

1,210,167.

W. HEYER.
NAPKIN FOLDING MACHINE.
APPLICATION FILED AUG. 6, 1915.

Patented Dec. 26, 1916.
5 SHEETS—SHEET 1.

Fig. 1—

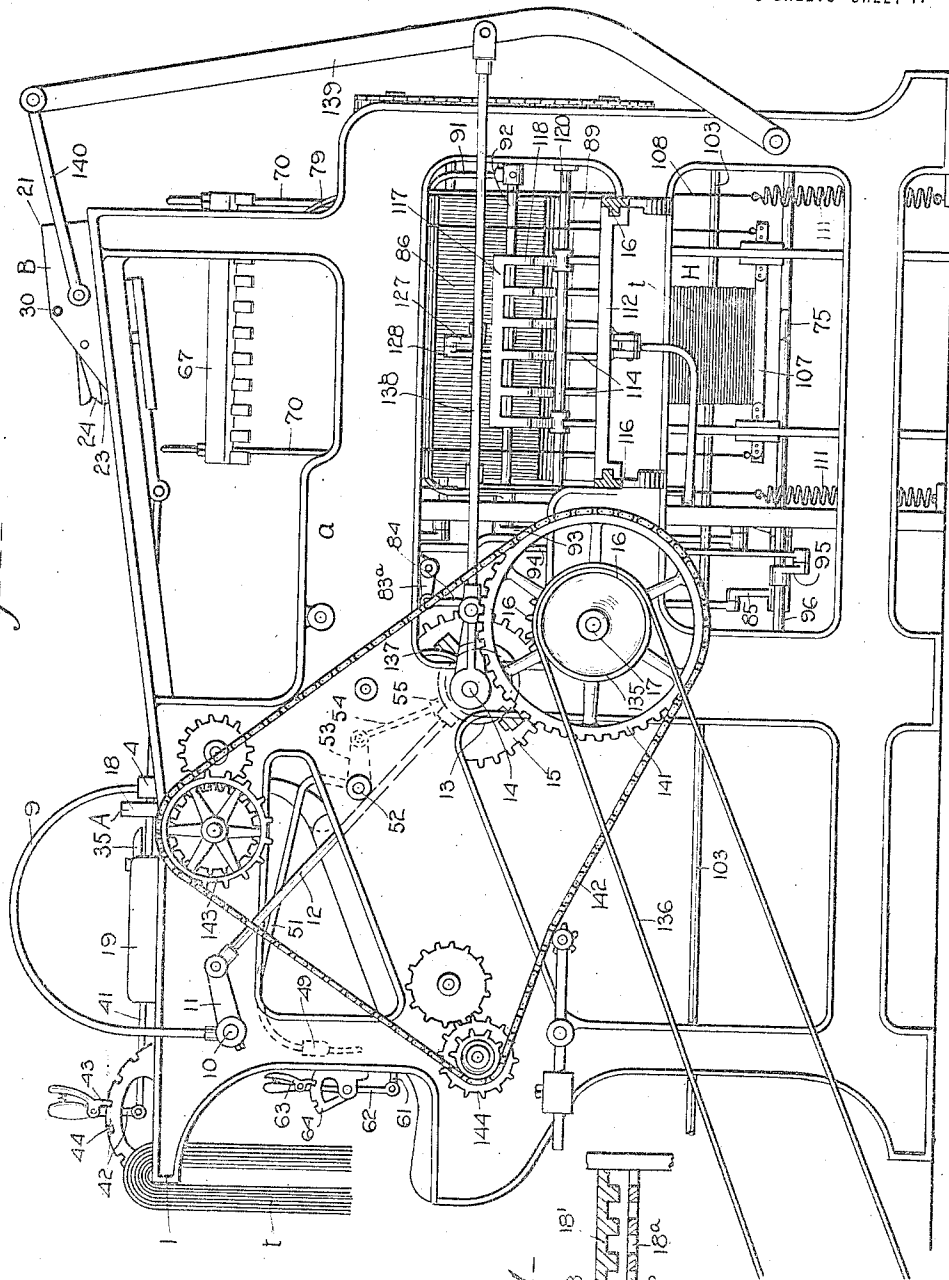
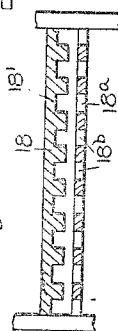


Fig. 11—



WITNESSES
Frank C. Palmer
S. Broadway

INVENTOR
William Heyer
BY *Mundco*
ATTORNEYS

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5 SHEETS—SHEET 2.

