

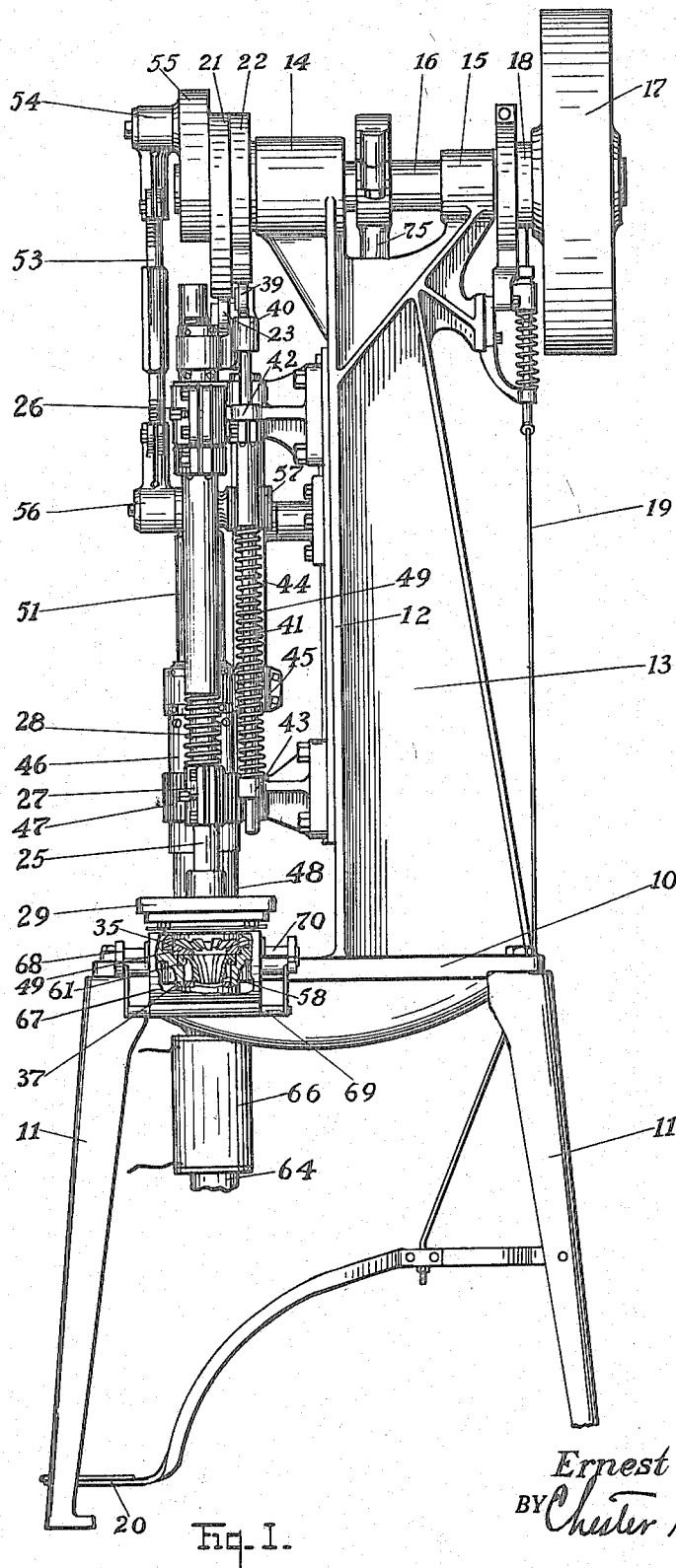
Aug. 12, 1924.

1,504,245

E. R. HUNTLEY

MACHINE FOR MAKING PAPER CUPS

Original Filed Sept. 29, 1919 6 Sheets-Sheet 1



INVENTOR.
Ernest R. Huntley
BY *Chester H. Praxton*
ATTORNEY

Aug. 12, 1924.

