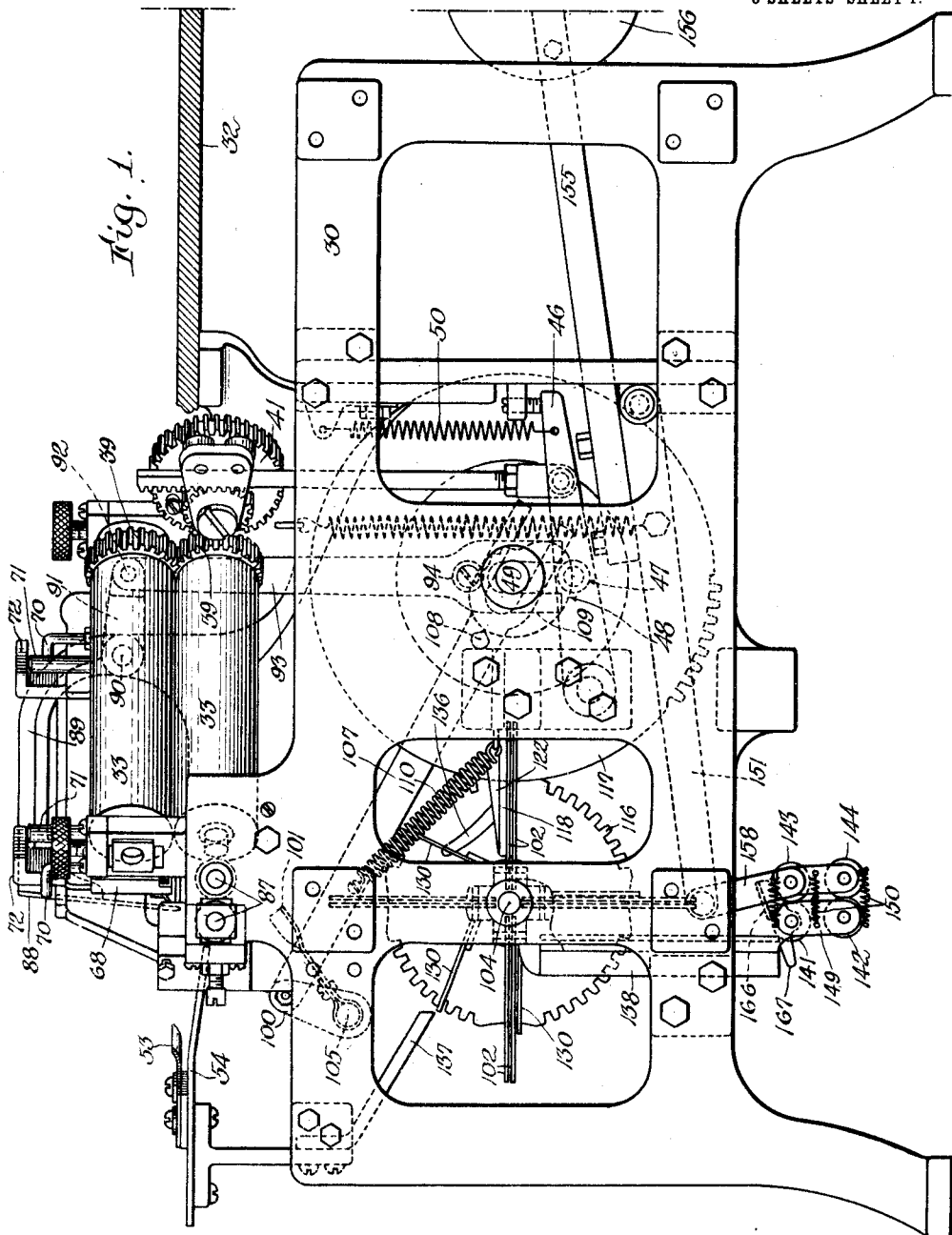


S. J. C. LUTTROPP.
MACHINE FOR MAKING FOLDED PAPER CUPS.
APPLICATION FILED MAR. 18, 1912.

1,056,564.

Patented Mar. 18, 1913.

8 SHEETS—SHEET 1.



Witnesses:

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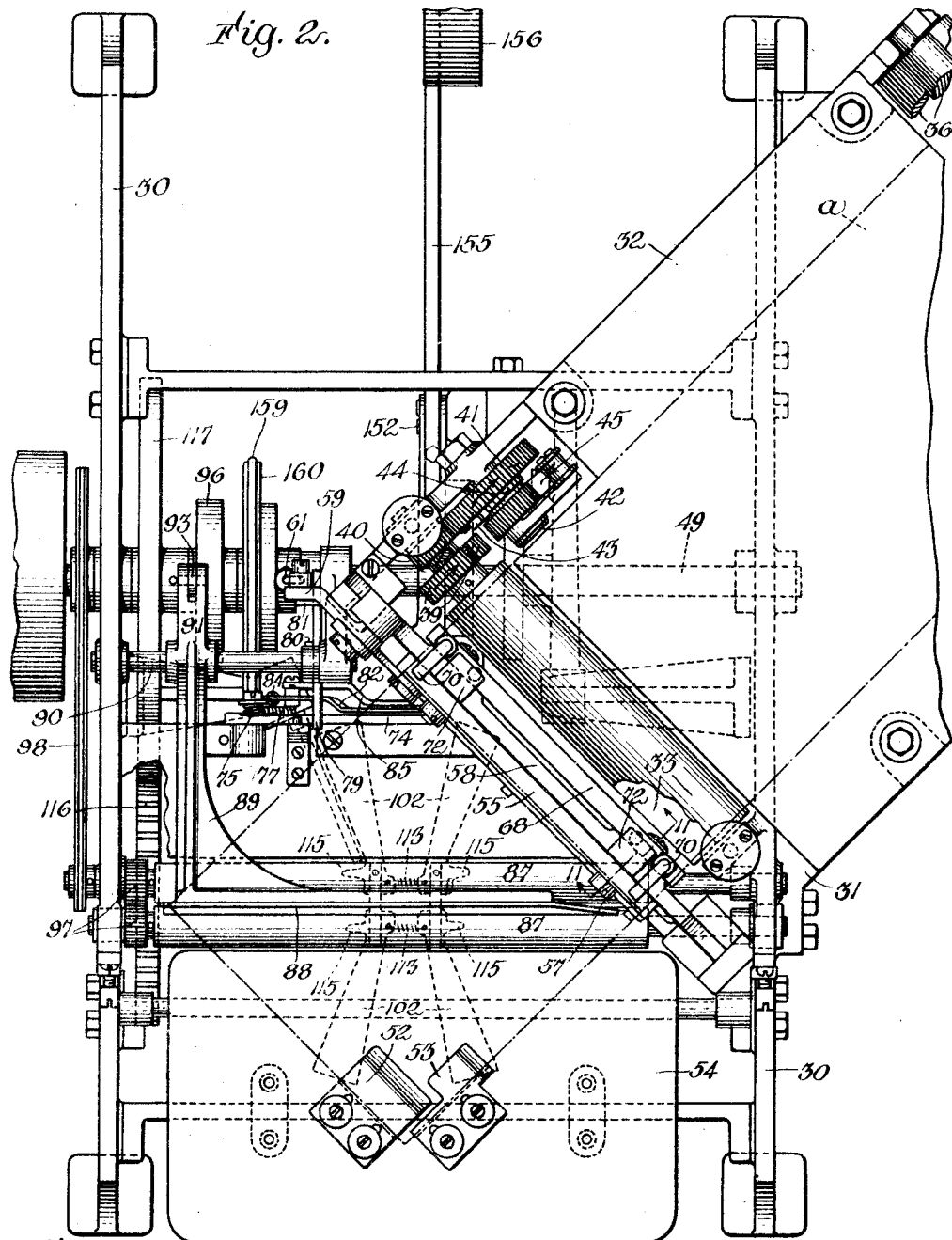
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8 SHEETS—SHEET 2.



