I. H. DEXTER.

FOLDING MACHINE.

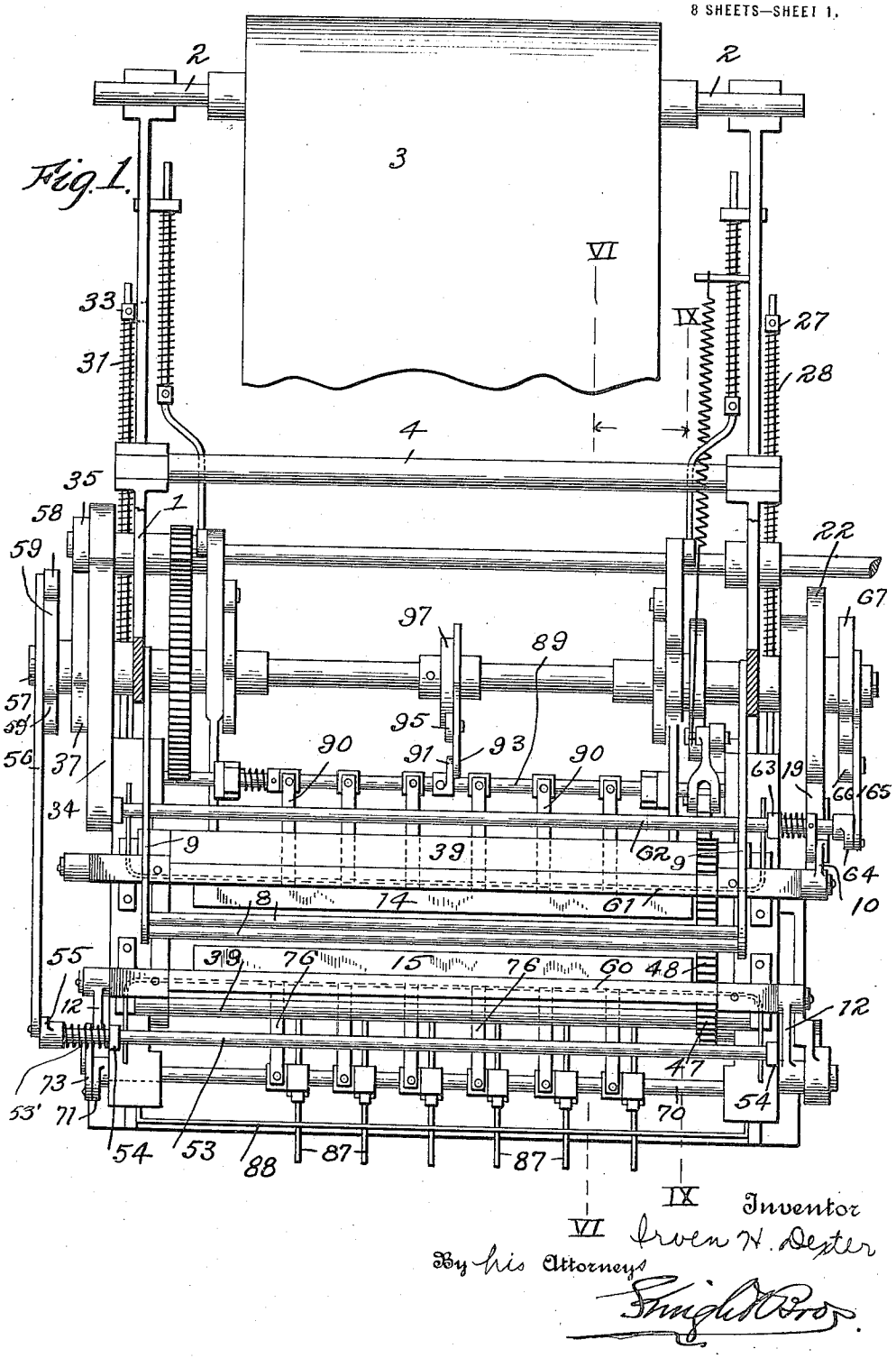
APPLICATION FILED MAY 4, 1917.

1,283,108.

Patented Oct. 29, 1918.

8 SHEETS—SHEET 1.

Fig. 1.



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8 SHEETS—SHEET 2.

