S. WHEELER.

FOLDING MACHINE.

APPLICATION FILED SEPT. 11, 1908.

980,373.

Patented Jan. 3, 1911.

3 SHEETS—SHEET 1.

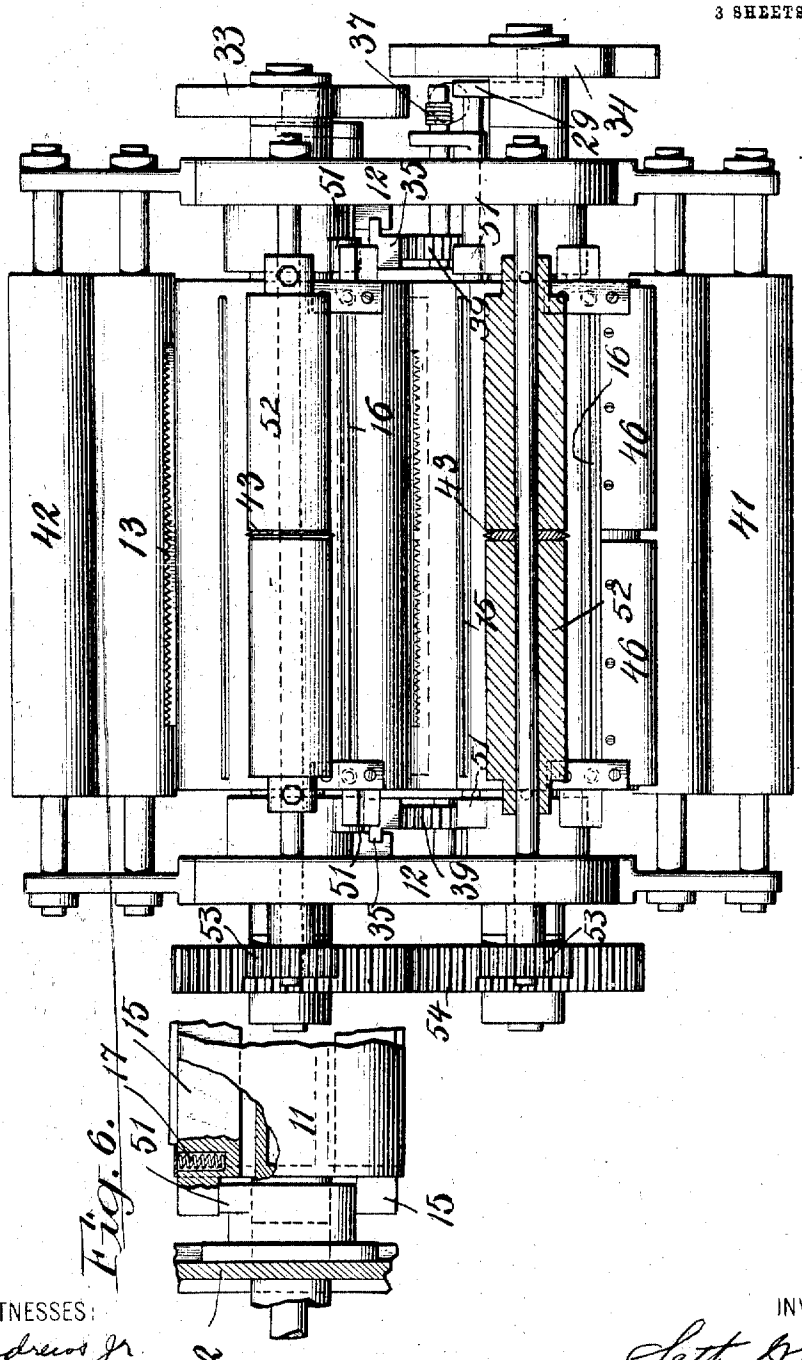

Fig. 1.

Fig. 6.

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3 SHEETS—SHEET 2.