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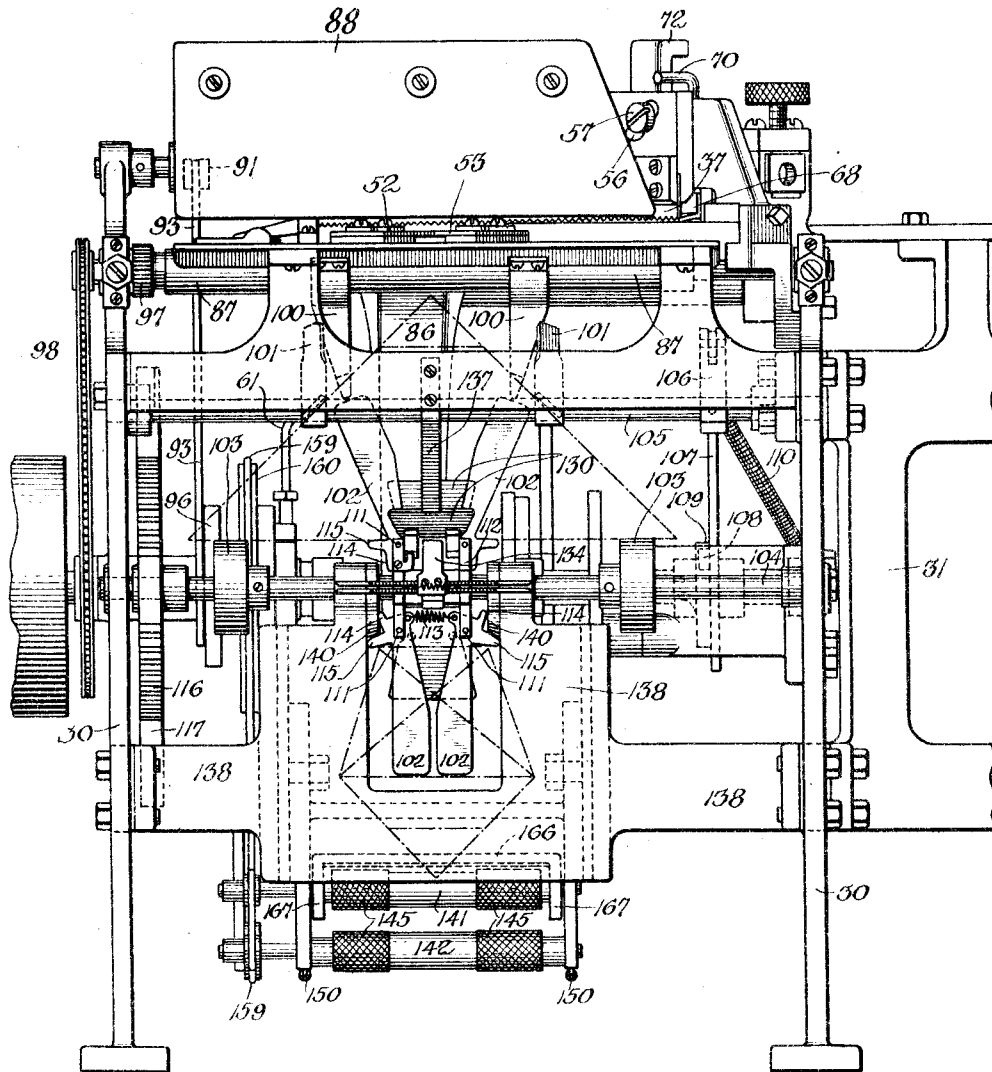
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8 SHEETS—SHEET 3.

Fig. 5.



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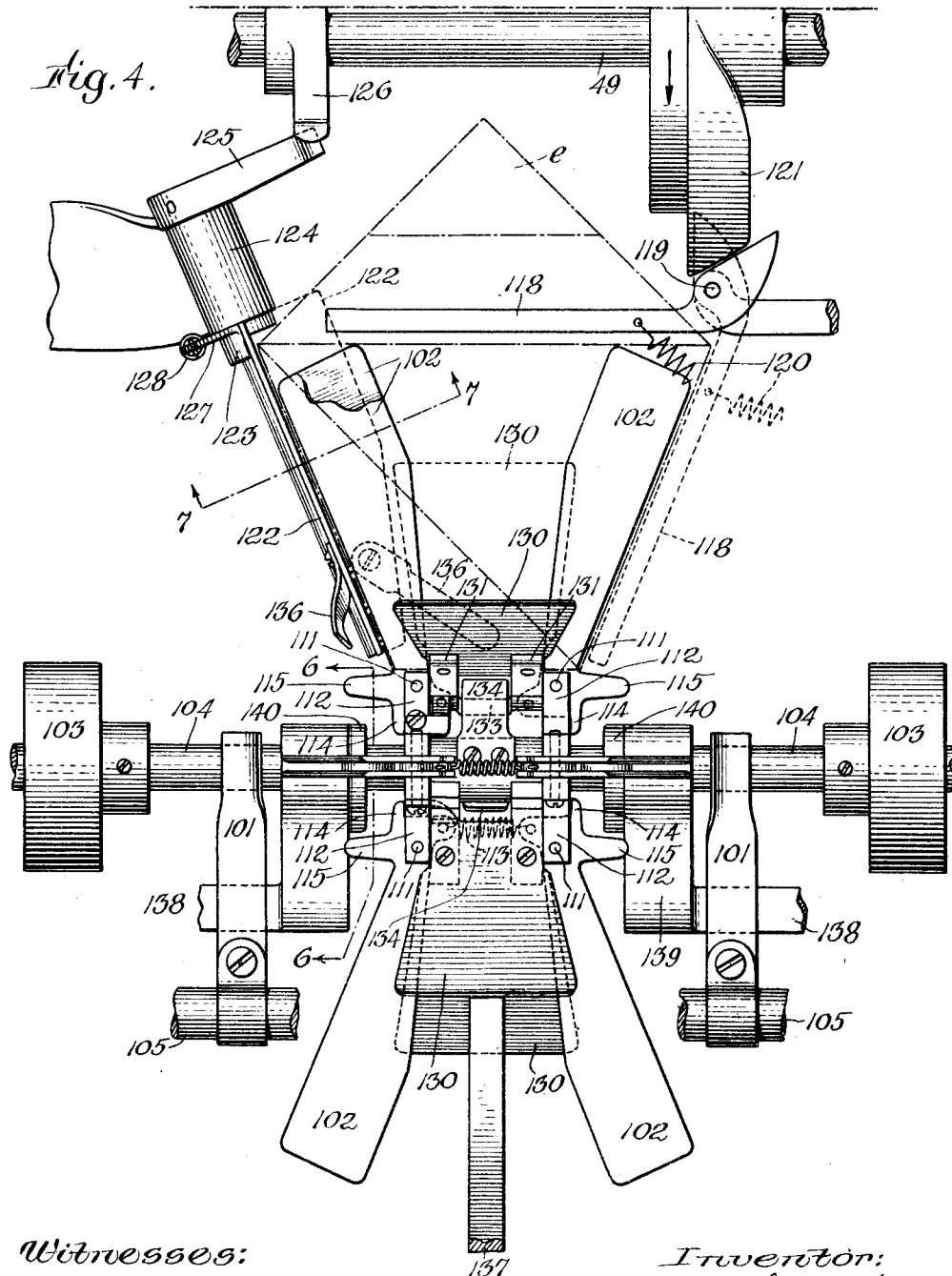
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8 SHEETS-SHEET 4.