1,504,245

E. R. HUNTLEY

MACHINE FOR MAKING PAPER CUPS

Original Filed Sept. 29, 1919

6 Sheets-Sheet 2

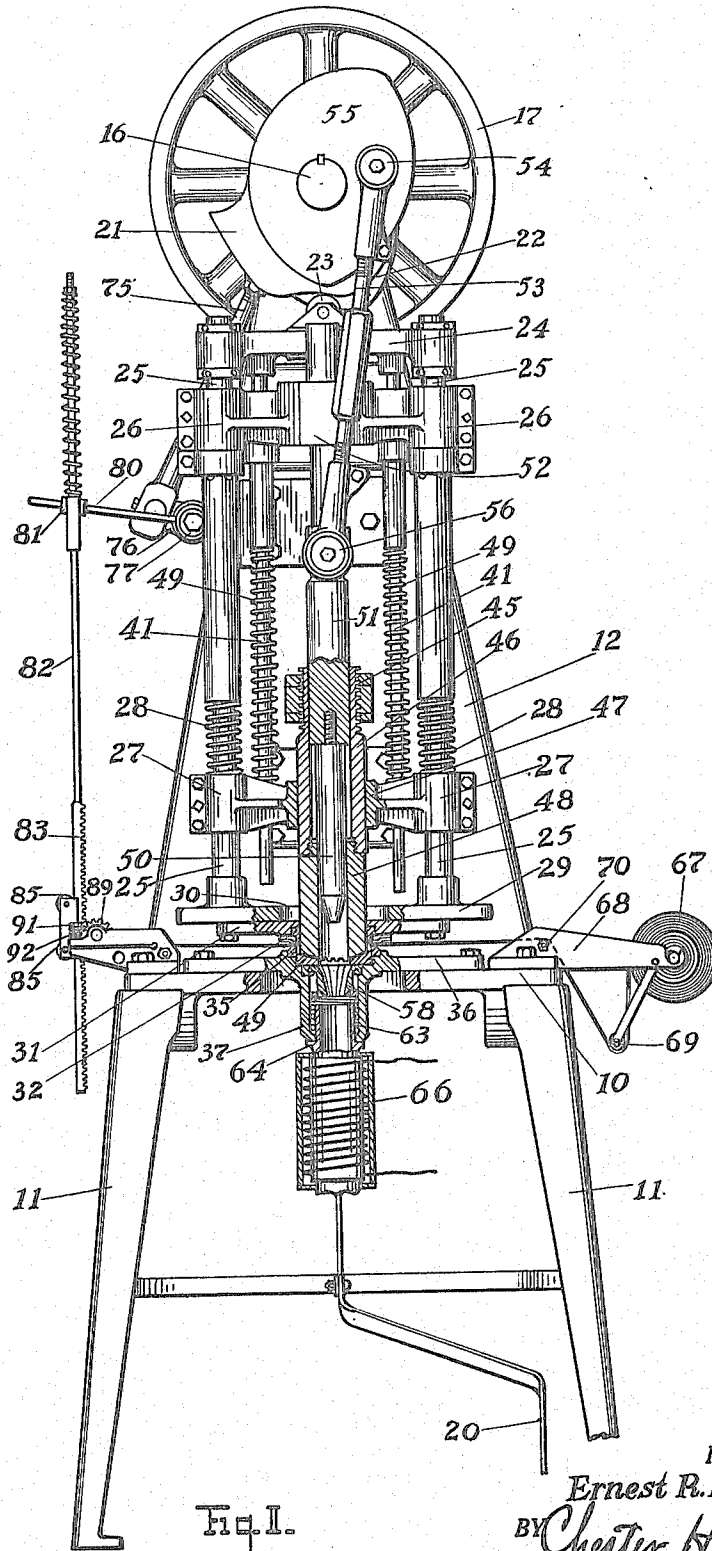


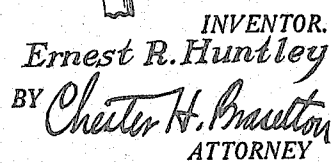
FIG. I.

INVENTOR.
Ernest R. Huntley
BY Chester H. Braselton
ATTORNEY

1,504,245

MACHINE FOR MAKING PAPER CUPS

Original Filed Sept. 29, 1919 6 Sheets-Sheet 3



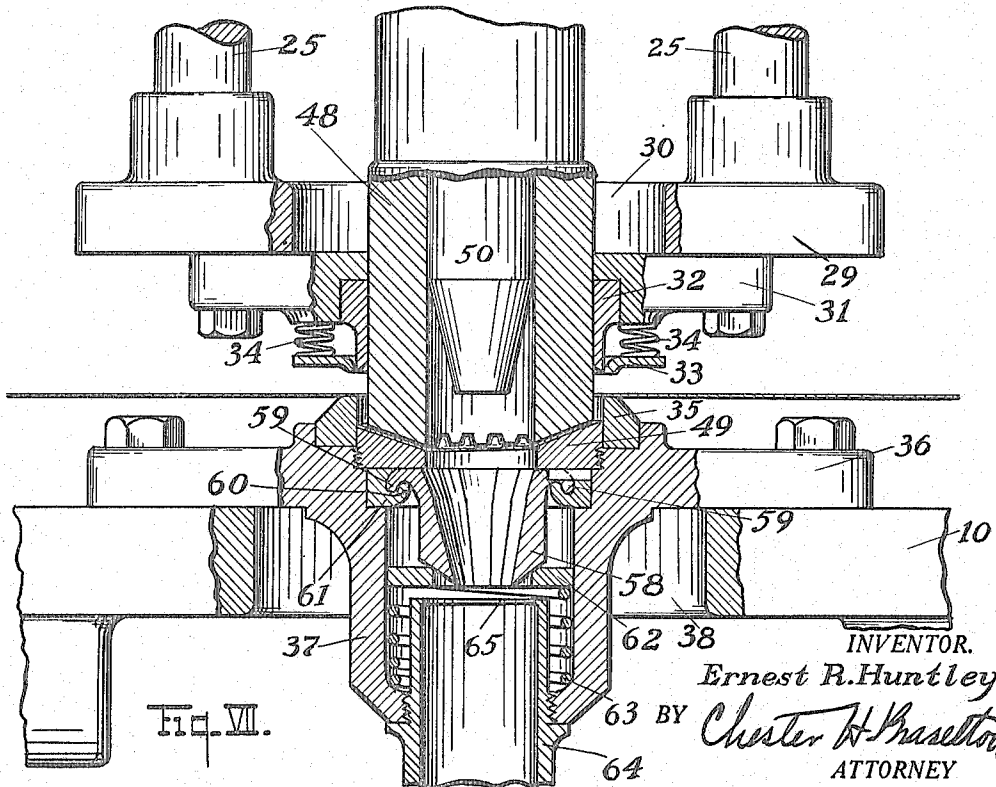
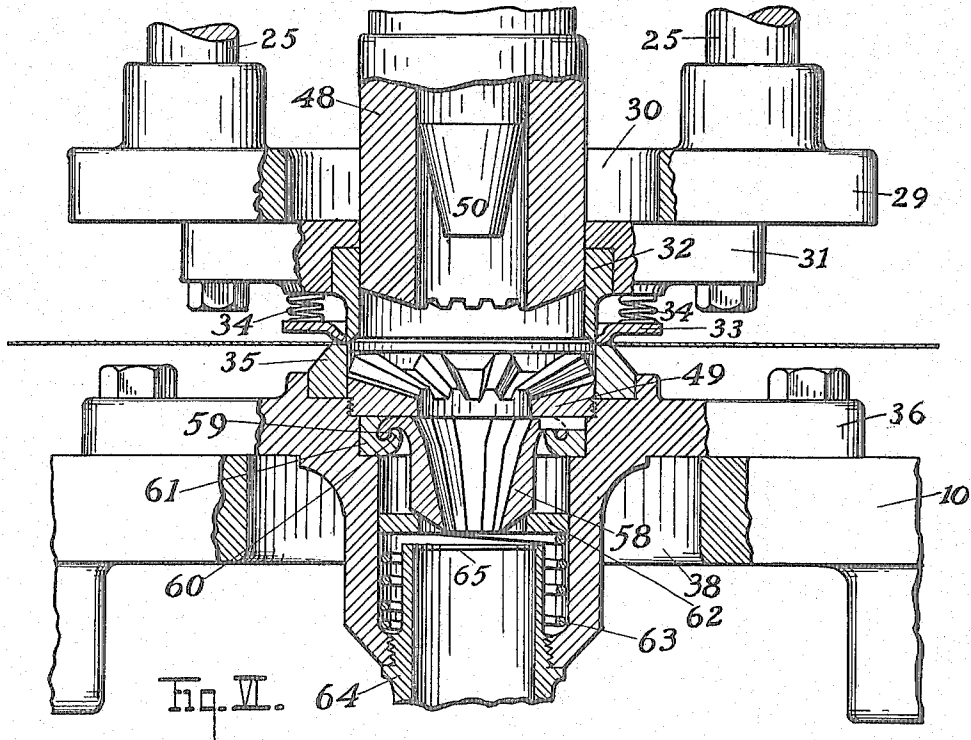
Aug. 12, 1924.

