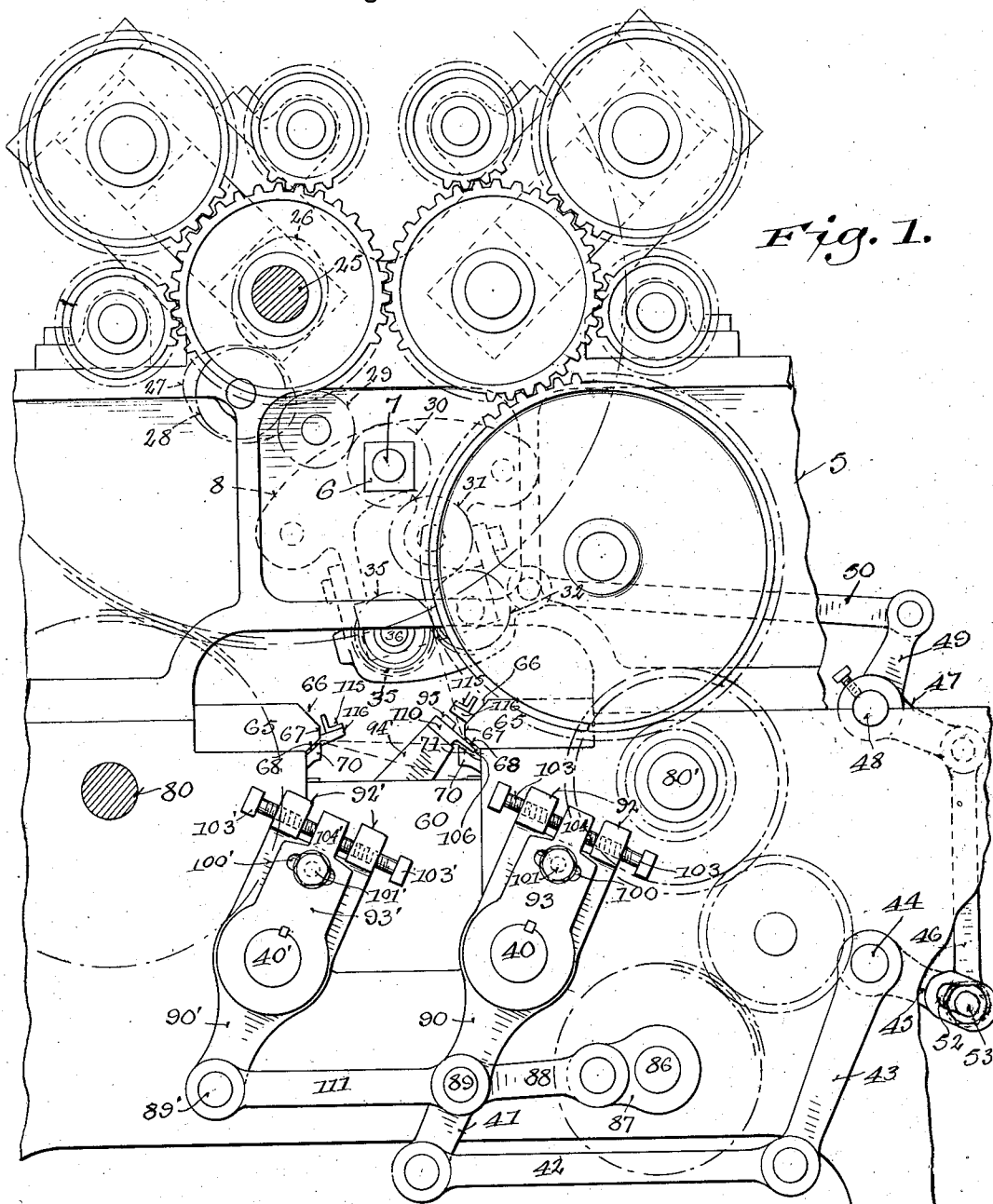


Feb. 19, 1924.

1,484,069

D. W. HUDSON
INTERFOLDING MACHINE

Original Filed Oct. 11, 1920, 5 Sheets-Sheet 1



David W. Hudson

INVENTOR.

BY

Erwin Behler & Wootard

ATTORNEYS.

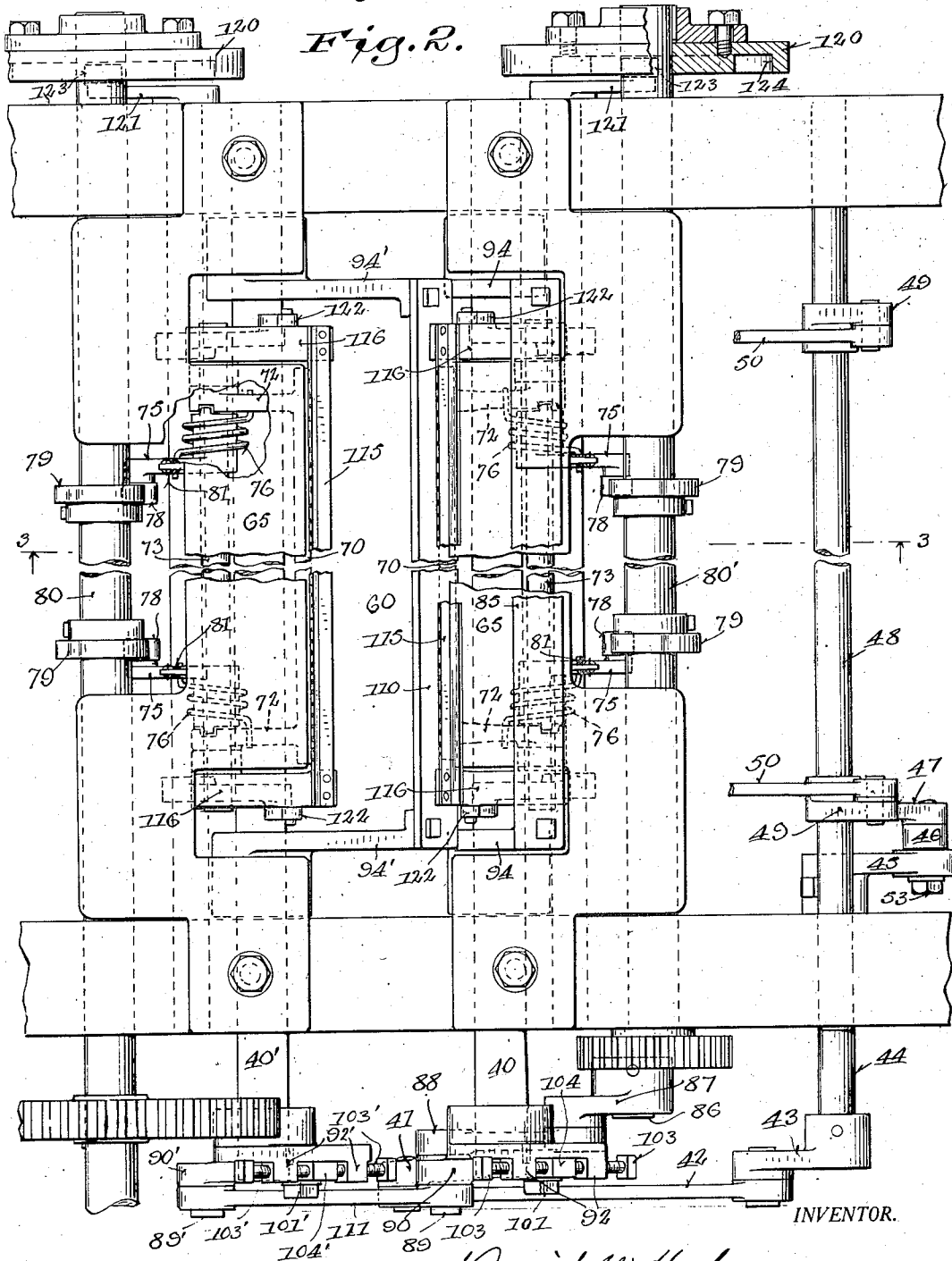
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1,484,069

