C. F. SMITH.

CUTTING MECHANISM.

APPLICATION FILED NOV. 8, 1910.

1,067,626.

Patented July 15, 1913.

5 SHEETS—SHEET 1.

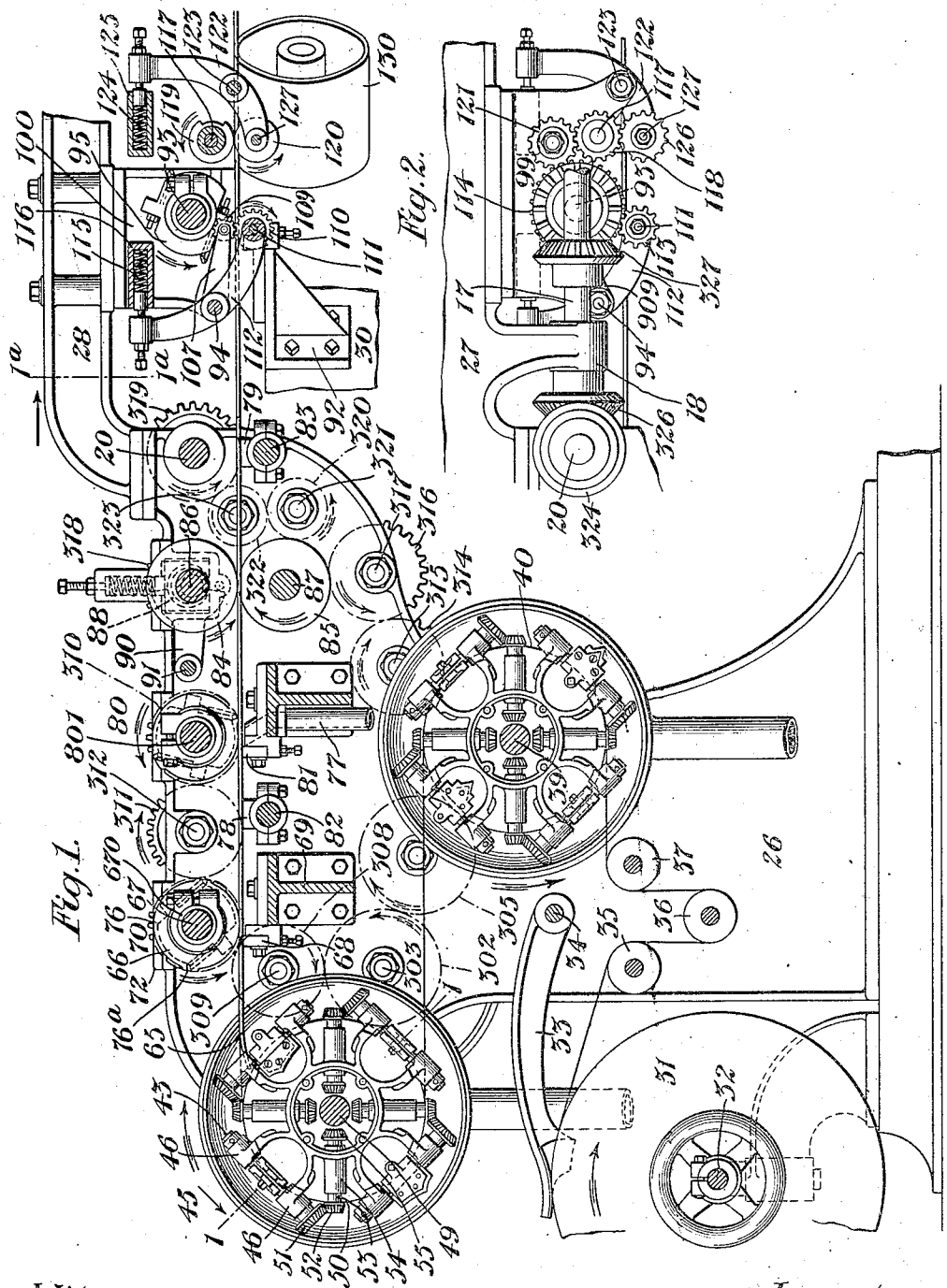


Fig. 1.

Fig. 2.

Witnesses:

Louis B. Fischler

Chas. W. La Rue

Inventor:

Charles F. Smith

by Wilbur M. Stone

Attorney.

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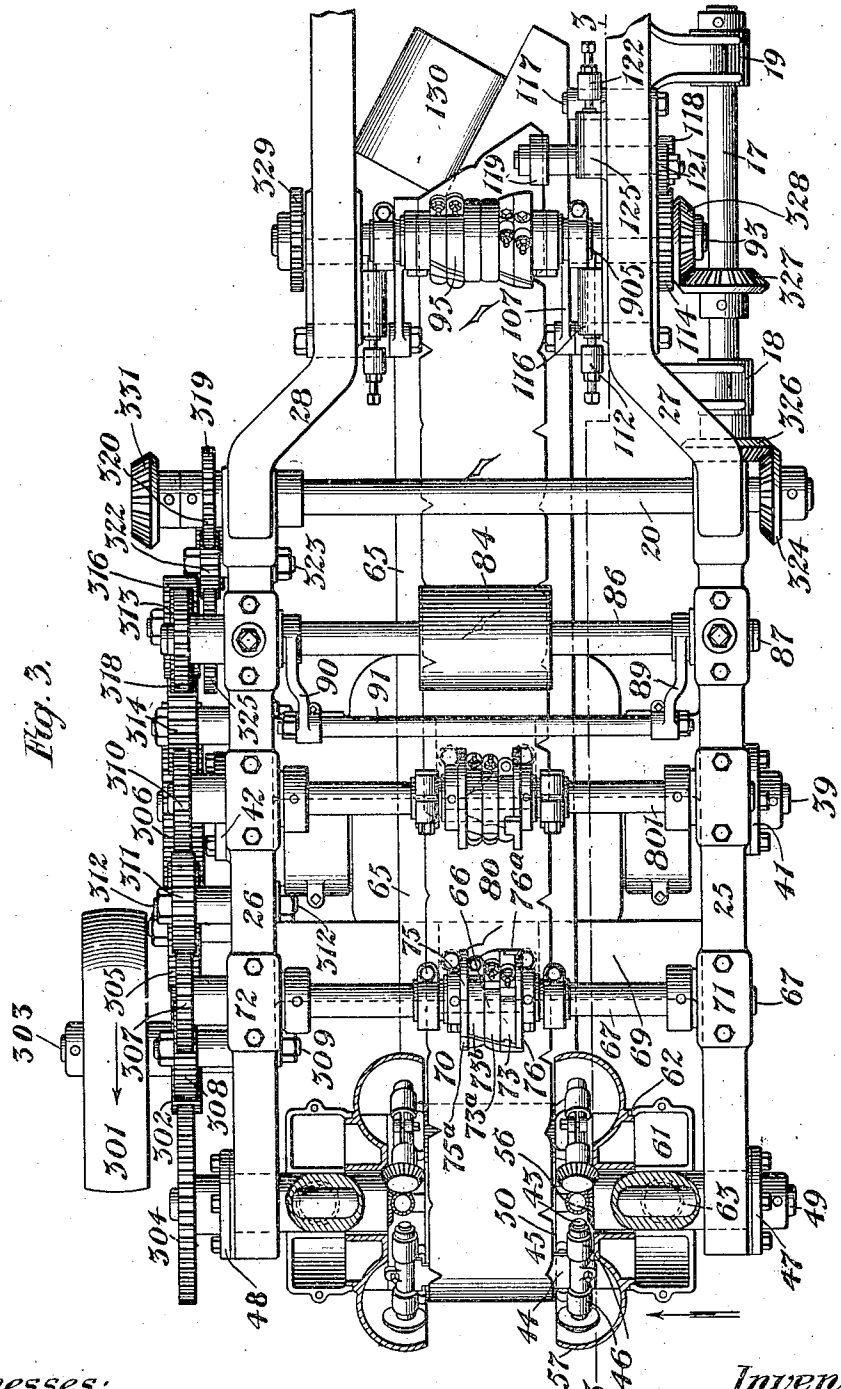
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5 SHEETS—SHEET 2.