1,504,245

E. R. HUNTLEY

MACHINE FOR MAKING PAPER CUPS

Original Filed Sept. 29, 1919 6 Sheets-Sheet 4



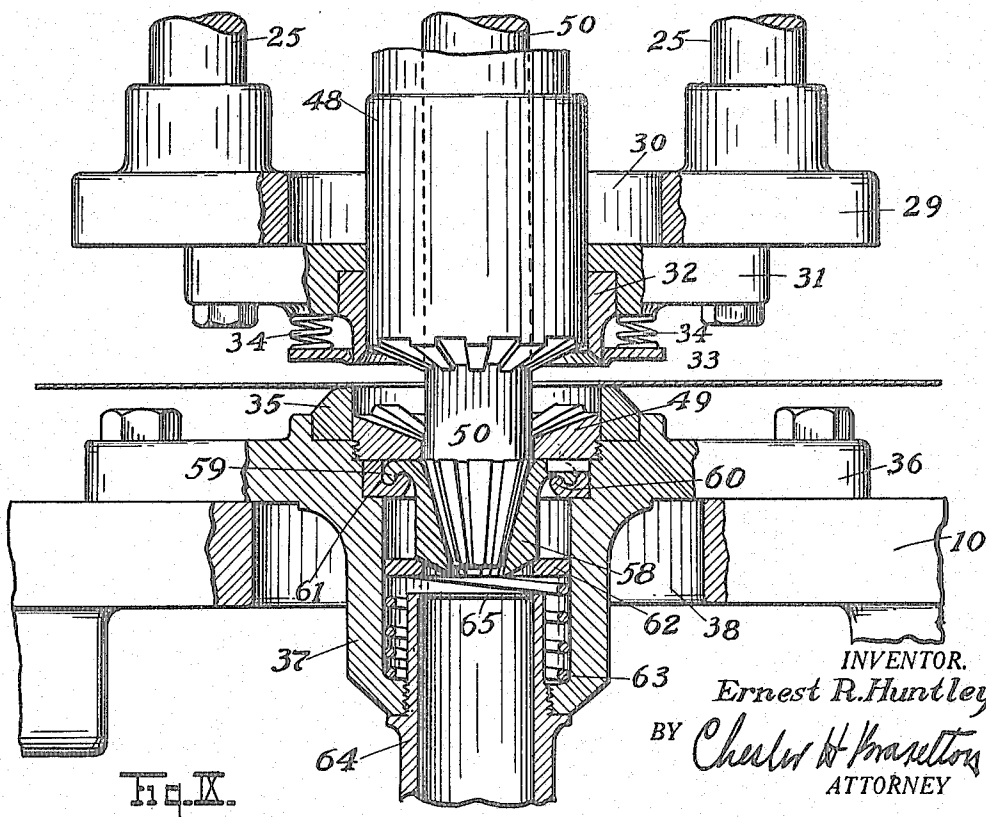
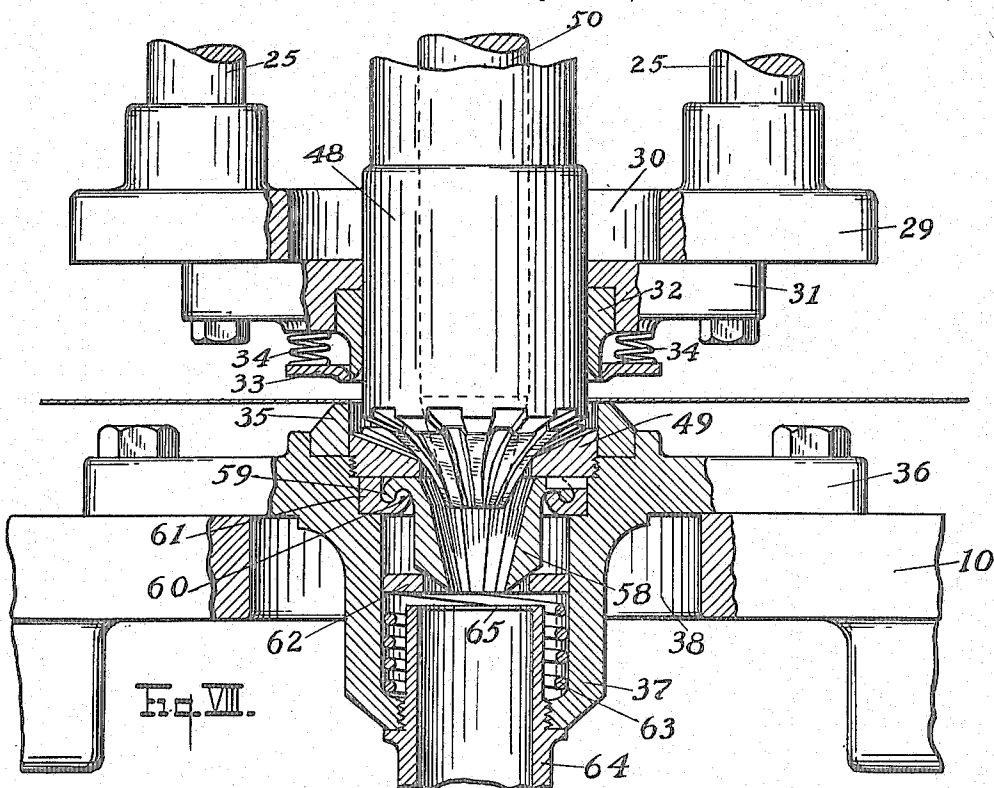
Aug. 12, 1924.