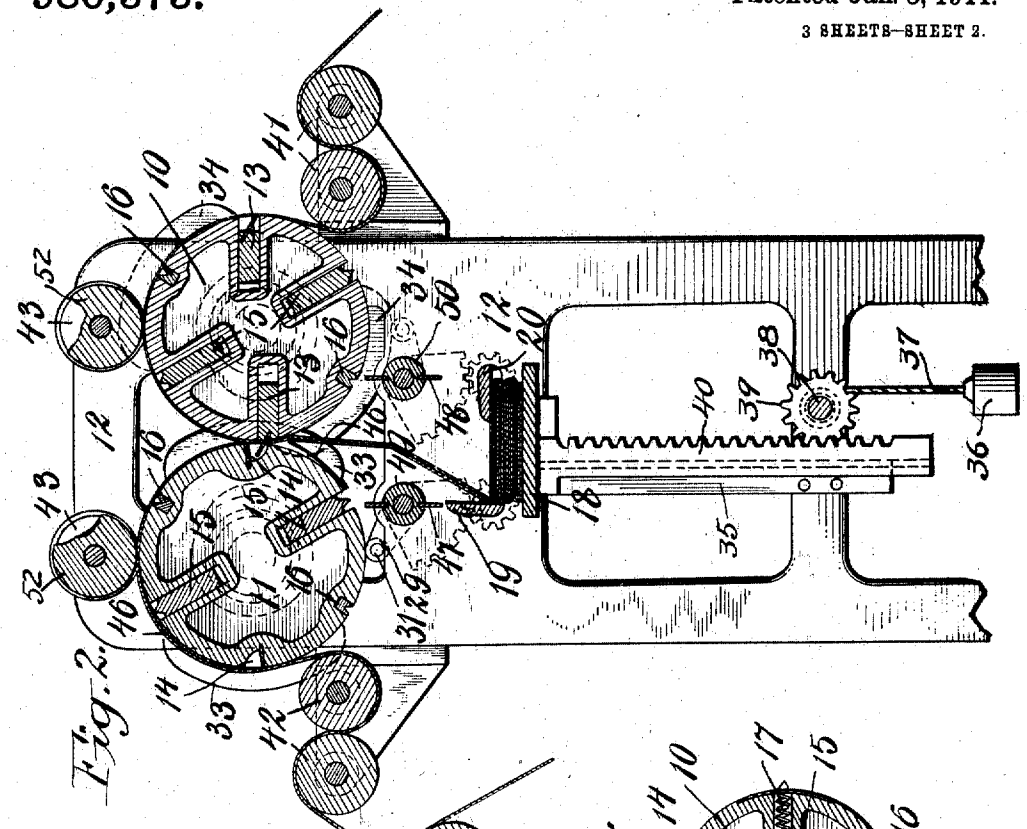

Fig. 2.

