F. H. VICK.

MACHINE FOR MAKING PAPER RECEPTACLES.

APPLICATION FILED NOV. 6, 1914.

1,226,034.

Patented May 15, 1917.

8 SHEETS—SHEET 1.

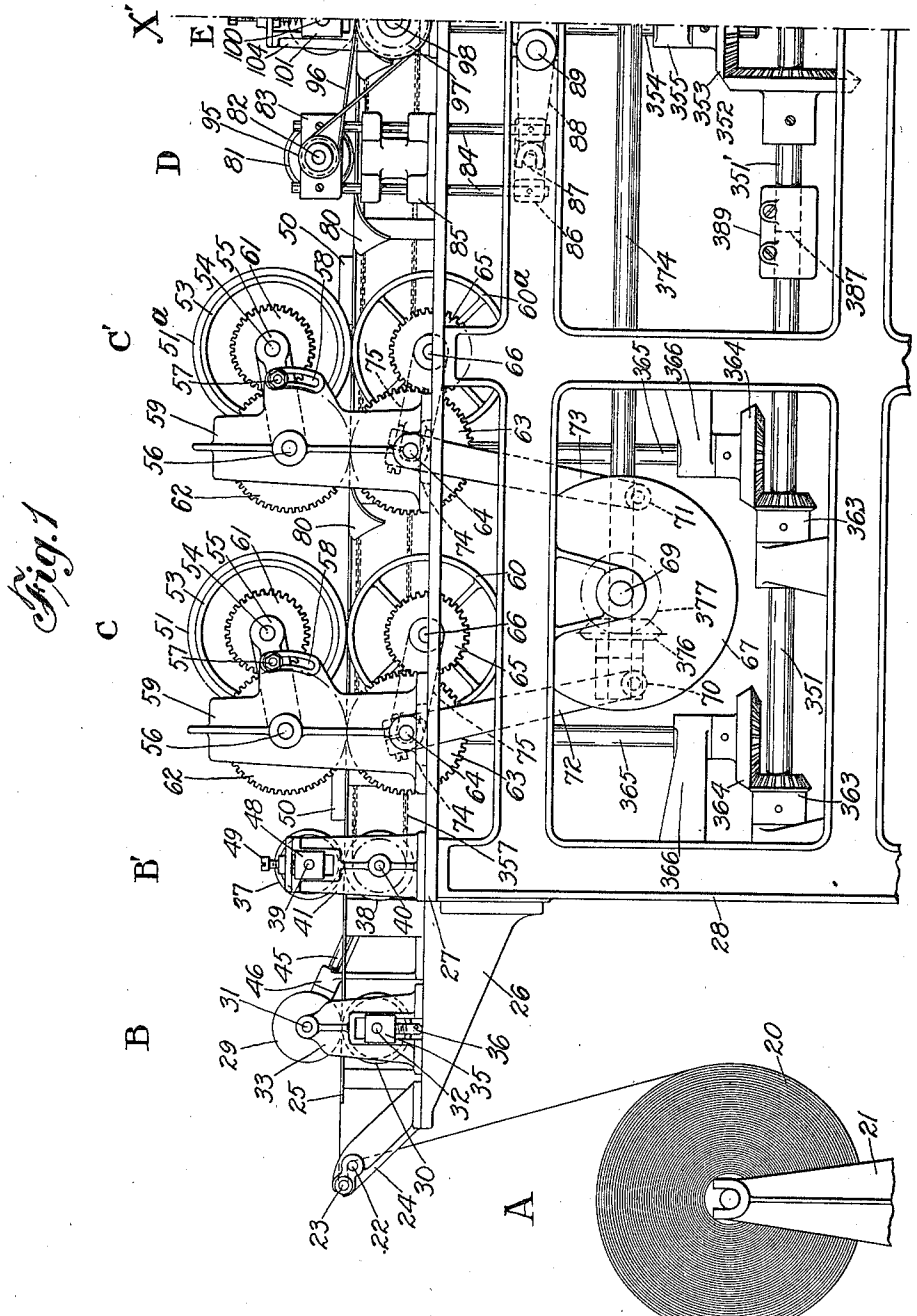


Fig. 1

Witnesses
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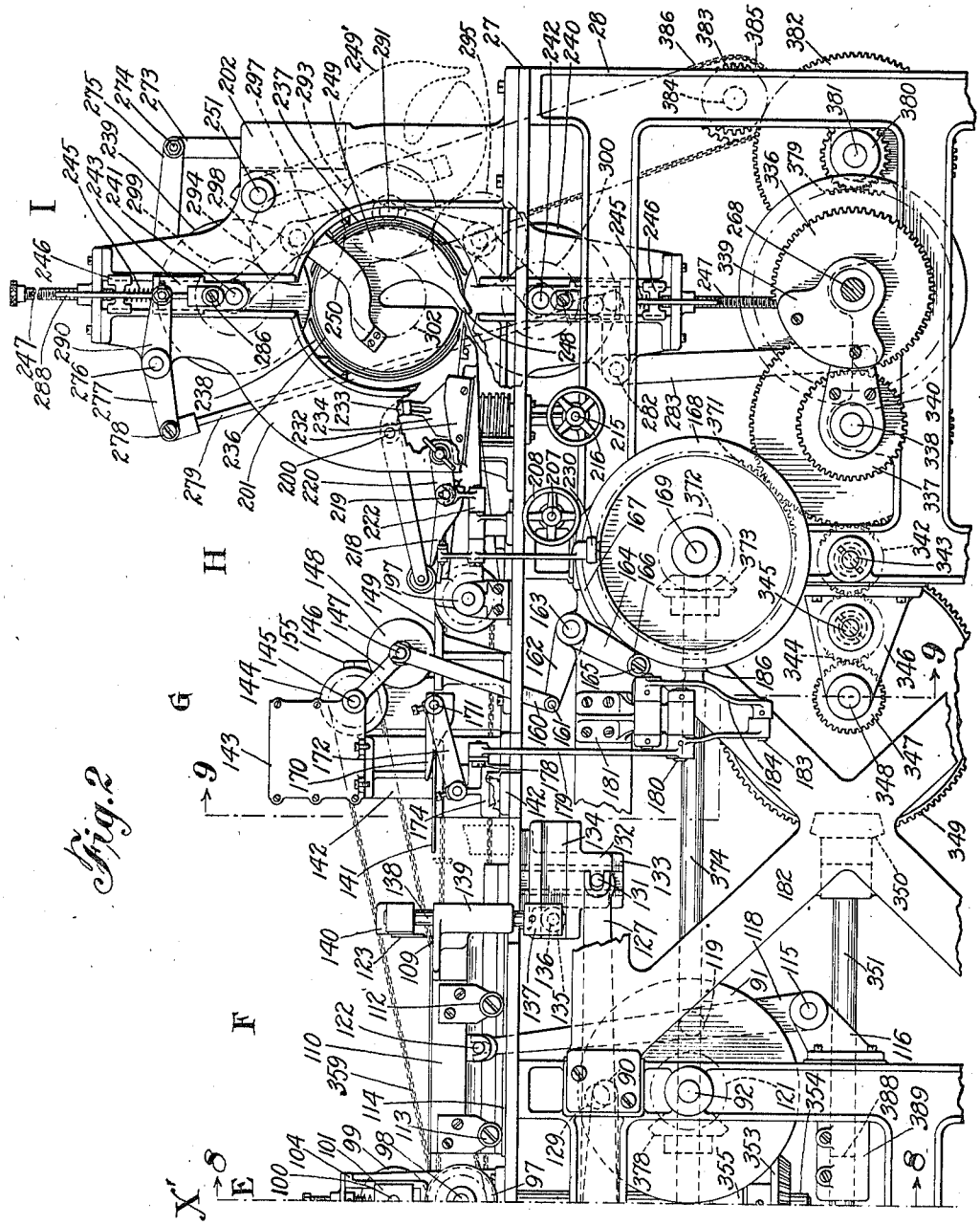