Fig. 3.



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Fig. 5.

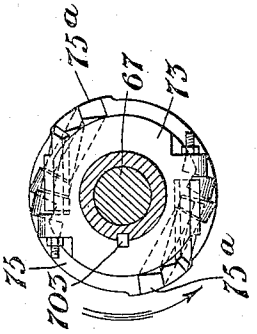


Fig. 6.

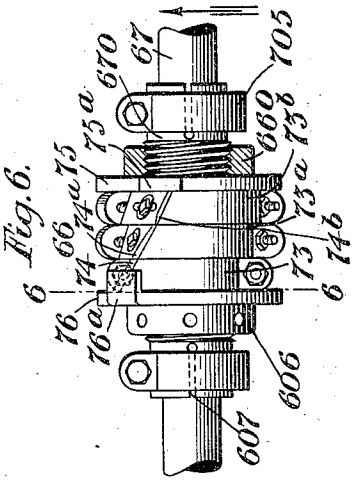


Fig. 4.

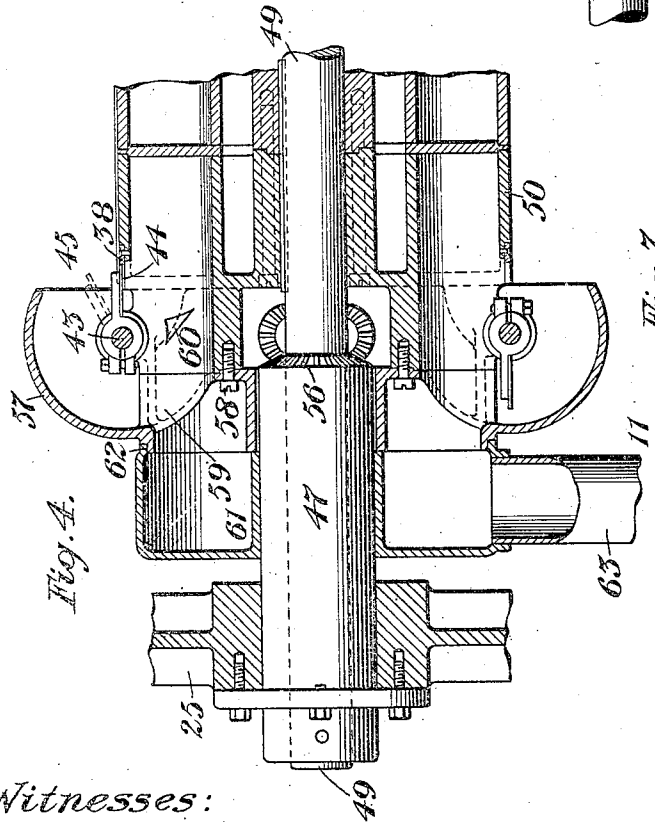
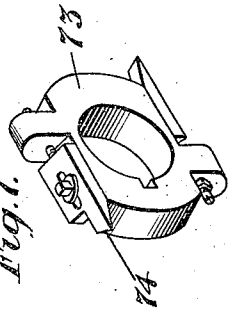


Fig. 7.



Witnesses:

Louis B. Fischler

Chas. W. La Rue

Inventor:

Charles F. Smith

by Wilbur M. Stone

Attorney.

C. F. SMITH.

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5 SHEETS—SHEET 4.

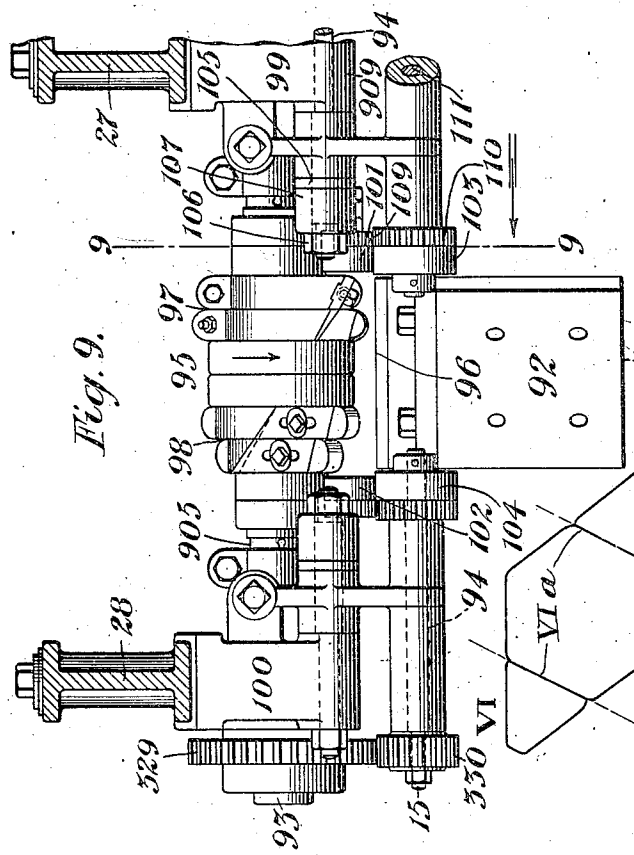


Fig. 9.

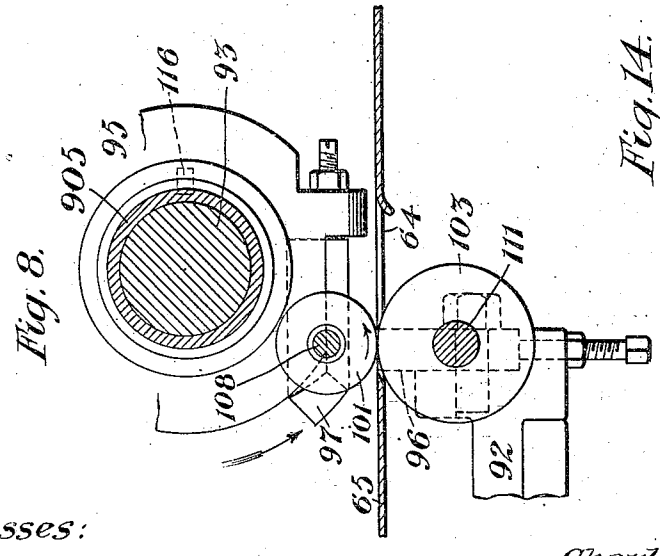


Fig. 8.