Fig. 2 is a detailed cross-sectional view of a mechanical device, likely a typewriter or adding machine. The diagram shows a complex arrangement of gears, levers, and structural components. Key parts are labeled with numbers: 140 (top frame), 22 (left side rail), 142 (left side rail), 138 (left side rail), 135 (left side rail), 116 (left side rail), 136 (left side rail), 139 (left side rail), 107 H (bottom left component), 113 (bottom left component), 115 (bottom left component), 112 (bottom left component), 117 (bottom left component), 122 (bottom left component), 127 (bottom left component), 121 (bottom left component), 123 (bottom left component), 124 (bottom left component), 125 (bottom left component), 129 (bottom left component), 128 (bottom left component), 118 (bottom left component), 126 (bottom left component), 119 (bottom left component), 147 (bottom left component), 148 (bottom left component), 149 (bottom left component), 129 (bottom left component), 94 (bottom left component), 103 (bottom left component), 74 (bottom left component), 75 (bottom left component), 72 (bottom right component), 71 (bottom right component), 137 (bottom right component), 138 (bottom right component), 16 (bottom right component), 17 (bottom right component), 86 (bottom right component), 139 (bottom right component), 73 (bottom right component), 99 (bottom right component), 93 (bottom right component), 92 (bottom right component), 50 (bottom right component), 91 (bottom right component), 88 (bottom right component), 73 (bottom right component), 67 (bottom right component), 70 (bottom right component), 15 (bottom right component), 140 (bottom right component), 66 (bottom right component), 79 (bottom right component), 57 (bottom right component), 4 (bottom right component), 22 (bottom right component), 140 (bottom right component).

WITNESSES

Frank C. Palmer, 23
Broadway

INVENTOR
William Heyer.
BY *Mum & Co*
ATTORNEYS

W. HEYER.
NAPKIN FOLDING MACHINE.
APPLICATION FILED AUG. 6, 1915.

5 SHEETS—SHEET 3.



A. Buckway

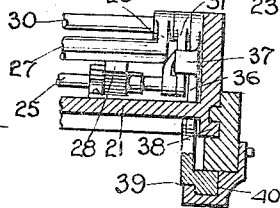
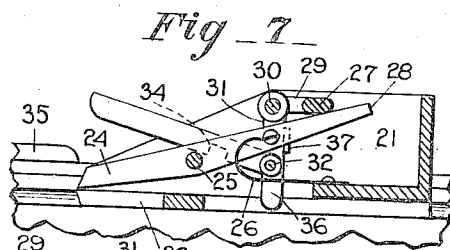
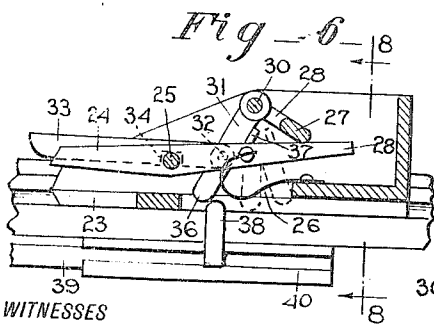
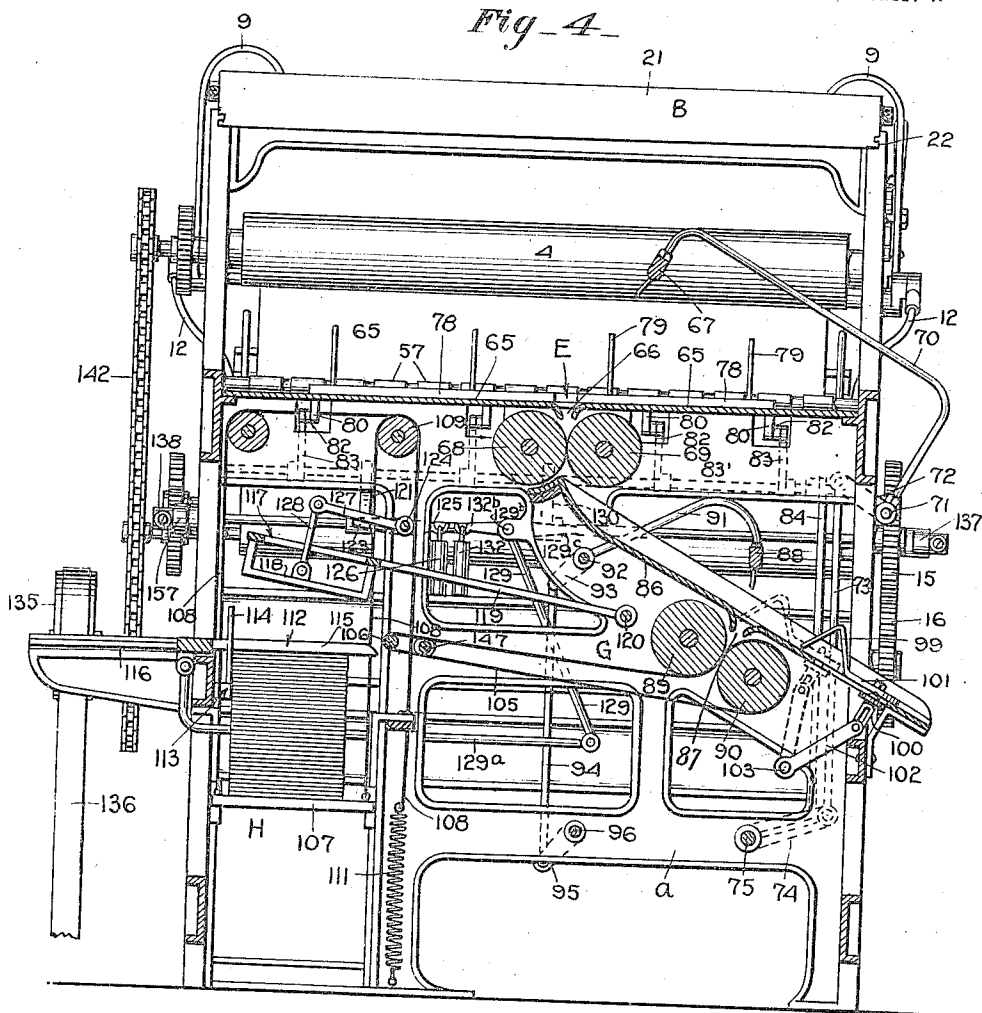
INVENTOR
William Meyer
BY *Mundt*
ATTORNEYS