Fig. 2

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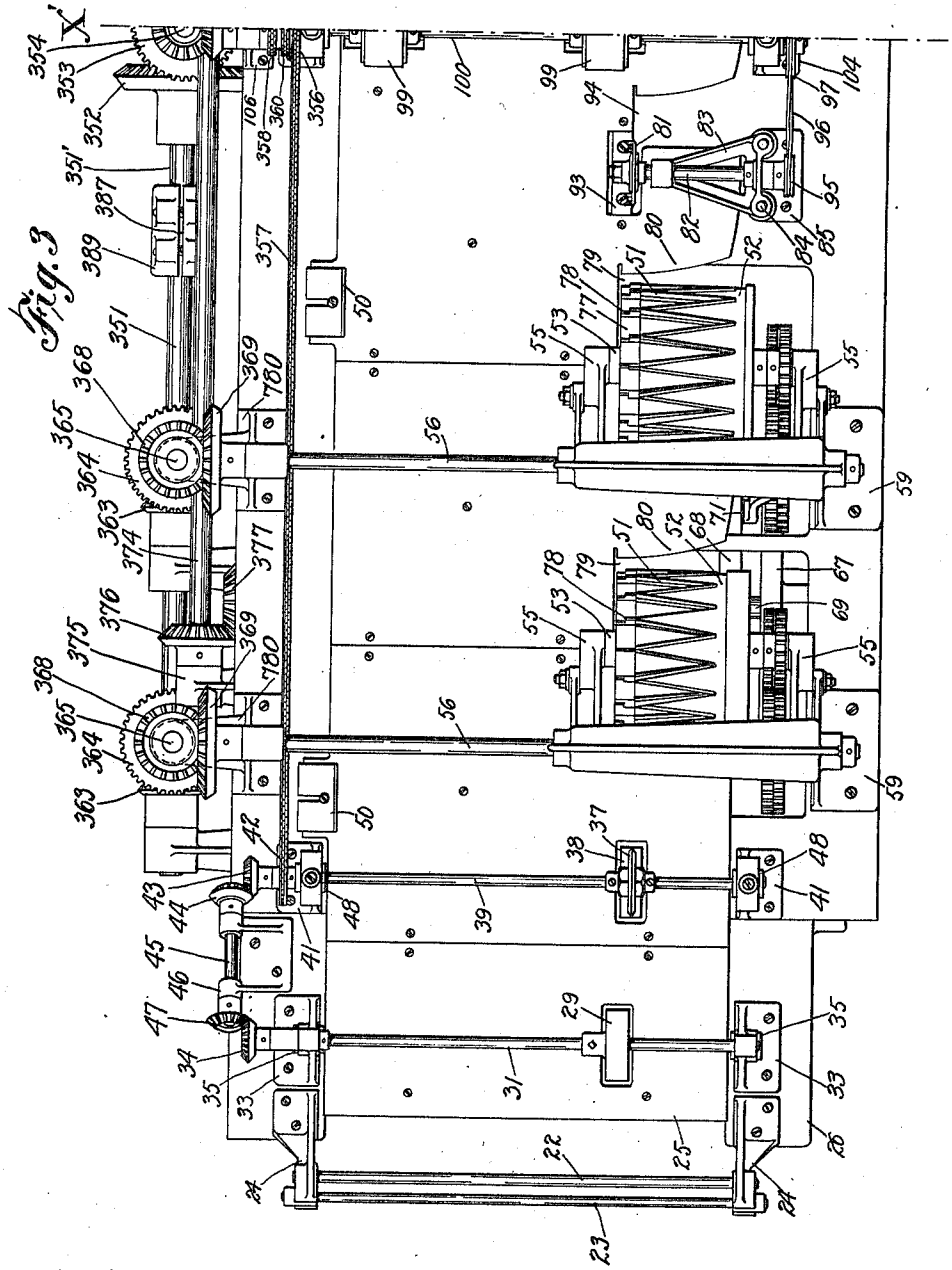
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8 SHEETS—SHEET 3.

Fig. 3



Witnesses

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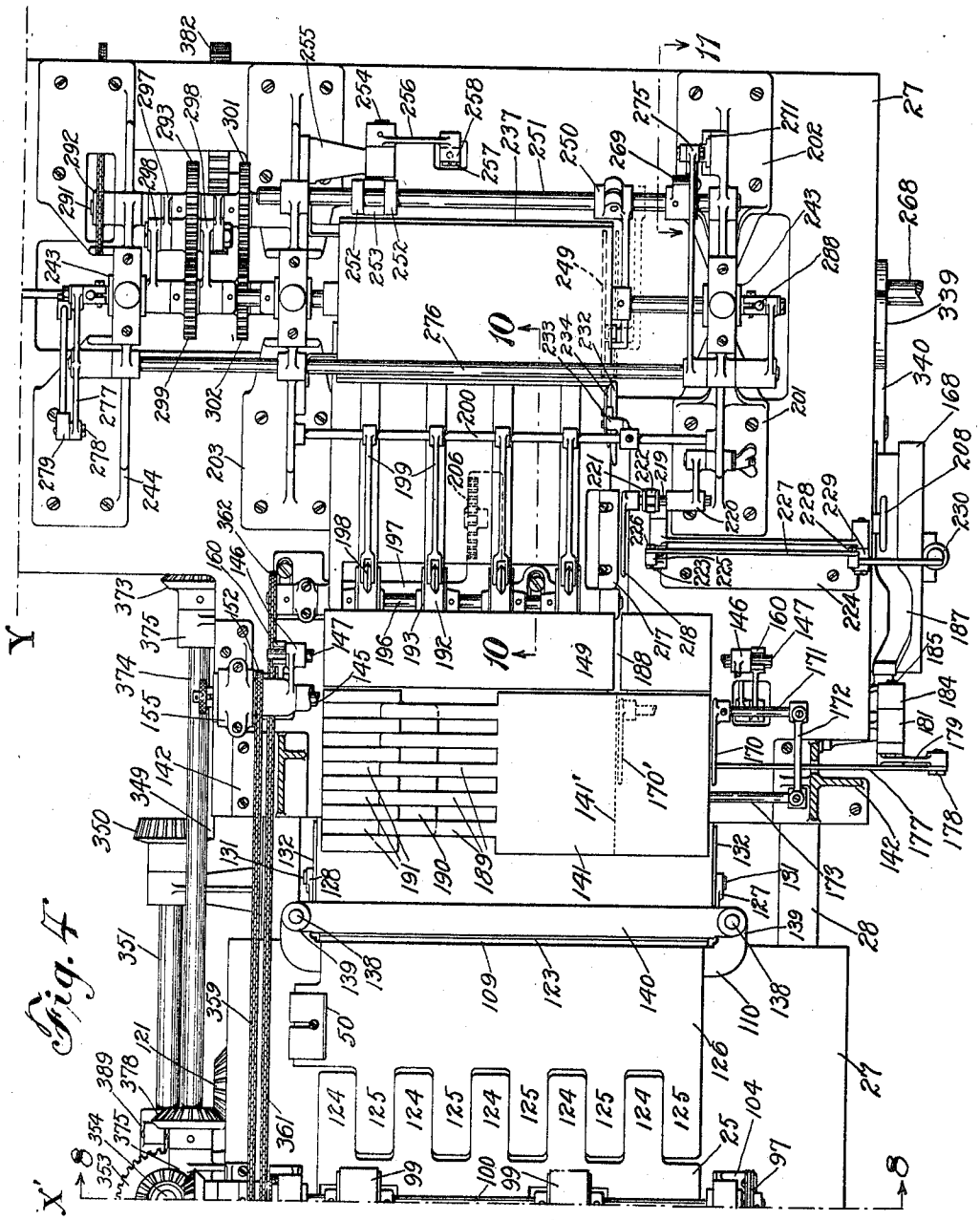