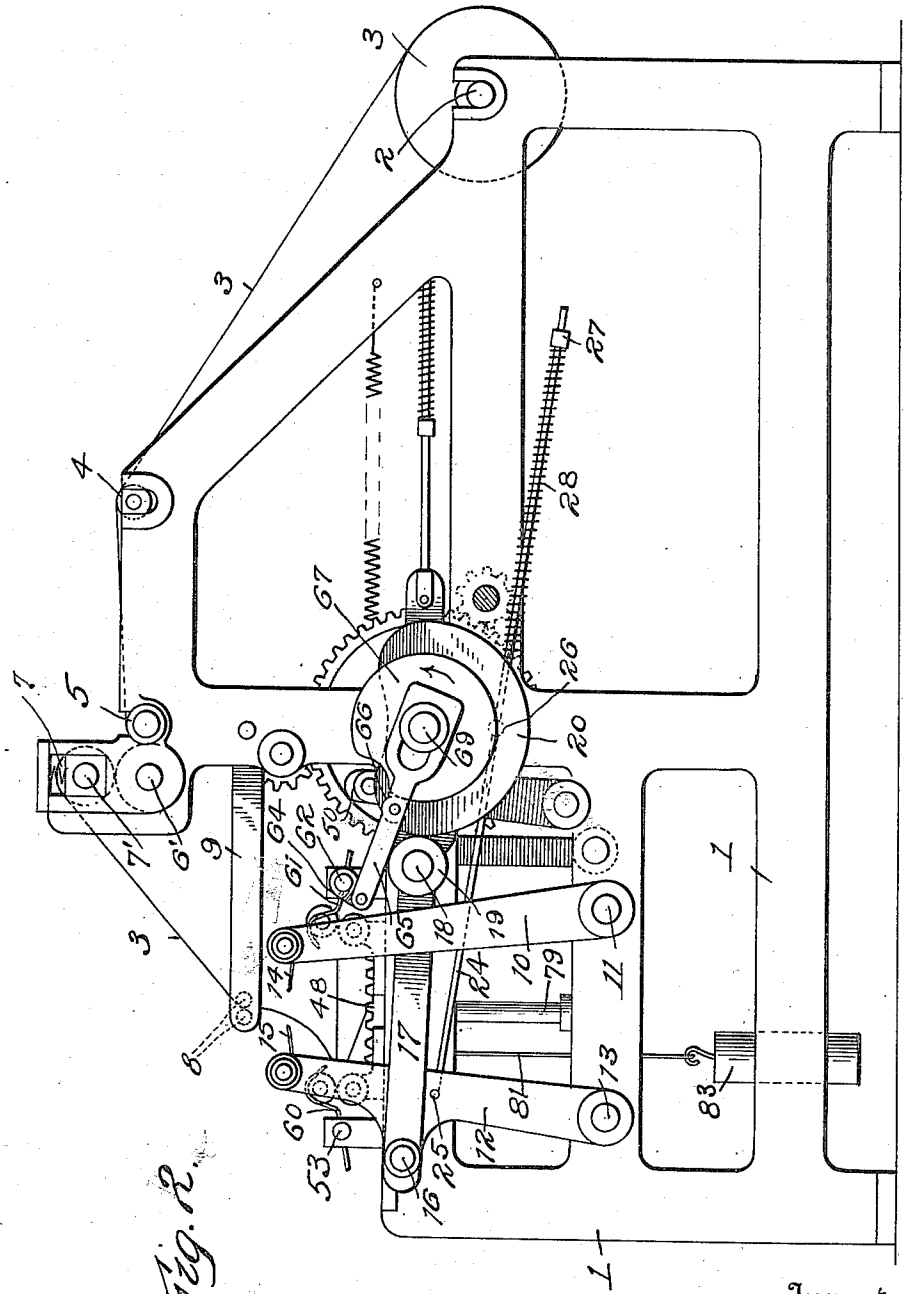


Fig. 2.

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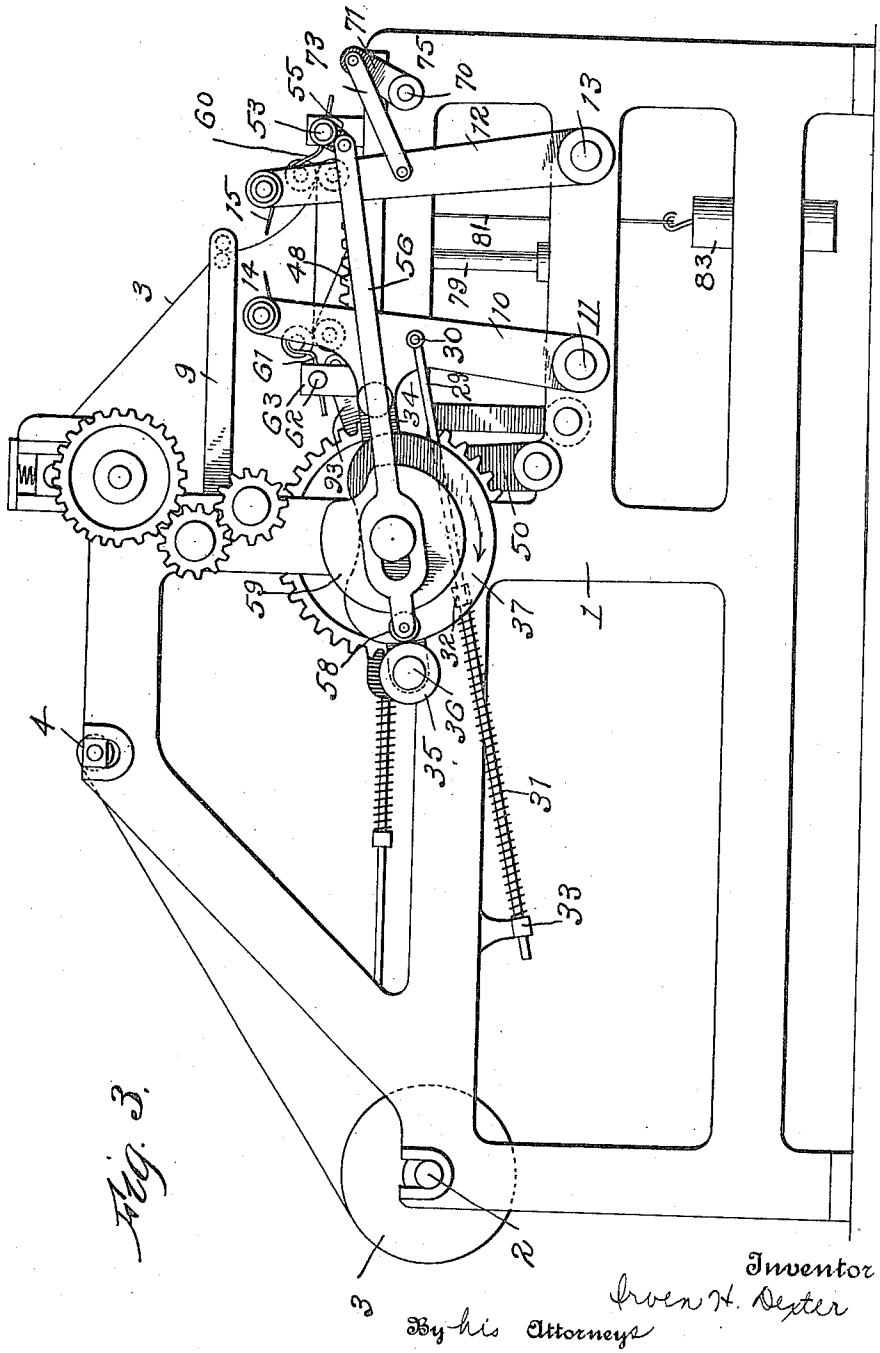


Fig. 3.