1,504,245

E. R. HUNTLEY

MACHINE FOR MAKING PAPER CUPS

Original Filed Sept. 29, 1919 6 Sheets-Sheet 5



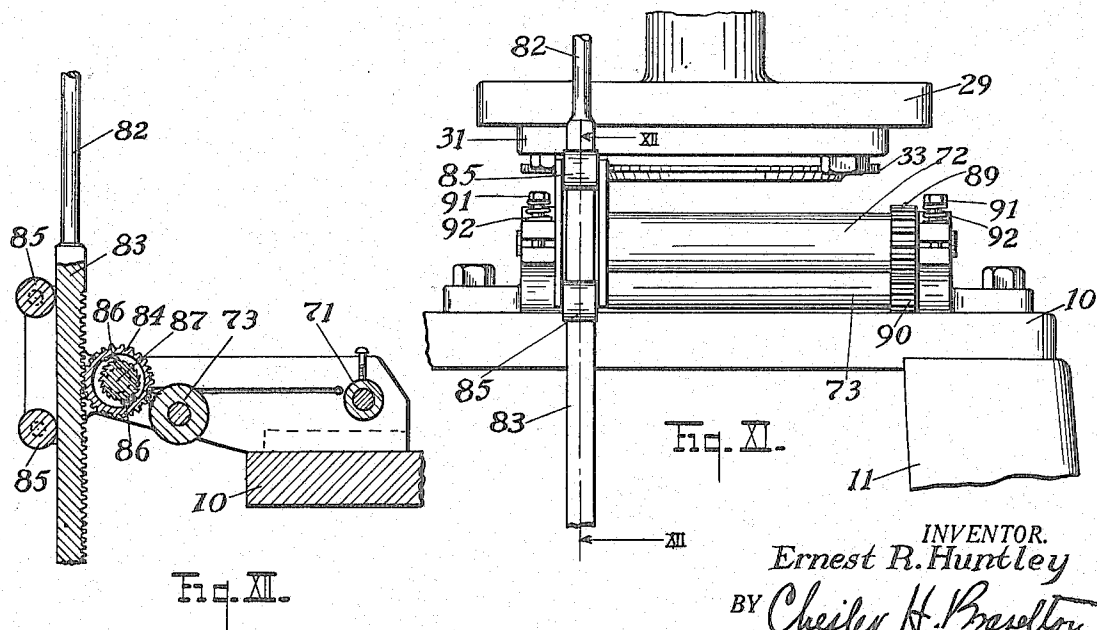
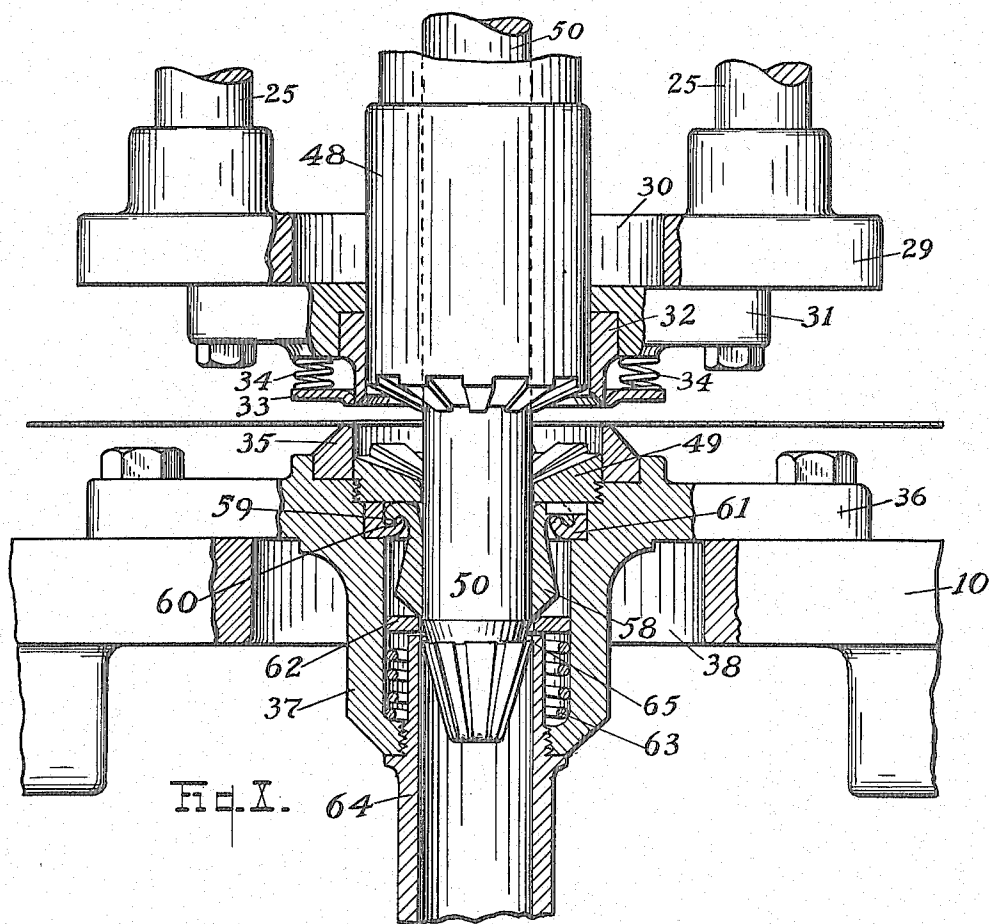
Aug. 12, 1924.