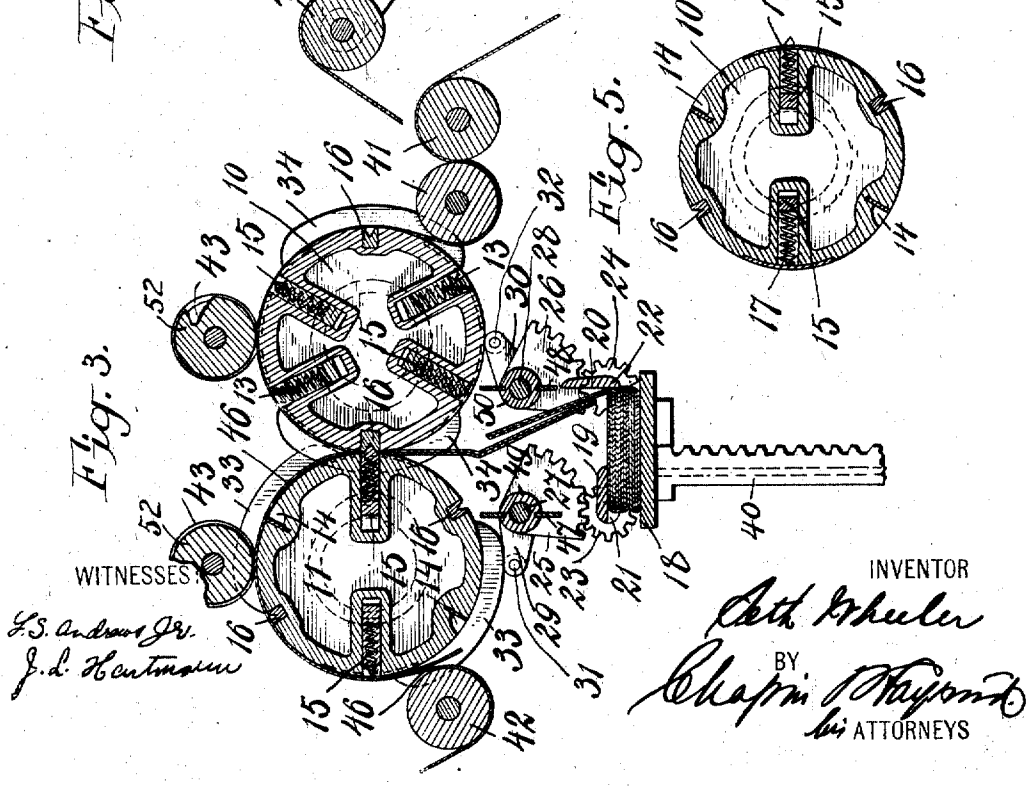

Fig. 3.

Fig. 5.

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3 SHEETS—SHEET 3.

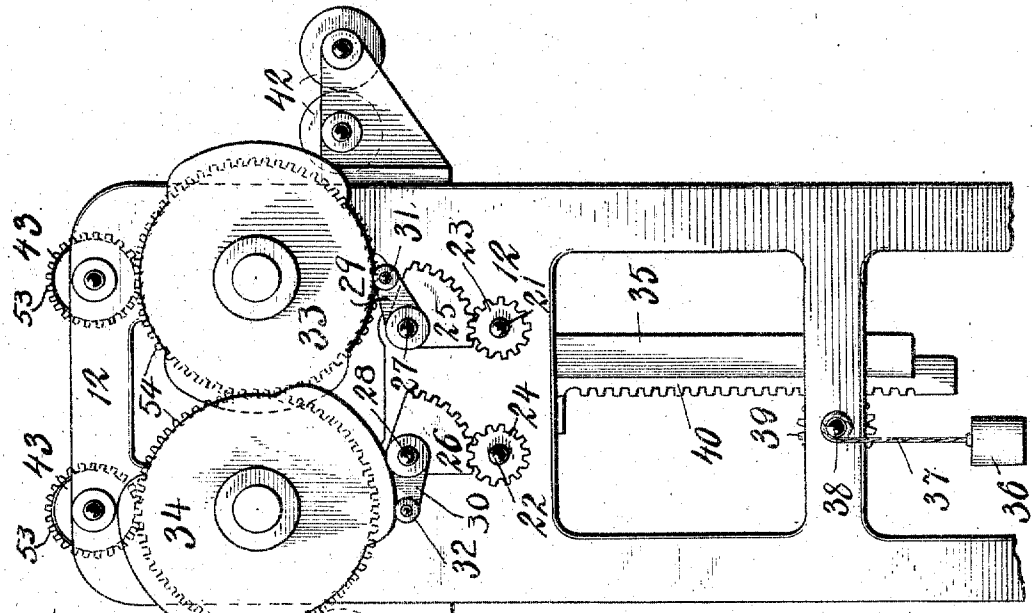

Fig. 4.