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W. HEYER.
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Patented Dec. 26, 1916.

5 SHEETS—SHEET 4.



WITNESSES
Frank C. Palmer.
C. Bradley

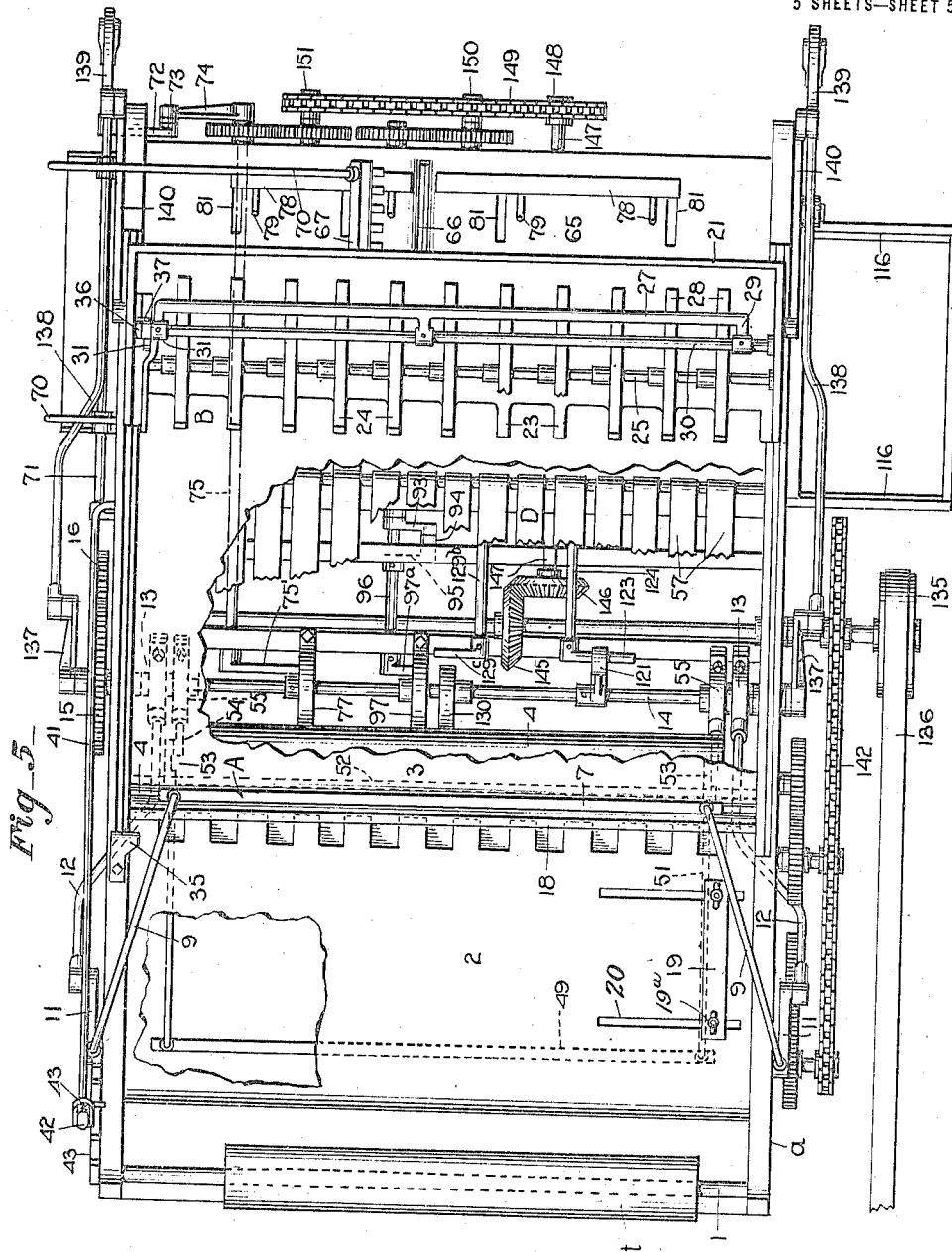
INVENTOR
William Hoyer
BY *Mund Co*
ATTORNEYS