1,504,245

E. R. HUNTLEY

MACHINE FOR MAKING PAPER CUPS

Original Filed Sept. 29, 1919 6 Sheets-Sheet 6



INVENTOR.
Ernest R. Huntley
BY Chester H. Bradton
ATTORNEY

UNITED STATES PATENT OFFICE.

ERNEST R. HUNTLEY, OF MILWAUKEE, WISCONSIN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO MILWAUKEE LACE PAPER COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

MACHINE FOR MAKING PAPER CUPS.

Application filed September 29, 1919, Serial No. 327,111. Renewed March 25, 1922. Serial No. 546,634.

To all whom it may concern:

Be it known that I, ERNEST R. HUNTLEY, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Machines for Making Paper Cups, of which I declare the following to be a full, clear, and exact description.

This invention relates to machines and dies for making paper cups or similar articles by folding and shaping flat blanks. The machines and dies of this character now in use are rather complicated, and, as a rule, distort and abuse the blank material while it is being formed to such an extent that it often breaks before the operation is completed, and after completion shows the effect of previous abuse, in case it does not break.

It is the object of the present invention to obtain simplicity of construction and rapidity of action, combined with an operation that will cause the blanks to be formed into cup shape without subjecting the blank material to the bending and tensile strains, occurring in other apparatus of the kind. Other subsidiary objects are:

First, to provide means to permit the cup to pass through the pressing die, after the function of that die has been performed, which is accomplished by building the die in sections capable of swinging outwardly on pivots to open the die.

Second, the provision of a single ring surrounding the sectional die and upon which all of the sections are pivotally supported.

Third, the provision of resilient means for maintaining the said sections in position to press the folds of the cup until the pressure upon the sections exceeds a predetermined limit.

Fourth, the provision of a nesting tube into which the finished cups are received, which is provided with means for stripping the cups from the punch that carries them through the die, and which is heated in order to lend permanency to the folds that have been made in the sides of the cup.

Fifth, the provision of a plaiting and shaping die that is mounted within the annular cutting die, but which is separate and

distinct therefrom and moves independently thereof.

Other objects will appear as I proceed with the description of that embodiment of the invention, which, for the purposes of the present application, I have illustrated in the accompanying drawings, in which—

Figure I is a side elevation of the complete machine, certain parts being broken away to more clearly illustrate the invention.

Fig. II is a front elevation, some of the parts being shown in section.

Fig. III is an elevation of the side opposite that shown in Fig. I, certain of the parts being broken away.

Fig. IV is a cross section on the line IV—IV, Fig. III, showing the double cam in elevation.

Fig. V is a cross section on the line V—V, Fig. III, showing the eccentric which drives the paper feeding mechanism.

Figs. VI to X inclusive show on a large scale and principally in section the punches and dies which operate upon the paper to produce the finished cup, Fig. VI showing the position of the parts directly after the blank has been cut from the paper strip, Fig. VII showing the blank as it is being acted upon by the plaiting and shaping punch and die, Fig. VIII showing the plaiting and shaping punch after it has receded slightly and the cupping or pressing punch is drawing the blank from between the plaiting and shaping punch and die into the cupping or pressing die, the plaits being folded close to the body of the cup in this operation, Fig. IX showing the cup as it is being pressed between the cupping or pressing punch and the sectional die, Fig. X showing the cup being stripped from the punch after the latter has pushed it through the sectional die into the nesting tube, and has begun to recede.

Fig. XI is a fragmental, elevational view showing part of the paper strip feeding mechanism, and

Fig. XII is a section taken on the line XII—XII, Fig. XI.

Similar reference characters refer to like parts throughout the views.

In the drawings, the machine table indicated at 10, is shown supported upon legs 11. Mounted upon the table is a supporting column composed of a wall 12 extending across the table from side to side, about midway between the front and rear thereof, and a bracing web 13 integral with and arranged at right angles to the wall 12. Upon the upper end of this supporting column are carried bearings 14 and 15, within which is journaled the main shaft 16 of the machine. A power pulley 17 is loosely mounted upon the shaft and may be locked thereto by a clutch 18 of any suitable construction, arranged to be operated through a rod 19 by means of a foot lever 20.

The machine contains three principal moving parts, the cutting punch, the plaiting and shaping punch, and the cupping or pressing punch. These are all operated from the shaft 16. The latter carries near its forward end a double cam, having cam surfaces 21 and 22.

The cam surface 21 acts at the proper time to depress a small wheel 23, which is journaled in the top of a yoke 24, bridging the upper ends of a pair of vertical rods 25, which are mounted to slide in upper and lower guides 26 and 27 respectively, both sets of guides being bolted to the front wall 12 of the supporting column. Springs 28 tend normally to hold the rods in their uppermost position. At their lower ends the rods 25 carry a supporting plate 29, provided with a large central opening 30. To the under side of the plate 29 is bolted a second plate 31, in the central part of which is removably mounted an annular cutting punch 32, the inner wall of which is flush with a central opening in the plate 31. A paper clamping ring 33 is suspended from the plate and is spaced therefrom by springs 34. The ring 33 surrounds the cutting punch 32 and slides thereupon when the punch is lowered and begins to perform the cutting operation. During this time the clamping ring 33 bears firmly upon the paper which is supported by a cutting die 35. The die 35 is fixedly mounted in the upper part of a casting 36, which is bolted to the top of table 10, and is provided with a cup shaped central supporting element 37, extending down through a central opening 38 in the table.

The plaiting and shaping elements of the mechanism will now be described. The cam surface 22, which is a part of the cam heretofore referred to, contacts during a portion of each revolution with a small wheel 39 journaled in the top of a yoke 40, connecting the upper ends of a pair of rods 41, mounted to slide vertically in guides 42 and 43 formed in the same brackets in which the guides 26 and 27 are located. The yoke also supports midway between the rods 41 a post 44, likewise guided in the same brackets.

