W. W. BEVAN AND C. E. CLARKE.

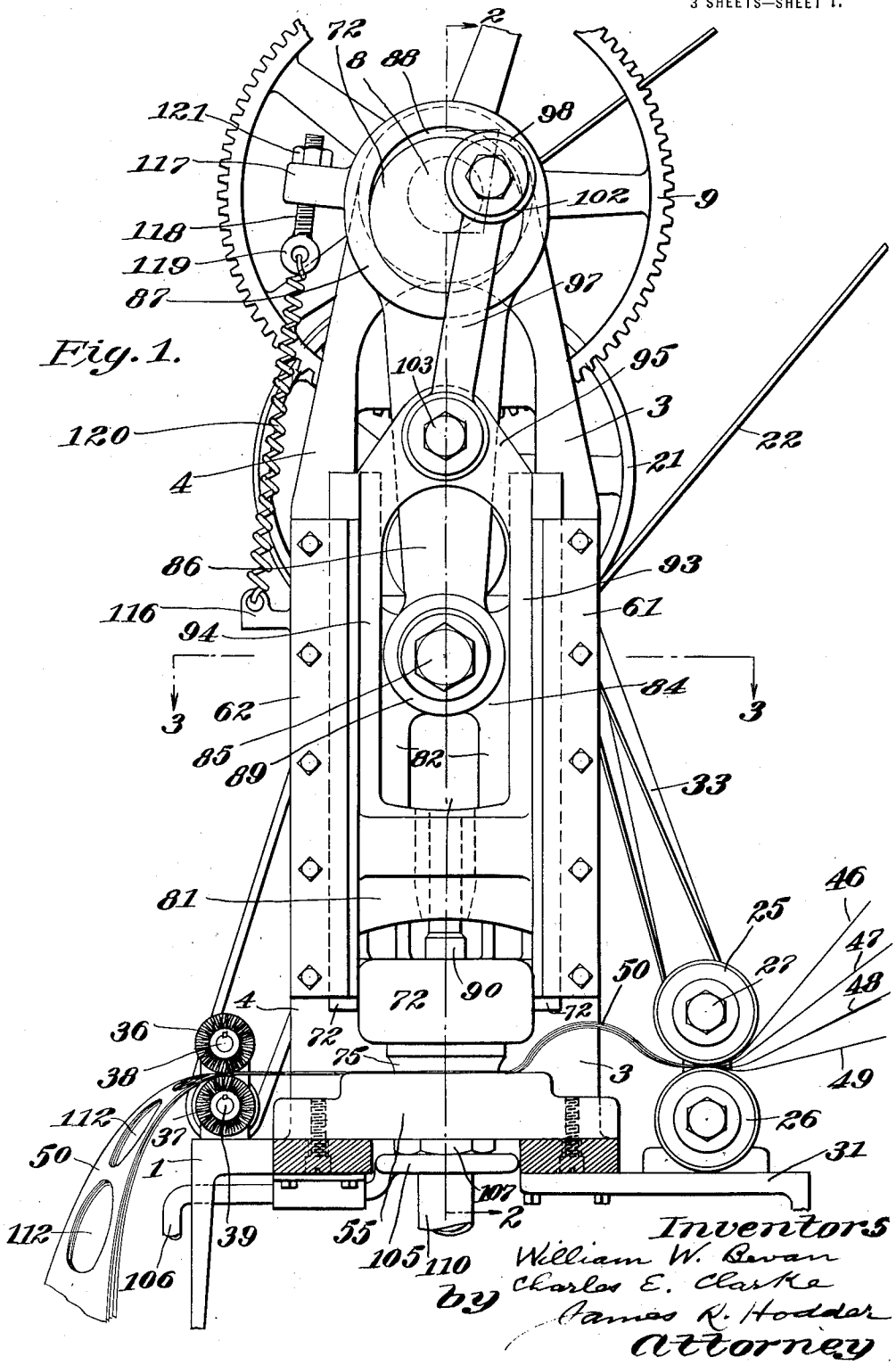
AUTOMATIC PAPER CUP FORMING MACHINE.