1,210,167.

W. HEYER.
NAPKIN FOLDING MACHINE.
APPLICATION FILED AUG. 6, 1915.

Patented Dec. 26, 1916.

5 SHEETS—SHEET 5.



WITNESSES
Frank C. Palmer.
Chas. A. Bradley.

INVENTOR
William Hoyer
BY *Mumford*
ATTORNEYS

UNITED STATES PATENT OFFICE.

WILLIAM HEYER, OF NEW YORK, N. Y.

NAPKIN-FOLDING MACHINE.

1,210,167.

Specification of Letters Patent. Patented Dec. 26, 1916.

Application filed August 6, 1915. Serial No. 43,984.

To all whom it may concern:

Be it known that I, WILLIAM HEYER, a citizen of the United States, and a resident of the city of New York, borough of Manhattan, in the county and State of New York, have invented a new and Improved Napkin-Folding Machine, of which the following is a full, clear, and exact description.

This invention relates to laundry machinery and has to deal more particularly with a machine for folding napkins, towels and the like.

The general objects of the present invention are to improve and simplify the construction and operation of machines of the character referred to so as to be reliable and efficient in use and of such design as to fold articles with one or more longitudinal and transverse folds in successive steps by a continuous operation, it being merely necessary for an operator to place the articles one at a time in the machine.

A more specific object of the invention is the provision of a folding device of novel form which embodies a table having a slot or mouth on which the article to be folded is placed, there being under the table a pair of folding rolls, and above the table a doubling bar having fingers which double and feed the article through the opening in the table to the folding rolls, which complete the folding operation.

A further object of the invention is the provision of a plurality of such folding devices with means whereby the second folding device may be rendered inoperative, as when one of the folding steps is to be dispensed with.

An additional object is the employment of a feeding device in connection with the preliminary folding device whereby the feeder is adaptable for towels, napkins and the like of different sizes, the feeding device being a reciprocatory element having jaws which on the forward stroke of the device grip the article which is supplied by the operator and then carry it backwardly over the table to such a position that the center of the article be over the opening of the table so as to be doubled and fed through the same to the folding rolls. When such point is reached the jaws of the feeding device will be automatically opened to release the article so that it can be folded.

Still another object of the invention is the provision of a novel piling mechanism into

which the folded articles are successively fed to form a pile.

With such objects in view, and others which will appear as the description proceeds, the invention comprises various novel features of construction and arrangement of parts which will be set forth with particularity in the following description and claims appended hereto.

In the accompanying drawings, which illustrate one embodiment of the invention and wherein similar characters of reference indicate corresponding parts in all the views, Figure 1 is a side view of the machine; Fig. 2 is a rear view; Fig. 3 is a longitudinal section of the machine; Fig. 4 is a transverse section of the machine taken through the rear portion thereof to show the transverse or final folding devices; Fig. 5 is a plan view of the machine with portions broken away; Figs. 6 and 7 are detail views of the article-gripping means of the feeder; Fig. 8 is a detail sectional view on the line 8—8, Fig. 6; Fig. 9 is a perspective view of the operating means for the gripping means shown in Figs. 6 and 7; Fig. 10 is a diagrammatic perspective view of the follower or platform of the pile-forming mechanism; and Fig. 11 is a detail sectional view of the first gage and adjacent parts.