Fig. 4.

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8 SHEETS—SHEET 5.

Fig. 5

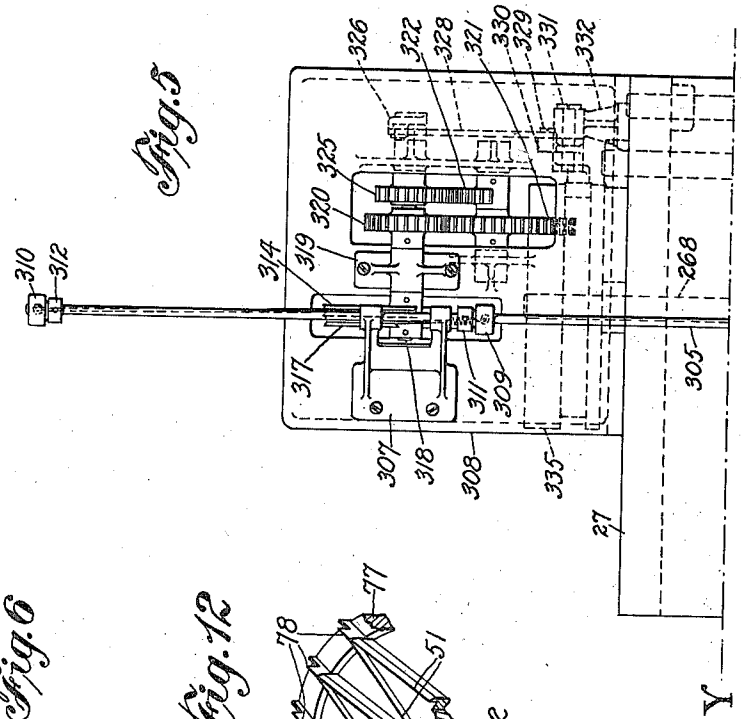


Fig. 6

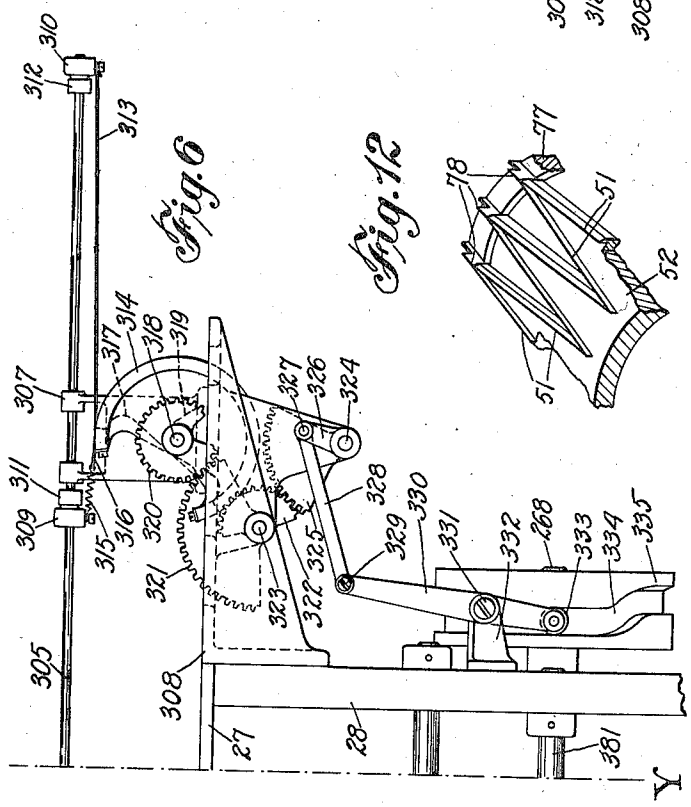
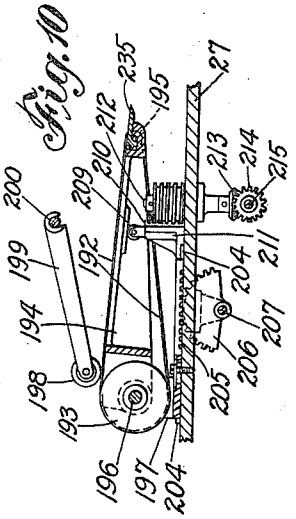