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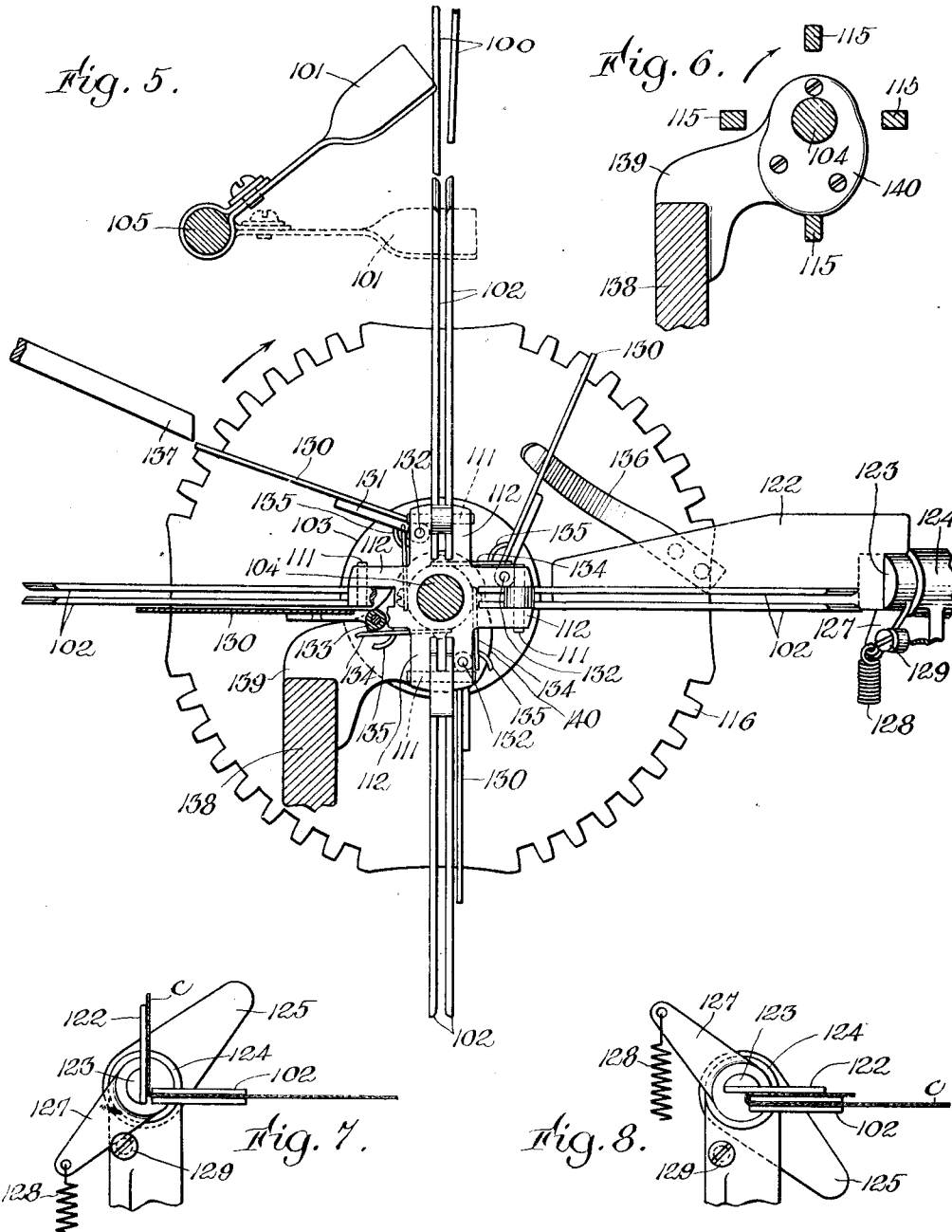
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8 SHEETS—SHEET 5.



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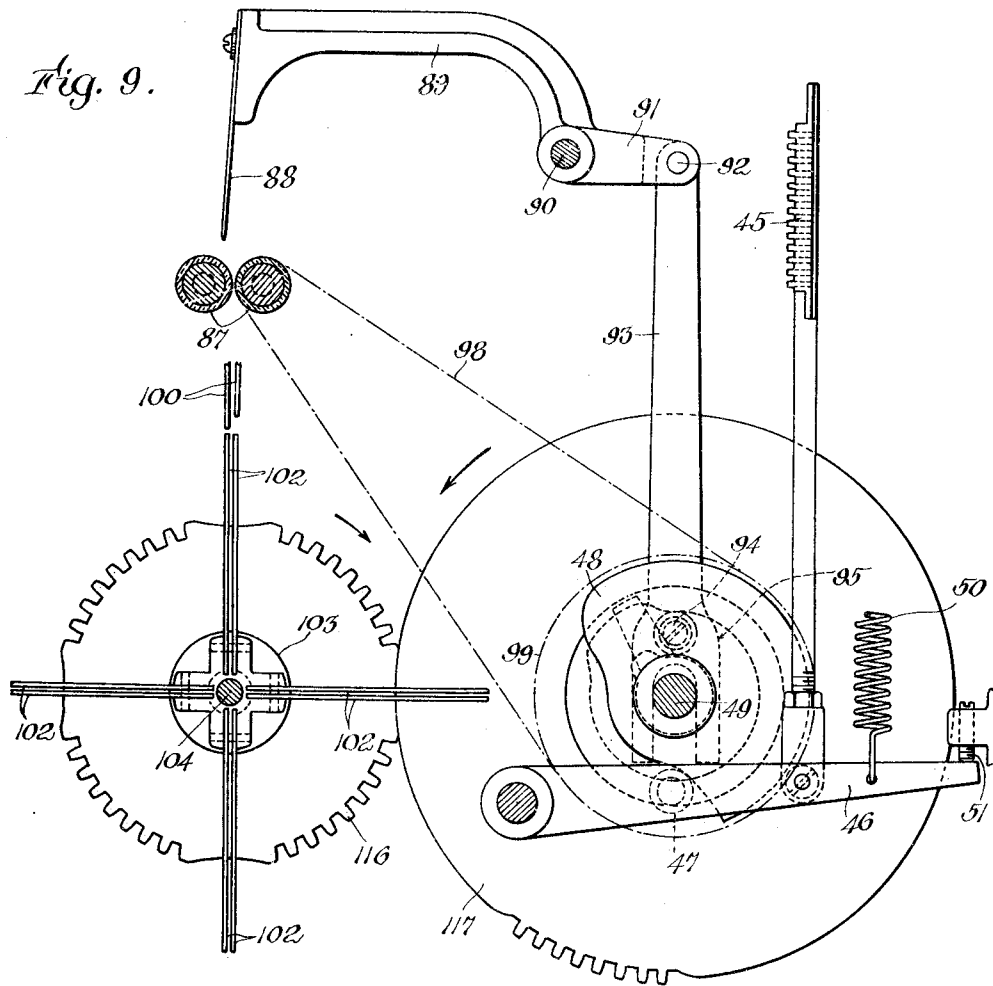
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8 SHEETS—SHEET 6.