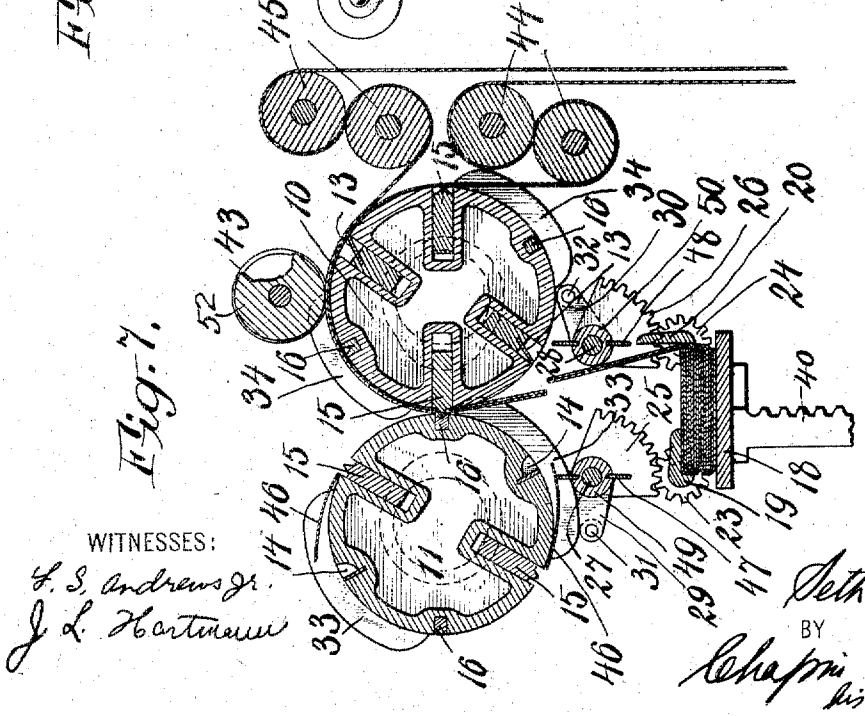

Fig. 7.

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UNITED STATES PATENT OFFICE.

SETH WHEELER, OF CASTLETON, NEW YORK.

FOLDING-MACHINE.

980,373. Specification of Letters Patent. Patented Jan. 3, 1911.

Application filed September 11, 1908. Serial No. 452,526.

To all whom it may concern:

Be it known that I, SETH WHEELER, a citizen of the United States of America, and a resident of Castleton, county of Rensselaer, State of New York, have invented certain new and useful Improvements in Folding-Machines, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to improvements in folding machines, and particularly to folding machines employed for the purpose of producing packages of paper composed of reverse-folded three-leaved units, whose end leaves are interfolded with the end leaves of adjacent units.

The main object of my invention is to produce and interfold such units continuously and quickly, and to this end I have so designed the machine as to employ continuous rotary movement to as great an extent as possible, such continuous rotary movement permitting very much higher speeds than is possible with any other form of movement, as will be well understood. I produce the sections to form the units, and I crease the said units so as to form the leaves thereof, entirely with rotary mechanism, the only oscillating parts being the folders for actually completing the folds which have been started by the creasing mechanism, but these folder blades are themselves operated by rotary cams, the necessary timing of the movements thereof being attained by the shaping and timing of the cams and dwells therein.

In order that my invention may be thoroughly understood, I will describe an embodiment thereof, having reference to the accompanying drawings illustrating the same, and will then point out the novel features in claims.

In the drawings: Figure 1 is a top view of a folding machine embodying my invention. Figs. 2 and 3 are cross-sectional views of the same with the parts shown in different positions. Fig. 4 is a view in side elevation of the machine. Fig. 5 is a detail cross-sectional view of one of the cylinders upon a plane in line with certain retractile springs employed therein. Fig. 6 is a detail view showing particularly a stationary cam employed in connection with cutting and creasing means carried by the cylinders. Fig. 7 is a cross-sectional view of a slightly modified form of the machine.