Fig. 12

Fig. 10



Witnesses

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8 SHEETS—SHEET 6.

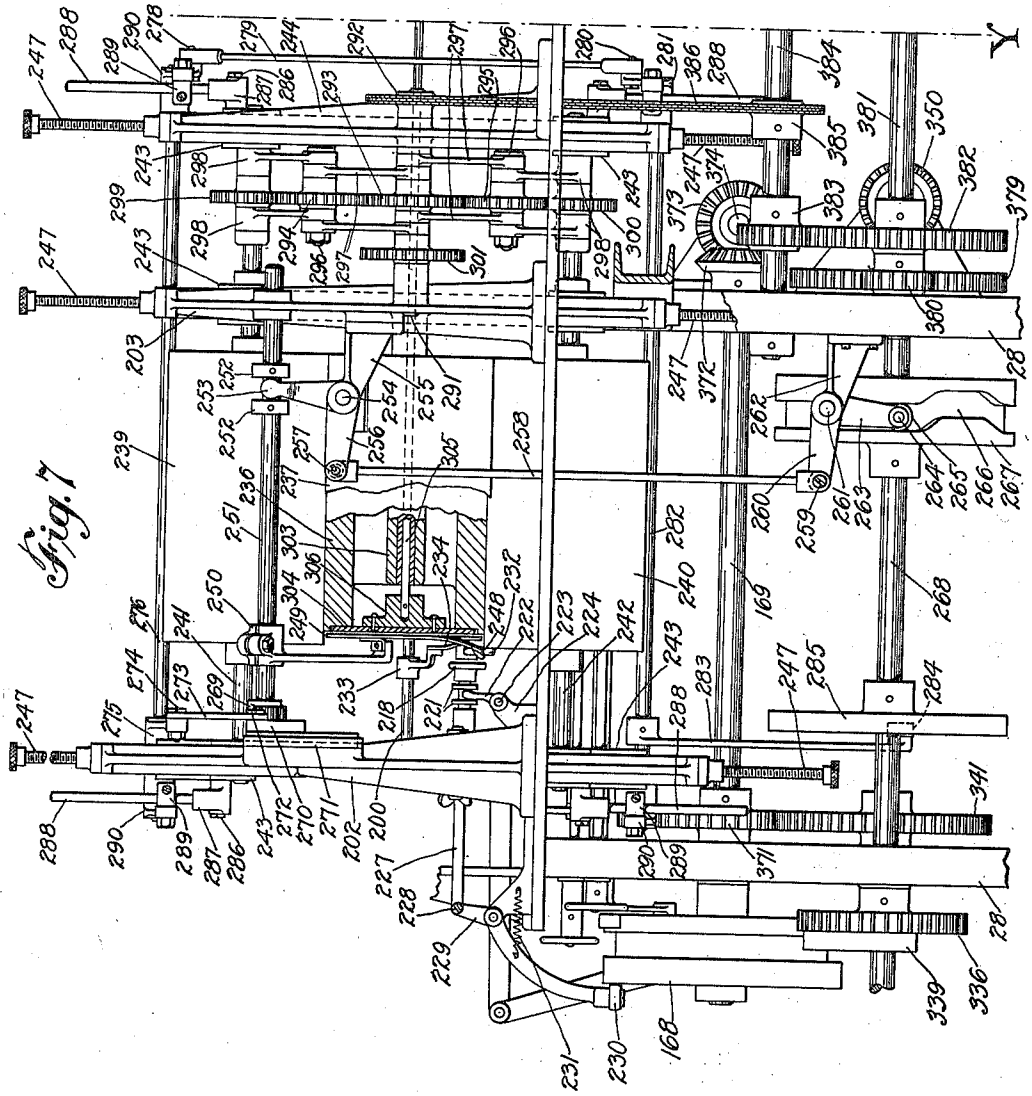


Fig. 7

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8 SHEETS—SHEET 7.