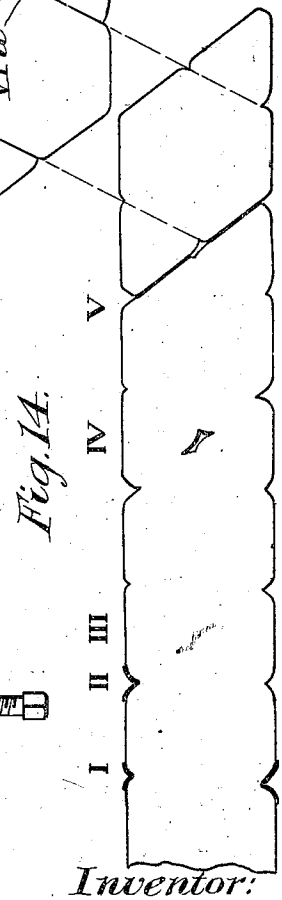


Fig. 14.

Witnesses:
Louis B. Fischler
Chas. W. La Rue

Inventor:
Charles F. Smith
by Wilbur M. Stone
Attorney.

C. F. SMITH.

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5 SHEETS—SHEET 5.

Fig. 12.



Fig. 13.

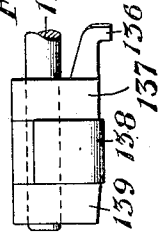


Fig. 11.

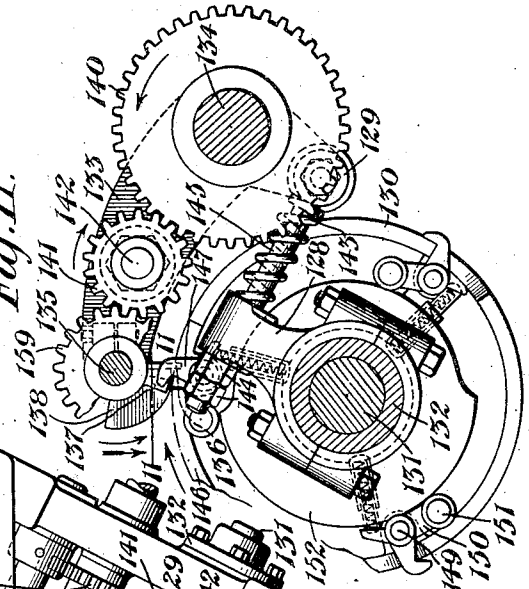
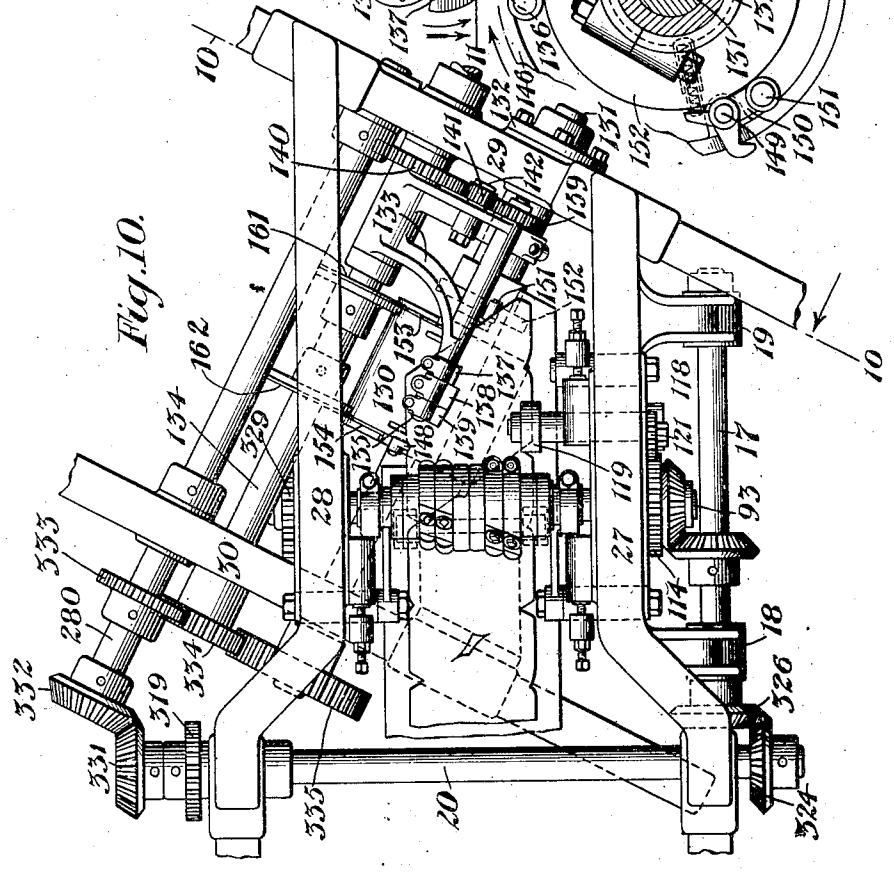


Fig. 10.



Witnesses:

Louis B. Fischler

Chas. W. La Rue

Inventor:

Charles F. Smith

by Wilbur M. Stone

Attorney.

UNITED STATES PATENT OFFICE.

CHARLES F. SMITH, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO MERCANTILE CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

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CUTTING MECHANISM.

1,067,626. Specification of Letters Patent. Patented July 15, 1913.

Original application filed December 31, 1909, Serial No. 535,750. Divided and this application filed November 8, 1910. Serial No. 591,334.

To all whom it may concern:

Be it known that I, CHARLES F. SMITH, a citizen of the United States, and a resident of Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Cutting Mechanism, of which the following is a specification.

This invention relates to cutting mechanism for paper and the like and particularly to that class of such mechanism as is provided for severing a continuous web of material into blanks of predetermined profile adapted to be used in the formation of envelops, boxes, bags and the like.

This application is divided out of my application for Letters Patent for improvements in envelop machines filed Dec. 31, 1909, Serial Number 535,750.

One object of my improvements is to furnish mechanism of simple construction which will accurately and rapidly form blanks of more or less irregular profile, with a low percentage of waste.

Another object of my improvements is to furnish means for advancing the blank in a path which deviates from the path of the web widthwise of the web. The particular portion of my improved mechanism by which said blank advancement is accomplished I denominate the angular transfer.

A further object of my improvements is to furnish means for delivering said blank from the cutting means to the angular transfer while maintaining full and accurate control of said blank.

To these ends my improvements comprise mechanisms and combinations illustrated in their preferred forms in the drawings accompanying this specification.

Figure 1 is a sectional side elevation on line 3, 3 of Fig. 3 of my improved machine. Fig. 2 is a side elevation of a detail thereof. Fig. 3 is a plan view with portions of the first cutter head casing removed, corresponding with Fig. 1. Fig. 4 is a detail sectional elevation on line 1, 1 of Fig. 1. Fig. 5 is a cross section on line 6, 6 of Fig. 6. Fig. 6 is an elevation of one of the cutter heads. Fig. 7 is a detail view in perspective of one member of the cutter head of Fig. 6. Fig. 8 is a detail sectional elevation on line 9, 9 of Fig. 9. Fig. 9 is a detail elevation, partly in section on line 1^a, 1^a of Fig. 1, of one of the cutter heads and coacting parts. Figs. 4 to 9 inclusive are shown on scales larger than that of, for instance, the constructional views of Figs. 1 and 2. Fig. 10 is a plan view of the latter portions of the cutting mechanism and of the angular transfer mechanism. Fig. 11 is a detail sectional elevation on an enlarged scale on line 10, 10 of Fig. 10. Fig. 12 is a section on line 11, 11 of Fig. 11 and Fig. 13 is an elevation of a detail of the blank locating means. Fig. 14 is a diagrammatic view illustrating the several steps in the process of making and delivering a blank in my improved machine.