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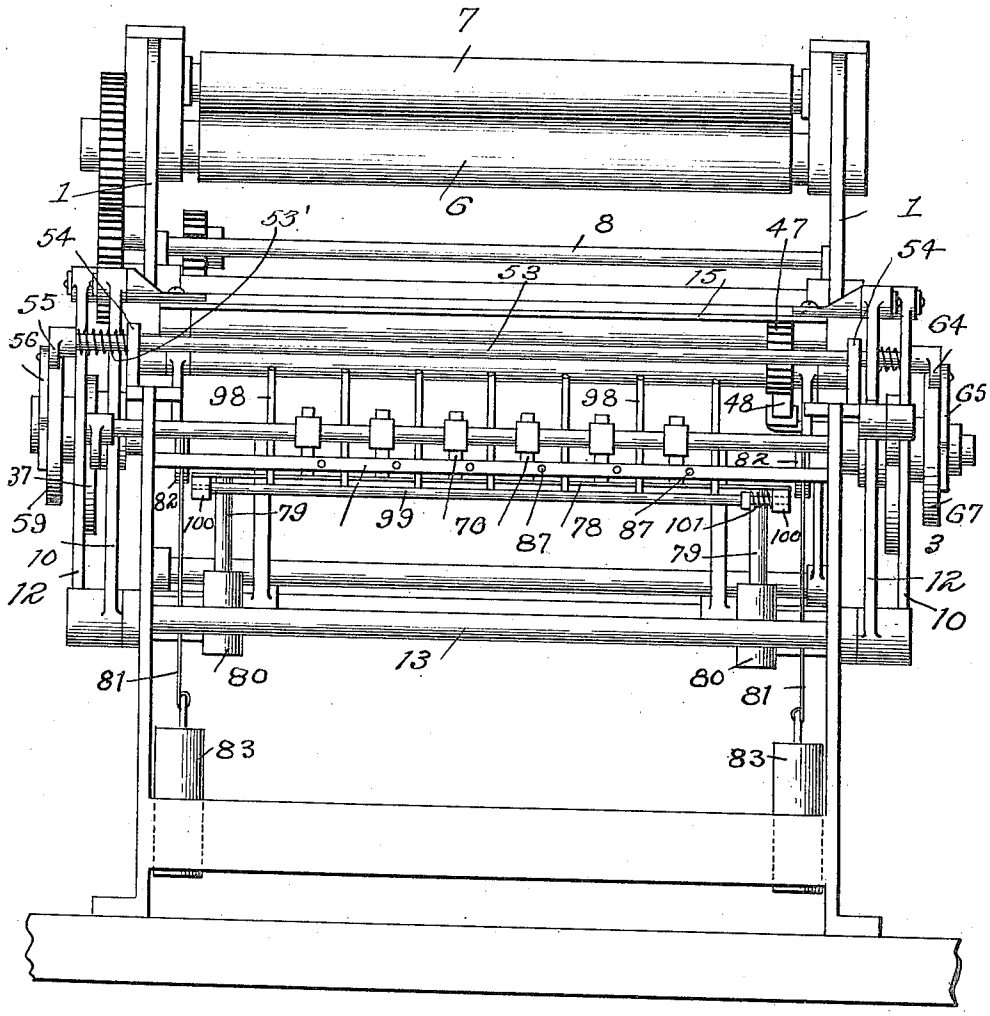
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8 SHEETS—SHEET 4.

Fig. 4.



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8 SHEETS—SHEET 5.

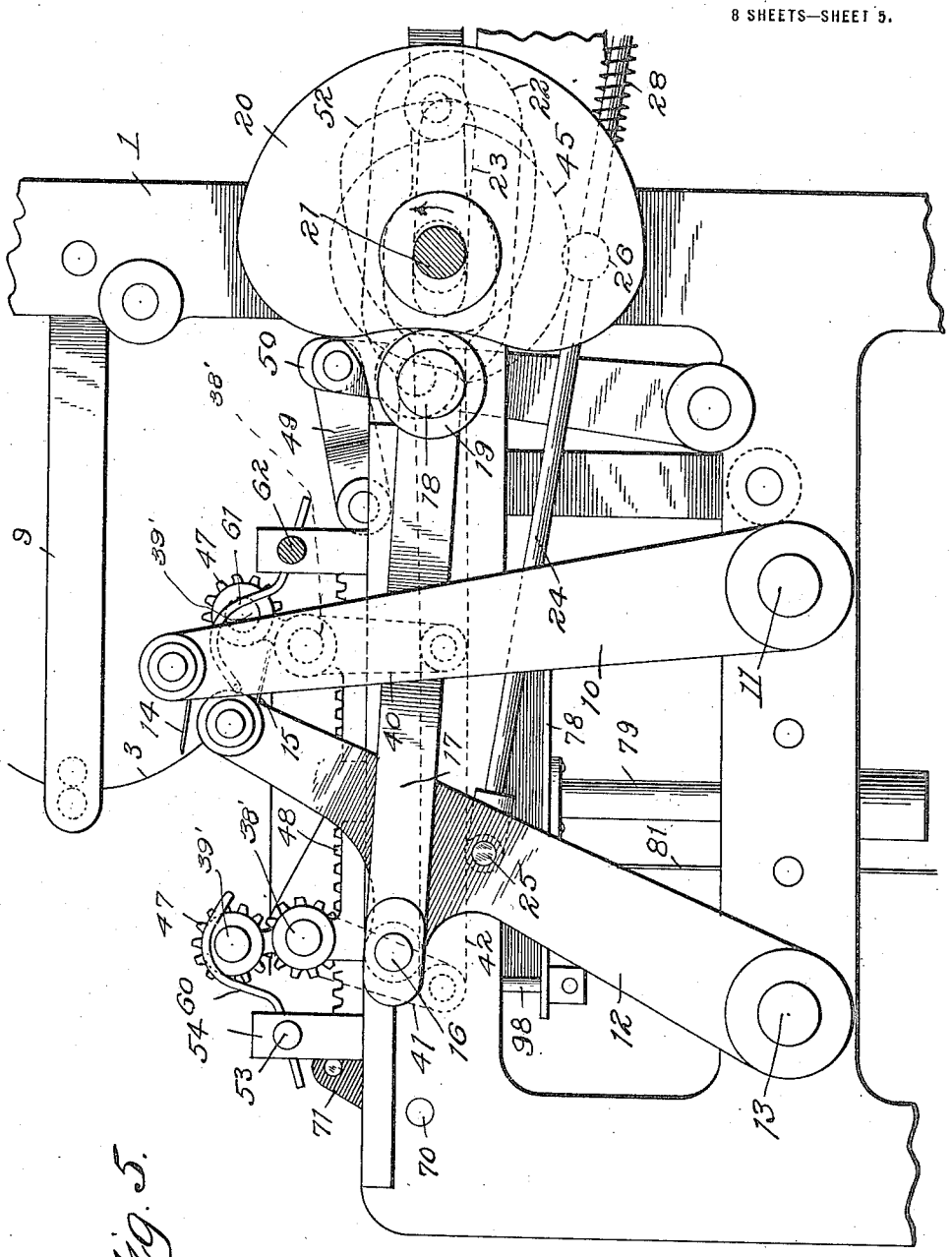


Fig. 5.

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8 SHEETS—SHEET 6.