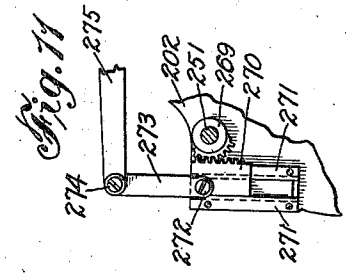


Fig. 11

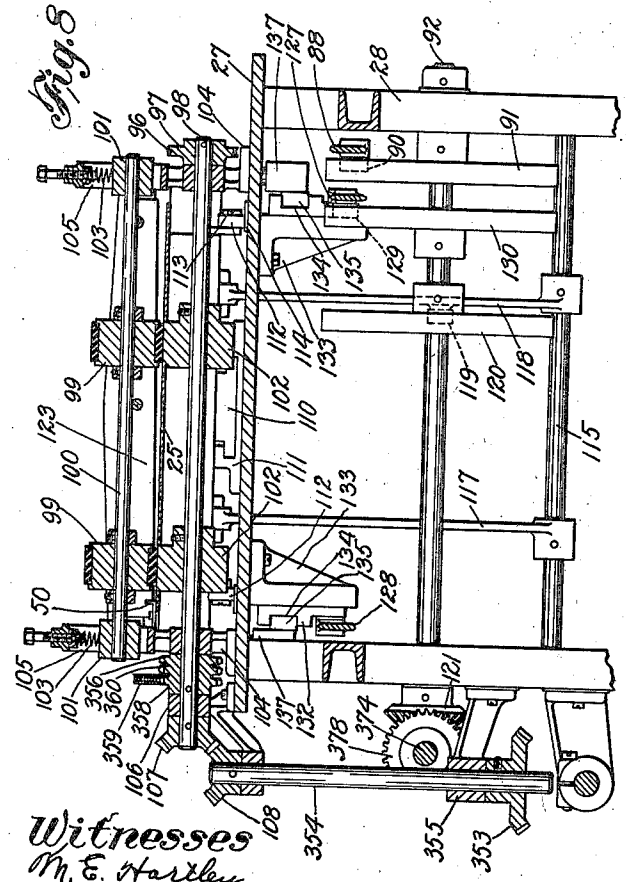


Fig. 8

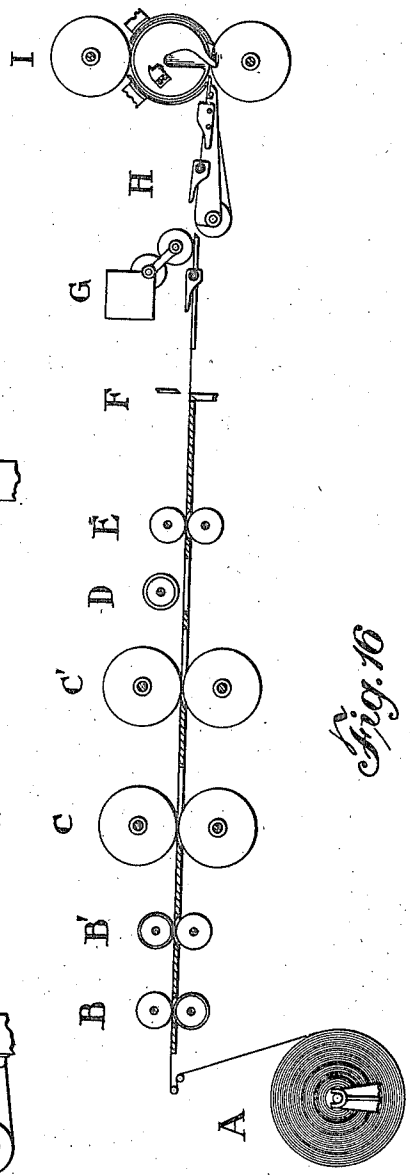


Fig. 16

Witnesses

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8 SHEETS—SHEET 8.