Referring to the drawing, *a* designates the frame of the machine, which may be of any desired construction. At the top and front of the machine is the preliminary folding device A to which articles are successively fed by a feeder B, and under the folding device A is a second folding device C that receives an article after the first fold has been made therein which may be longitudinal of the article, and in turn produces a second fold parallel to the first, the twice folded article being transferred by an endless conveyor mechanism D to a third folding device E, which produces the first transverse fold and then delivers the article to the fourth folding device F that completes the folding operation, the folding devices E and F being located at the rear part of the machine, and associated with the final folding device F is a conveying device G which delivers the folded articles to a pile-forming mechanism H.

At the upper front part of the machine is a horizontal bar 1 on which the operator supports the towels *t* that are to be folded, and from this holder the towels are taken

one at a time and placed in the machine. This holder is adjacent to the preliminary folding device A, which latter comprises a table made in two sections 2 and 3 in the form of approximately horizontal plates that are separated by a slot or opening 4 through which the article is forced in a doubled or folded state, and under the table and at opposite sides of the opening are folding rolls 5 and 6 which receive the article and evenly fold the same. The article is forced through the opening 4 and into gripping relation with the rolls 5 and 6 by a finger bar 7 which has vertical fingers 8. The bar is supported on its ends on arched members 9 that are rigidly connected with a horizontal shaft 10 extending transversely of the machine and supported by the frame thereof, this shaft being rocked by a crank 11 connected with a reciprocatory rod 12 which receives power from an eccentric 13. This eccentric is arranged on a shaft 14 which carries a gear 15 meshing with a gear 16 on the main shaft 17 of the machine. The finger bar 7 is adapted to swing about the rock shaft 10 as a center, and in doing so it feeds the articles successively through the opening 4 to the rolls 5 and 6.

Above the rear portion of the table section 2 is a gage 18 in the form of a bar extending transversely of the table so as to enable the operator to bring the edge of the article to be folded into proper position by contacting such edge with the gage so as to be gripped by the feeder B, and over the table, as shown in Fig. 5, is a lateral gage 19 adjustable by bolts 19^a in the slots 20 of the table. The operator in placing an article in the machine brings one of the side edges of the article into engagement with the gage 19 and the front edge of the article into engagement with the gage 18. The feeder B comprises a reciprocatory slide or bar 21 extending transversely of the machine at the top and its ends are engaged in guideways 22, whereby the slide moves from the rear of the machine to the gage 18 and back again. This slide is provided with a plurality of spaced fixed jaws 23 disposed under coacting movable jaws 24, which latter are fulcrumed on a horizontal shaft 25 carried by the slide 21 of the feeder. Each movable jaw is provided with a closing spring 26, as shown clearly in Figs. 7 and 9. The jaws are adapted to be opened by a depressing bar 27 which overlies the rear members 28 of the movable jaws. This bar 27 is connected by arms 29 with a rock shaft 30 mounted in the slide 21, and on this shaft is rigidly fastened a crank arm 31 that has pivotally connected at 32 a trigger or catch member 33. This member 33 extends forwardly from the arm 31 and has at its bottom edge a recess 34 that is adapted to engage the fulcrum bar 25 so as to hold the

movable jaws 24 in open position with the bar 27 depressed as clearly shown in Fig. 9. The jaws are in open position as the feeder B moves forwardly, and at the end of the forward movement the front end of the trigger member strikes an abutment 35, whereby the trigger member is thrown upwardly to disengage the recess 34 from the pivot bar 25, whereupon the depresser bar 27 is raised under the expansion of the closing springs 26 of the jaws. The resetting or cocking of the jaw-opening means is provided by a depending arm 36 loosely pivoted on the shaft 30, such arm 36 having a lug 37 that lies behind the arm 31, as shown in Figs. 6, 7 and 9. The lower end of the resetting arm 36 lies in the path of an abutment or trip 38, so that when the feeder B nears the end of its rearward movement, the arm 36 engages the abutment and is arrested thereby, so that the lug 37 will swing the arm 31 and cause the depresser bar 27 to be moved downwardly for opening the jaws, and at the same time the catch member moves forwardly so that its recess 34 will engage with the pivot bar 25, whereby the jaws will be held in open position. The article to be folded is thereby released in proper position with respect to the folding device A. As the feeding device B continues its rearward movement the member 36 will wipe over the abutment 38. On the next forward stroke the member 36 will drag over the abutment without performing any action.