The machine includes two main cylinders 10, 11, which are suitably journaled in the framework 12. These two cylinders are arranged side by side with their peripheries in close proximity to each other, the said cylinder 10 being provided with cutters 13, and the cylinder 11 with corresponding dies 14 for co-action therewith. Each said cylinder 10 and 11 is provided, between the cutters and the dies, with a pair of male impression members 15 and a corresponding pair of female impression members 16. The said male and female impression members are arranged in sets, the male impression member of one cylinder being fitted to, and co-acting with, the female impression member of the other cylinder, and the said sets are arranged alternately, that is to say, an impression member of either type on either cylinder is followed by an impression member of the other type on the same cylinder. The male impression members and the cutters are preferably formed as radially movable parts, being provided with springs 17 to normally force them inward with a yielding pressure, so that normally they will not extend beyond the periphery of the cylinders, while the female members may conveniently be held rigidly in the cylinders, with their faces flush with, or below the level of, the cylinder peripheries, as shown. Stationary cams 51 are employed to act upon the cutters 13 and the male impression members 15 as the cylinders revolve, whereby to force them outward for operative co-action with the corresponding dies 14 and female impression members 16 carried by the other cylinder. Each set of impression members constitutes means for creasing paper which is fed forward between the said cylinders 10 and 11, the alternation of the sets effecting such creasing alternately in opposite directions. Further, as co-acting cutters and dies alternate with each two sets or pairs of impression members, it will follow that a web or webs of paper fed between the cylinders will be creased first in one direction, then in another, and finally severed, thereby producing units of predetermined length having reverse folds of general Z-shaped form. These units, as they are formed, are directed downward on to a receiving table 18 in proximity

to the sides of which are provided folder blades 19 and 20. The folder blades 19 and 20 are arranged upon shafts 21 and 22 respectively, upon the outer ends of which are mounted pinions 23, 24. These pinions 23, 24 are arranged in mesh with the teeth of gear segments 25, 26 mounted respectively upon shafts 27, 28 upon which are also secured operating arms 29, 30. Said operating arms are provided with cam follower rollers 31 and 32 respectively, which are engaged by cams 33, 34 secured respectively to rotate with the cylinders 11 and 10. The cams 33, 34 are so positioned and timed as to cause the folders to oscillate through an arc of ninety degrees one after the other, the movement of each commencing at some time after the impressed or creased portion of a unit comes to a position opposite it. In Fig. 2 of the drawings the folder blade 20 has operated, and is pressing the end leaf of a unit down upon the pile beneath it, while the folder blade 19 is in an upright position but is about to be operated as the cam 33 reaches it. In Fig. 3 the folder blade 19 has been operated, while the blade 20 is shortly to be operated. In Fig. 7 the folder blades are shown in the same position as they are shown in Fig. 3, but the cylinders 10 and 11 are in a somewhat different position, the creasing by the impression blades being in the act of being effected by a male impression member carried by the cylinder 10, in Fig. 7, while in Fig. 3 such creasing is being effected by the male member carried by the cylinder 11. In Fig. 2 a die and cutter 13 and 14 are shown as having just operated. The arrangement and timing of the cams 33, 34 is preferably also such that one or other of the folder blades 19, 20 will always be in a horizontal position, and such blades will not only perform their function of folding over the leaves of the units which have already been creased or impressed by the impression members, but will also operate to feed the table 18 downward as the pile of folded units thereon increases in height. This table is mounted to move vertically, being guided by suitable slides and guideways 35. It is pressed upward with a yielding pressure by means of a weight or weights 36, connected by means of a cord or cords 37 to a shaft 38, the opposite ends of which carry pinions 39 in engagement with the teeth of rack bars 40 which depend from the said table 18.