APPLICATION FILED DEC. 14, 1918.

1,339,315. Patented May 4, 1920.

3 SHEETS—SHEET 1.

Fig. 1.



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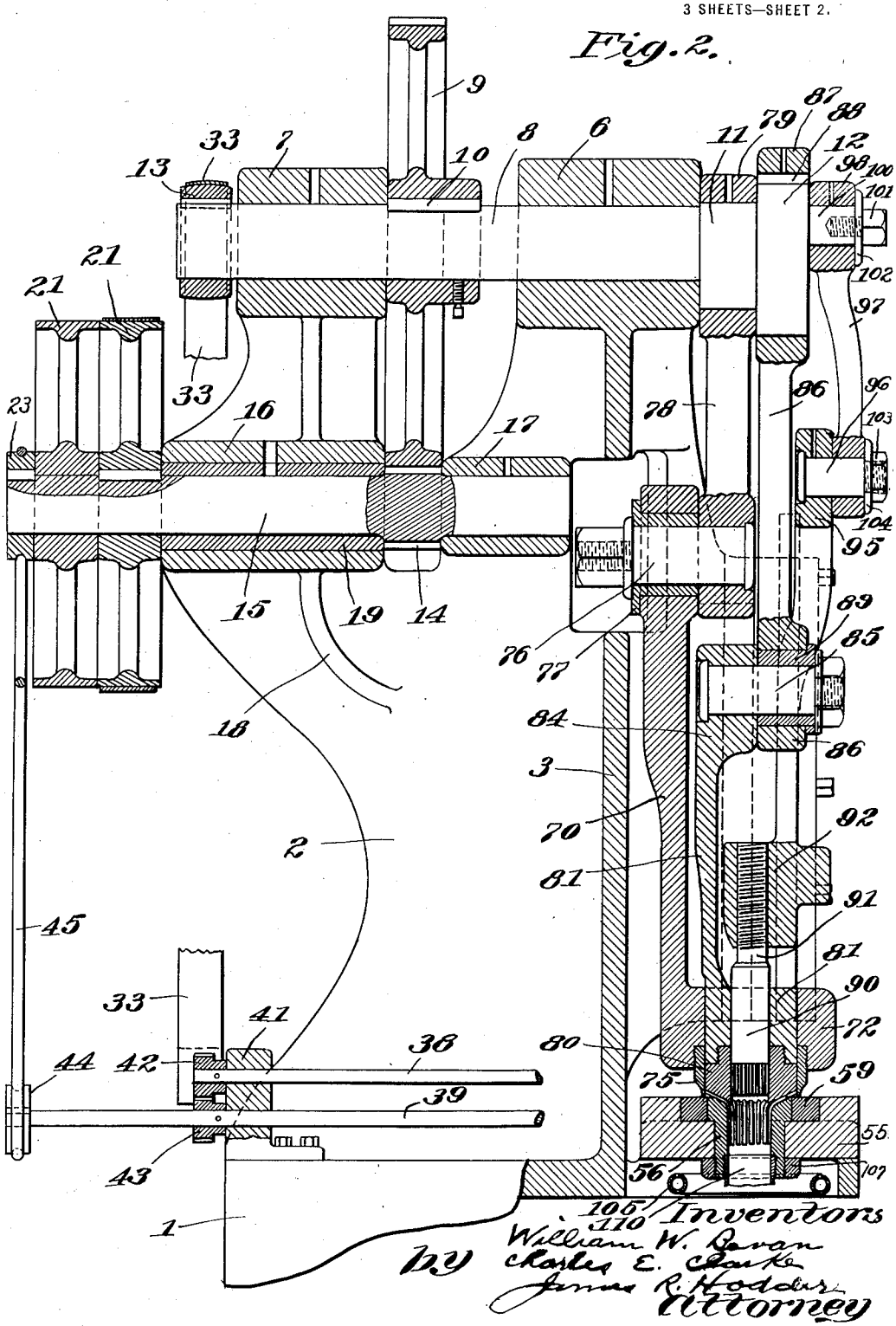
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3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