My improved machine comprises side frames 25, 26 on which are supported the various members and mechanisms. In the drawings I have illustrated my improvements as particularly adapted for forming from a continuous web of paper a succession of blanks suitable for folding into envelops. The envelop blank which I have illustrated is one whose sides form substantially a parallelogram having a pair of opposite sides parallel with the path of travel of the web. The particular form of said blank may vary materially but is preferably substantially a parallelogram having four equal sides and forming a rhombus or a square.

The operation of my improved machine comprises the making of cuts in each edge of the web, (I, II) cuts in the mid-portions of the web (III, IV) in severing (V) the completed blank from the leading end of the web and the advancement of said blank in a path (VI) which deviates from the path of the web widthwise of the web (Fig. 14). Said web of paper may be supplied in the usual roll as 31 revolubly mounted on shaft 32 in brackets upstanding from the base of the machine. Guide arms as 33 reach rearwardly from pivots as 34 in frames 25, 26 for engagement with the roll to keep the web of paper in the proper direction of travel. The web of paper is then threaded between a plurality of rolls 35, 36, 37 pivotally mounted in side frames 25, 26, and thence to first cutter cylinder 40 mount-

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ed for revolution on shaft 39 supported in sleeve-like boxes 41, 42 inreaching from side frames 25, 26 respectively. The web of paper engages the periphery of said cylinder for about half its circumference and while in said engagement cuts I (Fig. 14) are made in opposite edges thereof. The web then passes to similar engagement with second cutter cylinder 50 similarly mounted for revolution on shaft 49 supported in sleeve-like boxes 47, 48 inreaching from side frames 25, 26 respectively. While the web is in engagement with second cutter cylinder 50 cuts II (Fig. 14) are made in opposite edges of said web. Cylinders 40 and 50 are relatively timed to make cuts I and II at the desired intervals on the edges of the web. As cutter cylinders 40 and 50 are in all respects similar in construction and operation a description of one will suffice for both. Referring therefore more particularly to cutter cylinder 50 which is illustrated more in detail than cylinder 40, it will be observed that the circumference of said cutter cylinder is evenly divisible by the length of the blank measured on the edge of the web. In the present instance said circumference equals four times a blank length and said cutter head is therefore provided at each end thereof with four sets of cutting means equally spaced circumferentially. The several cutting means at one end are arranged relatively opposite those at the other end of said cylinder so as to make cuts, as I, in predetermined relation to each other on opposite edges of the web. As the set of four cutting means at one end of cylinder 50 is in every respect like the set of four cutting means at the other end thereof (except in detail profile of cut) a description of one set will suffice for both. Also as each group of the set of four cutting means is in every respect like the other three a description of one will suffice for all. Referring therefore particularly to cutting means indicated in a general way at 45 (see Figs. 1, 3, 4) die 38 having in the present instance a cutting profile corresponding with lower cut II (Fig. 14) is formed in or set into the edge of the periphery of cylinder 50. On shaft 43 is revolubly mounted cutter 44 having a profile complementary to that of die 38. Said shaft 43 is approximately tangent to cylinder 50 and to the face of die 38, and is supported in bearings 46, 46 on the end of cylinder 50. On one end of cutter shaft 43 is bevel gear 51 driven from bevel gear 52 on the outer end of radial shaft 53 in bearing 54 on the end of cylinder 50. Bevel gear 55 on the inner end of said radial shaft 53 is driven by fixed gear 56 on the inner end of sleeve like bearing 47 of cylinder shaft 49. Thus when cylinder 50 is rotated, gear 55 has a planetary relation to fixed gear 56 and is rotated on its own axis during its revolution about said gear 56. Said rotation of gear 55 is transmitted as described to cutter shaft 43. The relative diameters of the several gears of the train are such that cutter 44 on shaft 43 is caused to make one complete revolution during one revolution of cylinder 50, and the timing is such that said cutter 44 is caused to coact with its die 38 to make its predetermined cut in the edge of the web while the web is wrapped about the periphery of the cylinder and to then revolve through said die to permit the free tangential departure of the cut portion of the web from said cylinder.

An annular hood 57 is fixed to the end of cylinder 50 for revolution therewith, by any convenient means as screws 58 and is provided with apertures as 59 opposite the cutting means as 45 for the passage of waste as 60 cut from the edge of the web. Fixed hood 61 having a circular jointure 62 with revoluble hood 57 has pipe 63 leading therefrom. By suitable means not shown suction may be applied to said pipe 63 and chips or waste as 60 conducted away from the cutting mechanism.

Table 65, having apertures as 64 (Fig. 8) therein at suitable places for the operation upon the web of various instrumentalities, is provided to assist the progress of the web in its proper direction. Said table is supported on brackets 78, 79 on tie rods 82, 83 respectively, reaching from side frame 25 to side frame 26.

Indicated in a general way at 70 is illustrated the means for forming the first cut III (Fig. 14) in the mid-portion of the web. Said means comprises cutter 66 adjustably mounted on shaft 67 for coaction with fixed cutter 68 therebelow. Said shaft 67 is revolubly mounted in boxes 71, 72 in side frames 25, 26 respectively. Fixed cutter 68 is adjustably mounted on cross frame 69 supported from side frames 25, 26. Referring now more particularly to Figs. 5, 6 and 7 the peculiar construction of revoluble cutter 66 will be pointed out. Said cutter comprises a plurality of disk like heads as 73 in the edge of each of which is adjustably mounted one or more cutters as 74. In the present instance I have shown two diametrally opposite cutters in each head and the cutter head is revolved once for each two successive blank positions of the passing web so that any individual cutter operates upon alternate blank portions of said web. The cutting edges of cutters 74, 74^a, 74^b are arranged to present a continuous line of cut, preferably helical, whose profile corresponds with that of the cut to be made in the web. The dividing of cutter 66 into increments furnishes a mobility of adjustment, ease of removal for sharpening and replacement that greatly facilitates con-

tinuity of operation. At each end of and closely adjacent to said cutter 66 are presser disks 75, 76 respectively. Disk 75 is provided with two diametrally opposite feet 75ª, 75ª extending circumferentially each way from the cutting edge of cutters 66 respectively. Said feet extend radially to a point just short of the cutter radius so that in rotating past fixed cutter 68 said feet will press the web against or up to said cutting edge close to the point of cutting, thus preventing any tendency of cutter 66 to tear the web at the ends of the cut. In the present instance the cutting edge of cutter 74 extends only a portion of the way across said cutter and foot 76ª of disk 76 therefore extends sidewise therefrom and overhangs the blank portion of cutter 74. For convenience of assembling, cutter disks 73, 73ª and 73ᵇ and presser disks 75 and 76 are mounted between clamp nuts 606 and 660 on sleeve 670. Key 703 serves to locate the several disks relatively to each other on sleeve 670. Said sleeve may be split at its ends, as at 607 and by means of clamp collars, as 705, adjustably secured to shaft 67.

Cutting means 80 for forming the second cut IV (Fig. 14) in the mid-portion of the web is substantially similar to means 70 just described for making cut III except that cut IV has a profile the reverse, relatively to the web, of cut III and except that provision is made for removing the waste formed by cutting means 80. The waste remover comprises tube or conduit 77 leading from directly in front of fixed cutter 81 to some suitable means, not shown, for exhausting the air from said tube and thereby conducting the chips or scrap away from the cutting point.