The material to be operated upon may conveniently be fed in to the machine in the form of continuous webs, and any number of such webs may be fed in together as may be desired. I have shown two such webs as being fed into the machine, and have provided two sets of feed rolls 41, 42 for the purpose of so feeding them. These sheets or webs may be of any desired width, but if they are of greater width than the width of a single unit in its final condition, longitudinal cutters may be employed to sever the webs or sheets longitudinally into strips as they are fed through the machine. In Figs. 1, 2, 3 and 4 such cutters 43 are employed in connection with each of the said cylinders 10 and 11, whereby the webs will be thus severed longitudinally after they are fed to the cylinders 11, 10, but before they are operated upon by the transverse cutters or the impression devices. The cutters are arranged upon shafts which also carry presser rolls 52 disposed in peripheral contact with the cylinders 10, 11, and driven by pinions 53 in engagement with the gearing 54 which connects the said cylinders. In Fig. 7 two sets of feeding rollers 44, 45 are arranged upon one side of the machine in proximity to the cylinder 10, in which case but one cutting device or set of cutting devices 43 is employed, the same being mounted immediately above, and adapted to co-act with, the said cylinder 10.

The operation of the machine is as follows: Considering the parts as they are illustrated in Fig. 2 of the drawings, it will be seen that a set of the transverse cutters 13, 14 have just operated to sever the webs which have been fed into the machine by the feeding devices, and severed longitudinally into strips by the rotary cutters or slitters 43. A pile of folded units are on the table 18, the folder blade 20 at the right hand edge of the said units resting upon the top of the pile, while the last unit has its first leaf interfolded with the last leaf of the preceding unit, the said last unit being shown as creased or impressed in two places to form a middle and an end leaf. The folder 19 is in a vertical position ready to fold the middle leaf of the last unit over upon the pile. In Fig. 7 the cylinders 10 and 11 have gone forward one-sixth of a revolution. The right hand folder 20 has moved up to a vertical position, while the left hand folder 19 has moved down to a horizontal position, folding the middle-leaf of the last unit over upon the pile, and placing the last leaf in a position to be folded by the folder blade 20 at its next operation. The web or webs have moved forward with the cylinders 10 and 11, and the male impression member 15 of the cylinder 10 is co-acting with a female impression member of the cylinder 11 to make the first crease or impression in the unit now being formed. During the next one-sixth of a revolution of the cylinders 10, 11, which will bring the parts from the position shown in Fig. 7 to the position shown in Fig. 3, the folder blades will remain stationary, but as the end of the new unit being formed moves forward with the movement of the cylinders, such end will be fed downward against the

inner face of the last leaf of the unit upon the table, whereby, when upon a later movement, the folder blade 20 is operated, not only will the last leaf of the last unit be folded over, but with it will be folded the first leaf of the unit just being formed. In Fig. 3 a male impression member 15 is shown as co-acting with a female impression member 16 carried by the cylinder 10 whereby to form the second or reverse fold in the unit being formed, such unit being finally severed when the cylinders move around to a position corresponding to the position of the parts shown in Fig. 2. To insure proper cutting of the cutter blades 13, I have provided the cylinder 11 with spring elements 46, which tend to force the paper against the surface of the cylinder 10 at the moment the cutting is taking place; and to prevent the accidental displacement of the units as they are being fed down to the table 18, I have provided stationary guides or supports 47—48 upon either side of the path of movement thereof, said guides being conveniently disposed upon sleeves or thimbles 49—50, which loosely surround the shafts 27—28.

In referring to the units of which the packages are formed it will be understood that such units may comprise any number of sheets, one, two or more as may be desired, the number of sheets in each unit depending upon the number of webs fed in at one time, or the number of sheets contained in a web or webs so fed into the machine.

What I claim is:

1. The combination with means for producing oppositely projecting creases or impressions in successive units, and for continuously feeding the units so impressed or creased to folder blades, of oscillating folder blades, and means for operating same, said means so timed with relation to the feed of the units as to permit one unit to partially overtake the preceding unit, after the latter has left the creasing means, whereby, when the terminal leaf of one unit is folded by a folder blade, the first leaf of the succeeding unit will be interfolded therewith.