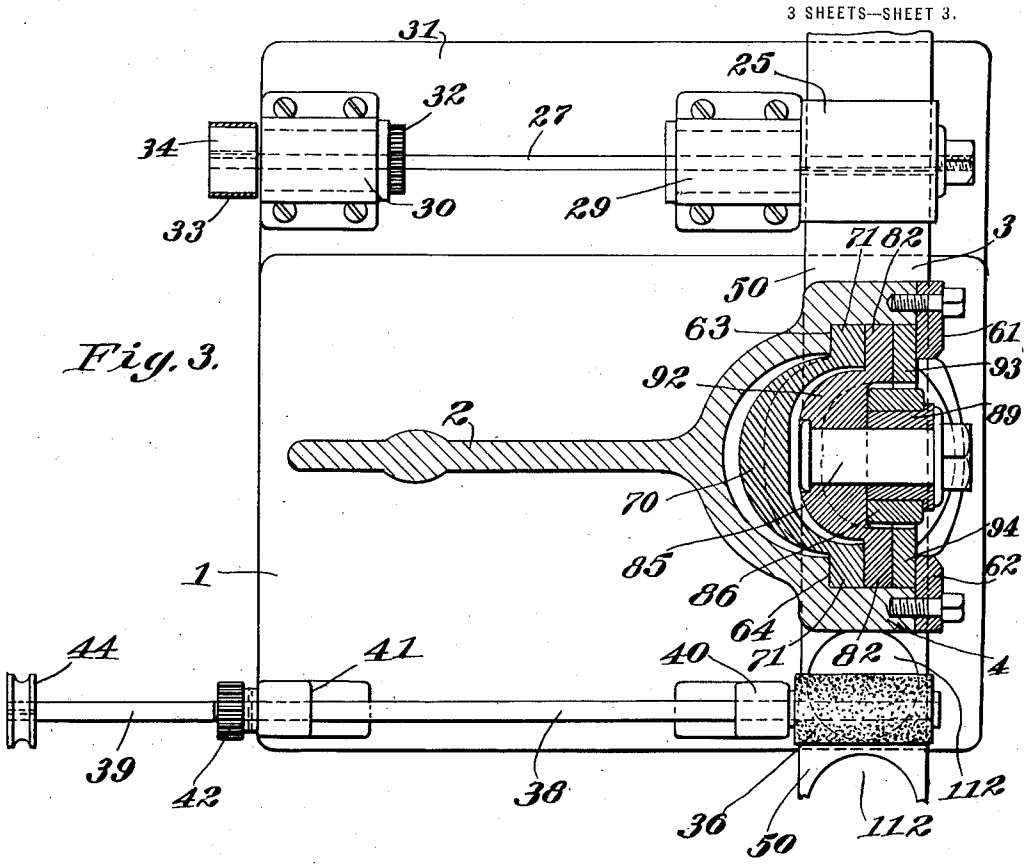


Fig. 4.

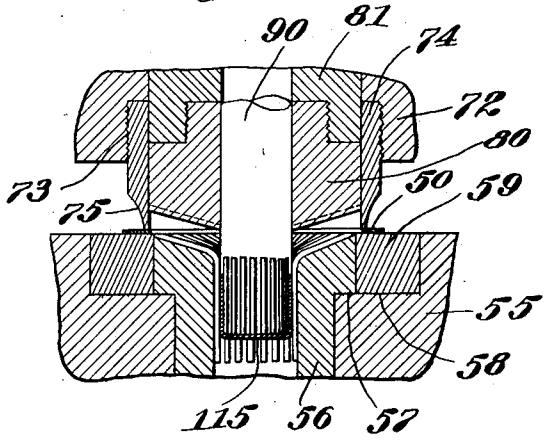
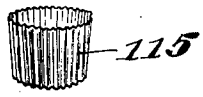


Fig. 5.