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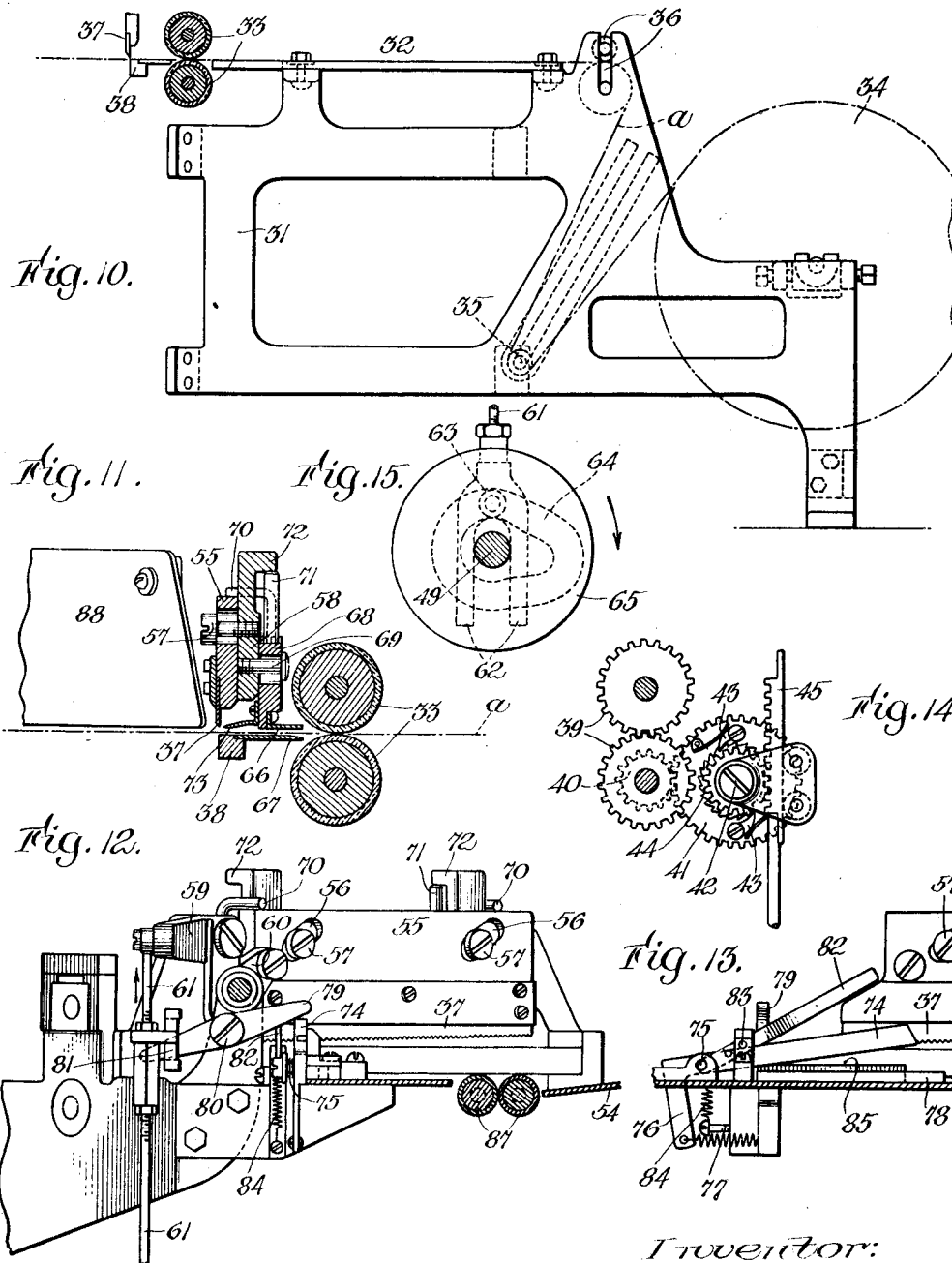
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8 SHEETS—SHEET 7.



Witnesses:
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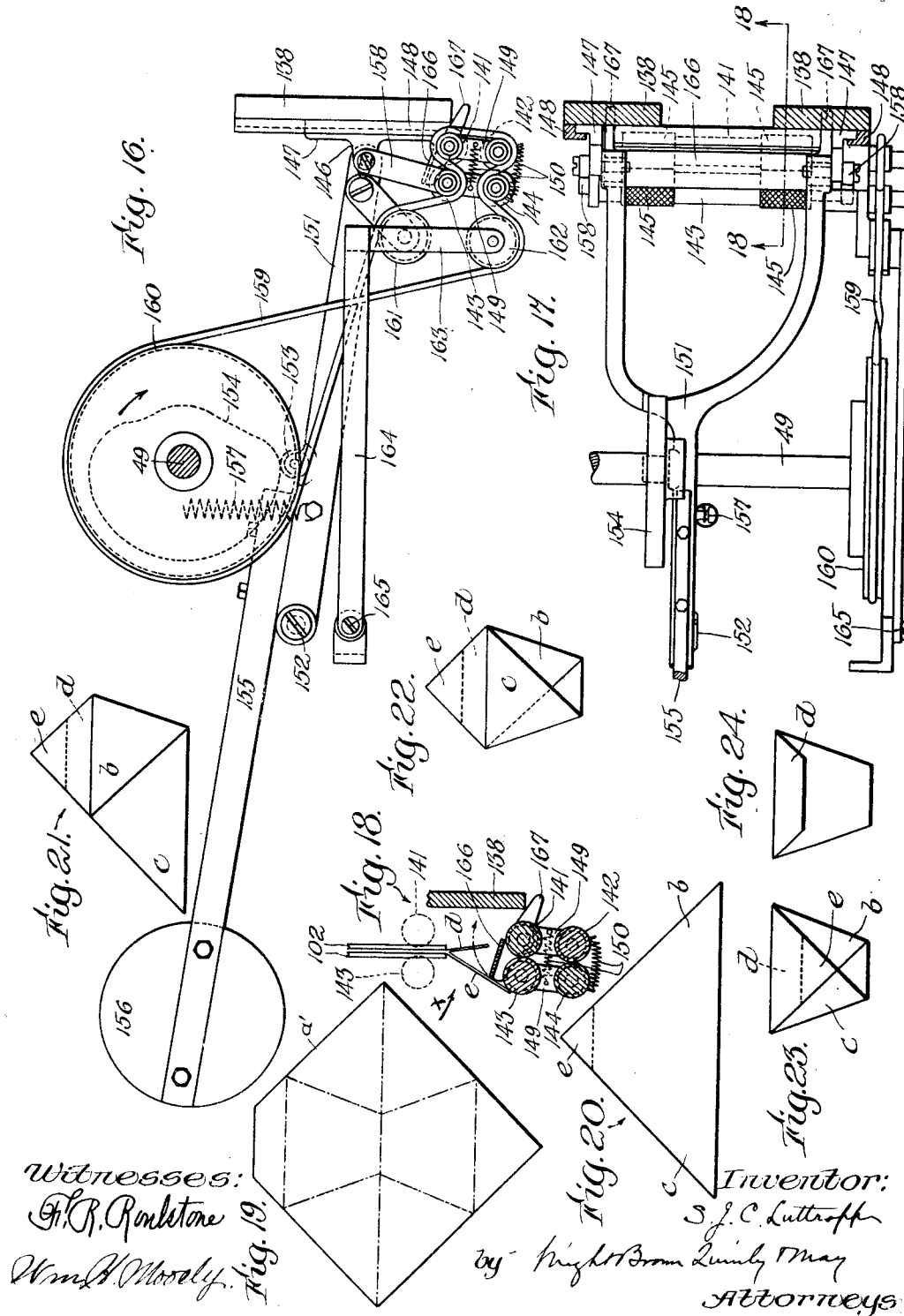
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Patented Mar. 18, 1913.