Fixed upon the post 44 is a clamp 45, which at its front end is rigidly secured to a sleeve 46, mounted to slide in a guide 47 integral with, and midway between the guides 27. Into the lower end of the sleeve 46 is threaded the upper end of the plaiting and shaping punch 48. When not acted upon by the cam, this punch is held in its elevated position by means of two springs 49, which bear at their upper ends against shoulders on the rods 41, and at their lower ends against the upper surfaces of the guides 43. Lifting the rods 41 lifts the yoke 40, post 44, clamp 45, sleeve 46 and punch 48 as will be apparent. The bottom surface of the punch 48 is provided with flat-sided, radial corrugations, which are complementary to similar corrugations formed upon the upper side of a die 49, which is removably fixed in the upper part of casting 36, just within the cutting die 35.

The cupping or pressing punch 50, which is tapered at its lower end to conform to the shape desired for the finished cup, slides within the punch 48 and sleeve 46, being threaded into the lower end of a vertically sliding post 51, the upper portion of which moves through a guide 52. The guide 52 and the sleeve 46 act together to maintain the post 51 in its proper vertical alignment. The post 51 is driven by a connecting rod 53, which receives its motion from a crank pin 54, projecting from the base of a disc 55 keyed to the forward extremity of the shaft 16. This disc 55 is shaped as shown in the drawing for shaft balancing purposes merely.

The lower end of the connecting rod 53 is journaled upon a pin 56, carried by the post 51. In order to prevent any rotary movement of the post 51, there is formed integral with the pin 56, a collar 57 which slides freely upon the vertically reciprocating post 44.

The cupping or pressing die is made up of a series of longitudinal sections 58, the upper ends of which are provided externally with hook-shaped projections 59. These projections rest upon an upwardly turned flange 60, extending inwardly from a ring 61. The edges of the flange 60 are rounded so as to enable it to serve as a pivot, upon which the hook projections may rock freely. The sections 58 are held normally in the position shown in Figs. VI to IX inclusive by a ring 62, which is caused to bear against the beveled lower ends of the sections by a coil spring 63, positioned within the cup-shaped portion 37 of the die supporting casting. The inner surfaces of the sections 58 are made with a slight angle somewhat below the pivot point, in order that the pressure of the punch 50 acting to separate the sections, may be applied at a point where it will exert leverage tending to swing the sections.

Into the lower end of the cup-shaped portion 37 of casting 36 is threaded a nesting tube 64, into which the finished cups are carried. An internal flange 65 is formed at the upper end of the tube. When the punch 50 has proceeded into the tube far enough to carry the upper edge of the cup below the flange 65, the cup expands slightly and its upper edge catches underneath the flange 65, thus stripping the cup from the punch. The tube 64 is preferably heated in order to assist in giving permanency to the folds in the sides of the cup. Each cup remains in the tube for a time sufficient to enable it to move to the discharge end where the cups may be withdrawn one at a time, or if preferred, the cups may be removed only at intervals in nests containing a considerable number of cups. In either event there is sufficient opportunity for the heat to produce its desired effect. Any convenient heating means may be employed, but I prefer to use for this purpose an electric heating coil, illustrated at 66 in Figs. I, II and III.

The paper from which the cups are made is taken from a roll 67, slightly wider than the diameter of the blank cut by the machine. This roll is mounted to rotate in bearing sockets in the ends of a pair of laterally extending arms 68, bolted at their inner ends to the top of the table. The strip of paper passes from the roll 67 beneath a tensioning roll 69, then upwardly over a guiding roll, the position of which is indicated at 70 in Fig. II, then horizontally across the machine and between the cutting die 35 and the cutting punch 32, and over a guiding roll 71, from which it passes between the feeding rolls 72 and 73 and out of the machine.

The mechanism for driving the feed rolls includes an eccentric 74 on the shaft 16, by means of which a connecting rod 75 is reciprocated. The lower end of the rod is pivotally connected to a crank 76 on a rock shaft 77, mounted in a bearing 78, which is supported upon a bracket 79, the latter being bolted to the front wall 12 of the supporting column. The rock shaft 77 carries a relatively long crank arm 80. A clamp 81 adjustable upon the crank 80 is pivotally mounted in a vertical rod 82, carrying a rack 83 at its lower end, which meshes with an annular spur gear 84, loosely mounted upon one end of feed roll 72. The rack is held in mesh with the gear 84 by means of wheels 85, against which the smooth rear surface of the rack bears. The inner side of the annular gear 84 carries a series of pawls 86 co-operating with a ratchet 87, the latter being rigidly mounted upon the roll 72. At the opposite ends of the rolls are intermeshing pinions 89 and 90, through which motion is transmitted from roll 72 to roll 73. The pressure of

the rolls upon the paper may be adjusted by means of nuts 91 which regulate the tension in springs 92, bearing upon the journals of the upper roll. It will be evident that movement of the rack 83 upward will turn the annular gear 84 clock-wise, causing the pawls 86 to engage with the teeth of the ratchet 87, thus driving the roll 72, and through it the roll 73. When the rack 83 descends, however, it merely rotates the gear 84 idly, the pawls 86 running over the teeth of the ratchet wheel 87. Consequently the paper strip moves through the machine on the up stroke of the rod 82 and remains stationary during the down stroke thereof, during which time the cutting of the blanks occurs, and the cup-making operations are performed.

The operation of the machine will be readily apparent from the above description of its parts. When the machine is started, the plates 29 and 31 are the first parts to descend. When they have nearly reached the limit of their motion, the clamping ring 33 grips the paper and holds it securely against the upper face of the cutting die 35, the springs 34 being compressed as the cutting punch 32 descends past the clamping ring 33, and in co-operation with the die 35 severs the blank, in the present instance of circular shape. The punch 32 and clamping ring 33 then recede. As soon as the cutting operation, which is illustrated in Fig. VI, is completed, the punch 48 which has also been descending, touches the paper blank and carries it downwardly into contact with the die 49 (see Fig. VII). As the punch 48 and die 49 come together, the blank is given a concave shape and at the same time, sharp cornered corrugations or plaits are produced in that portion of the blank which later constitutes the sides of the cup.