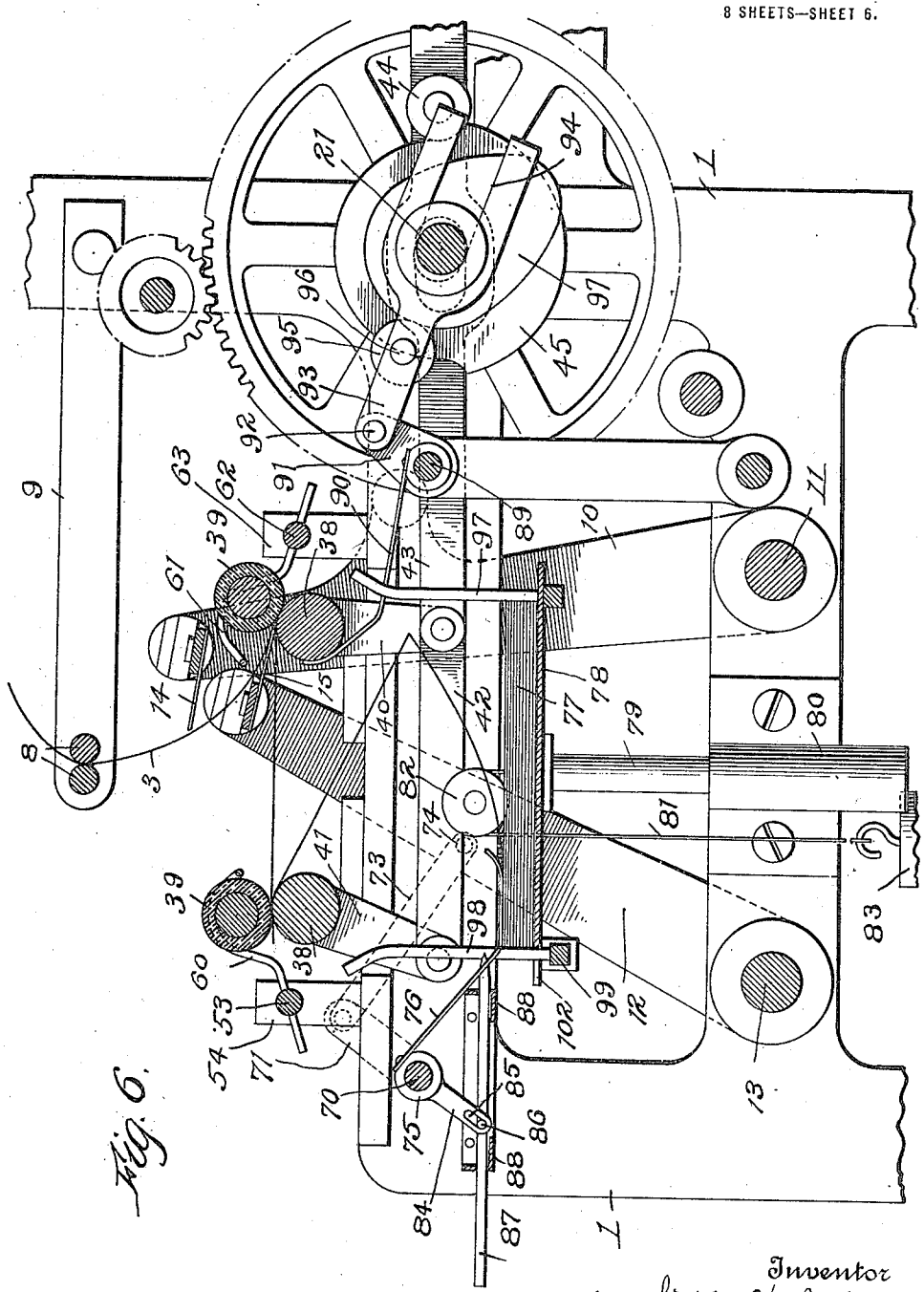


Fig. 6.

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8 SHEETS—SHEET 7.