8 SHEETS-SHEET 3.



Witnesses:
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UNITED STATES PATENT OFFICE.

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MACHINE FOR MAKING FOLDED PAPER CUPS.

1,056,564.

Specification of Letters Patent.

Patented Mar. 18, 1913.

Application filed March 18, 1912. Serial No. 684,430.

To all whom it may concern:

Be it known that I, SVEN J. CONRAD LUTTROPP, a subject of the King of Sweden, and residing at Attleboro, in the county of Bristol and State of Massachusetts, have invented certain new and useful Improvements in Machines for Making Folded Paper Cups, of which the following is a specification.

Sanitary cups for individual use are made in various forms of paper: some are pressed or molded into the usual cup shape, and others are folded to a flat form prior to use, with overlapping portions secured by an adhesive. Some objections are raised to both. The molded or pressed cups are more bulky than the flat folded ones, while the latter require the use of an adhesive, or else have interfolded portions that require abrupt bends which are liable to crack and leak.

The object of the present invention is to provide a machine that will rapidly convert flat water-proof paper, preferably thin and quite flexible, into flat cups, the articles being made and completed ready for use purely by folding and without the use of an adhesive, and with no portions that require much bending out for use.

To these ends the invention consists in the machine and the parts thereof substantially as hereinafter described and claimed.

Of the accompanying drawings:—Figure 1 is a side elevation of the machine, a portion being removed. Fig. 2 is a plan view. Fig. 3 is a front elevation. Fig. 4 is a detail plan view of the spider mechanism on a larger scale than Fig. 3. Fig. 5 is a detail elevation looking from the right of Fig. 4, the shaft being in section. Fig. 6 represents a section on line 6—6 of Fig. 4. Fig. 7 represents a section on line 7—7 of Fig. 4. Fig. 8 represents the same parts as Fig. 7, but showing the folders closed. Fig. 9 is a detail, partly in side elevation and partly in section, of the mechanism for performing the first folding operation and for operating the feed rolls. Fig. 10 is a detail elevation (on a smaller scale) of the parts of the machine which are omitted from Figs. 2 and 3, said parts comprising a bracket and rolls and table for the supply of the paper. Fig. 11 represents a section on line 11—11 of Fig. 2. Fig. 12 is a fragmentary elevation of the mechanism for cutting the web. Fig.

13 is a front elevation of the shears for cutting off one corner of each blank that is severed from the web. Fig. 14 is a detail elevation of the gearing for the feed rolls. Fig. 15 is a detail side elevation of the cam disk which controls the cutter and shears. Fig. 16 is a detail elevation partly in section of the stripping mechanism. Fig. 17 is a plan view of the parts shown in Fig. 16. Fig. 18 represents a section on line 18—18 of Fig. 17. Fig. 19 represents a blank which has been cut from the supply web or strip, and with a corner clipped off, the dotted lines indicating the lines on which said blank is to be folded successively by the machine. Figs. 20, 21, 22, 23 and 24 are views illustrating the results of the successive folding operations, the last two figures showing the finished cup from opposite sides.

To facilitate an understanding of the detailed description, the following brief preliminary description will be given. The paper from a supply roll 34 (Fig. 10), passes over a table 32 and between the feed rolls 33 to the position shown in Fig. 2. A blank is then cut off from the supply by the blade 37. At the same time a triangular piece is cut off from the corner of the blank by the clipper 74. The blade 88 then operates to double the blank diagonally and force it downwardly between folding rolls 87 (Fig. 9). The blank which is then folded into the triangular shape shown in Fig. 20, is fed into the arms 102 of a spider which has an intermittent rotary motion. The spider itself is next given a quarter turn by means of the Geneva movement gears 116, 117. The next folding operation is while the blank is in horizontal position. The folder arm 118 (Fig. 4) is operated by the cam 121 so as to bring it across the top face of the folded blank from the dotted line position to the full line position, producing the form shown in Fig. 21. Next the folder 122 is rocked by a cam to fold the left hand part of the blank in a similar manner to the operation just described, producing the form shown in Fig. 22. On the folder 122 is a small arm 136 which engages a swinging plate 130 and brings it against the part of the blank which has just been folded and holds it firmly in position. The Geneva movement next gives a quarter turn to the spider and the folded blank is then in ver-

tical position, bottom edge up. The two pairs of rotating rolls 141, 142, 143, 144 (Fig. 18) of the stripping mechanism are next brought upwardly and grip the blank and strip it from the spider arms, at the same time creasing it, producing the finished form shown in Figs. 23 and 24. Just before the stripping operation, the spider arms 102 are brought together so as to leave the folded blank free to be taken off from the spider arm by the stripping rolls.

The details of the machine will now be explained.

The frame 30 of the machine is provided with an extension or bracket 31 (Figs. 2, 3 and 10) the latter having a table 32 across which the paper is drawn by feed rolls 33 from a supply roll 34, said paper passing under a take-up roll 35 and between smoothing or holding rolls 36 as is common in many machines which operate on paper that is drawn intermittently from a supply roll. Just beyond the feed rolls is a knife 37 which coöperates with a fixed edge 38 in cutting from the web or strip *a*, a succession of rectangular pieces, said pieces having the same length as the width of the web; in other words the pieces cut off by the knife 37 are square. The knife, of course, operates intermittently, and it is desirable therefore that the feed rolls shall operate intermittently. As illustrated in Figs. 1, 2, 11 and 14, the shafts of the feed rolls 33 are geared together at 39 and one shaft has also a pinion 40 meshing with a gear 41 on a stud shaft 42. The gear 41 has pawls 43 operated by a combined ratchet and pinion 44 on shaft 42, said pinion being in mesh with a rack 45 the lower end of which is pivoted to a lever 46 (Figs. 1 and 9) having a roll 47 engaged by a cam 48 on main shaft 49. A spring 50 imparts return movements to the lever and rack to an extent variably determined by an adjustable stop 51. As the rack reciprocates, it imparts intermittent feed movements to the rolls 33, the feed being regulated by the stop 51 to advance the web or strip until one end corner comes to rest under guide plates 52, 53. Said plates 52, 53 serve to steady the blank and retain it in proper position during the short interval of time between the operation of the knife and the operation of the first folder blade presently described.