D. W. HUDSON

INTERFOLDING MACHINE

Original Filed Oct. 11, 1920 5 Sheets-Sheet 2



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Feb. 19, 1924.

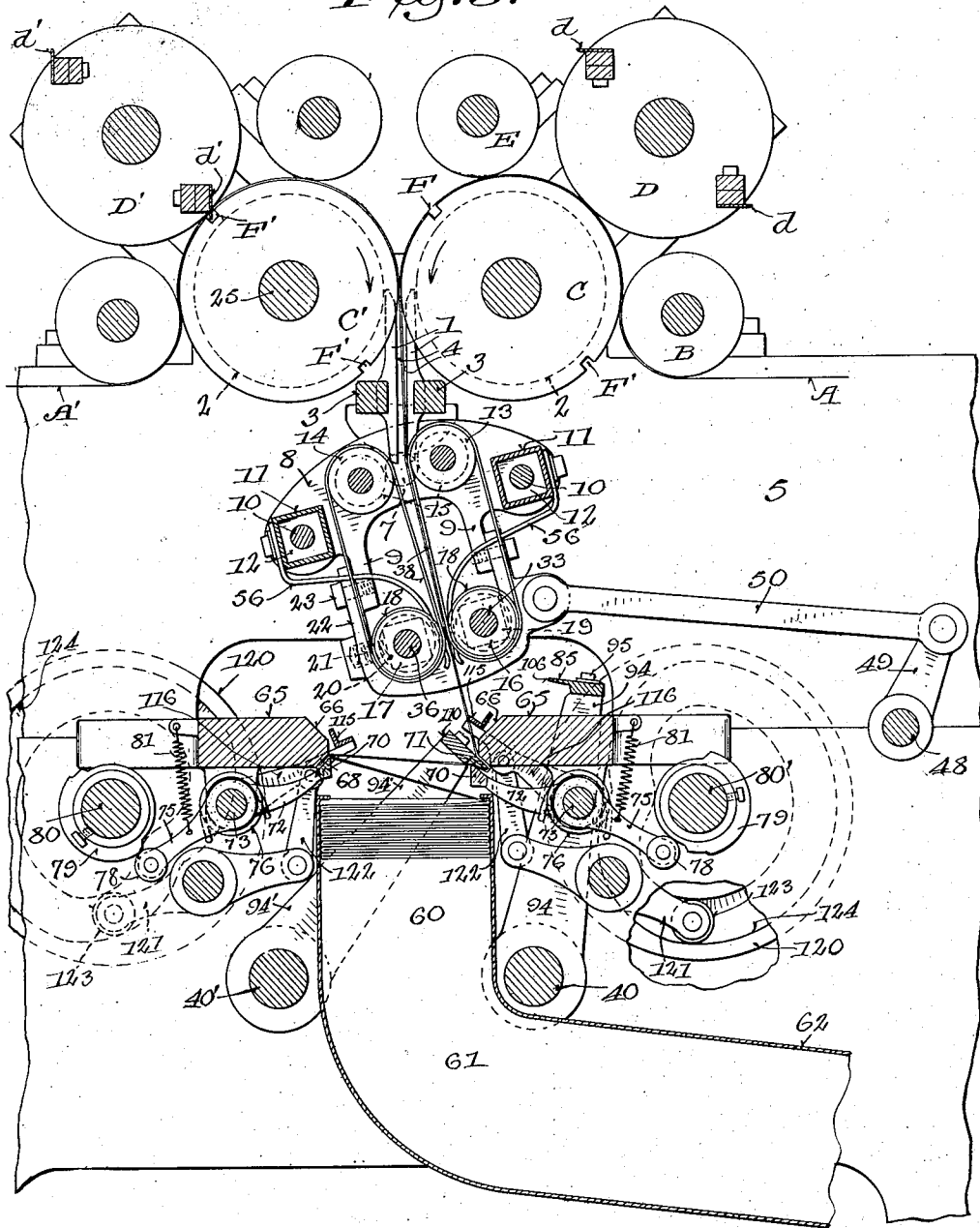
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D. W. HUDSON

INTERFOLDING MACHINE

Original Filed Oct. 11, 1920 5 Sheets-Sheet 3

Fig. 3.