Fig. 14

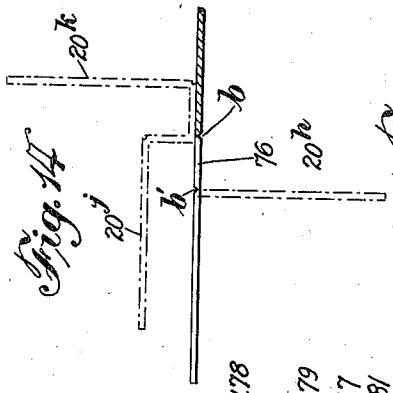


Fig. 15

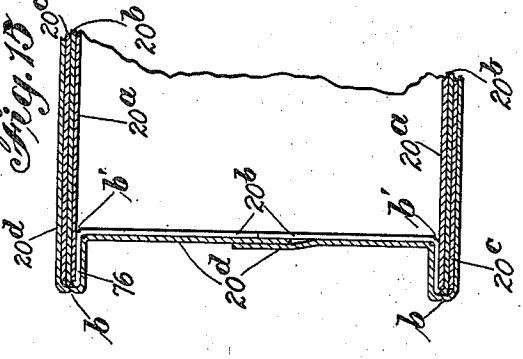


Fig. 9

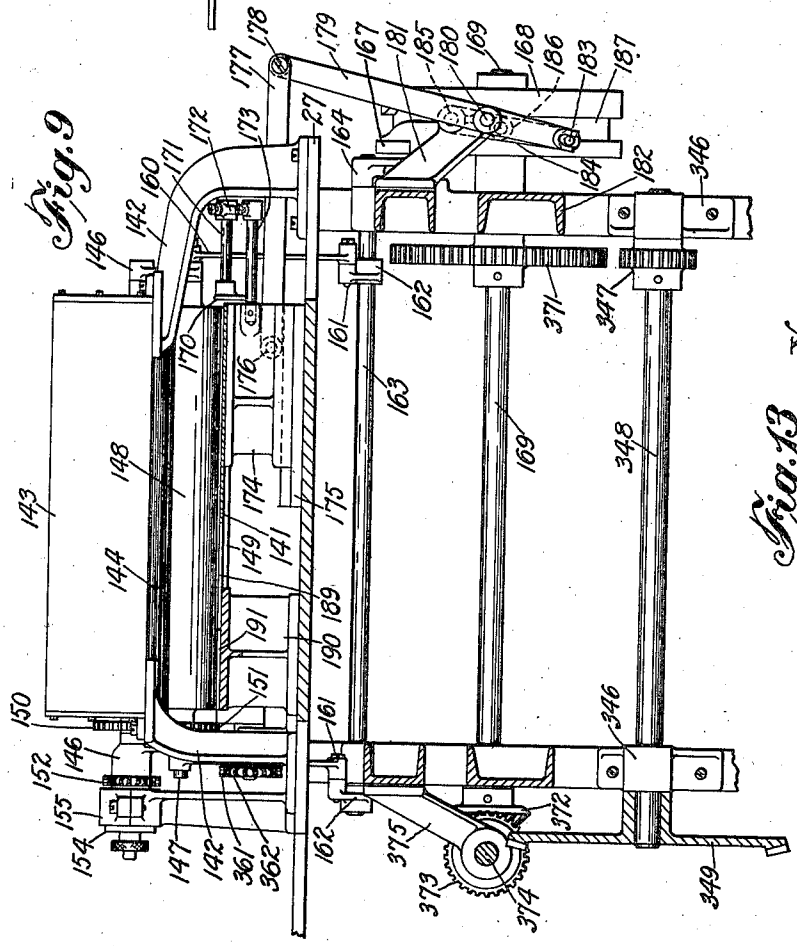
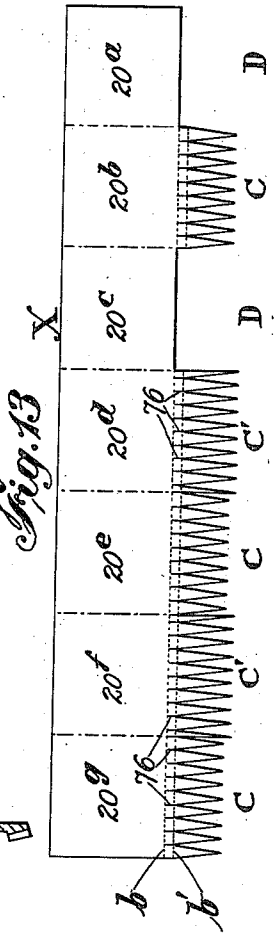


Fig. 13



Witnesses

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UNITED STATES PATENT OFFICE.

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MACHINE FOR MAKING PAPER RECEPTACLES.

1,226,034. Specification of Letters Patent. Patented May 15, 1917.

Application filed November 6, 1914. Serial No. 870,680.

To all whom it may concern:

Be it known that I, FRANK H. VICK, a citizen of the United States, residing in the city of New York, borough of Manhattan, county and State of New York, have invented a certain new and useful Machine for Making Paper Receptacles, of which the following is a specification.

This invention is a machine for making paper receptacles, and the object of the invention is to make receptacles having a plurality of plies with their sides and bottoms integral, in a simple, effective, sanitary and economical manner.

Speaking generally, the invention, in its entirety, embodies a combination of mechanisms whereby blanks are continuously and automatically formed from a roll of paper, and subsequently manipulated so as to form receptacles having a plurality of integral plies forming the sides and bottom of such receptacles.