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AUTOMATIC PAPER-CUP-FORMING MACHINE.

1,339,315. Specification of Letters Patent. Patented May 4, 1920.

Application filed December 14, 1918. Serial No. 266,678.

To all whom it may concern:

Be it known that we, WILLIAM W. BEVAN, of Melrose, Massachusetts, and CHARLES E. CLARKE, of Winthrop, Massachusetts, have invented an Improvement in Automatic Paper-Cup-Forming Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

Our present invention is an improved machine to form paper cups by a novel process, and the object of the invention is to improve and perfect an automatic cup forming machine and to simplify the process of manufacturing said cups as well as to produce a more satisfactory article.

The invention is particularly applicable to the forming of paper cups of very thin stock, fluting or corrugating the same around the sides so that the cups will preserve their cup-like conformation for subsequent use in receiving and holding confectionery, such as bonbons, chocolates, etc. It will be appreciated that the paper cups for this purpose must be formed from very light, economical and inexpensive, as well as thin stock, and the problems involved are very much more difficult from, and different than, forming cups from paper stock of heavy material, such as is employed in making paper drinking cups or the like. In the handling of such paper stock, also, great care must be taken not to break the stock or the completed cup after it is formed.

With the above and other objects in view, our present invention contemplates the formation of corrugated paper cups for confectionery or the like by a novel process, adapted to form such cups from a continuous strip of stock and preferably from a plurality of such strips of stock which are fed continuously to the machine, although intermittently stopped and held, while a preliminary die conforming operation is performed upon the strip or strips, drawing the needed amount of stock into the dies before the blanks are actually cut from the strip, then a further conforming operation is performed thus striking up the cups by a progressive plurality of steps. This novel process is further important in enabling each cup thus formed to be of uniform dimensions after it is completed, whereas formerly the manufacture of these cups required preliminary stamping or cutting out of blanks which were then fed through dies and the drawing of the paper stock through the dies rendered same frequently uneven and with ragged edges.

We also provide means for adjustment of the machine to operate upon any desired plurality of thicknesses, with equal efficiency, fifteen to thirty thicknesses of paper stock for forming such confectionery cups being actuated simultaneously so that the capacity of the machine is vastly greater than machines heretofore made for this purpose, so far as we are aware. The speed and accuracy of operation of our machine constitute important features.

A still further important advantage consists in the arrangement whereby the paper cups are held in their final and desired conformation for a considerable period and preferably under the influence of heat, both heat and pressure setting the paper cups and the corrugations in a more permanent form than has heretofore been possible in dealing with such thin and cheap stock in making cups of this kind.

Further features of the invention, novel combinations of parts and important advantages will be hereinafter more fully pointed out and claimed.

Referring to the drawings illustrating a preferred embodiment of our invention showing a machine carrying out our novel process of manufacture;

Figure 1 is a front view of our machine;

Fig. 2 is a cross sectional view on the line 2—2 of Fig. 1;

Fig. 3 is a cross sectional view on the line 3—3 of Fig. 1;

Fig. 4 is an enlarged detail partly in cross section of the cup forming dies; and

Fig. 5 illustrates a completed cup.

As shown in the drawings, we provide a compact machine comprising a suitable base 1 which may be supported upon a bench or separate standards, said base carrying a vertical flange 2 and side wings 3 and 4, carrying at their uppermost portions bearings 6 and 7 for the cam shaft 8. A gear wheel 9 is secured to said shaft by a key 10 and at the front of the machine the cam shaft 8 carries eccentrics 11 and 12 to operate the die forming devices and cutter, as

will be explained. At the opposite end of the shaft 8 is a pulley 13 thereon to supply power for rotating the stock feeding wheels. The gear 9 is in mesh with teeth 14 on the power shaft 15 mounted in suitable bearings 16 and 17 formed as hubs in the flange 2 with a bracing lug 18 at each side of the main bearing 16. A bushing 19 is provided for the main bearing and fast and loose pulleys 20 and 21 respectively are fitted, (see Fig. 2) to the power shaft 15 to which a belt 22 is led from any suitable source of power. On the outer end of the power shaft 15 is a small pulley 23 to supply power to rotate the feeding brushes leading the stock from the machine.