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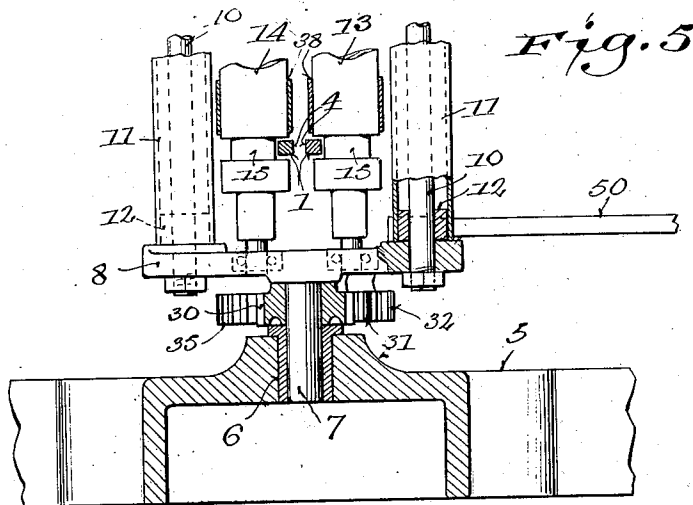
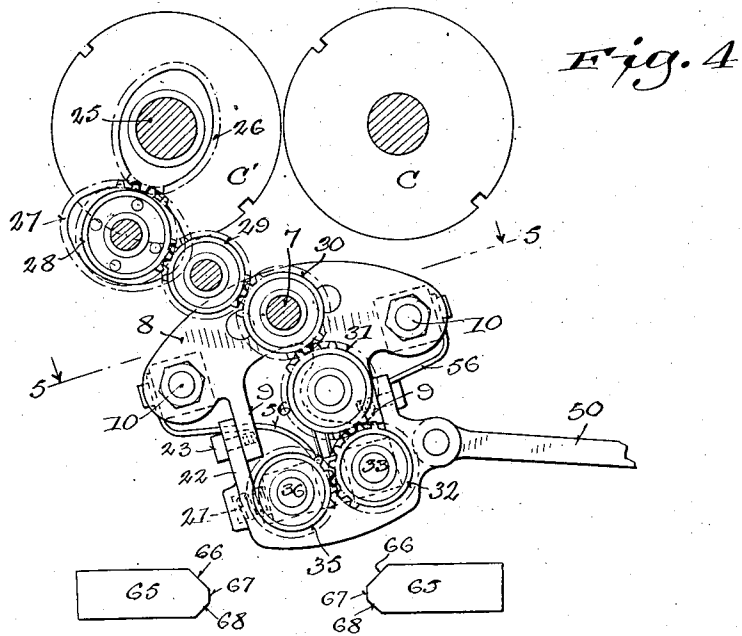
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D. W. HUDSON

INTERFOLDING MACHINE

Original Filed Oct. 11, 1920 5 Sheets-Sheet 4



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D. W. HUDSON

INTERFOLDING MACHINE

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Fig. 6.

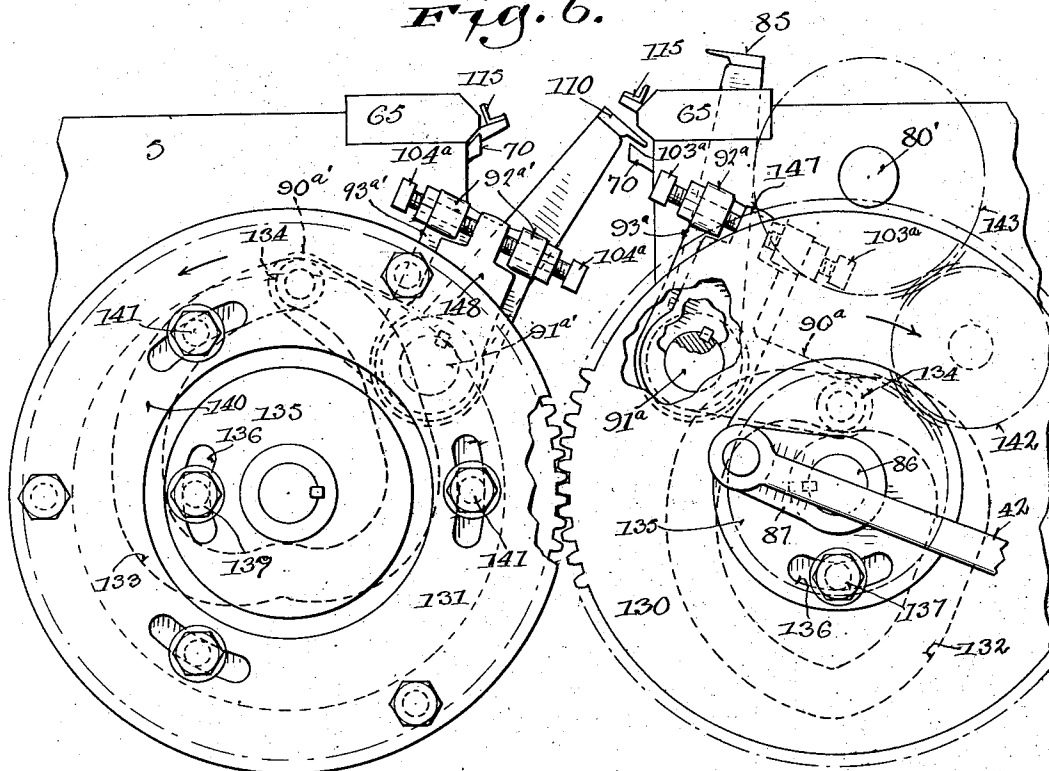
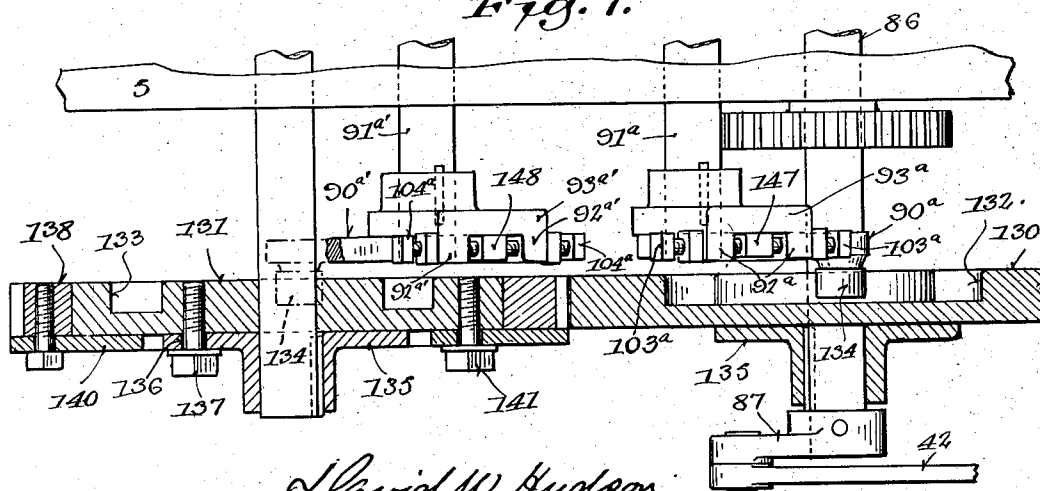


Fig. 7.



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UNITED STATES PATENT OFFICE.

DAVID W. HUDSON, OF GREEN BAY, WISCONSIN.

INTERFOLDING MACHINE.

Application filed October 11, 1920, Serial No. 416,201. Renewed January 2, 1924.

To all whom it may concern:

Be it known that I, DAVID W. HUDSON, a citizen of the United States, residing at Green Bay, county of Brown, and State of Wisconsin, have invented new and useful Improvements in Interfolding Machines, of which the following is a specification.

My invention relates to improvements in interfolding mechanism for sheets of paper or other flexible material to be folded in such a manner that the abutting or adjacent ends of two sheets in one series of sheets will be engaged between the folded portions of a third sheet in another series, the sheets of which are similarly interfolded in an opposite direction with those of the first mentioned series to form a continuous duplex series of interfolded and superposed sheets adapted to be packaged, and fed from a cabinet successively.