At the completion of this operation, the cupping punch 50 (see Fig. VII) in its downward travel, is just touching the blank, and is timed and cooperating with punch 48, in such relation that as punch 50 continues to descend, punch 48 starts its upward travel in such relation to the downward travel of the punch 50 that the portion of the blank which is to constitute the sides of the cup is allowed to swing up over the edge of die 49, to form the cup. The folds thus occur on the lines predetermined by the previous scoring operation, positive control of the blank is maintained, and overlapping and irregularity in the folds is prevented by the cooperation of the two punches 48 and 50 in conjunction with the edge of the die 49 (see Fig. VIII) in such manner, that during the cupping operation, the blank is engaged at its outer edge, at the point where the folds terminate at the

bottom of the cup, and also at a varying point intermediate thereto, allowing the cups to be formed without "breaking" the blank material over the comparatively sharp edge of die 49.

During this time, the punch 50 with the blank upon it is entering the sectional die. As this movement proceeds, the plaits in the sides of the blank are pressed against the sides of the die, tightening the folds (see Fig. IX). When the pressure of the punch 50 in the die becomes great enough, it begins to swing the sections 58 upon their pivots, thereby depressing the ring 62 against the coil spring 63. The punch 50 continues to descend and eventually passes through the opened end and into the nesting tube 64, as shown in Fig. X, where the cup which is now finished has room to expand just a trifle, but sufficiently to cause the upper edge of the cup to engage beneath the flange 65 on the tube as the punch begins to ascend once more, the cup being thereby stripped from the punch. A series of cups are thus rapidly formed and nested within the tube 64, the heat of which is conducted to the cups and produces permanency in the folds of the latter. When all of the punches have been withdrawn above the line of the paper strip, the paper feeding mechanism causes the strip to be drawn along sufficiently to present an uninterrupted portion to the cutting punch and die, after which the latter operate to cut a new blank and the other punches and dies operate upon the blank to form another cup. The cups are removed from the machine by any suitable means and are thereafter preferably paraffined.

It is understood that any means might be adopted to accomplish the cooperation described between the punches 48 and 50 and still be within the scope of the invention. Further, that while in this instance we have made use of this feature in combination with a sectional "push through" die of the class described, combined with a cupping die, it is understood that it might be used in combination with any other type of cupping die, and also independent of the cupping die herein shown.

Without further elaboration, the foregoing will so fully explain the gist of my invention, that others may, by applying current knowledge, readily adapt the same for use under various conditions of service, without eliminating certain features which may properly be said to constitute the essential features of novelty involved which items are intended to be defined and secured to me by the following claims.

I claim:

1. In a machine for making cups from flat blanks, means for plaiting the sides of the cup, a punch shaped to fit the interior

of the cup to be formed, a sectional die shaped to fit the exterior of the cup, and arranged to receive said punch, the sections of said die being resiliently supported and adapted to move outwardly in order to open the die and permit the cup to be projected therethrough by said punch.

2. In a machine for making cups from flat blanks, means for plaiting the sides of the cup, a punch having tapered sides, a sectional die of complementary shape adapted to receive said punch, the sections of said die being resiliently supported and adapted to move outwardly in order to open the die and permit the cup to be projected therethrough by said punch.

3. In a machine for making cups from flat blanks, means for plaiting the sides of the cup, a punch having tapered sides, a die of complementary shape adapted to receive said punch, said die being separated into longitudinal sections pivoted adjacent the large end of the die, and means for maintaining said sections in juxtaposition throughout their length until the pressure of said punch in said die exceeds a predetermined limit, whereupon the sections swing outwardly upon their pivots and permit the punch to pass through the die.

4. In a machine for making cups from flat blanks, means for plaiting the sides of the cup, a punch having tapered sides, a die of complementary shape adapted to receive the said punch, said die being separated into longitudinal sections, pivoted adjacent the large end of the die, means for maintaining said sections in juxtaposition throughout their entire length for a period during which the punch and die co-operate to press the sides of the cup and thereafter permitting said sections to swing outwardly on their pivots, and permitting the punch to move through the open die.

5. In a machine for making cups from flat blanks, means for plaiting the sides of the cups, a punch having tapered sides, a die of complementary shape adapted to receive said punch, said die being separated into longitudinal sections, a ring surrounding the large end of the die, upon which said sections are pivotally supported, means for maintaining said sections in juxtaposition throughout their length for a period during which the punch and die co-operate to press the sides of the cup, and thereafter permitting said sections to swing outwardly upon their pivots, and means for projecting the punch through the open die.

6. In a machine for making cups from flat blanks, means for plaiting the sides of the cups, a punch having tapered sides, a die of complementary shape adapted to receive said punch, said die being separated into longitudinal sections pivoted adjacent the large end of the die, resilient means for

maintaining said sections in juxtaposition throughout their length, said means being adapted to yield and permit the sections to swing outwardly upon their pivots, when the pressure of the punch in the die exceeds a predetermined limit, and means for projecting the punch through the thus opened die.

7. In a machine for making cups from flat blanks, means for plaiting the sides of the cup, a punch having tapered sides, a die of complementary shape adapted to receive said punch, said die being separated into longitudinal sections pivoted adjacent the large end of the die, the opposite ends of the sections being exteriorly beveled, a spring pressed ring bearing against said beveled surfaces for maintaining the sections in closed position until the pressure exerted by said punch becomes sufficient to overcome that of the spring pressed ring, whereupon the sections swing outwardly upon their pivots, opening the die and permitting the punch to pass therethrough.

8. In a machine for making cups from flat blanks, means for plaiting the sides of the cup, a punch adapted to fit the interior of the cup to be formed, a sectional die of complementary shape, arranged to receive said punch, the sections of said die being resiliently supported and adapted to move outwardly in order to open the die, means for projecting the punch through the open die, and means for stripping the cup from the punch while it extends through the die.