The stock feeding means comprise a pair of rolls 25 and 26, each feed wheel is mounted on a shaft, the shaft 27 for the upper feed wheel 25 being shown in Fig. 3 and both shafts are mounted in suitable bearings 29 and 30 carried on a bracket 31 secured to the base 1. The wheels 25 and 26 are turned in unison by a set of gear wheels 32, to feed stock between them, and power is received from a belt 33 leading from the pulley 13 on the cam shaft 8 to and around the pulley 34 on the upper shaft 27.

The rolls to lead the stock from the machine after the cup forming blanks have been cut therefrom comprise a pair of rolls 36 and 37 preferably of yielding material such as brushes. These rolls are mounted on the shafts 38 and 39 respectively, each supported in bearings 40 and 41 on the base 1. Gear wheels 42 and 43 keyed to the outer end of the shaft 38 and to the shaft 39, as shown in Fig. 2, act to turn the brushes 36 and 37 together, the shaft 39 extending beyond the gears and carrying the pulley 44 which receives a belt 45 uniting this pulley to the pulley 23 on the power shaft 15 giving a high speed of rotation to the brushes.

In our present machine we arrange a plurality of strips of paper stock designated generally at 50 and comprising as many thicknesses as desired, being led from separate rolls outside the machine to and between the pairs of feeding in rolls 25 and 26, the numerals 46, 47, 48, and 49 indicating a plurality of such strips of paper. It will be understood, however, that a very considerable number of strips of paper may thus be united, as many as 30 being capable of being consolidated into the strip 50 and efficiently acted upon by our machine. The feeding in rolls 25 and 26 rotate continuously and thereby draw a plurality of strips of paper, 46, 47, 48, and 49, steadily and evenly from their respective rolls. A suitable space is also provided between the feeding in rolls 25 and 26 and the dies and cutter mechanism to allow for the continuous feeding in of the paper strips during the intermediate stopping of the strips 50 during the die forming and cutting operations. Meanwhile the yielding rolls 36 and 37 rotating at high speed serve to draw the strips 50 tightly and enable the strip to be momentarily stopped without injury thereto because of the flexibility of the feeding out rolls 36 and 37, while their speed will serve to instantly feed outwardly the strips 50 when released from the cutter and dies so as to straighten out the strips 50 and permit a new portion to be drawn tightly under the dies for the succeeding operation of the machine.

The strips 50 are drawn across the work table 55, which is raised under the movable dies to receive the fixed die 56, said die being preferably formed with an annular shoulder, as shown at 57 to rest upon a corresponding shoulder 58, on the work table 55, but spaced from the inner diameter of the recess in the work table in order to permit the ring 59 to be fitted therebetween. Preferably this ring 59 is of steel, wood, fiber, rubber or other suitable material to coöperate with the cutting die and under both the edges thereof while the work table 55 and die 56 are of metal.

In accordance with our invention and our novel operation, we arrange the strips of material to be fed through the machine and to have the first forming die, stamp out a blank directly from said strip or strips of material 50, thus enabling the forming dies to gather within their respective periphery the stock that is needed therefor, thus actually stamping said stock into the dies and giving it the first forming action in the plurality of successive conforming movements of the dies. This action momentarily stops the feeding of the paper through the rolls 36 and 37 which however being flexible permit the same without injury. Thereupon the cutter is actuated to cut clearly around the forming dies, releasing the blank or stock held between the first dies, whereupon the second die action forces said stock into the completed cup forming contour. The dies then release the stock and the rapid rotation of the flexible rolls 36 and 37 instantly straightens out the stock 50 to permit the succeeding operation.