In general, the object of my invention is to provide efficient means for interfolding and packing the sheets as they are being delivered from a duplex cutter of any ordinary type adapted to cut strips of paper or other flexible material into sheets, or to cut or subdivide wide strips into a set of relatively narrow strips of the desired width and then further subdivide or partially subdivide them into sheets by transverse cutting and slitting operations.

More specific objects are to provide means for a controlled delivery of the subdivided sheets from the slitte to the folding devices, the sheets being positioned and held in proper relation to each other; to provide folding devices adapted to operate in alternation and in opposite directions upon a suspended series of duplex sheets while the latter are being fed and controlled as to position by the delivery mechanism; to provide means whereby the delivery mechanism may co-operate with the folding devices to carry the suspended series of sheets from side to side to facilitate folding them in superposed relation; to provide sets of relatively fixed and movable press jaws adapted to co-operate with the folding devices in the folding operation, and also adapted to complete such operation and render it permanent by compressing the folded sheets to form crease lines after the withdrawal of the folding devices; and to pro-

vide a suitable well or receiver for the folded sheets in proper relation to the folding devices and press jaws, and packers to press the folded sheets into said well immediately after their release from the press jaws.

In the drawings:—

Figure 1 is an end elevation.

Figure 2 is a plan view with slitte and feeder omitted.

Figure 3 is a vertical sectional view drawn generally on line 3—3 of Figure 2 with the slitte and feeder included.

Figure 4 is a detail view of the feeder driving connections, some of the shafts being shown in cross section.

Figure 5 is a fragmentary sectional view on line 5—5 of Figure 4.

Figures 6 and 7 are detail views of modified means for actuating the folder blades.

Like parts are identified by the same reference characters thruout the several views.

The paper slitting and sheet cutting machine may, in the general features of its construction, be of ordinary type. One strip of paper A is passed between the feed rollers B over a die roller C, the paper passing between said die roller C and a cutting roller D and being held to the die roller thereafter by a guide roller E until it turns downwardly and passes between the die roller C and an associated die roller C' over which the companion strip of paper A' is passed. The cutting rollers D and D', and the die channels F, F' in the die rollers C and C', respectively, are relatively so disposed that the strips of paper A and A' are cut into sheets alternately, the line of separation or partial separation of the sheet from the strip A being half way between two successive similar lines of separation or partial severance in the strip A' as delivered from between the die rollers C and C' in a downward direction to the packer mechanism.

Preferably the cutter blades *d* on the cutting rollers D and the similar blades *d'* on the roller D' are adapted to only partially sever the paper sheets from the strips, leaving them connected by a plurality of tongues about one eighth of an inch in width, whereby the sheets remain connected with the respective strips sufficiently to prevent them from being displaced from their proper line of travel pending their engagement by the

packing mechanism and the subsequent tearing away of these connecting tongues as hereinafter described.

Upon passing downwardly from between the die rollers C and C' the paper sheets are stripped from such rollers by a set of stripping fingers 1, the upper ends of which are received within annular channels 2 formed in the die rollers for that purpose. These fingers 1 are arranged in sets, one set for each of the die rollers C or C', and the fingers of each set are mounted upon a supporting bar 3 with which they are interlocked as shown. The inner surfaces 4 of these fingers constitute paper guiding surfaces adapted to hold the sheets in a substantially vertical position until they pass the lower ends of the fingers 1, whereupon they are delivered to the receiving rollers of the feeding mechanism of the interfolding mechanism.

The frame 5 of the interfolding mechanism is provided at each end with journal blocks 6 in which trunnions 7 connected with an oscillatory sheet guiding frame are journaled. The sheet guiding frame has an arcuate portion 8 at each end, and depending feed roller carrying portions 9. The arcuate portions 8 are connected longitudinally of the machine by rods or bolts 10 enclosed in hollow spacer bars 11 which are preferably rectangular in cross section, and provided with bushing members 12, whereby the rods 10 are centrally positioned, and within which said rods are fitted, whereby the connecting bolts or rods 10 may serve as clamping bolts to clamp the ends of the arcuate members against the ends of the spacers 11, thereby forming a rigid frame adapted to oscillate about an axis common to the end trunnions 7.

A set of receiving rollers 13 and 14 are journaled in the arcuate end members 8 of the frame on opposite sides of the trunnion axis, and anti-friction bearings are preferably employed, whereby the rollers 13 and 14 may turn freely. These rollers are provided with annular channels 15 in which the lower ends of the fingers 1 are entered, and they are preferably adapted to revolve in close proximity to each other, but out of actual contact. They serve as guiding members for the paper strips which pass loosely between them.

Similar rollers 16 and 17 are journaled in the depending portions 9 of the oscillatory frame above described. But these rollers 16 and 17 are provided with a felt jacket 18. Their metal portions are of the same diameter as the rollers 13 and 14, but the felt jacket 18 adds to their normal diameter. These rollers 16 and 17 revolve with their felt jacket coverings in pressure contact with each other. The journal boxes 19 of one roller may be fixed in the support-

ing end frame members 9, whereas the boxes 20 of the opposing roller are socketed loosely in the members 9, and are pressed in the direction of the boxes 19 by springs 21, these being preferably socketed in a removable cap 22 held to the member 9 by screws 23.

The partially severed sheets from the strips of paper A and A' pass downwardly between the rollers 13 and 14, and then between the rollers 16 and 17, which not only guide them to the interlapping mechanism hereinafter described, but which also subject them to sufficient tension to tear away the connecting tongues unsevered by the cutters 4. This tension is obtained by causing the jacket peripheries of the rollers 16 and 17 to travel at a slightly greater speed than the peripheral travel of the die rollers C and C'. I preferably provide driving connections of such a character that the metal portions of the rollers 16 and 17 travel at their peripheries at a speed corresponding with the peripheral speed of the rollers C and C'. The additional diameter secured by applying the jacket 18 will increase the peripheral speed of the rollers 16 and 17 taken at the outer surfaces of the jackets sufficiently to apply the required tension to the paper strips.

The rollers 16 and 17 are positively driven, as follows:—

The roller 17 is driven from the shaft 25 of the die roller C' thru the elliptical gear wheels 26 and 27, spur gear wheel 28 rigidly connected with the elliptical gear wheel 27, and the train of spur gear wheels 29, 30, 31 and 32, the gear wheel 32 being fast on the trunnion 33 of the roller 16. The gear wheel 32 also drives a gear wheel 35 which is fast on the trunnion 36 of roller 17. These gear wheels 32 and 35, being of the same diameter, it is obvious that the rollers 16 and 17 will travel at the same speed, but in opposite directions.