In order to adapt the feeder B for napkins and other articles of different sizes, the point of opening the jaws with respect to the stroke of the feeder B can be varied, this being accomplished by adjusting the position of the stop 38. This stop is mounted on a slide 39 slidable in a guideway 40 in the frame of the machine, and this slide is connected by a rod 41 with an adjusting lever 42 which has a latch 43 engageable at any point with a toothed sector 44, as clearly shown in Fig. 3. The second folding device C comprises an inclined table 45 which is divided into two sections with an opening 46 between them, and under this opening are coacting folding rolls 47 and 48. A finger bar 49 having fingers 50 operates to deliver the article to the folding rolls 47 and 48 in the same manner as the finger bar of the first folding device. This finger bar 49 is carried by arms 51 fastened on a rod 52, and connected with this rod 52 is an arm 53 which is oscillated by a rod 54 that receives motion from an eccentric 55 on the shaft 14. A gage 56 is bolted to the bottom of the table 45 so as to stop the folded article in proper relation to the opening 46.

The doubly-folded article is transferred from the feeding device C to the folding device E at the rear of the machine by the

conveying device D, which comprises a plurality of endless belts 57 which pass around the roll 47 and under the roll 48, the other end of the belt passing around a guide bar 58. At intermediate points are additional guide bars 59. It is the top flight of these belts which are operative in carrying the twice-folded article. It may be desirable to longitudinally fold an article only once. For this purpose a switch I is arranged at the top or receiving portion of the table 45 and directly under the rolls 5 and 6, as shown in Fig. 3. This switch is an extension of the table 45 and is pivoted at 60 so as to swing from the full to the dotted-line position, this adjustment being effected by a rod 61 which is connected with the switch I and with a lever 62 that has a latch 63 engageable with the stationary toothed sector 64. When the switch is in the full-line position the articles will be delivered to the second folding device C, but when it is in the dotted line position the folded articles will be switched directly from the first folding device to the conveyer D, whereby the articles will be delivered to the folding device E, to be thereby folded transversely.

As shown in Fig. 4, the folding device E comprises a transversely extending table 65 divided into two sections separated by a slot or opening 66 through which a finger bar 67 forces the article between the folding rolls 68 and 69, and the finger bar 67 is carried by arms 70 fastened to a rock shaft 71 that is rocked by an arm 72 that is connected by a rod 73 with an arm 74. This arm 74 is mounted on a rock shaft 75 that has an arm 75' connected by a rod 76 with an eccentric 77 on the shaft 14. A gage device is used in connection with the table 65 so as to properly position the article with respect to the opening 66 of the folding device E. This gage is made in two parts operating respectively at opposite sides of the opening 66, each part consisting of a bar 78, Figs. 3 and 4, and on the bar are upwardly extending fingers 79. The folded article is discharged forcibly by the conveyer D to the rear and strikes the fingers 79, but the articles are not liable to come to rest on the table 65 in all the same position. Therefore, each gage bar 78 is moved forwardly to bring the article into proper position. For this purpose each gage bar 78 has depending lugs 80 which pass through slots 81 in the table 65, and these lugs are connected with operating rods 82 that are in turn connected with arms 83 on the shaft 83' which has an arm 83^a, Fig. 3, that is oscillated by a rod 84 connected with the arm 85 on the rock shaft 75. The final folding device F comprises an inclined table 86 made in two sections so as to provide an opening or slot 87 through which the finger bar 88 delivers the article to the folding rolls 89 and 90.

The finger bar is carried by swinging arms 91 fastened to a shaft 92 which has a lever 93 connected by a rod 94 with an arm 95 on a shaft 96 that receives motion from an eccentric 97 from the shaft 14 through the rod 97' and arm 97^a on the shaft 96.

It may be desirable to transversely fold the article only once. To do this the gage 99 arranged at the bottom of the table 86 is adjustable from the full to the dotted line position, Fig. 4, so that the folded article after leaving the folding device E will slide down the table 86 and stop directly at the opening 87. The finger bar 88 will then descend and deliver the folded article to the rolls 89 and 90 without another fold being imparted to the article. This gage 99 is slidably mounted on the table 86 and has members 100 extending through slots 101 in the table. These members are connected with oscillatory arms 102 on a shaft 103, such shaft being rocked by a mechanism 104 controlled by the operator.