9. In a machine for making cups from flat blanks, means for plaiting the sides of the cup, a punch shaped to fit the interior of the cup to be formed, a sectional die of complementary shape arranged to receive said punch, the sections of said die being resiliently supported and adapted to move outwardly in order to open the die, a nesting tube mounted in axial alignment with said punch and die, and means for projecting the punch through the open die, and into said tube.

10. In a machine for making cups from flat blanks, means for plaiting the sides of the cup, a punch shaped to fit the interior of the cup to be formed, a sectional die of complementary shape arranged to receive said punch, the sections of said die being resiliently supported and adapted to move outwardly in order to open the die, a nesting tube mounted in axial alignment with said punch and die, means for projecting the punch through the open die and into said tube, said tube having an internal flange at its end adjacent the die.

11. In a machine for making cups from flat blanks, means for plaiting the sides of the cup, a punch shaped to fit the interior of the cup to be formed, a sectional die of complementary shape arranged to receive

said punch, the sections of said die being resiliently supported and adapted to move outwardly in order to open the die, a heated nesting tube mounted in axial alignment with said punch and die, and means for projecting the punch through the open die and into said tube.

12. In a machine for making paper cups, means all in axial alignment for cutting the blank and for plaiting, shaping and pressing the cup, a nesting tube, means for nesting the finished cups, within said tube, and means for applying heat to said tube.

13. In a machine for making paper cups, means for supporting a strip of paper arranged to extend through said machine, means for advancing said strip at intervals, a cylindrical cutting die, and a cylindrical cutting punch arranged upon opposite sides of said strip and adapted to cooperate to cut paper blanks from said strip, a plaiting and shaping die fixedly mounted within said cutting die, and a cooperating plaiting and shaping punch mounted to slide within and independently of said cutting punch.

14. In a device of the class described, plaiting die means and forming die means arranged to operate in succession on the same piece of material, and means for holding said plaiting die means partly separated during the operation of said forming die means, to ease the material in its passage into said forming die means.

15. In a device of the class described, a plaiting die and a forming die arranged to operate in succession on the same piece of material, and means for actuating said plaiting die, means for subsequently actuating said forming die, and means for keeping said plaiting die in only partially withdrawn position during the forming operation, to ease the material into its formed position.

16. In a device of the class described, a plaiting die and a forming die arranged to operate in succession on the same piece of material, means for actuating said plaiting die, means for subsequently actuating said forming die, and means for keeping said plaiting die in only partially withdrawn position during the forming operation, to ease the material into its formed position, said dies being power driven in synchronism from a common drive shaft.

17. In a device of the class described, a plaiting die and a forming die arranged to operate in succession on the same piece of material, means for actuating said plaiting die, means for subsequently actuating said forming die, and means for keeping said plaiting die in only partially withdrawn position during the forming operation, to ease the material into its formed position, said dies being power driven in synchronism from a common drive shaft, one drive being

driven by a connecting rod linkage, and the other by a cam.

18. In a device of the class described, a plaiting die and a forming die arranged to operate in succession on the same piece of material, means for actuating said plaiting die, means for subsequently actuating said forming die, and means for keeping said plaiting die in only partially withdrawn position during the forming operation, to ease the material into its formed position, said dies being power driven in synchronism from a common drive shaft, a connecting rod linkage for driving said forming die, and a cam connection for driving said plaiting die.

19. In a device of the class described, male and female forming dies, means for moving said male die to carry the formed article through said female die, and stationary rigid stripping means for removing the article from said male die.

20. In a device of the class described, male and female forming dies, means for moving said male die to carry the formed article through said female die, and stationary stripping means for removing the article from said male die, said stripping means being brought into engagement with the article by the distortion of the article due to its residual resilience.

21. In a device of the class described, a die moving through a determined path to distort material beyond its limit of resilience and thereby change its shape, and stationary rigid means adjacent the path of said die for stripping the material therefrom.

22. In a device of the class described, dies operating to distort material beyond its limit of resilience and thereby change its shape, said dies having relative movement to carry one die and the material through the other die, and a rigid stripper positioned to be engaged by the material as it expands by its residual resilience upon release of die pressure, whereby the return movement of the material carrying die will transfer and deliver the finished article to said stripper.

23. In a device of the class described, a rotary shaft, three reciprocating elements, cam connections for driving two of said ele-

ments from said shaft, a connecting rod for driving the other element and a disc and crank pin on said shaft shaped to balance the shaft.

24. In a device of the class described, three sets of dies arranged to operate on the material in sequence, and means for retaining one set in partial engagement with the material during the operation of the succeeding set.

25. In a machine for making cups from flat blanks, means for plaiting the sides of the cup, a punch shaped to fit the interior of the cup to be formed, a sectional die shaped to fit the exterior of the cup, and arranged to receive said punch, the sections of said die being adapted to move outwardly in order to open the die and permit the cup to be projected therethrough by said punch.

26. In a machine for making cups from flat blanks, means for plaiting the sides of the cup, a punch having tapered sides, a sectional die of complementary shape adapted to receive said punch, the sections of said die being adapted to move outwardly in order to open the die and permit the cup to be projected therethrough by said punch.

27. A cupping and forming machine of the character described including a lower die, an upper plaiting die, a plunger, a forming die carried by said plunger and working within said lower and upper dies, said lower die having longitudinal ribs formed therein, said upper and lower dies having opposed flanges with cooperating radial ribs formed thereon, the radial ribs on the flange of the lower die constituting continuations of the longitudinal ribs of said die, and means for exerting pressure on said upper plaiting die and then relieving the same during formation of a cup.

28. In a device of the class described, plaiting die means and forming die means arranged to operate in succession on the same piece of material, and means for relieving the pressure of said plaiting die means during the operation of said forming die means, to ease the material in its passage into said forming die means.

In testimony whereof, I affix my signature.

ERNEST R. HUNTLEY.