Belts 38 are disposed about the roller 16, and the roller 13 directly above it. Similar belts connect the roller 17 with the roller 14, which is directly about it. Therefore, the rollers 13 and 14 are not only positively driven by these belts, but the belts also serve as guides or conveyors to deliver the paper sheets from the rollers 13 and 14 between the rollers 16 and 17. The object of using the elliptical gear wheels 26 and 27 is to compensate in one direction for the increased speed, due to the relative travel of the intermediate gear wheel 31 about gear wheel 30 in a direction opposite that in which gear wheel 30 revolves, whenever the roller carrying frame above described is oscillated to effect such traverse of gear wheel 31. When the roller carrying frame is swung in the opposite direction the elliptical gears will correspondingly accelerate the transmitted

movement of rotation in the gear wheel 31 to compensate for the retardation which would otherwise be caused by such swinging movement. The swinging movements of the frame are so timed as to secure the desired acceleration and retardation derived from the elliptical form of the gears.

The swinging movement of the roller carrying frame is derived from a shaft 40 of the interfolding mechanism, hereinafter described, thru crank arm 41, connecting bar 42, crank arm 43, rock shaft 44, arm 45, link 46, arm 47, shaft 48, arm 49 and link 50. The arm 45 is provided with a slot 52 which receives the coupling pin 53 of link 46, whereby the stroke may be regulated by adjusting the coupling pin 53 in slot 52. The connections are such that the roller carrying frame, including the arcuate member 8 and its depending portion 9, will be oscillated upon its trunnings 7 in synchronism with the interfolding movements now to be described, and to an extent which will carry the strips or sheets of paper from side to side during the folding operations, and facilitate a delivery of the sheets to the sheet creasing jaws.

To avoid having the sheets of paper adhere to the rollers 16 and 17 when fed between them, I preferably provide stripping fingers 56. These may be conveniently formed of wire, the upper ends of which are adjustably secured to the hollow bars 11. The lower end portions are disposed in annular channels in the respective rollers 16 and 17, the lower extremities of the wire projecting a short distance below these rollers.

The interfolding jaws and tucker or folding mechanism.

A sheet receiving magazine or well 60 is so located that its central vertical plane, projected upwardly, includes the axis of the trunnions 7. This well is rectangular in cross section and the walls thereof are elbowed at 61 to provide a nearly horizontal delivery portion 62 which extends to one side of the machine. The oscillatory movements of the roller carrying frame above described are adapted to carry the downwardly traveling sheets toward one side of this well 60 for a folding and creasing operation, and then toward the opposite side of the well for another folding and creasing operation, the folded and creased sheets being pressed downwardly into the well during the intervals between such operations by suitable packer bars provided for that purpose. The folding operations are performed by swinging folder blades acting in cooperation with creasing jaws which automatically separate to allow the sheets to be pushed between them, and then close for a pinching or creasing operation as the folder

blades are withdrawn. These parts will now be described in detail.

At each side of the well, and directly above the side wall thereof, there is a longitudinally extending fixed member or creasing jaw 65, which, at its inner margin, is provided with a downwardly and inwardly inclined surface 66, a substantially vertical surface 67 and a downwardly and outwardly inclined surface 68, this latter surface constituting the clamping or working face of the jaw. An associated movable jaw 70 is provided with a clamping face 71, and is supported at the respective ends of the machine by arms 72 connected with a rocking pivot shaft 73. The arms 72 of the movable jaw 70 are rigidly secured to the pivot shaft 73. Actuating arms 75 are loosely pivoted on the shaft 73 and are connected with the shaft or with the arms 72 by torsional springs 76, whereby the movable jaw 70 may be actuated in the direction of the clamping face 68 of the stationary jaw 65 under resilient pressure. The actuating arms 75 have their outer ends provided with rollers 78 which bear against a cam 79 located on the power driven shaft 80. Coiled tension springs 81 tend to draw the arms 75 upwardly and retract the jaw 70. But when the thicker portion of the cam, (i. e., that portion which has the longer radius), encounters the roller 78, the latter is pushed downwardly carrying with it the arms 75 against the tension of spring 81, and transmitting motion thru the torsion spring 76 and the arms 72 to swing the jaw 70 into clamping position. The jaws 65 and 70 are duplicated on the opposite side of the well, but the jaws of the respective pairs are of course opposed, i. e., they extend inwardly from opposite sides of the well to receive the strips of paper passing to the well thru the space immediately above it.

The folder blade 85 is actuated from a power driven shaft 86 thru the crank 87, connecting rod 88, pivot pin 89, lever 90 pivoted on shaft 40, and provided with lateral extensions 92, arm 93 keyed to the shaft 40, and a pair of arms 94 also keyed to the shaft between the end portions of the machine frame and to the outer ends of which the folder blades 85 are secured by set screws or bolts 95. The arm 93 is provided with a slot 100, and is clamped to the arm 90 by a clamping bolt 101 extending thru said slot 100. The lateral extensions 92 are provided with adjusting screws 103, the inner ends of which bear upon a reduced extension 104 of the arm 93, and cooperate with the clamping bolt 101 in holding the lever 90 to the arm 93 in the desired position of adjustment. This arrangement allows for a very accurate positioning of the folder blades 85 when the thin portion

106 thereof is entered in the space between the jaws 65 and 70.

The folder blade 110 is actuated from the the coupling pin 89 thru a link 111, lever 90' and connections similar to those above described and identified by reference characters 91 to 104 inclusive, prime marks being added to these reference characters for the purpose of distinguishing between these connections associated with the folder blade 110 and those which are associated with the folder blade 85.

The movements of the folder blades and of the creasing jaws 70 are so timed that each jaw 70 will swing away from the clamping face 78 of its associated jaw 65 preparatory to the movement of the folder blade between the jaws. This movement of the tucker blade occurs simultaneously with an oscillation of the feeder frame and paper guiding rollers 16 and 17 into a position for a delivery of paper between the jaws, the associated folder blade thereupon engaging one of the strips of paper along the line of severance thereof, where cut by the blades d , and pushing the sheet ends, together with the unsevered sheet overlapping the slitted joint into the space between the jaws for a preliminary folding operation. Thereupon the folder blade is withdrawn and the jaw 70 swung forcibly against the paper to compress it against the inclined clamping face 68, thereby completely folding and creasing the unsevered sheet in a manner to firmly engage the ends of the severed sheets preparatory to the packing operation.

The packing bar 115 is supported at its respective ends by arms 116 pivoted to supporting rods or shafts 73, which also serve as the pivot shafts for the arms 72 of the vise jaw 70. The arms 116 are loosely pivoted upon these shafts, and are actuated by grooved cam wheels 120, levers 121, and links 122, the levers 121 being provided with rollers 123 which travel in the eccentric groove 124 of the cam wheel 120. The movement of each of the packer bars 115, thus derived from its associated cam wheel 120, is so timed that the packer bar will move downwardly and compress the folded paper sheets upon the pile within the well 60 during the interval between the retraction of the creasing jaw 70 and the subsequent entry of the folder blade 110 between such jaw and the associated stationary jaw 65.