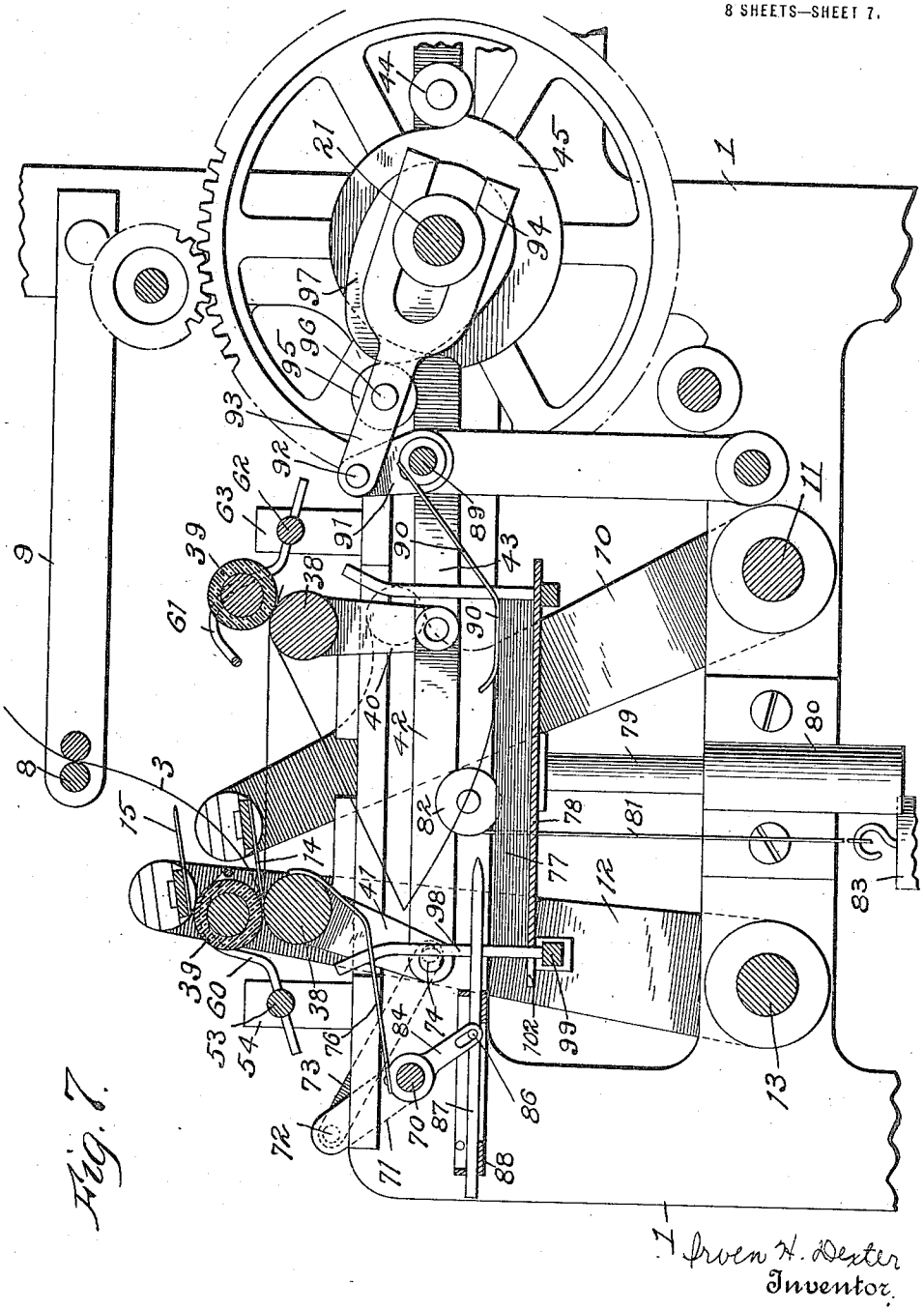


Fig. 7.

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8 SHEETS—SHEET 8.

Fig. 8.

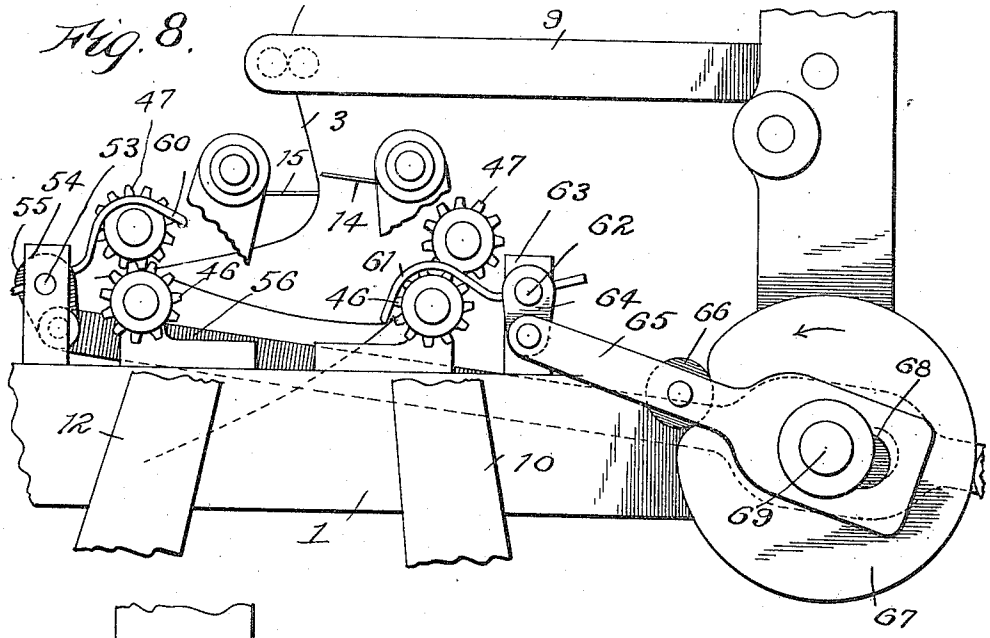
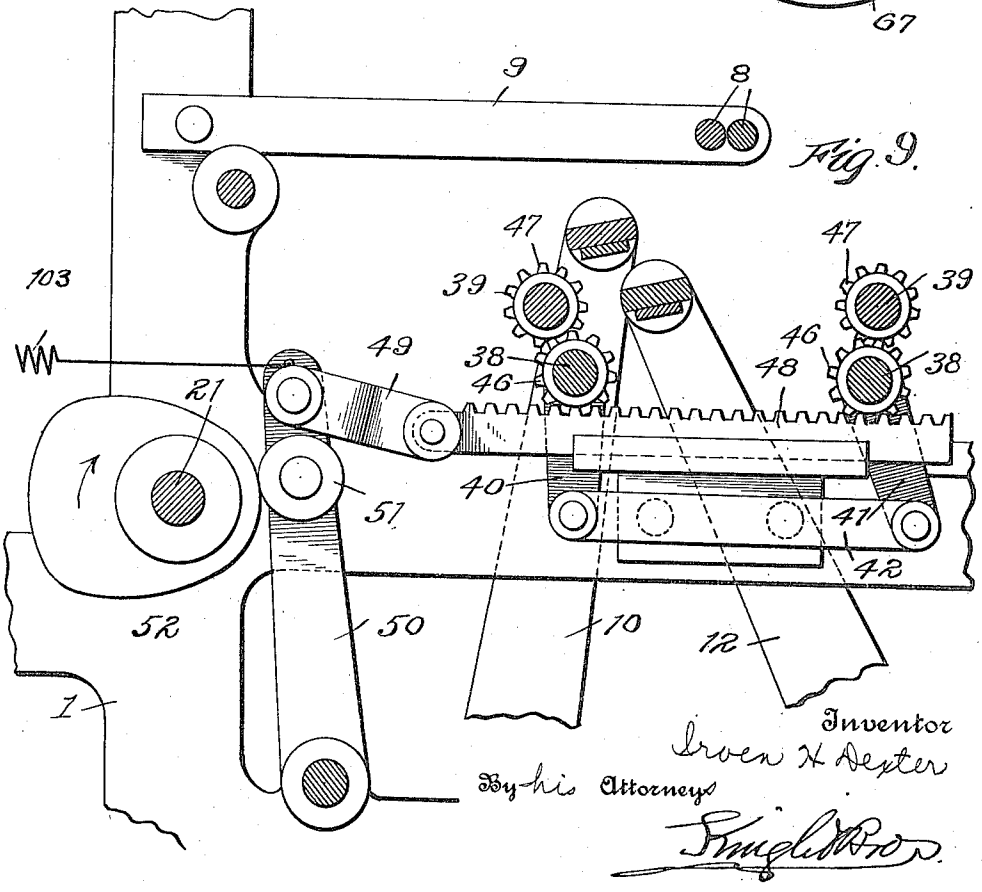


Fig. 9.



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FOLDING-MACHINE.