The movable dies and cutting mechanism therefor will now be described. Secured to the forward flanges 3 and 4 are guide plates 61 and 62 respectively, forming with a recess or shoulders 63 and 64 in the flanges 3 and 4, a suitable slideway or bearing for the several die carriers, as will be clearly seen on reference to Fig. 3. The cutter die carrier 70 is formed with ribs 71, at either side, ending in a lowermost head 72, having an inner threaded recess 73 to which a shank 74 of the cutter die 75 is correspondingly threaded, the cutter die 75 projecting suit-

ably therefrom. At the upper end of the carrier 70 is a bolt 76 extending through an eccentric bushing 77 in a corresponding recess in the carrier 70 and uniting said carrier to a connecting rod 78, said rod having a strap 79, extending around the eccentric 11 on the cam shaft 8. Rotation of the cam shaft 8 thus imparts vertical reciprocation to the carrier 70 and cutter 75. The forming die 80 is fitted to a carrier 81, this carrier 81 has a pair of ribs 82, 82, (see Fig. 3) said ribs being united at the top in a yoke 84. Through the yoke 84 is a bolt 85 connecting this carrier with a connecting rod 86, preferably an eccentric bushing 89 is also provided. The eccentric bushings 77 and 89 afford adjustable means for correcting the dies and for varying thickness of stock. Said rod 86 has its upper end in the form of a strap 87 to encircle the eccentric 12. Preferably a suitable space 88 or lost motion is provided between the strap 87 and the cam 12 to allow, automatically for a dwell, permitting the die 80 to rest on the stock while the plunger 90 draws the stock downwardly. The central die 90 is provided to reciprocate through a central plunger in the forming die 80 as the latter slides within the cutter 75 and this central die 90 has a shank 91 threaded into its carrier 92, this threaded arrangement providing for vertical adjustment when desired. The carrier 92 has a similar pair of ribs 93 and 94, thus all the ribs of the various carriers constituting cooperating slide bearings for each other, are held slidingly within the members 61 and 62 and the shoulders 62 and 64 of the frame. The upper end of the ribs 93 and 94 are united in a yoke 95, through which a bolt 96 secures the lower end of a connecting rod 97, said rod having its upper end 98 pivoted to a stud 100 formed on the face of the eccentric 12. Securing this rod to the respective pivots are headed bolts 101 and washer 102 at the stud 100 and corresponding bolt 103 and washer 104 at the lower end securing same to the bolt 96.

Rotation of the cam shaft 8 imparts to the several die carriers vertical reciprocation in timed relation to each other.

In order to supply heat to the stock to still further enable the same to be permanently set in its desired conformation, we apply a steam or gas heater 105 around the lower part to the fixed die 56 leading steam or gas thereto by a supply pipe 106 from any suitable source. In order to still further have the dies and completely formed cups thus heated, we have the lower die 56 extending downwardly from the work table 55 and receiving a threaded nut 107, holding said die firmly in position and interiorly threaded, a pipe 110 through which the formed cups are succesively forced by successive die forming operations, passing through the heated die and pipe 110 until they are completely forced out of the machine.