The conveyer G comprises, as shown in Fig. 4, endless belts 105 which pass around the roll 90, and under the roll 89, and the forward ends of the endless belts 105 pass around a guide 106 arranged adjacent the piling device H. The piling device H consists of a vertically movable horizontally disposed follower or platform 107 suspended by four cords 108 connected with the corners of the platform, these cords being windable around a shaft 109 suitably mounted in the machine. The shaft 109 is adapted to be turned by winding cords 108 which are connected with springs 111, such springs exerting a pull in a direction to cause the cords 108 to wind and thereby hold the platform or follower 107 raised, but as the pile of folded articles is increased on the follower, the latter moves lower and lower step by step. A horizontal grid 112 is disposed at the discharge end of the conveyer G, and upon this grid is the folded article deposited. A stop 113 is arranged at the forward side of the piling device so as to arrest the folded articles delivered by the conveyer G, whereby a pile will be evenly formed. This stop comprises vertically extending members 114 which pass between bars 115 of the grid 112, the grid being slidable in horizontal guideways 116 so that the grid can be moved forwardly from the pile to permit the last article to be depressed to position below the level of the grid, whereby the latter can move rearwardly to the position shown in Fig. 4 for holding the pile depressed. Coöperating with the grid is a downwardly acting pressing element 117 composed of spaced bars 118 which enter between the members 115 of the grid so as to force the pile of folded articles downwardly, so that the grid 112 can be withdrawn and then returned to en-

gage the top of the pile. This presser element 117 is carried by a lever 119 fulcrumed at 120, and is actuated by a mechanism consisting of a cam 121 on the shaft 14, which
 5 cam strikes an arm 123 fastened to a short shaft 124 which has an arm 125 carrying a weight 126 that lifts the device 117, and which also has an arm 127 that is connected by a link 128 with the device 117. The grid
 10 112 is operated by a swinging arm 129 connected by a rod 129^a with the grid, the arm 129 being mounted rigidly on a shaft 129^b, Fig. 4, that has a short crank arm 129^c which is actuated by a wiping cam 130 on the
 15 shaft 14. A counterbalanced weight 132 carried by an arm 132^b on the shaft 129^b serves to move the grid rearwardly from its forward position.

The main shaft 17 may be driven in any
 20 suitable manner, but in the present instance it is provided with a pulley 135 which is driven by a belt 136. As previously explained, the main shaft drives the shaft 14 which has crank arms 137 connected by rods
 25 138 with long vertically disposed levers 139 at the rear of the machine, which levers are connected by links 140 with the article feeder B. Also on the main shaft 17 is a large sprocket wheel 141 which drives a
 30 chain 142. This chain meshes with sprocket wheels 143 and 144 connected with the rolls 5 and 47 of the first and second folding devices A and C, whereby such rolls are rotated. These rolls are geared to their companion
 35 rolls to impart rotation thereto. On the shaft 17 is a bevel gear 145 which meshes with a bevel gear 146 on a longitudinal horizontally extending shaft 147 that has on its rear end a sprocket wheel 148 which drives
 40 a sprocket chain 149, such chain meshing with sprocket wheels 150 and 151 connected with the rolls 68 and 89 of the folding devices E and F, such rolls being geared to their companion rolls to cause simultaneous
 45 rotation.

As shown in Fig. 11, the gage bar 18 has its bottom edge provided with recesses 18^c so that the gripping jaws of the feeder B
 50 can pass thereunder and grip the rear edge of the article which the operator places in the machine to be folded. Under this gage bar 18 is a plate 18^a which has recesses 18^b registering with the recesses in the gage
 55 bar 18, so as to accommodate the gripping jaws of the feeder B and enable them to grip the article to be folded.

From the foregoing description taken in connection with the accompanying drawings the advantages of the construction and
 60 method of operation will be readily understood by those skilled in the art to which the invention appertains, and while I have described the principle of operation, together with the apparatus which I now
 65 consider to be the best embodiment thereof,

I desire to have it understood that the apparatus shown is merely illustrative and that such changes may be made when desired as fall within the scope of the appended
 70 claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. In a folding machine, the combination of a device for producing a fold in an article, a chute down which the article slides
 75 by gravity, a device for producing a second fold in the article after moving down the chute, an endless conveyer having one end disposed adjacent the second device for receiving the folded article, whereby the latter
 80 travels by the upper flight of the conveyer, and means between the first device and chute for shunting the article to an intermediate portion of the upper flight of the endless
 85 conveyer when the second folding device is not required.