The principal feeding means for the web comprises a pair of feed rolls 84, 85 mounted on shafts 86, 87 respectively having bearings in side frames 25, 26. Upper shaft 86 is mounted in eccentric sleeves as 88 having arms 89, 90, the free ends of which are secured to rod 91, for lifting upper roll 84 from engagement with lower roll 85 to facilitate threading the web of paper therebetween.

The means for severing the blank from the leading end of the web V (Fig. 14), comprises revoluble cutter 95 in coaction with fixed cutter 96 (Figs. 1, 3, 8, 9 and 10). Revoluble cutter 95 has right and left cutting portions 97, 98, each comprising a plurality of cutting members mounted on sleeve 905 all similar in construction to similar parts of cutter head 70 previously described in detail. But in the present instance presser disks, as 75, 76, are omitted as the severing cuts have their ends unconfined and are therefore not liable to tear as are the mid web cuts. The several members of cutter 95 are mounted on shaft 93 and are located circumferentially relatively to each other by key 116. Shaft 93 is mounted in bearings 99, 100 depending from bridge frames 27, 28 respectively. Fixed cutter 96 is adjustably mounted on bracket 92 fixed to frame 30.

For advancing the leading end of the web between revoluble cutter 95 and fixed cutter 96 I provide opposite pairs of small rolls 101, 103 and 102, 104 respectively for engagement with the edges of the web. Said rolls have their line of coaction just prior to the cutting line, are actuated at a surface speed slightly in excess of the speed of the web and the members of each pair of rolls are urged to coaction by spring pressure. Because of this increase in surface speed there is a very slight slipping of the rolls on the web and a slight tension applied thereto whereby any tendency to slackness is obviated. As said pairs of rolls are right and left duplicates, a description of rolls 101, 103 and their mountings will suffice for both. Bearing 99 for cutter shaft 93 has ear 909 therein in which is fixed stud 94. Said stud 94 has collar 105 thereon and between said collar and nut 106 is adjustably fixed arm 107 carrying at its outer end stud 108 on which roll 101 freely turns. Said roll 101 has gear 109 fixed thereto for engagement with gear 110 of roll 103. Lower roll 103 is fixed on the inner end of shaft 111 mounted for rotation in the lower end of yieldable arm 112. The outer end of said shaft 111 has gear 113 fixed thereon for engagement with gear 114 of shaft 93. The relative sizes of gears 113, 114 are such as to impart to roll 103 a surface speed slightly in excess of that of the web, as already described. Yieldable arm 112 is pivoted about midway its length on stud 94 and its upper end engages spring 115 in socket 116 of bearing bracket 99, whereby its lower end is caused to urge roll 103 to coaction with roll 101.

For advancing the leading end of the web while it is being severed from the main portion of the web to form a blank, rolls 119, 120 are provided. Upper roll 119 is segmental and is fixed to the inner end of shaft 117 having a bearing in bracket 99. The outer end of said shaft 117 has gear 118 thereon driven from gear 114 on shaft 93 through intermediate gear 121. Lower roll 120 is fixed to shaft 127 revolubly mounted in the lower end of yieldable arm 122 pivoted at 123 in bracket 99. Said arm urges roll 120 to coaction with roll 119 by means of spring 124 in socket 125 in engagement with the upper end of said arm 122. Gear 126 is fixed to the outer end of shaft 127 for engagement with gear 118.

Segmental roll 119 and roll 120 are the last instrumentalities to operate upon the web and the first to operate upon the severed

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blank. They are the last instrumentalities whose axes are parallel to the axes of the blank forming means as for instance shaft 93. The functions of said rolls are first, to advance the leading end of the web, as already described, during the operation of the severing means, and second, upon the completion of the severing and substantially coincident therewith to deliver the blank to the locating means and the gripping means of the transfer mechanism, thereby performing the first step in the operation of the angular transfer mechanism.

Receiving cylinder 130 is fixed to shaft 131 having one bearing in sleeve 132 of frame 29 and another bearing in frame 30. Above roll 130 in the free end of arm 133 on shaft 134 parallel with shaft 131 is shaft 135. Said shaft has fixed thereto for revolution therewith front stop 136 for locating the blank relatively to cylinder 130. Shaft 135 has gear 159 fixed to the outer end thereof and is driven from gear 140 on shaft 134 through intermediate gear 141 on stud 142 in arm 133. Arm 133 has ear 129 extending downwardly therefrom and sleeve 132 has arm 128 clamped thereto. Between ear 129 and arm 128 spring 143 is efficient to urge arm 133 to cause segmental rolls 137, 138 to coact with receiving cylinder 130. Nuts 144 on spring stud 145 are efficient to hold segmental rolls 137, 138 on arm 133 in proper positions relatively to cylinder 130 (Fig. 11). Said cylinder 130 has three receiving beds as 146 thereon and each is provided with clips as 147, 148 for gripping the blank to the receiving bed. Said cylinder is geared to make one-third of a revolution for each blank delivered thereto. On shaft 135 and adjacent to the hub of front stop 136 is segmental roll 138 for coaction with cylinder 130 for assisting the delivery of the blank to said cylinder. On shaft 135 on each side of said segmental roll 138 are segments 137 and 139 respectively. Segment 137 is fixed to the hub of front stop 136 and segment 139 has a hub of its own. Segments 137 and 139 are shorter radially than segmental roll 138 and do not assist in feeding the blank but are efficient to prevent buckling and to smooth the blank out on cylinder 130. Two clips as 147, are mounted on one shaft as 149 in said cylinder 130 and said shaft has an arm as 150 having a roll as 151 for engagement with fixed cam 152. Said rolls, as 151, are spring urged to engagement with cam 152.

The driving mechanism for my improved machine is as follows: Main pulley 301 having gear 302 fixed to the hub thereof is mounted for free rotation on stud 303 outstanding from frame 26. Power may be applied to said pulley 301 from some suitable source not shown. Said gear 302 drives gear 304 on shaft 49 of second cutter cylinder 50, on the one side, and through intermediate gear 305, gear 306 on shaft 39 of first cutter cylinder 40. Gear 307 on shaft 67 of cutter 66 is driven from main gear 302 through intermediate gear 308 on stud 309. Shaft 801 of cutting mechanism 80 has gear 310 thereon driven from gear 307 through intermediate gear 311 on stud 312. Shaft 87 of lower feed roll 85 has gear 313 thereon driven from gear 306 through intermediate gears 314, 316 on studs 315, 317 respectively. Upper feed roll shaft 86 has gear 318 thereon driven from gear 313 therebelow. Power is conveyed to gear 319 on transfer shaft 20 from second gear 325 on lower feed roll shaft 87 through intermediate gears 320, 322, on studs 321, 323 respectively. Bevel gear 324 on the near end of shaft 20 (Fig. 3) drives bevel gear 326 on shaft 17 lying lengthwise of the machine in bearings 18, 19 depending from bridge frame 27. Bevel gear 327 on shaft 17 drives bevel gear 328 on cutter shaft 93. On the other end of said shaft 93 gear 329 drives gear 330 on shaft 15 of roll 104. Bevel gear 331 on the rear end of transfer shaft 20 (Fig. 10) drives bevel gear 332 on the rear end of second transfer shaft 280. Gear 333 on said shaft 280 drives gear 334 on shaft 134 and said gear 334 drives gear 335 on shaft 131 of receiving cylinder 130. Said cylinder 130 is provided with circumferential grooves 153, 154, for coaction with casing rolls 161, 162 respectively on shaft 134 for forming creases VI^a (Fig. 14) in the blanks. Said shaft 134 has bearings in side frames 29, 30, turns freely in arm 133 and is geared to make one-half a revolution for each passing blank on cylinder 130.