1,283,108. Specification of Letters Patent. Patented Oct. 29, 1918.

Application filed May 4, 1917. Serial No. 166,364.

To all whom it may concern:

Be it known that I, IRVEN H. DEXTER, a citizen of the United States, and residing at Pearl River, in the county of Rockland and State of New York, have invented certain new and useful Improvements in Folding-Machines, of which the following is a full and clear specification.

This invention relates more especially to machines for forming consecutive folds or creases in a continuous web which is fed thereto for that purpose. Primarily, my invention has for its object to provide improved means for folding said web first in one direction and then in the other and thus producing an accordion fold in which the successively folded portions of the web are superimposed one after the other. The resulting stack is pressed down on to a suitable table which may be adjusted in height to accommodate the folded web and which is preferably provided with stacking gages along opposite edges to retain the folded edges in alinement. The stacking gages along one edge of the table are movable to permit the folded web to be readily removed whenever necessary. Various specific objects of my invention will appear in the specification and be pointed out in the appended claims, reference being had to the accompanying drawings, in which,—

Figure 1 is a top plan view of a preferred embodiment of my invention;

Fig. 2 is a side elevation of the same taken from the right of Fig. 1;

Fig. 3 is a side elevation of the same taken from the opposite side;

Fig. 4 is a front elevation of the same;

Fig. 5 is a side elevation on an enlarged scale corresponding to Fig. 2, parts being broken away, parts shown in section, and some of the operating parts being shown in different positions;

Fig. 6 is a section on the line VI—VI, Fig. 1, parts being broken away;

Fig. 7 is a section similar to Fig. 6 with the parts shown in changed positions;

Fig. 8 is a side elevation on an enlarged scale similar to Fig. 2, parts being broken away;

Fig. 9 is a section on an enlarged scale taken on the line IX—IX of Fig. 1.

Referring more particularly to the drawings, the embodiment shown therein includes oppositely arranged side frames 1 in one end of which is journaled a shaft 2, which carries a web or roll 3 of paper or other material to be operated upon by the machine. As shown in Fig. 2, the web 3 passes successively over guide rollers 4 and 5, and thence between the guide roller 5 and a guide roller 6 mounted on a shaft 6′, around said guide roller 6 and between it and a guide roller 7 mounted on a shaft 7′. Thence the web 3 passes between the guide bars or rolls 8 mounted in the outer end of bars 9 which extend forwardly from the upper portions of the side frames 1. Referring now to Figs. 2 and 3, a pair of oppositely arranged lever arms 10 are journaled on a shaft 11 on the side frames 1. Another pair of lever arms 12 are journaled on a shaft 13 carried by said side frames. In the upper ends of the levers 10 is mounted a folding blade 14. In the upper ends of the levers 12 is mounted another folding blade 15. In the positions of these parts shown in Fig 2, the web 3 as it depends from between the guides 8, is disposed between the folding blades 14 and 15. One lever 12 carries a stud 16 upon which is pivotally mounted one end of a cam roller arm 17 provided with a pin 18 for journaling a cam roller 19 which runs on a cam 20 keyed to the cam shaft 21. Said cam shaft 21 rotates in the direction of the arrows shown in the several figures. The other end of the cam rod 17 is provided with an enlarged end 22 having a longitudinal slot 23 which permits the rod 17 to slide endwise over the cam shaft 21 while at the same time said cam rod is supported by said cam shaft (see Fig. 5). A spring rod 24 is pivotally connected at 25 with one of the levers 12 and slides in an eyebolt 26 between which and an abutment 27 on the spring rod 24, is arranged a compression spring 28. The action of this spring thus serves to hold the cam roller 19 against the cam 20. Likewise one of the lever arms 10 (see Fig. 3) has a spring rod 29 pivotally connected thereto at 30, said rod carrying a compression spring 31 interposed between a collar 32 fixed to the rod 29 and a fixed abutment 33 depending from the side frame 1. A cam rod 34 is pivotally connected to the lever arm 10 and carries a cam roller 35 journaled on stud 36. The cam roller 35 runs on a cam 37 keyed to the cam shaft 21. As shown best in Figs. 6 and 7, oppositely arranged pairs of folding rolls 38 and 39 are adapted to have suc-