Power is applied to the machine thru the main driving shaft 80, upon which the cam wheel 120 and cam 79 are mounted at the left hand end of the machine as illustrated. Corresponding shaft 80' at the opposite side of the machine is driven from the shaft 80 in any suitable manner, preferably by ordinary trains of gearing. Similar trains of gearing are employed to connect up all other positively driven elements

of the machine. These gear connections are not illustrated for the reason that they are of ordinary type with which any mechanic is familiar.

It will be noted that the movement of the tucking blade upon the sheets of material in frictional contact therewith is relied upon to stretch the material taut in the manner in which it is shown in Fig. 3. Obviously, if it were not for the co-operation, in the above described manner, of the tucking blade, the sheets delivered from the oscillatory feeder would hang straight downwardly and would never reach the clamping jaws. It will be noted further that in the series of sheets first encountered by the tucking blade there is a break or division between two adjacent sheets, whereas the second series of sheets encountered by each blade presents to the blade an intact sheet to be creased between the jaws.

From the foregoing it will be understood that it is important to have the tucking blade moved in such a manner as to insure that the free ends of the sheets of the series, first encountered, will be properly secured within the jaws in order that they may be interfolded in the crease of the intact sheet. To this end the tucking blades move about pivot points located below the jaws, so that as the blade encounters the paper it will move in substantially the same direction as that in which the paper is already moving. The paper delivered from the feeding device in Fig. 3, for example, is moving to the right and downwardly, and the movement of the tucking blade, at the moment of contact with the paper, is also to the right and downwardly. Support is thereby provided for the free end of the last-formed sheet of material which is included in the fold or crease made by the right hand creasing jaws. If the tucking blades were to move in arcuate paths about axes located above the creasing jaws, instead of below the jaws, the blade would necessarily travel in frictional contact with the face of the material toward the source thereof. In so doing it would provide no support for the free end of the last-formed sheet of the first series encountered, which would thus be left to hang vertically downward from the delivery end of the feeder, while the remaining sheets were pressed into the creasing jaws to be creased therein. It follows, therefore, that it is important that the tucking blade shall move substantially with the sheets of material when a duplex series of sheets is to be folded.

Briefly reviewing the operation of the machine, it will be understood that the paper strips A and A' are fed to the die rollers C and C' from opposite sides of such rollers, and are alternately cut by the cutting blades d to partially sever the strips

into sheets in such a manner that when the strips pass between die rollers C and C', the transverse slits in one strip will be located mid-way between those in the other strip.

5 The sheets are then guided between the sets of rollers on the swinging feeder and upon passing between the rollers of the second set, (i. e., the rollers 16 and 17), tension is applied to completely sever the sheets successively and to present the sheets in position

10 for a tucking or folding operation between the creasing jaws at one side or the other of the receiving well. The folder blade then presses the sheets between the separated

15 creasing jaws on that side of the well, after which the blade withdraws and the jaws close together to complete the folding operation and establish a permanent crease at the middle of the unsevered sheet embraced by

20 said jaws. In the meantime the roller carrying frame will have swung to the opposite side of the well to present the sheets to the opposing set of jaws for a further folding and creasing operation, followed by a release of the paper from the first mentioned

25 jaws, and a subsequent depression of the packer to carry the folded or creased portions into the well and press the same upon the previously folded sheets therein.

30 It is not material to my invention how wide the strips of paper A and A' may be when they enter the machine. It is my purpose to employ slitting rollers for cutting such strips longitudinally into strips of the

35 desired width and the length of the interfolding mechanism will then depend not only upon the width of the individual sheets, but upon the number of strips into which the original strips A and A' have been slitted,

40 i. e., the length of the interfolding machine will correspond to the total width of the strips A and A', regardless of the width of the individual sheets into which those strips may be cut.

45 The folder blades 85 and 110 may be actuated by motion transmitting connections which include the cam wheels 130 and 131 shown in Figures 6 and 7. These wheels are provided with intermeshing peripheral teeth,

50 and their inner faces have cam grooves 132 and 133, respectively, in which rollers 134 and 135 carried by the associated levers 90^a and 90^{a'}, are loosely engaged. The cam grooves 132 and 133 are so formed as to impart a relatively quick final movement to the

55 folder blades, for tucking the paper between the creasing jaws, and a correspondingly quick retraction from between such jaws.

60 The cam wheels also facilitate providing for a complete retraction of each blade followed by a dwell or period of no material movement while the other blade is in operation, or while the creased paper is being withdrawn from the jaws and packed in the

65 receiving well.

The cam wheels are connected with their supporting shafts by disks 135 having segmental slots 136 to receive the connecting bolts 137 and allow the necessary adjustment. The gear teeth on the cam wheel 131

70 are also mounted upon a ring 138 separate from the body of the wheel and connected thereto by a similarly slotted web 140, and connecting bolts 141 whereby accurate timing of the folder blade movements is possible, and an adjustment of the wheel 130

75 may be compensated for in the wheel 131 by a counter adjustment of the gear ring.

The cam wheels may be actuated (rotated or oscillated) by any suitable means. In

80 the drawings the cam wheel 130 is shown as driven from a gear wheel 142 which in turn is driven from shaft 80' by a gear wheel 143 fixed thereto.

In Figures 6 and 7 the levers 90^a and 90^{a'} are loosely mounted on their associated

85 fulcrum shafts 91^a and 91^{a'}, and their respective upper end portions or arms 147 and 148 correspond in shape to the shaft arms 93 and 93' shown in the other views. The

90 arms 93^a and 93^{a'} in Figures 6 and 7 are keyed to the fulcrum shafts and carry the lateral extensions or lugs 92^a and 92^{a'} which support the adjusting screws 103^a and 104^a.

95 The relation of these levers and arms to their associated shafts is therefore the converse of that shown in the other views, but the effect upon the shafts and folder blades is the same.

It will be understood that in either form

100 of construction shown in the drawings, the motion transmitting connections must be proportioned and arranged to actuate each of the folder blades and jaws twice for each revolution of the die roller C (or C'), since

105 each of these die rollers has two die grooves along which the paper is cut into sheets, thereby delivering two sheets for each revolution. All sheets delivered from one die

110 roll are folded between the creasing jaws on the same side of the machine. Those from the other die roll are folded between the opposing set of jaws.

I claim:—

1. An interfolding machine including

115 means for supplying strips of paper, means for partially severing said strips into sheets, means for positively feeding the partially severed strips together at a given

120 rate, a set of rollers arranged to act upon the sheets, and means for driving said rollers at a rate tending to advance the sheets faster than they are fed by said feeding

125 means, whereby the severance of the sheets is completed.