2. The combination with rotatably mounted cylinders, and impression means carried thereby for creasing paper fed between the said cylinders, of folder blades for operating upon the creased paper as it is received from the cylinders, and means for operating the said blades so timed with relation to the movement of the cylinders as to cause the adjacent ends of creased paper sheets fed from the cylinders to overtake each other before they are folded, whereby the said sheet ends will be interfolded when the folding is effected.

3. The combination with rotatably mounted cylinders and impression means carried thereby for producing creases which project alternately in opposite directions in paper fed between the said cylinders, of folder blades for operating upon the creased paper as it is received from the cylinders, and means for operating the said blades so timed with relation to the movement of the cylinders as to cause the adjacent ends of creased paper sheets fed from the cylinders to overtake each other before they are folded, whereby the said sheet ends will be interfolded when the folding is effected.

4. The combination with continuously rotating cylinders, means for feeding a web between them, impression means carried by the cylinders for creasing the web; and means for cutting the web transversely into units, of oscillating folder blades and means for operating same, the said means so timed with relation to the movement of the cylinders that the units are caused to overtake each other to the extent that a portion of a succeeding unit is interfolded with the terminal of a preceding unit when the said terminal is operated upon by a said folder blade.

5. The combination with a pair of rotatable cylinders each provided with one element of a pair of cutting members, a male impression member and a female impression member, each said member arranged for co-action with a complementary member on the other said cylinder, the said cutting and impression members being all so normally disposed with respect to the cylinders carrying them that they do not project beyond the peripheries of the said cylinders, of means for forcing certain of the members beyond the peripheries of the cylinders as they revolve.

6. The combination with a pair of rotatable cylinders, each provided with one element of a pair of cutting members, a male impression member, and a female impression member, each said member co-acting with a complementary member on the other said cylinder, of retractile means for normally withdrawing certain of the said members to a normal position with their faces flush with, or below the level of, the peripheries of the cylinders, and stationary cam means for forcing the said members outward for co-action in the rotation of the cylinders as the members of opposite cylinders approach each other.

7. The combination with rotatably mounted cylinders, impression means carried thereby for creasing paper fed between the said cylinders, and transverse cutting elements also carried by the cylinders for separating the paper into units, of folder blades for operating upon the creased units as they are received from the cylinders, and means for operating the said blades so timed with relation to the movement of the cylinders as to cause the adjacent ends of units fed from the cylinders to overtake each other before they are folded, whereby the said unit ends will be interfolded when the folding is effected.

8. The combination with rotatably mounted cylinders, and impression means carried thereby for creasing paper fed between the said cylinders, of folder blades for operating upon the creased paper as it is received from the cylinders, and cams rotating with the cylinders for operating the said blades, said cams having dwell portions therein, whereby the operation of the said blades is so timed with relation to the movement of the cylinders as to cause the adjacent ends of sheets fed from the cylinders to overtake each other, substantially as set forth.

9. The combination with a pair of co-acting cylinders, transverse cutting elements carried by said cylinders, two sets of co-acting impression members also carried by said cylinders, means for forcing one element of a pair of cutting members and one member of each of the pairs of impression members beyond the peripheries of the cylinders as they revolve and for again retracting them.

10. The combination with a pair of rotatable cylinders, of a transverse cutter carried by one of the said cylinders, a co-acting die carried by the other said cylinder, a male impression member carried by each said cylinder, a female impression member for co-action with the said male impression member also carried by each said cylinder, and means for forcing the cutter and the male impression members beyond the peripheries of their respective cylinders as they revolve and for again retracting them.

SETH WHEELER.

Witnesses:
WM. A. WHEELER,
SETH WHEELER, Jr.