The operation of my improved machine is as follows: A roll of paper 31 being supplied on shaft 32 the leading end of the web therefrom is led forwardly about rolls 35, 36, 37 (Fig. 1) and guide arms, as 33, are adjusted in position on said roll. The web of paper is then led upwardly around and in contact with the periphery of first cutting cylinder 40, then backwardly and upwardly around and in contact with the periphery of second cutting cylinder 50, then forwardly over table 65, through cutting means 70 and cutting means 80 and between main feed rolls 84, 85 (roll 84 being temporarily lifted by means of rod 91 to afford room for the web between said rolls). The web is then advanced under cutter 95 and between adjacent feed rolls, as 102, 104 and 119, 120, all respectively. Power now being applied to main pulley 301 the machine is started. Referring now to the several step views of Fig. 14 the operations of the machine will be described relatively thereto. Opposite cutters of first cutting cylinder 40, as, for in-

stance, the lower right hand pair, one of which appears in Fig. 1, rotate over and inwardly and coact with their respective dies in the periphery of said cylinder, thereby cutting opposite notches in the edges of the web I. Said cutters then pass downwardly through their dies respectively, thus leaving the web free to pass off from said cylinder and onto second cutting cylinder 50. Thereupon opposite cutters of said second cylinder, as for instance the lower left hand pair, one of which appears in Fig. 1, rotate in coaction with their respective dies in the periphery of said cylinder, and cut a second pair of notches in the edges of the web II. The relative timing of cylinders 40 and 50 is such as to space cuts I and II the predetermined distance apart. The scrap cut from said web edges falls into hoods, as 57, and is conveyed away through pipes as 63, all respectively, by suitable suction means not shown. The web now progresses through cutting mechanism 70, over fixed cutter 68 and under rotary cutter 66 where mid cut III is made, presser feet 75ª and 76ª pressing the web down against the fixed cutter close to the ends of cutter 66, whereby tearing of the ends of the cut is prevented. Said web is now advanced through cutting mechanism 80 where cut IV is formed. Cutting mechanisms 70 and 80 are timed relatively to each other and to cylinder 50 to form cuts III and IV in their proper relation to the edge cuts of the web. The scrap liberated by cut IV is conducted away through tube 77 by suitable suction means not shown. Up to this point the web has been advanced by means of main feed rolls 84, 85 between which the cut portions are now advanced and pass under rotary cutter 95 and over fixed cutter 96 where they are fed forwardly by edge rolls, as 102, 104, and the leading end of the web passes into grip of rolls 119, 120. Edge rolls as 102, 104 being actuated at a speed slightly in excess of the speed of the web, keep said web taut between their point of action and main feed rolls 84, 85. After the leading end of the web is in the grip of rolls 119, 120, cutter 95 rotates into coaction with fixed cutter 96 and severs the web between the larger edge cuts and the mid cuts V. At the instant of the completion of the severing of the blank from the web, rolls 119, 120 deliver the blank against front stop 136 which revolves in time therewith. The cut away portion of roll 119 at the same instant has rotated into position over roll 120, thereby liberating the blank. Directly succeeding said delivery of the blank against stop 136 the leading edge of segmental roll 138 coacts with receiving cylinder 130 to grip the blank and start it in its new direction of travel at such an angle to the path of the web and without changing the angular relation of the blank to the web path as will cause said blank to travel in a path parallel to folding lines VIª. Immediately following the engagement of the blank by segmental roll 138, segments 137, 139 on each side of segmental roll 138 hold the blank down and guide it to proper engagement with receiving cylinder 130. Directly following the engagement of segmental roll 138, clips as 147, grip the leading edges of the blank to the face of cylinder 130 and said blank is conducted along a path which deviates from the web path widthwise of the web, under creasing rolls 161, 162, and thence if desired to other mechanism not shown for further operation thereon, or said blank may be discharged from the machine.

I claim:

1. The combination of a cylinder, a die mounted for rotation therewith, a cutter for coaction with the die, said cutter being mounted on an axis revoluble about the axis of the cylinder; means for moving said cutter on its axis for coaction with the die synchronously with the revolution of the die, means to rotate the cylinder, and means to move the axis of the cutter about the axis of the cylinder synchronously with the die during the coaction of the cutter with the die.

2. The combination of a cylinder, a die mounted in the periphery thereof, a shaft mounted on the end of said cylinder and having a cutter thereon for coaction with the die, means for revolving the cutter continuously in one direction, and means for rotating the cylinder.

3. The combination of a revoluble cutter and a fixed cutter each having its cutting edge at all points substantially equi-distant from the axis of revolution of the revoluble cutter, said revoluble cutter having a continuous cutting edge comprising a plurality of independently adjustable portions, means to revolve the revoluble cutter, and means for feeding the web normal to the axis of the revoluble cutter.

4. The combination of a revoluble cutter and a fixed cutter each having its cutting edge at all points substantially equi-distant from the axis of revolution of the revoluble cutter, said revoluble cutter having more or less of its cutting edge out of parallelism with said fixed cutter, means for revolving the revoluble cutter and means for feeding the web at a speed equal to the peripheral speed of the cutting edge of the revoluble cutter and normal to the axis thereof.

5. The combination of a revoluble cutter having a transverse profile other than a straight line and having all points in that profile substantially equi-distant from its axis of revolution, a fixed cutter whose cutting edge is a straight line parallel with the

axis of revolution of the revoluble cutter, means to revolve the revoluble cutter, and means for feeding the web normal to the axis of the revoluble cutter.

6. The combination of a revoluble cutter having a transverse profile other than a straight line and having all points in that profile substantially equi-distant from its axis of revolution, a fixed cutter whose cutting edge is a straight line parallel with the axis of revolution of the revoluble cutter, means to revolve the revoluble cutter and means for feeding the web at a speed equal to the peripheral speed of the cutting edge of the revoluble cutter and normal to the axis thereof.

7. A cutting mechanism comprising the combination of rotatable means and fixed means operable for cutting a predetermined profile in a web of material transverse the direction of movement of said web without disturbing the continuity of movement thereof and means for moving the web synchronously with the speed of the rotatable means.

8. The combination of a plurality of cylinders each having a die mounted in the periphery thereof, a cutter for coaction with the die, means controlled by the rotation of the cylinder for actuating the cutter, means for rotating the cylinders at the same surface speed and means for feeding the web to the cylinders synchronously with the surface speed of the cylinders.

9. The combination of a die revolubly mounted, a cutter mounted for coaction with the die, means for revolving the die and means for actuating the cutter to engage the die during the revolution of said die, a revoluble cutter and a fixed cutter each having its cutting edge at all points substantially equidistant from the axis of revolution of the revoluble cutter, means for revolving the revoluble cutter and the die at the same peripheral speed and means for feeding a web of material synchronously with the common peripheral speed of the die and the revoluble cutter.

10. The combination of a revoluble cylinder having a die therein whose cutting edges are coincident with the periphery of the cylinder, means for feeding a web of material onto the cylinder and over the die at the peripheral speed of the cylinder, a cutter revolubly mounted on the cylinder for coaction with the die, means for revolving the cutter continuously in one direction, means for revolving the cylinder and means for timing the cylinder and the cutter.