2. An interfolding machine including

means for supplying paper in continuous strips, means for partially severing said strips into sheets, means for positively feeding the partially severed strips together

130

with each point of partial severance intermediate of two similar points in the adjacent strip, a set of rollers acting positively upon the sheets and driven at a rate tending to advance the sheets faster than they are fed by said feeding means, whereby the individual sheets are severed from each other, and means for folding each sheet over the ends of two consecutive sheets in the adjacent series.

3. An interfolding machine, including means for supplying paper in continuous strips, means for partially severing said strips into sheets, means for feeding the partially severed strips together with the potential sheets in mutually overlapped relation, a pair of juxtaposed belts bodily movable with a pendular movement adapted to receive and guide the joined strips and to complete the severance of the individual sheets thereof, sets of clamping jaws upon opposite sides of the path of said sheets, and means co-operating with said belts for folding and creasing each sheet over the ends of two consecutive sheets in the adjacent series.

4. An interfolding machine, including the combination of sets of jaws, normally open to allow sheets of material to be pressed between them, said jaws being arranged with those of one set in opposition to those of the other set, means for feeding sheets of material progressively across the space between the sets of jaws, means for engaging the material on opposite sides thereof at successive stages of its advancement across said space and pressing the same alternately between the jaws of the respective sets, and means for closing the jaws of each set after receiving the material between them, said sheet feeding means being adapted to hold a duplex series of sheets with those of one series extending across the spaces between the end margins of adjacent sheets in the other series while feeding them to the folding mechanism.

5. An interfolding machine, including the combination of sets of jaws, normally open to allow sheets of material to be pressed between them, said jaws being arranged with those of one set in opposition to those of the other set, means for feeding sheets of material progressively across the space between the sets of jaws, means for engaging the material on opposite sides thereof at successive stages of its advancement across said space and pressing the same alternately between the jaws of the respective sets, and means for closing the jaws of each set after receiving the material between them, said sheet feeding means being adapted to hold a duplex series of sheets with those of one series extending across the space between the end margins

of adjacent sheets in the other series while feeding them to the folding mechanism, and to swing the sheets into proximity to the receiving set of jaws preparatory to each pressing operation.

6. An interfolding machine, including the combination of opposed fixed jaws, a movable jaw associated with each fixed jaw and provided with a co-operating working face adapted to press material against an opposing face of the fixed jaw to crease the same when folded between the jaws, means for cutting duplex strips of material into series of overlapping sheets, means including an oscillatory conveyor and a co-operating blade for feeding the overlapping sheets across the space between the fixed jaws and folding them alternately in opposite directions, at successive stages of their feeding movement, between the sets of associated jaws to interfold the margins of adjacent sheets in one series with a single sheet of the other series, and means for closing the movable jaw of each set upon the associated fixed jaw to crease the single sheet upon the interfolded ones.

7. An interfolding machine, including the combination of opposed fixed jaws spaced apart to receive sheets of material between them, a magazine positioned to receive the sheets after they have been folded upon said jaws, a set of bodily oscillatory, juxtaposed belts for progressively feeding duplex series of sheets of material between the jaws, means for interfolding them in opposite directions across the working faces of said jaws, and means for packing the folded sheets in the magazine after each folding operation.

8. In an interfolding machine including means for supplying two series of paper sheets in a mutually overlapped relation, the combination with sets of relatively fixed and movable jaws, of means for guiding said sheets alternately between said sets of jaws, and means for causing said sheets to be engaged and creased thereby.

9. An interfolding machine, including the combination with means for supplying duplex series of sheets in mutually overlapped relation, of sets of relatively fixed and movable jaws, means for folding the sheets between one set of jaws and then advancing the sheets while maintaining their overlapped position as aforesaid, and folding them between the jaws of the other set, means for closing each set of jaws after the sheets have been received between them, and means for subsequently opening the jaws, and packing the folded material upon that which has previously been folded.

10. An interfolding machine including the combination with a paper splitter adapted to feed two series of sheets of paper into parallel relation with their flat sur-

- faces opposed and their ends mutually overlapped, sets of relatively fixed and movable jaws on opposite sides of the path of the downwardly moving strips, means for guiding the series of sheets alternately to different sets of jaws, swinging, folding members each operative to press the sheets between the jaws of one set, and means for actuating the movable jaws.
11. An interfolding machine including the combination with a paper splitter adapted to feed two series of sheets of paper into parallel relation with their flat surfaces opposed, and their ends mutually overlapped, sets of relatively fixed and movable jaws on opposite sides of the path of the downwardly moving strips, swinging folding members each operative to press the sheets between the jaws of one set, means for actuating the movable jaws, and means for swinging the paper strips into proximity to the respective sets of jaws preparatory to the operation of their associated folding member.
12. An interfolding machine including the combination with a paper splitter adapted to feed series of sheets of paper into parallel relation with their flat surfaces opposed and the ends of sheets in adjacent series mutually overlapped, sets of relatively fixed and movable jaws on opposite sides of the path of the downwardly moving strips, swinging folding members, each operative to press the sheets between the jaws of one set, means for actuating the movable jaws, and a set of packers, one associated with each set of jaws to press the folded sheets downwardly when released from the jaws.
13. In an interfolding machine, the combination of means for supplying strips of material, means for partially severing sheets from said strips of material, means for bringing the potential sheets together in a mutually overlapping relation, a movable feeding mechanism including a set of feeding rollers supported for bodily oscillation and arranged to receive said strips, means for oscillating said feeding mechanism, and means for driving said rollers at a speed such as to tend to advance said strips faster than they are supplied by said supplying means, whereby the potential sheets are severed from said strips, and creasing means adapted for receiving and temporarily retaining the sheets fed from the feeding mechanism adjacent the limit of each oscillation thereof.
14. In an interfolding machine, the combination of a set of members for operating upon strips of material, a pivotally mounted feeding frame for receiving said strips from said members and for feeding said strips, means for oscillating said feeding frame about its pivot, means for pressing against said strips alternately upon opposite sides after said strips have left said feeding frame and in step with the oscillations, and means for temporarily holding said strips as they are pressed from side to side, whereby said strips are alternately folded back and forth.
15. In an interfolding machine, the combination of a swinging feeding frame for receiving and feeding strips of paper, a set of jaws between which said frame swings, means for pressing said strips alternately into said jaws in step with the swing of said frame to thereby fold said strips, and means for causing said jaws to clamp and there- after release said strips, whereby said strips are folded back and forth and provided with creased folded edges.
16. An interfolding machine comprising means for associating a pair of strips of material, a pivoted frame within which said strips are received, feed rollers carried by said frame for feeding said strips outwardly from said frame, driving means for said rollers for causing a uniform rotation thereof irrespective of the swing of said frame, and means for receiving said strips as they are fed outwardly from said frame as it swings from side to side, whereby said strips are folded back and forth in superposed relation.
17. An interfolding machine comprising means for associating a pair of strips of material and partially severing them at staggered points, a pivoted frame within which said strips are received, feed rollers carried by said frame for feeding said strips outwardly from said frame, driving means for said rollers for causing a uniform rotation thereof irrespective of the swing of said frame, and in such timed relation to said first mentioned means as to cause a further severing of said strips, and means for receiving said strips as they are fed outwardly from said frame as it swings from side to side, whereby a series of interfolded substantially distinct sheets are arranged in superposed relation.
18. In an interfolding machine, the combination of a pair of rollers for associating a pair of strips of material, a pivotally mounted feeding frame into which said strips pass, feed rollers carried by said frame for feeding said strips outwardly therefrom, power transmission gearing for said rollers having a pinion in axial alignment with the pivot point of said frame, and elliptical gearing for correcting the angular variation between said pinion and said frame as said frame swings, causing said second mentioned rollers to feed said strips uniformly from side to side as said frame swings.
19. An interfolding machine comprising a pair of grooved die rolls for associating