2. In a folding machine, the combination of a device for producing a fold in an article, a chute down which the article slides
 90 by gravity, a device for producing a second fold in the article after moving down the chute, an endless conveyer having one end disposed adjacent the second device for receiving the folded article, whereby the latter
 95 travels by the upper flight of the conveyer, means between the first device and chute for shunting the article to an intermediate portion of the upper flight of the endless conveyer when the second folding device is not
 100 required, a third folding device for producing a fold in the article transverse to the first fold, a fourth folding device for folding the article with a fold parallel to the fold made by the third device, and means for rendering
 105 the fourth folding device inoperative when a second transverse fold is not required.

3. A folding machine comprising a frame, a table thereon and having a slot through
 110 which is drawn an article to be folded, a feeder movable over the rear portion of the table toward and from the slot, a gage in front of the slot for gaging the positioning on the front part of the table of the article
 115 to be folded, said feeder including jaws adapted to automatically open and close to grip and release the article, a stop device for determining the time of opening of the jaws to release the article when over the
 120 slot, means at the front of the table for adjusting the position of the said stop, and a holder adjacent the said means for holding the articles to be folded and from which the operator places the articles successively on
 125 the table against said gage.

4. A folding machine including a table, a device associated therewith for producing
 130 a fold in an article, an inclined chute down which the folded article is adapted to pass

by gravity, a second folding device arranged to receive the article from the chute to produce another fold, an endless conveyer for conveying away the article from the second folding device, and a switch at the upper end of the chute for directing the article directly from the first device to the conveyer, said switch being located over an intermediate portion of the endless conveyer, whereby the switch discharges the article on the upper flight of the latter.

5. A folding machine including a folding device, a chute for receiving articles therefrom, an endless conveyer, a pivoted switch at the top of the chute for permitting articles to pass to the chute when the switch is in one position and permitting the articles to pass directly to the conveyer without entering the chute when the switch is in its other position, a second folding device adjacent the bottom of the chute and comprising a pair of rolls, one of which forms the support for one end of the endless conveyer and the upper flight of the endless conveyer passing between the rolls.

6. A folding machine including a folding device, a second folding device, an endless conveyer for receiving articles from the second folding device, and a switch for discharging articles directly from the first folding device to the conveyer without the articles passing through the second folding device, said endless conveyer being disposed under both devices and having an intermediate portion under the first-mentioned device, and a switch whereby an article shunted by the second folding device will lodge on the upper flight of the endless conveyer.

7. A folding machine including a folding device, a second folding device, an endless conveyer for receiving articles from the second folding device, an inclined chute extending from the first device to the second and disposed over a portion of the conveyer, and a switch between the upper end of the chute and the first device and adapted when in one position to direct the articles from the first device to the chute, and when in another position to direct the articles from the first device to the conveyer.

8. A folding machine including a folding device, a second folding device, an endless conveyer for receiving articles from the second folding device, an inclined chute extending from the first device to the second and

disposed over a portion of the conveyer, a switch between the upper end of the chute and the first device and adapted when in one position to direct the articles from the first device to the chute, and when in another position to direct the articles from the first device to the conveyer, and a regulator at the front of the machine and connected with the switch for adjusting and holding the same in either of its operative positions.

9. A machine of the class described comprising a pair of folding devices for producing successively parallel folds in an article, a conveyer for conveying away the folded article from the second device, a switch for directing the article from the first device to the second or to the conveyer, a pair of folding devices for producing transverse folds in the longitudinally folded article, a gage for determining the position of the article in the second of the last mentioned folding devices, and means for adjusting the gage to cause the article to pass through the second of the last mentioned folding devices without receiving a fold.

10. A machine of the class described comprising a pair of folding devices, one disposed under the other, whereby the article moves by gravity from the first to the second device, a second pair of folding devices arranged one above the other whereby the folded article will move by gravity from the first to the second, and an endless conveyer for transferring the article from the first pair of devices to the second pair.

11. A machine of the class described comprising a pair of folding devices, one disposed under the other, whereby the article moves by gravity from the first to the second device, a second pair of folding devices arranged one above the other, whereby the folded article will move by gravity from the first to the second, an endless conveyer for transferring the article from the first pair of devices to the second pair, a pile-forming device, and means between the second pair of folding devices and the pile-forming device for conveying the folded articles to the latter.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM HEYER.

Witnesses:

GEO. W. ELKINS,
FRANK C. PALMER.