11. A cutting mechanism, including in combination a revoluble cylinder having a die therein whose cutting edges are coincident with the periphery of the cylinder, means for feeding a web of paper onto the cylinder and over the die at the peripheral speed of the cylinder, a cutter revolubly mounted on the cylinder for coaction with the die, means for revolving the cutter continuously in one direction, means for revolving the cylinder and means for timing the cylinder and the cutter.

12. A cutting mechanism including in combination a plurality of cylinders, each having a die in the periphery thereof, a cutter for coaction with each die, means controlled by the rotation of the cylinder for actuating the cutter, means for rotating the cylinders at the same surface speed and means for feeding a web of paper successively onto the cylinders and over the dies at the peripheral speed of the cylinders.

13. A revoluble cutter having a continuous cutting edge all points of which are equi-distant from its axis of revolution, said cutter comprising a plurality of independently mounted and independently adjustable cutting members arranged lengthwise said axis.

14. A revoluble cutter having a continuous spirally disposed cutting edge all points of which are equi-distant from its axis of revolution, said cutter comprising a plurality of independently mounted and independently adjustable cutting members arranged lengthwise said axis.

15. A revoluble cutter having a cutting edge comprising a plurality of independently mounted and independently adjustable cutting members arranged lengthwise the axis of revolution and a fixed cutter having a straight edge for coaction with the revoluble cutter.

16. A revoluble cutter having a spirally disposed cutting edge comprising a plurality of independently mounted and independently adjustable cutting members arranged lengthwise the axis of revolution and a fixed cutter for coaction with the revoluble cutter.

17. A revoluble cutter having a cutting edge comprising a plurality of independently mounted and independently adjustable cutting members arranged lengthwise the axis of revolution, a fixed cutter for coaction with the revoluble cutter, all points of both cutters being substantially equi-distant from the axis of the revoluble cutter.

18. A revoluble cutter having a spirally disposed cutting edge comprising a plurality of independently mounted and independently adjustable cutting members, a fixed cutter for coaction with the revoluble cutter, all points of both cutters being substantially equi-distant from the axis of the revoluble cutter.

19. A revoluble cutter having a presser foot adjacent to and transverse one end of its cutting edge for revolution therewith and a fixed cutter for coaction with the revoluble cutter.

20. A revoluble cutter having a cutting

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edge comprising a plurality of independently mounted and independently adjustable cutting members, a presser foot adjacent to one end of its cutting edge for revolution with the cutter and a fixed cutter for coaction with the revoluble cutter.

21. The combination of a revoluble cutter and a fixed cutter, each having its cutting edge at all points substantially equi-distant from the axis of revolution of the revoluble cutter, means for revolving the revoluble cutter and means for feeding a web of material between the revoluble cutter and the fixed cutter at a speed equal to the peripheral speed of the revoluble cutter.

22. A cutting mechanism including in combination means for advancing a web of paper, means for forming said web into blanks during the advancement of said web, comprising coacting rotary means and fixed means for cutting the mid-portions of the web and means for severing the web.

23. A cutting mechanism including in combination means for forming a web of paper into blanks, comprising a revoluble cutter and a fixed cutter, each having its cutting edge at all points substantially equidistant from the axis of the revoluble cutter, means for revolving the revoluble cutter, means for feeding the web at a speed equal to the peripheral speed of the revoluble cutter and normal to the axis thereof.

24. The combination of means for continuously advancing a web of material, rotary means for cutting portions from the edges of the web, coacting rotary means and fixed means for cutting the mid-portion of the web and coacting rotary means and fixed means for severing the web between the edge cuts and the mid-cuts.

25. A cutting mechanism including in combination means for continuously advancing a web of paper, means for forming said web into blanks during the continuous advancement of said web, comprising means for cutting portions from the edges of the web, means for cutting the mid-portion of the web and means for severing the web between the edge cuts and the mid-cuts and means for creasing the blanks.

26. A cutting mechanism including in combination means for continuously advancing a web of paper, means for forming said web into blanks during the continuous advancement of said web, comprising rotary means for cutting portions from the edges of the web, coacting rotary means and fixed means for cutting the mid-portion of the web and coacting rotary means and fixed means for severing the web between the edge cuts and the mid-cuts and means for creasing the blanks.

27. A cutting mechanism including in combination means for forming from a web of paper a blank whose sides form substantially a parallelogram having sides parallel with the path of the web, comprising a revoluble cylinder having a die therein whose cutting edges are coincident with the periphery of the cylinder, means for feeding the web onto the cylinder and over the die at the peripheral speed of the cylinder, a cutter revolubly mounted on the cylinder for coaction with the die, means for revolving the cutter continuously in one direction, means for revolving the cylinder, means for timing the cylinder and the cutter, means for severing the blank from the leading end of the web and means for advancing the blank in a path which deviates from the web widthwise of the web and means for creasing the blank.

28. A cutting mechanism including in combination means for forming from a web of paper a blank whose sides form substantially a parallelogram having sides parallel with the path of the web, comprising a plurality of cylinders each having a die in the periphery thereof, a cutter for coaction with each die, means for rotating the cylinders at the same surface speed, means controlled by the rotation of the cylinders for actuating the cutters respectively, means for feeding a web of paper successively onto the cylinders and over the dies at the peripheral speed of the cylinders, means for severing the blank from the leading end of the web, means for advancing the blank in a path which deviates from the web path widthwise of the web and means for creasing the blank.

29. A cutting mechanism including in combination means for forming from a web of paper a blank whose sides form substantially a parallelogram having sides parallel with the sides of the web, comprising a revoluble cylinder having a die therein whose cutting edges are coincident with the periphery of the cylinder, means for feeding the web onto the cylinder and over the die at the peripheral speed of the cylinder, a cutter revolubly mounted on the cylinder for coaction with the die, means for revolving the cutter continuously in one direction, means for revolving the cylinder, means for timing the cylinder and the cutter and means for severing the blank from the leading end of the web, means for advancing the blank in a path which diverges from the web path widthwise of the web without changing the angular relation of the blank to the web path and means for creasing the blank: the angle of divergence being the angle which one of the creasing lines of the blank bears to one of the sides of the web.

30. A cutting mechanism including in combination means for forming from a web of paper a blank whose sides form substantially a parallelogram having sides parallel with the path of the web, comprising a plu-

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rality of cylinders, each having a die in the periphery thereof, a cutter for coaction with the die, means controlled by the rotation of the cylinder for actuating the cutter, means for rotating the cylinders at the same surface speed and means for feeding the web successively onto the cylinders and over the dies at the peripheral speed of the cylinders, means for advancing the blank in a path which diverges from the web path widthwise of the web without changing the angular relation of the blank to the web and means for creasing the blank, the angle of divergence being the angle which one of the creasing lines of the blank bears to one of the sides of the web.

31. A cutting mechanism including in combination means for advancing a web of paper, means for forming from said web a blank whose sides form substantially a parallelogram having sides parallel with the path of the web, comprising a revoluble cutter having a cutting edge comprising a plurality of independently mounted and independently adjustable cutting members and a fixed cutter for coaction with the revoluble cutter, means for advancing the blank in a path which diverges from the web path widthwise of the web and means for creasing the blank.

32. A cutting mechanism including in combination means for advancing a web of paper, means for forming from said web a blank whose sides form substantially a parallelogram having sides parallel with the path of the web, comprising a revoluble cutter having a presser foot adjacent to each end of its cutting edge for revolution therewith and a fixed cutter for coaction with the revoluble cutter, means for advancing the blank in a path which diverges from the web path widthwise of the web without changing the angular relation of the blank to the web path and means for creasing the blank.