The knife 37 is carried by a bar 55 (Fig. 11) having inclined slots 56 (Fig. 12) through which guide studs 57 project from a fixed transverse bracket 58. An elbow lever 59 is connected by a link 60 to the bar 55 and to its outer end is pivoted the upper end of a vertical rod 61, the lower end of which has a yoke 62 (Fig. 15) which straddles the main shaft 49. The yoke 62 carries a roll 63 engaging a cam

groove 64 in a disk 65 secured to the main shaft. This mechanism imparts the necessary movements to the knife to cut the web of paper at the proper intervals.

To hold the paper that is between the rolls 33 and the knife, during the operation of the latter and for a short time after the cut has been made, I provide means comprising a presser foot 66 (Fig. 11) which coöperates with a fixed plate 67, said foot being carried by a vertically movable transverse bar 68 having slots through which guide studs 69 project from the bracket 58. The weight of the bar 68, which may be supplemented by suitable springs, will cause it to descend. It is provided with hooked pins 70 which extend above knife bar 55 and with upright pins 71 adapted to engage the under side of lugs 72 of bracket 58. When the knife bar descends, the presser foot also descends and holds the paper, but the knife continues to descend a little farther, this being permitted by the slots in the bars 55 and 68. Although the paper is cut, the presser foot does not release the paper until the knife rises clear of the paper and, in doing so, engages the hooked pins 70 and positively raises the presser foot bar. Said bar is preferably provided with a flanged plate 73 which projects over the paper close to the knife 37 to prevent the cut edge from curling up.

The piece of paper cut off by the knife 37 is square as indicated by dotted lines in Fig. 2. For reasons explained hereinafter, it is desirable that one corner of the square piece shall be removed so that the blank to be folded will have substantially the form shown in Fig. 19. To remove the triangular piece I employ a supplemental knife which I shall refer to as the clipper, to distinguish it from the main severing knife. The clipper 74 (Fig. 13) is pivoted at 75 and has an arm 76 connected by a spring 77 to a suitable fixed part of the machine, said clipper coöperating with a fixed bar 78, to act like shears or scissors. The clipper is mounted to cut at an angle of 45 degrees to the line of cut produced by knife 37, as indicated in Fig. 2. The spring 77 acts to hold the clipper 74 in the position shown in Fig. 13. The clipper is depressed against the action of the spring, by a lever 79, pivotally supported at 80 (Fig. 12) one end of said lever projecting over the clipper, and the other end extending into a yoke 81 adjustably secured to the rod 61 so that as the latter rises to cause the descent of the main knife 37, the yoke will cause the lever 79 to oscillate and throw the clipper down. As the lever so oscillates, it also throws down another lever 82, which, for purposes of definition and not limitation, I shall refer to as the pincer. Said pincer lever is pivoted at 83 and is normally held in the

position shown in Fig. 13 by a spring 84. When the pincer is forced down, it co-operates with a fixed strip 85 to hold the triangular piece of paper so that if the clipper does not entirely remove the said piece, the pull of the rolls 87 of the first folder presently described will tear what slight portion remains uncut, and carry away the body of the blank without drawing the triangular piece also or giving a pull to the supply strip. The triangular pieces drop into a suitable chute, the receiving end of which is shown at 86 in Fig. 3.

The first fold, to convert the blank from the form shown at *a'* in Fig. 19 to the form shown in Fig. 20 is performed by two rolls 87 with which a blade 88 coacts, said blade striking the blank at its diagonal center and starting the fold and presenting it to the nip of the rolls in a manner well known in machines for folding newspapers and other sheet material. The blade 88 is carried by an arm 89 (Figs. 1, 2, and 9) mounted on a suitably supported rod 90 and having a short arm 91 to which is pivoted at 92 the upper end of a link or bar 93 which has a roll 94 engaged by a cam groove 95 in a disk 96 on main shaft 49. The lower end of the bar 93 is formed or provided with a yoke straddling the shaft 49. The rolls 87 are geared together at 97 (Fig. 2) and are driven by a belt or chain 98 from a pulley or sprocket 99 on shaft 49.

The blanks, as they are successively folded as described to triangular form, are fed down to the arms of an intermittently rotated device which, for purposes of definition and not limitation is referred to herein as the spider. On the way to said arms from the rolls 87, each blank passes between two pairs of guides 100 (Figs. 3, 5, and 9) and after it leaves the nip of the rolls its inclined upper edges are engaged by two swinging pushers 101 and pushed down into the arms 102 of the spider until its lower folded edge comes to rest against two rolls or cylindrical stops 103 carried by the shaft 104 of the spider. The pushers 101 are secured to a rock shaft 105 (Figs. 1, 3, 4 and 5), said shaft having an arm 106 which is actuated by a rod 107 provided with a yoke straddling the main shaft 49 and having a roll 108 (Fig. 1) engaged by a cam 109 on said shaft. The cam actuates the rod and rock shaft and pushers in their return direction, the other or operative direction of movement being imparted by a spring 110 connected to said rod and a fixed part of the frame, so that the movement of the pushers when performing their function will be a yielding one.

It being understood that I do not limit myself to the number of pairs of spider arms 102 shown, I will proceed to describe the structure illustrated, in which there are

eight such arms, in four pairs. Each arm comprises two plates to constitute a jaw and the blank is carried down by the rolls 87 and pushers 101 between the plates of the two arms standing upright. The two plates of each arm are connected so as to present a narrow space to receive the folded blank, each arm being pivotally mounted at 111 (Figs. 4 and 5) in a radial recess in an ear 112 carried by shaft 104, there being four pairs of such recessed ears. The two arms of each pair are caused to normally diverge as shown in Fig. 4, to cause the proper shape of the next folds of the blades to be attained as presently described, by a spring 113 connecting such two arms. To limit the outward spread or divergence of the arms, they are provided with heels 114 which contact with the sides of the ears 112 at the inner ends of the recesses of the latter. The arms are also provided with outwardly projecting fingers 115, which, at certain times hereinafter described, ride over fixed cams to cause the two arms of each pair to approach each other to permit the folded cup to be removed.

After the triangularly folded blank has been located in the jaws or arms that are in upright position, the spider shaft is given a one-quarter rotation by a "Geneva movement" mechanism comprising the gears 116, 117, (Figs. 1, 2, 3, 5 and 9), the latter being carried by main shaft 49. By this movement the blank is carried to and held in horizontal position, for the wing folders to turn or fold over the acute-angled portions of the doubled blank on lines defined by the outer edges of the spider arms 102. At this time the blank occupies the position indicated by the dotted outline in Fig. 4 which is a plan view, but not yet folded further than shown in Fig. 20. To fold or turn in the corner *b*, a folder 118 (Fig. 4) pivoted at 119 to a fixed bracket arm and normally held outwardly by a spring 120, is acted upon by a cam 121 on shaft 49 to swing from the dotted to the full line position. This causes the corner *b* to be carried over or folded (see Fig. 21) because, when the spider was moving to the position last mentioned, the doubled blank was carried down, with the corner part *b* on top of folder arm 118 and slightly past it, so that when the spider came to rest, the corner part *b* was deflected upwardly by the then stationary arm 118.