cessive portions of the web 3 delivered thereto by the folding blades 14 and 15. In each pair of rollers, the upper roller 39 is made of rubber or other suitable yieldable material for a purpose to be hereinafter explained. Said rolls are provided with end journals 38′ and 39′ (see Fig. 5), by means of which they are journaled in bent levers 40 and 41. Said bent levers respectively swing on the axes of the rolls 38. A connecting rod 42 joins the depending arms of the levers 40 and 41, in order to periodically reciprocate said levers, said connecting rod being provided with an extension or cam rod 43 carrying a roller 44 adjacent its rear end which runs on a cam 45 keyed to the cam shaft 21. The rolls 38, 39 of each pair are geared together by means of gears 46 and 47, rotary motion being imparted to these gears by a reciprocatory rack 48 connected by a link 49 to the upper end of a lever arm 50. This arm 50 carries a cam roller 51 which by means of a spring 103 is made to follow a cam 52 keyed to the shaft 21. From this description it will be obvious that the folding rolls of each pair are rotated in one direction to draw the folded portion of the web or sheet thereinto and then the direction of rotation is reversed to force the folded portion out of the bite of said rolls. Suitable means for positively displacing the folded portion away from before these rolls is provided as follows. A rock shaft 53 (see Figs. 1 and 8) is journaled in suitable brackets 54, a crank arm 55 being keyed to said rock shaft. A cam bar 56 is connected at one end to the crank arm 53 and is slotted at its other end (as shown in dotted lines in Fig. 8) to pass over the stud 57, a cam roller 58 (see left hand portion of Fig. 1) being journaled on its rear end and thus adapting it to be periodically operated by a cam 59 which is similar to cam 67 shown in Fig. 8. Mounted in the rock shaft 53 is a flattened U-shaped rod 60, the legs of which are disposed sufficiently far apart to move in vertical planes outside the journaled ends of folding rolls 38 and 39 so that whenever the cam roller 58 drops into the depression in the cam 59, the rod 60 falls past the bite of the rolls 38 and 39, and by its engagement with the just folded portion of the web or sheet, pulls it away from the folding rolls. Similarly for the other pair of rolls, a tappet rod 61 is mounted in the rock shaft 62 journaled in brackets 63, said rock shaft carrying a crank arm 64 to which is pivotally connected one end of a cam rod 65 carrying a cam roller 66 running on a cam 67. The rear end of the cam rod 65 is provided with a slot 68 to accommodate the stud 69 on the outer end of cam shaft 21 so that whenever cam roller 66 drops into the depression in cam 67, as shown in Fig. 8, the U-shaped bar 61 drops and forces downwardly the fold which has just been released from the rolls adjacent thereto. As shown in Figs. 6 and 7, a rock shaft 70 carries a crank arm 71 pivotally connected at 72 with a rod 73, said rod 73 being also connected at 74 to the folder blade arm 12. Keyed to the rock shaft 70 are a plurality of collars 75 to which are secured pressure arms or fingers 76 having their rear extremities deflected to adapt them to press down on the top fold of a stack of folds 77 which have been deposited upon a table 78 carried by posts 79 which are adjustable in elongated sockets 80. A rope or cable 81 which passes over a guide pulley 82 at each end of the table 78 is secured to said table at one end and has suspended from its other end a counterweight 83. Each of the collars 75 carries a depending arm 84 with a slot 85 in its lower extremity which operates a pin 86 which projects laterally from a rod 87 reciprocably mounted in guides 88. The rods 87 act as retaining members for preventing the stack of folded portions expanding upwardly after they have been once pressed into position. These rods are operated alternately with the presser fingers 76. A second rock shaft 89 carries a plurality of presser fingers 90 and also has keyed thereto a crank arm 91 pivotally connected at 92 with one end of a cam rod 93, the other end of said cam rod being bifurcated at 94. A cam roller 95 journaled on a stud 96 on the cam rod 93, runs on a cam 97 keyed to the cam shaft 21. The outer extremities of the presser fingers 76 and 90 are suitably deflected to fit around the peripheral surface of the rolls 38 when said presser fingers are in raised position. The table 78 is provided on opposite edges thereof with suitable stacking gages 97 and 98, the stacking gages 97 along the rear edge of table 78 being rigidly joined to said table. The stacking gages 98 adjacent the forward edge of the table 78 are mounted on an oscillatory rod 99, the rod 99 being pivotally mounted in bearing lugs 100, as shown best in Fig. 4. A spring 101 interacts between one of the lugs 100 and the rock shaft 99 to impart a tendency to retain the stacking gages 98 in vertical position, as shown in Fig. 6. The table 78 is slotted at 102 to permit the stacking gages 98 to be lowered for the purpose of removing the stacked folded web whenever desired. The operation of my improved web folding machine will now be readily understood and briefly described is as follows. Thus according to Figs. 2 and 3, the arms 10 which carry the folder blade 14 have completed a return movement of the folder blade 14 which, prior to the instant shown in Fig. 2, has been moved into position to bring the web 3 into the bite of folding rolls 38 and 39 on the left. The yieldable material of which the roll 39 is constructed has permitted the folder blade

14 to be retracted from the bite of the rolls 38, 39, leaving the folded portion of the web to be drawn between said rolls. At the time the fold is engaged by the rolls 38, 39, the cam roller 44 has just dropped from the outer run of the cam 45, causing the rubber roll 39 of the left hand pair shown in Fig. 6 to be moved angularly toward the right around the axis of the roll 38, an action which has resulted in drawing the web away from the folder blade 14. The folder blade 14 has then been returned to the position shown in Fig. 2 by the action of the outer run of cam 37 on the cam roller 35. The several parts being in the positions shown in Fig. 2, the lever arms 12 carrying the folder blade 15 are moved to the right as shown in Fig. 6, an adjacent portion of the web being forced into the bite of the right hand pair of rollers 38 and 39. At this instant, the cam 52 (shown best in Fig. 9) has displaced the lever arm 50 to its extreme right position, and as it begins to permit said arm to move toward the left in Fig. 9, the rolls 38 and 39 are rotated by the gears 46 and 47 and rack 48 to draw the folded web into the bite of said rolls. At the same time, the left hand pair of rolls 38 and 39 are rotated in reverse direction to release the folded web portion which has been formerly drawn thereinto, both of these actions being aided by a movement of connecting rod 42 toward the right (see Fig. 9) which causes both of the upper rolls to revolve toward the left about the axis of the rolls 38 respectively. The lever arms 12 which carry the folder blade 15 now move toward the left according to Fig. 6, such movement serving to elevate the presser fingers 76 from the stack of folds on the table 78, while, at the same time, the cam 59 keyed to the shaft 21 has reached a point in its travel to permit the cam roller 58 to drop into the recess in said cam which causes the cam rod 56 to shift toward the right according to Fig. 3 under the torsion of a spring 53′ interposed between left hand bracket 54 and crank arm 55 (see Figs. 1 and 4). This movement swings the crank arm 55 keyed to rock shaft 53 and causes the rod 60 to descend, thus displacing the folded portion of the web just released from the rolls 38, 39, downwardly. When the lever arms 12 again move toward the right, according to Fig. 6, carrying the folder blade 15, the presser fingers 76 are forced downwardly into engagement with the stack of folds on table 78 while the operations just described as taking place on the left hand now take place on the right hand. These operations may be repeated consecutively as long as the machine is operated or until the web is exhausted.

I claim:

1. In a machine of the character described, a support, a pair of folding rolls journaled in said support, a knife blade movable toward and away from said folding rolls, and means for rotating said folding rolls on their axes, and means for oscillating said support about the axis of one of said folding rolls.

2. In a machine of the character described, a pair of folding rolls journaled on parallel axes, a knife blade movable toward and away from said folding rolls, means for rotating said folding rolls on their axes, and means for moving one of said folding rolls about the axis of the other of said folding rolls.

3. In a machine of the character described, oppositely arranged pairs of folding rolls rotatable about axes, means for angularly shifting the axis of one roll in each pair about the axis of the other roll in that pair as an axis, and knife blades coöperating respectively with said pairs of rolls.

4. In a machine of the character described, pairs of folding rolls rotatable about axes and arranged to operate on different portions of a web or sheet, means for angularly shifting the axes of each pair of rolls relatively to each other, knife blades coöperating respectively with said pairs of rolls, the axes of one pair of said rolls being shifted in a direction opposite to that in which the axes of the other pair are shifted, and means for rotating said pairs of rolls in directions to release the portion of said web or sheet folded by one pair of rolls while taking in the portion of said web or sheet which is being folded by the other pair of rolls.

5. In a machine of the character described, pairs of folding rolls, means for supporting each pair of said rolls, means for oscillating each supporting means about the axis of one of the rolls carried thereby and a folder blade coöperating with each pair of rolls.