33. A cutting mechanism including in combination means for advancing a web of paper, means for forming from said web a blank whose sides form substantially a parallelogram having sides parallel with the path of the web, comprising a revoluble cutter having a cutting edge comprising a plurality of independently mounted and independently adjustable cutting members, a presser foot adjacent to each end of its cutting edge for revolution with the cutter and a fixed cutter for coaction with the revoluble cutter, means for advancing the blank in a path which diverges from the web path widthwise of the web without changing the angular relation of the blank to the web path and means for creasing the blank, the angle of divergence being the angle which one of the creasing lines of the blank bears to one of the sides of the web.

34. A cutting mechanism including in combination means for forming from a web of paper a blank whose sides form substantially a parallelogram having sides parallel with the path of the web, comprising a revoluble cylinder having a die therein whose cutting edges are coincident with the periphery of the cylinder, means for feeding the web onto the cylinder and over the die at the peripheral speed of the cylinder, a revoluble cutter mounted on the cylinder for coaction with the die, means for revolving the cutter continuously in one direction, means for revolving the cylinder, means for timing the cylinder and the cutter, coacting rotary means and fixed means for cutting the mid-portion of the web, means for severing the blank from the leading end of the web, means for advancing the blank in a path which deviates from the web path widthwise of the web and means for creasing the blank.

35. A cutting mechanism including in combination means for forming from a web of paper a blank whose sides form substantially a parallelogram having sides parallel with the path of the web, comprising a plurality of cylinders each having a die in the periphery thereof, a cutter for coaction with the die, means controlled by the rotation of the cylinders for actuating the cutters respectively, means for rotating the cylinders at the same surface speed and means for feeding the web successively onto the cylinders and over the dies at the peripheral speed of the cylinders, a revoluble cutter and a fixed cutter each having its cutting edge at all points substantially equidistant from the axis of the revoluble cutter, said axis being normal to the path of the web, means for revolving the revoluble cutter at a peripheral speed equal to the speed of the web, means for severing the blank from the leading end of the web, means for advancing the blank in a path which deviates from the web path widthwise of the web and means for creasing the blank.

36. A cutting mechanism including in combination means for forming from a web of paper a blank whose sides form substantially a parallelogram having sides parallel with the path of the web, comprising a revoluble cylinder having a die therein whose cutting edges are coincident with the periphery of the cylinder, means for feeding the web onto the cylinder and over the die at the peripheral speed of the cylinder, a cutter revolubly mounted on the cylinder for coaction with the die, means for revolving the cutter continuously in one direction, means for revolving the cylinder, means for timing the cylinder and the cutter, coacting rotary means and fixed means for cutting the mid-portions of the web, means for severing the blank from the leading end of the web, means for advancing the web in a path

which diverges from the web path widthwise of the web without changing the angular relation of the blank to the web path and means for creasing the blank, the angle of divergence being the angle which one of the creasing lines of the blank bears to one of the sides of the web.

37. A cutting mechanism including in combination means for forming from a web of paper a blank whose sides form substantially a parallelogram having sides parallel with the sides of the web, comprising a plurality of cylinders each having a die in the periphery thereof, a cutter for coaction with the die, means controlled by the rotation of the cylinders for actuating the cutters respectively, means for rotating the cylinders at the same surface speed and means for feeding the web successively onto the cylinders and over the dies at the peripheral speed of the cylinders; a revoluble cutter and a fixed cutter each having its cutting edge at all points substantially equi-distant from the axis of the revoluble cutter, said axis being normal to the path of the web, means for revolving the revoluble cutter at a peripheral speed equal to the speed of the web, means for severing the blank from the leading end of the web, means for advancing the blank in a path which deviates from the web path widthwise of the web and means for creasing the blank, the angle of divergence being the angle which one of the creasing lines of the blank bears to one of the sides of the web.

38. A cutting mechanism including in combination means for continuously advancing a web of paper, means for forming from said web a blank whose sides form substantially a parallelogram having sides parallel with the path of the web, comprising means for cutting portions from the edges of the web, means for cutting the mid-portion of the web and means for severing the web between the edge cuts and the mid-cuts, means for advancing the blank in a path which deviates from the web path widthwise of the web and means for creasing the blank.

39. A cutting mechanism including in combination means for continuously advancing a web of paper, means for forming from said web during its continuous advancement a blank whose sides form substantially a parallelogram having sides parallel with the path of the web, comprising rotary means for cutting portions from the edges of the web, coacting rotary means and fixed means for cutting the mid portion of the web and coacting rotary means and fixed means for severing the web between the edge cuts and the mid-cuts; means for advancing the blank in a path which deviates from the web path widthwise of the web and means for creasing the blank.

40. A cutting mechanism including in combination means for continuously advancing a web of paper, means for forming from said web during its continuous advancement a blank whose sides form substantially a parallelogram having sides parallel with the sides of the web, comprising means for cutting portions from the edges of the web, means for cutting the mid portion of the web and means for severing the web between the edge cuts and the mid-cuts; means for advancing the blank in a path which diverges from the web path widthwise of the web without changing the angular relation of the blank to the web path and means for creasing the blank, the angle of divergence being the angle which one of the creasing lines of the blank bears to one of the sides of the web.

41. A cutting mechanism including in combination means for continuously advancing a web of paper, means for forming from said web during its continuous advancement a blank whose sides form substantially a parallelogram having sides parallel with the path of the web, comprising rotary means for cutting portions from the edges of the web, coacting rotary means and fixed means for cutting the mid-portion of the web and coacting rotary means and fixed means for severing the web between the edge cuts and the mid-cuts; means for advancing the blank in a path which diverges from the web path widthwise of the web without changing the angular relation of the blank to the web path and means for creasing the blank, the angle of divergence being the angle which one of the creasing lines of the blank bears to one of the sides of the web.

42. The combination of a revoluble cutter having a continuous spirally disposed cutting edge, said cutter comprising independently adjustable members arranged lengthwise the axis of revolution and a fixed cutter, each of said cutters having its cutting edge at all points substantially equi-distant from the axis of revolution of the revoluble cutter, means for revolving the revoluble cutter and means for feeding the web at a speed equal to the peripheral speed of the cutting edge of the revoluble cutter and normal to the axis thereof.

43. The combination of a revoluble cutter having a continuous spirally disposed cutting edge all points of which are substantially equidistant from its axis of revolution, said cutter comprising independently adjustable members arranged lengthwise the axis of revolution, a fixed cutter whose cutting edge is a straight line parallel with the axis of revolution of the revoluble cutter, means to revolve the revoluble cutter and means for feeding the web normal to the axis of the revoluble cutter.

44. The combination of a revoluble cutter having a continuous spirally disposed cut-

ting edge all points of which are substantially equidistant from its axis of revolution, said cutter comprising independently adjustable members arranged lengthwise the axis of revolution, a fixed cutter whose cutting edge is a straight line parallel with the axis of revolution of the revoluble cutter, means to revolve the revoluble cutter and means for feeding the web at a speed equal to the peripheral speed of the cutting edge of the revoluble cutter and normal to the axis thereof.

Signed this 5th day of November, nineteen hundred and ten (1910) before two subscribing witnesses.

CHARLES F. SMITH.

Witnesses:
WILBUR M. STONE,
CHAS. W. LA RUE.