Before the folder arm 118 reaches the position shown by full lines in Fig. 4, and consequently before the part *b* turned thereby is released from the hold of said arm, the next folder 122 turns over the other acute angled portion *c* (Figs. 20 and 21) to the position shown in Fig. 22. In Fig. 4, the folder 122 is shown by full lines as not having started from its inoperative position, for the sake of clearness in that figure. As a

matter of fact, the folder 122 moves from the full line position partly toward the dotted line position before the folder 118 quite reaches its full line position. The folder 122 is a plate or blade carried by a rock shaft 123 mounted in a suitably supported bearing 124 (Figs. 4, 5, 7 and 8) and having an arm 125 in the path of movement of a cam arm 126 carried by shaft 49. Another arm 127 of the rock shaft is actuated by a spring 128 to hold the folder 122 upright as shown in Fig. 7, this position being determined by a stop 129, until the cam arm 126 causes the rock shaft to move to carry the folder plate 122 over to the position shown in Fig. 8 and by dotted lines in Fig. 4. This results in the blank being then folded as shown in Fig. 22. In order that the blank will remain so folded while the spider makes the next step or one-fourth rotation, I provide a flap or holder for each pair of spider arms. Each of said holders comprises a plate 130 (Figs. 4 and 5) carried by a pair of lugs 131 secured to a rock shaft 132 mounted at its ends in the ears 112. Midlength of the rock shaft is secured a cam 133 against which a plate spring 134 secured to the hub which carries the ears, so that said spring will hold the plate 130 either toward or away from the plane of the spider arms 102. Suitably mounted curved stops 135 limit the outward positions of the flaps or holders.

When the folder plate 122 moves as hereinafter described to fold the portion *c* of the blank on top of the portion *b*, a small curved arm 136, projecting from said plate 122, throws the plate 130 down so that the spring 134 of the latter keeps it in position to hold the blank in its folded position while the spider is given another step or one-fourth rotation. Each plate or holder 130 remains in this, its closed position, until the spider arms carrying it are moving from their left hand horizontal position, (Fig. 5) to the upright position to receive another doubled blank from the first folder rolls. When so moving, the outer edge of plate 130 strikes the tip of a fixed arm or opener 137 which holds back said outer edge so that, as the spider continues its movement, the holder 130 is swung outwardly and its flat spring 134 holds it open until again closed by the arm 136 of folders 122.

In Fig. 3, two dotted outlines indicate blanks in position in the spider arms, the upper one showing the doubled blank that has just been pushed down into a pair of spider arms, and the lower one showing the blank that has been folded as so far described and carried down to lower-inverted position and ready to be stripped from the spider arms and have its two lips spread and folded against opposite sides of the cup to complete it. If the lower, inverted blank

should now be pulled off from the spider arms, the spring 113 being depended upon to yield to permit this to be done, there would be liability of the cups being torn or cut while being pulled off. Therefore I prefer to positively collapse the two lower arms 102 to enable the stripper mechanism to remove the folded blank without risk of injury. Extending transversely of the frame of the machine, is a web member 138 (Figs. 1 and 3) having ears 139 provided with cams 140 (Fig. 6) around which the fingers 115 of the spider arms travel. As shown by comparing Figs. 3 and 6, when a pair of spider arms approaches the lower vertical position, their fingers 115 ride over the parts of the cams 140 having the greater radius and cause the arms to approach each other so as to release the folded blank carried thereby.

The mechanism which simultaneously strips the blanks from the spider arms and completes the folding and does the final creasing will now be described, referring to Figs. 1, 3, 16, 17 and 18. Four rolls, 141, 142, 143, 144 are provided, each having roughened or knurled end portions 145 slightly larger than the intermediate portions. The shaft of roll 141 is mounted in ears of slides 147 mounted in vertical ways 148 carried by web 138 said slides having ears 146 (Fig. 16). The rolls 141, 142, 143, 144, are connected by two pairs of links 149, and springs 150 connect the links 149 so that the front and rear rolls will be held yieldingly together. To raise and lower the rolls, I provide a lever 151, pivoted at 152 and having a roll 153 engaged by a cam 154 on shaft 49, said lever having an extension 155 provided with a weight 156 to cause the roll to follow the contour of the cam. A spring 157 may also be connected to the lever 151. The operative end of the lever 151 is formed as a yoke the ends of which are connected by links 158 to the shaft of the upper roll 143. Said yoke ends also have slotted connections with the ears 146 of slides 147. The four rolls have pulleys engaged by a belt 159 driven by pulley 160 on shaft 49, two idlers 161, 162 being employed, the latter being carried by an arm 163 of a lever 164 pivoted at 165, whereby the idler 162 serves as a gravity belt tightener that rises and falls with the four stripping rolls.

Mounted in the shaft of roll 141 is a separator bar 166 (Figs. 3, 17 and 18) having its ends provided with toes 167 adapted, when the stripping rolls rise, to engage the lower edge of web 138 so that said separator will swing in the direction of the dotted arrow in Fig. 18. In said figure, the view is opposite to that in Fig. 1. When the spider is bringing a blank in the condition of Fig. 22 (but inverted of course) to lower

vertical position, it is moving in the direction of arrow *x*, Fig. 18. The lip or flap *d*, having been truncated by the removal of the small triangular piece as described, passes over the separator 166 while the pointed lip or flap *e* is stopped by the edge of the separator and the roll 143. Then the set of stripping rolls and the separator rise, but owing to the toes 167 being detained by the lower edge of web 138, the separator immediately swings and deflects the flap *d*, turning it up against one side of the spider arms 102. Roll 143 does the same to the other flap *e*. Continuing to rise until the upper rolls reach the dotted positions of Fig. 18, the four rolls, which are being driven by the belt 159 in the proper direction, pull or strip the article from the spider arms. The roughened parts 145 of the rolls do this, and at the same time press and crease the final folds, the smooth intermediate parts of the rolls passing the spider arms without being spread thereby. As shown by Figs. 23 and 24, the longer or pointed flap *e* overlies the side of the cup which has several thicknesses, due to the previously folded parts *b* and *c*, while the shorter or truncated flap *d* overlies the side having a single thickness.

It will now be understood that the machine manufactures cups of the type illustrated in Fig. 24 from a quadrilateral blank, the first fold being on a diagonal line to form a two-ply triangle, as shown by comparing Figs. 19 and 20, the machine then folding the opposite extremities of the triangle reversely against the sides of the middle portion of the triangle, as shown by comparing Figs. 20, 22 and 23, especially in connection with the hereinbefore explained successive operations of the folders. When the parts are so folded the portions of the folded extremities which are not connected together, or in other words, the upper edges of the triangular extremities, are substantially parallel with the middle portion of the first mentioned diagonal fold, which constitutes the bottom of the cup. The final folding of the flaps *d*, *e*, as shown in Fig. 18, results in turning the angular portions of the blank in opposite directions against the outer faces of the previously returned extremities. In other words, the machine folds a blank upon itself to form triangular end sections and trapezoidal intermediate sections, edge portions of said sections being finally folded over the upper portions of the other sections to hold the folds in position to form a cup.

What I claim is:—

1. A machine of the character described, comprising a cutter for severing a strip transversely to form a rectangular blank, a folder at an angle to the line of cut to double the blank on a diagonal line, suc-

cessively operated folders to fold the two acute-angled ends of the doubled blank, and means for spreading the two remaining corners of the blank and folding them against opposite sides of the article.