6. In a machine of the character described, pairs of folding rolls, means for oscillating each pair of said rolls about the axis of one of said rolls, and a folder blade coöperating with each pair of rolls.

7. In a machine of the character described, oscillatable supports, a pair of folding rolls journaled on each support, a folder blade for each pair of rolls, means for simultaneously oscillating said supports, said pairs of folding rolls being arranged to operate on different portions of a web or sheet, and means for simultaneously rotating all of said folding rolls, each pair of said rolls being first rotated in a direction to fold said sheet or web and then rotated in a reverse direction to discharge the folded sheet or web.

8. In a machine of the character described, oscillatable supports, a pair of folding rolls journaled on each support, a folder blade for each pair of rolls, means for simultaneously oscillating said supports, said pairs of folding rolls being arranged to operate on different portions of a web or sheet, and means for

simultaneously rotating all of said folding rolls, each pair of said rolls being first rotated in a direction to fold said sheet or web and then rotated in a reverse direction to discharge the folded sheet or web, the directions of rotation for said pairs of rolls being such that a portion of a sheet or web is being folded by one pair of rolls at the same time that a previously folded portion of said web or sheet is being discharged from another pair of said rolls.

9. In a machine of the character described, oscillatable supports, a pair of folding rolls journaled on each support, a folder blade for each pair of rolls, means for simultaneously oscillating said supports, said pairs of folding rolls being arranged to operate on different portions of a web or sheet, and means for simultaneously rotating all of said folding rolls, each pair of said rolls being first rotated in a direction to fold said sheet or web and then rotated in a reverse direction to discharge the folded sheet or web, said pairs of rolls being arranged oppositely with respect to each other and operated to fold successive portions of said sheet in opposite directions.

10. In a machine of the character described, oscillatory supports, means for oscillating said supports together, a pair of folding rolls journaled on each support, the axis of one roll of each pair being coincident with the oscillatory axis of the support on which it is mounted, intermeshing gears carried by the respective rolls of each pair, and a reciprocatory rack engaging the gears which have their axes coincident with the oscillatory axes of said supports.

11. In a machine of the character described, two pairs of folding rolls suitably arranged to operate upon different portions of a web or sheet, oscillatory folder-blade carrying arms coöperating with said pairs of rolls, a table for receiving said web or sheet, means for operating said folding rolls and blade-carrying arms to form successive folds in said web or sheet in opposite directions, and presser fingers movable from said folding rolls down on to the folded web or sheet on said table.

12. In a machine of the character described, two pairs of folding rolls suitably arranged to operate upon different portions of a web or sheet, oscillatory folder-blade carrying arms coöperating with said pairs of rolls, a table for receiving said web or sheet, means for operating said folding rolls and blade-carrying arms to form successive folds in said web or sheet in opposite directions, a rock shaft operatably connected to one set of said blade-carrying arms, presser fingers mounted on said rock shaft and movable thereby between one pair of said folding rolls and a folded web or sheet on said table, and pile-clamping means movable by said rock shaft to hold said folded web or sheet while said presser fingers are raised.

13. In a machine of the character described, oppositely arranged pairs of folding rolls, means for tucking successive portions of a web or sheet into the bites of said folding rolls, and means for rotating said folding rolls to effect the folding operation, and to reverse the directions of rotation thereof to release the folded portions of said web or sheet.

14. In a machine of the character described, oppositely arranged pairs of folding rolls, means for tucking successive portions of a web or sheet into the bites of said folding rolls, and means for rotating said folding rolls to effect the folding operation, and to reverse the directions of rotation thereof to release the folded portions of said web or sheet, said rolls-rotating means being adapted to rotate the rolls of one pair to fold the web or sheet while rotating the rolls of the other pair to release another fold in said web or sheet.

15. In a machine of the character described, a pair of folding rolls, a knife blade suitably mounted to coöperate with said folding rolls in folding a web or sheet, means for feeding a web or sheet of paper into position between said folding rolls and said knife blade, and means for moving one of said folding rolls about the axis of the other.

16. In a machine of the character described, a pair of folding rolls, a knife blade suitably mounted to coöperate with said folding rolls in folding a web or sheet, means for feeding a web or sheet of paper into position between said folding rolls and said knife blade, and means for moving one of said folding rolls about the axis of the other, said folding rolls being provided with means for rotating them on their axes to effect the folding operation and for reversing their direction of rotation to discharge the folded web or sheet.

17. In a machine of the character described, a pair of folding rolls, a knife blade suitably mounted to coöperate with said folding rolls in folding a web or sheet, means for feeding a web or sheet of paper into position between said folding rolls and said knife blade, and means for moving one of said folding rolls about the axis of the other, said folding rolls being provided with means for rotating them on their axes to effect the folding operation and for reversing their direction of rotation to discharge the folded web or sheet, and an oscillatable member adapted to tap the folded portion of the web or sheet to remove it from before said feed rolls.

18. In a machine of the character described, oppositely arranged pairs of folding rolls rotatable on their axes, knives coöperating with said pairs of rolls respectively,

means for feeding adjacent portions of a web or sheet into position to be operated upon by said pairs of rolls respectively and the knives coöperating therewith, and means for simultaneously operating said pairs of rolls to produce the fold in one portion of the web or sheet at the same time that a previously folded portion thereof is being discharged from the other pair of rolls.

19. In a machine of the character described, a table, means for feeding a web into position over said table, means for folding said web alternately in opposite directions, and means for pressing the folded web down onto said table, said folding means including pairs of folding rolls disposed above opposite edges of said table, and folder blades movable successively with said pairs of rolls in folding successive portions of said web.

20. In a machine of the character described, a table, means for feeding a web into position over said table, means for folding said web alternately in opposite directions, and means for pressing the folded web down onto said table, said folding means including pairs of folding rolls disposed above opposite edges of said table, folder blades movable successively into positions to cooperate with said pairs of rolls in folding successive portions of said web, and a reciprocable rack geared to both pairs of said rolls.

21. In a machine of the character described, a table, means for feeding a web into position over said table, means for folding said web alternately in opposite directions, and means for pressing the folded web down onto said table, said folding means including pairs of folding rolls disposed above opposite edges of said table, folder blades movable successively into positions to cooperate with said pairs of rolls in folding successive portions of said web, and a reciprocable rack geared to both pairs of said rolls, one roll in each pair being oscillatable to and fro about the axis of the other roll.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."