a pair of strips of paper and partially severing them at staggered points; a swinging frame pivotally mounted adjacent said die rolls; grooved guiding rollers carried by said frame adjacent the pivot point; stripper bars extending between said die rolls and guiding rollers and fitting within all of said grooves; feed rollers carried by the lower portion of said frame and having a peripheral speed slightly greater than said die rolls to effect a further severing of said strips into a series of juxtaposed, overlapping, substantially distinct sheets; and means for folding said sheets in step with the swing of said frame, whereby a series of superposed interfolded sheets is formed.

20. An interfolding machine comprising a pair of die rolls for assembling a pair of sheets of paper in juxtaposed relation and partially and alternately severing each sheet at points apart so that the relatively free edges of one sheet are positioned adjacent the imperforate portion of the other sheet; a swinging frame pivotally hung upon trunnions below said die rolls; a pair of feed rolls carried by the lower portion of said frame for feeding said strips downwardly from said frame; gearing positively connecting said die rolls and feed rolls to give said feed rolls a greater peripheral velocity than said die rolls and comprising a pinion loosely mounted upon one of said trunnions, and an elliptical gear operatively associated therewith to correct the changing angular velocity of a portion of said gearing due to the swinging of said frame; clamping jaws positioned below said frame for temporarily holding and creasing said strips; folders for alternately engaging opposite sides of said sheets to press them into said jaws alternately in timed relation to the swinging of said frame; a receiving chute below said jaws; and packers for withdrawing said strips from said jaws and forcing them downwardly into said chute.

21. In an interfolding machine, the combination of a pair of grooved die rolls for associating strips of thin material; a feeding frame pivotally mounted below said rollers; grooved guiding rolls carried by said frame and positioned one upon each side of the pivot point and beneath a die roll; and stripping bars extending between each die roll and the corresponding guide roll, and entering the slots in said rolls, whereby said feeding frame may be oscillated and the thin strips properly guided into the feeding frame irrespective of the oscillations.

22. A feeding frame, for interfolding machines, comprising frame members pivotally mounted adjacent their upper portions; a pair of guide rollers carried by said frame and positioned upon opposite sides of said pivot point; a pair of feed rollers carried by said frame adjacent its lower portion

and positioned, one under each guide roller, belts operatively connecting the associated guide and feed rollers; gearing for driving said feed rollers, and including a pinion coaxially mounted with respect to said pivot point; and stripping members for said feed rollers extending upon either side thereof.

23. In an interfolding machine, a sheet-folding blade provided with pivoted supporting arms, in combination with an actuating member pivoted on the same axis, and means for adjustably connecting said member with a blade supporting arm, whereby the ultimate positions of the blade in its movement upon the pivoted arm may be varied.

24. In an interfolding machine, the combination with a magazine, of means, operative at the receiving end thereof for feeding duplex series of sheets continuously to the magazine while swinging them across the receiving end thereof, and means for folding, creasing and packing the sheets in the magazine while they are being delivered thereto by the feeder.

25. The combination with means for supplying a duplex series of overlapped sheets, of an oscillatory guiding device arranged to discharge the sheets from the oscillatory end thereof, opposed sets of clamping jaws arranged to receive sheets discharged by the oscillatory guiding device, tucking blades adapted to cooperate with said guiding device in delivering material to the clamping jaws, and means for causing said tucking blades to move alternately in arcuate paths about axes located beyond said jaws in the line of sheet travel.

26. The combination with means for feeding downwardly a duplex series of overlapped sheets, of an oscillatory guiding device arranged to receive said sheets and discharge them from the oscillatory end thereof, opposed sets of clamping jaws arranged to receive said sheets, tucking blades adapted to co-operate with said guiding device, and means for actuating the tucking blades alternately in arcuate paths about axes below said jaws.

27. The combination with means for supplying a duplex series of symmetrically overlapped sheets of material, of an oscillatory feeding device arranged to discharge said material from its oscillatory end, opposed sets of clamping jaws arranged to receive material delivered by the feeding device, and tucking blades connected for movement in step with said feeding device and adapted to act alternately upon said duplex series, the ends of two sheets being folded within a third sheet between said clamping jaws by each engagement of a tucking blade with the series.

28. The combination with means for supplying a duplex series of mutually over-

lapped sheets, of opposed sets of clamping
jaws, means for engaging said series of
sheets alternately upon opposite sides and
folding the sheets so engaged between the
5 clamping jaws, means for actuating said
jaws initially to engage the folded sheets
upon either side of said sheet engaging and
folding means, and means for bringing the
jaws of each set together subsequent to the

initial clamping action and subsequent to 10
the withdrawal of said engaging and fold-
ing means from the creasing sheet.

In testimony whereof I affix my signature
in the presence of two witnesses.

DAVID W. HUDSON.

Witnesses:

G. A. RICHARDSON,
A. E. BUTTRICK.

DISCLAIMER

1,484,069.—*David W. Hudson*, Green Bay, Wis. INTERFOLDING MACHINE. Patent dated February 19, 1924. Disclaimer filed March 27, 1934, by the patentee, the exclusive licensee, *Hoberg Paper and Fibre Company*, acquiescing.

Hereby enters the following disclaimer, to that part of the claim of said Letters Patent which is in the following words, to wit:

"28. The combination with means for supplying a duplex series of mutually overlapped sheets, of opposed sets of clamping jaws, means for engaging said series of sheets alternately upon opposite sides and folding the sheets so engaged between the clamping jaws, means for actuating said jaws initially to engage the folded sheets upon either side of said sheet engaging and folding means, and means for bringing the jaws of each set together subsequent to the initial clamping action and subsequent to the withdrawal of said engaging and folding means from the creasing sheet."

[*Official Gazette April 24, 1934.*]