2. A machine of the character described, comprising a cutter for severing a strip transversely, a clipper to remove one corner of the severed blank, a diagonally mounted folder to double the blanks, folders for turning the ends of the doubled blank against the center portion, and means for folding the truncated corner and the corner that was doubled against it over against opposite sides of the article.

3. A machine of the character described comprising blank doubling mechanism, means for feeding a strip of paper thereto in a direction substantially at an angle of 45 degrees, a cutter for severing the strip between the feeding and doubling mechanisms, and means for folding the corners of the doubled blank.

4. In a machine of the character described, blank doubling mechanisms, means for feeding a strip of paper thereto at an angle, a cutter for severing the strip, a clipper for removing a corner of the blank, means for holding the clipped corner to prevent it from following the blank to the doubling mechanism, and means for folding the corners of the doubled blank.

5. In a machine of the character described, a pair of intermittently rotatable arms, means for doubling a blank and assembling it with said arms when the latter are in one position, means cooperating with said arms when in another position to further fold doubled portions of the blank, and means for removing the blank from the arms when the latter are in a third position.

6. A machine of the character described, comprising intermittently rotatable arms, means for doubling a blank on a diagonal line and inserting it in said arms while the latter are upright, folders to turn opposite ends of the doubled blank over while the arms are substantially horizontal, and means for folding the remaining corners of the blank while the arms are in vertical position.

7. A machine of the character described, comprising intermittently rotatable arms, means for doubling a blank on a diagonal line and inserting it in said arms while the latter are upright, means including pushers for positively moving the doubled blank to position relatively to the arms, folders to turn opposite ends of the doubled blank over while the arms are substantially horizontal, and means for folding the remaining corners of the blank while the arms are in inverted position.

8. A machine of the character described, comprising intermittently rotatable arms,

means for doubling a blank on a diagonal line and inserting it in said arms while the latter are upright, folders to turn opposite ends of the doubled blank over while the arms are substantially horizontal, a holder movable with the arms to retain the said ends in folded position while the arms move the next step, and means for folding the remaining corners of the blank while the arms are in inverted position.

9. A machine of the character described, comprising intermittently rotatable arms, means for doubling a blank on a diagonal line and inserting it in said arms while the latter are upright, folders to turn opposite ends of the doubled blank over while the arms are substantially horizontal, and means for folding the remaining corners of the blank while the arms are in inverted position, and stripping the folded article from said arms.

10. A machine of the character described, comprising intermittently rotatable arms, means for doubling a blank on a diagonal line and inserting it in said arms while the latter are upright, folders to turn opposite ends of the doubled blank over while the arms are substantially horizontal, and means for folding the remaining corners of the blank while the arms are in vertical position, and stripping the folded article from said arms, said arms being collapsible to facilitate the removal of the articles therefrom.

11. In a machine of the character described, a spider having a plurality of pairs of arms, means for intermittently rotating it, means for doubling blanks diagonally and assembling them with the arms while the latter are upright, folders to turn opposite ends of the doubled blanks over while the arms are substantially horizontal, and means for folding the remaining corners while the arms are in inverted position.

12. In a machine of the character described, a spider having a plurality of pairs of arms, means for intermittently rotating it, means for doubling blanks diagonally and assembling them with the arms while the latter are upright, folders to turn opposite ends of the doubled blanks over while the arms are substantially horizontal, the arms of each pair being collapsible, and means for simultaneously folding the remaining corners and removing the article while the arms are in inverted position.

13. In a machine of the character described, a spider comprising an intermittently rotatable shaft, a plurality of pairs of arms pivotally supported thereby to swing toward and from each other, stops to limit their outward movement, springs to hold them normally apart, means cooperating with said arms for folding blanks carried thereby, strippers for removing the

folded blanks from the arms, and means for automatically swinging the arms of each pair toward each other to facilitate the operation of the strippers.

14. In a machine of the character described, a spider comprising an intermittently rotatable shaft, a plurality of pairs of arms pivotally supported thereby to swing toward and from each other, stops to limit their outward movement, springs to hold them normally apart, means cooperating with said arms for folding blanks carried thereby, strippers for removing the folded blanks from the arms, and means for automatically swinging the arms of each pair toward each other to facilitate the operation of the strippers, said swinging means comprising fixed cams, the arms having fingers to engage said cams.

15. In a machine of the character described, an intermittently rotatable pair of arms, means for doubling a blank and assembling it with said arms when the latter are in one position, a pair of folders for successively acting on portions of the doubled blank while the arms carrying it are in another position, one of said folders comprising an arm movable in a plane parallel with the plane of the carrier arms and the other folder comprising a plate mounted to rock on an axis parallel with the line of the fold to be made thereby, and means for further folding the blank and removing it when the arms are in a third position.

16. In a machine of the character described, an intermittently rotatable series of carriers, means for doubling blanks to triangular form and inserting them in said carriers, folders cooperating with said carriers for folding opposite ends of the doubled blanks on lines determined by said carriers to convert the blanks into cups, and strippers for removing the cups from the carriers.

17. In a machine of the character described, an intermittently rotatable series of carriers, each comprising a pair of arms, means for successively supplying a doubled blank to each carrier while in one position, folders for turning over two portions of the doubled blank while in the next position, and means for completing the folding of the article while the carrier is in a third position and simultaneously removing it from said carrier.

18. In a machine of the character described, an intermittently rotatable series of carriers, each comprising a pair of arms, means for successively supplying a doubled blank to each carrier while in one position, folders for turning over two portions of the doubled blank while in the next position, and means for completing the folding of the article while the carrier is in a third position and simultaneously removing it from

said carrier, said means comprising a separator for spreading two flaps or tips of the partially folded article, rolls, means for rotating the rolls, and means for raising and
5 lowering the separator and rolls.

19. A machine for making cups comprising folders for doubling a quadrilateral blank on a diagonal line to form a two-ply triangle, folders for turning the opposite
10 extremities of said triangle reversely against the sides of the middle portion of said triangle, and actuating mechanism for said folders.

20. A machine for making cups comprising folders for doubling a quadrilateral blank on a diagonal line to form a two-ply triangle, folders for turning the opposite extremities of said triangle reversely against
15 the sides of the middle portion of said triangle, with the unconnected edges of said folded extremities substantially parallel with the middle portion of the first mentioned diagonal fold, and means for carrying
20 the blank from the first mentioned folders to the second mentioned folders.

21. A machine for making cups comprising folders for doubling a quadrilateral blank on a diagonal line to form a two-ply

triangle, folders for turning the opposite extremities of said triangle reversely against
25 the sides of the middle portion of said triangle, with the unconnected edges of said folded extremities substantially parallel with the middle portion of the first mentioned diagonal fold, folders for turning the
30 two plies of the remaining angles of the triangle in opposite directions against the outer faces of the previously intumed extremities, and means for carrying the blanks
35 for successive operation by said folders.

22. A machine for making cups comprising folders for doubling a blank upon itself to form triangular end sections and trapezoidal intermediate sections, folders for
40 turning edge portions of two of said sections over the upper portions of the other sections to hold the folds in position to form
45 a cup, and automatic mechanism for actuating said folders and carrying the blank
50 from one to the other.

In testimony whereof I have affixed my signature, in presence of two witnesses.

S. J. CONRAD LUTTROPP.

Witnesses:

F. W. POWER,

A. W. HARRISON.