The operation of our improved automatic machine will be readily understood. Any desired number of paper rolls being fitted in proximity to the machine and led through the feeding in rolls 25 and 26 across the work table 55 and over the feeding out rolls 36 and 37, the machine is then ready for operation. Power being applied, the rotation of the cam shaft and sets of feeding rolls, first stretches the stock 50 tightly under the dies, then the first conforming die 80 is moved downwardly into contact with the stock 50, momentarily stopping the stock and giving the preliminary shaping contour to the stock. Immediately thereafter and while the forming die 80 and fixed die 56 are thus in contact, holding the stock between them, the cutter 75 is actuated to sever the material thus drawn within the dies, freeing same from the strip 50, leaving blanks as indicated at 112, Fig. 1. Thereafter while the forming die 80 is resting on the stock, because of the dwell 88 the central die 90 moves downwardly drawing the now severed and partly formed blank or blanks 115 out from the tension of the die 80 and into the second progressive state of the operation, further completing the same by forcing the stock into the lower and more highly heated portion. The cutters being raised during its cycle of movement, the die 80 is now raised together with the plunger 90, permitting the feeding out rolls 36 and 37 to instantly draw in under the dies a new strip of stock which has been curled upwardly, as indicated in Fig. 1, inside the feeding rolls 25 and 26. The blank forming operation is repeated on a successive strip and the successive blanks are forced down on top of the preceding blanks which are compelled to travel the entire length of the die 56 and pipe 110, thus giving them a relatively long time in which to be maintained in their proper cup shape and corrugated cup conformation. It will be understood that the corresponding surfaces of the fixed die 56, forming die 80 and central die 90 are coöperatively corrugated to simultaneously conform and corrugate the edges of the cups. In addition to the weight of the die 80 and its carrier, rod, etc., we may also supply varying degrees of pressure on said stock by utilizing a spring if desired. For this purpose a lug 116 is attached to the side frame 4 and a boss 117 on the strap 87; this boss 117 is threaded to receive the threaded shank 118 of a bolt 119 to which a spring 120 extends to the lower lug 116. Rotation of the bolt 119 will give the desired degree of tension and a lock nut 121 will hold the same in adjusted position. With this construction, pressure in addition to the mere weight

of the die 81 and carrier, can be attained for the preliminary cup forming die action. The resulting product, besides being more uniform than those heretofore made, where blanks were first stamped out and then put through a die, insures the cups retaining their cuplike form irrespective of the extremely thin and inexpensive stock from which such cups must be made for commercial use.

Our present invention is further described and defined in the form of claims as follows:

1. In a machine of the class described, means to feed a plurality of strips of stock through the machine, said feeding means comprising continuously actuated feeding-in rolls and continuously actuated flexible feed-out rolls, in combination with a plurality of successively operated dies, and means to actuate said dies to momentarily stop the feeding of stock through the machine while stamping out cups therefrom.

2. In a machine of the class described, means to feed a plurality of paper strips through the machine in alinement for die forming and cutting operations, said feeding means comprising continuously acting feeding-in rolls and flexibly formed feeding-out rolls rotating at higher speed than the feeding-in rolls, whereby the stock can be momentarily stopped during die forming and thereafter will be fed out at greater speed than the feeding in, to hold said stock in position for the succeeding cup forming action of the dies.

3. In a machine of the class described, the combination of a stationary die, a plurality of movable dies, means for moving said plurality of movable dies relatively to the stationary die, stock feeding-in rolls located at one side of said dies, means for rotating said rolls to continuously feed stock to the dies, stock feeding-out rolls located at the other side of said dies, and means for rotating said stock feeding-out rolls, said stock feeding-out rolls coöperating with the dies to intermittently feed stock therefrom.

4. In a machine of the class described, the combination of a stationary die, a plurality of movable dies, concentrically mounted with respect to each other, means for moving said plurality of movable dies relatively to the stationary die, continuously rotating rolls for continuously feeding stock to the dies, continuously rotating brush rolls coöperating with the dies for intermittently feeding stock therefrom, and means for rotating said rolls.

5. In a machine of the class described, the combination of a stationary die, a plurality of movable dies coöperating therewith and successively operated, means for feeding a plurality of superposed strips of paper to the machine to be simultaneously operated upon by the dies, means for operating one of said movable dies in advance of the others, to momentarily stop the strips of paper in position over the stationary die, and means for feeding the paper strips from the machine more rapidly than the same are fed to the machine.

In testimony whereof, we have signed our names to this specification, in the presence of two subscribing witnesses.

WILLIAM W. BEVAN.
CHARLES E. CLARKE.

Witnesses:
JAMES R. HODDER,
RACHAEL G. LESLIE.