In the preferred arrangement of the mechanisms constituting the invention, paper is fed from a roll to scoring or creasing mechanism, whereby the paper is suitably creased to facilitate the subsequent folding thereof, thence to notching rolls which operate to serrate one edge of the paper, such serrated portion being subsequently infolded to form the bottom of the container, whereupon the paper is cut into blanks. The blanks thus formed are delivered to glue applying mechanism, whence they pass to container shaping mechanism, said latter mechanism operating to wind the paper on a mandrel, thus forming the body of the container with a plurality of plies, and simultaneously infolding the serrated portion of the blank, whereby the bottom of the container is also formed of a plurality of plies integral with the sides of the container. The container having been completed, as described, suitable ejecting mechanism is brought into operation, whereby the container is automatically delivered from the machine. It will be understood that the mechanisms hereinbefore referred to as performing the main operation in making the receptacle, have coöperating therewith various accessory mechanisms, such as feed rolls, guiding means, and similar incidental devices.

A further feature of the invention resides in the fact that the various mechanisms are so arranged and constructed as to permit of their being operated, if desired, to make containers of different sizes, shapes, and constructed of variable plies.

It will be noted from the foregoing statement, with reference to the general nature and objects of the invention, that all the operations of making a complete container are performed automatically, but it will be understood that the invention is not limited to a series of mechanisms wherein all the operations are performed automatically, or to the precise arrangement of mechanisms, whereby the various operations are performed in the sequence set forth.

Features of the invention, other than those described, will be apparent from the hereinafter detailed description, when read in conjunction with the accompanying drawings.

In the accompanying drawings I have illustrated one practical embodiment of the invention, but the construction shown therein is to be understood as illustrative, only, and not as defining the limits of the invention.

Figure 1 is a front elevation of the blank forming end of a machine made according to the present invention.

Fig. 2 is a like view of the remainder of the machine, or that portion thereof which cuts off the blank from the strip of paper fed and manipulates the same into cup form.

Figs. 3 and 4 are plan views of the device illustrated in Figs. 1 and 2, respectively. In Fig. 4 a portion of the plan is omitted which portion constitutes means for ejecting the finished container.

Fig. 5 is a plan view of the ejecting mechanism omitted in the plan view, Fig. 4.

Figs. 6 and 7, combined, illustrate the container forming end of the machine in end elevation.

Fig. 8 is a transverse section through the machine, said section being taken on line 8—8 of Fig. 2.

Fig. 9 is a like section taken on line 9—9 of Fig. 2.

Fig. 10 is a fragmental, longitudinal section taken on line 10—10 of Fig. 4.

Fig. 11 is a similar section taken on line 11—11 of Fig. 4.

Fig. 12 is a fragmental perspective of a portion of the circumference of the means utilized for notching the paper.

Fig. 13 illustrates a blank of the type

formed on the machine illustrated in the previous figures.

Fig. 14 illustrates the manner in which the scoring, or creasing, is utilized in the infolding of the serrated edges to form the bottom of the container.

Fig. 15 is a transverse section through a partially finished container made from the blank illustrated in Fig. 13.

Fig. 16 illustrates, in reduced scale and in diagrammatic form, the principal elements of the entire machine, which elements by their coöperative effect are adapted to produce a finished container by their joint operation upon a strip of paper fed from the roll thereof.

Referring, more particularly, to Figs. 1 and 2, the device of the present invention may be briefly described as embodying a paper supporting and supplying element generally characterized as A from which paper is fed over suitable straightening or uncurling members to be formed into blanks and afterward rolled and shaped into a finished one-piece container; B and B′ indicate means provided for scoring the paper to facilitate its subsequent shaping into a container; C and C′ denote means for notching out certain parts of the paper blank to allow of its proper manipulation; D indicates a rotary blade for trimming off certain portions of the paper blank not required in the formation of the container; E represents a set of feed rolls for advancing the paper through its subsequent various manipulations. F is a pair of coöperating blades for severing the now completed blank from the paper strip; G embodies means for applying adhesive to predetermined portions of the advancing paper blank; H indicates means for advancing the blank after being cut from the strip in which it is fed; and, I embodies means whereby the completed blank is formed into a finished container, said container being subsequently, automatically ejected from the machine.

Having thus briefly described my invention, I shall now set forth the same in its entirety with reference to the construction and operation of its component parts.

Referring to Fig. 1, a continuous roll of paper 20 is mounted in suitably positioned standards 21 from which the paper is led over rods 22 and 23 mounted in brackets 24 which serve to remove the curl from the rolled paper and allow the smooth feeding of the paper over the feeding or operating table 25. Table 25 is suitably positioned above a bracket 26 and the bedplate 27 of the machine which, in turn, are mounted upon suitable supports 28.

After leaving the rod 23, the paper advances along table 25, and between a plain roll 29 and a scoring wheel 30, which constitutes the first scoring mechanism B, and which roll and wheel are adjustably mounted on the shafts 31 and 32, respectively. Shaft 31 is mounted in bearings 33 and has on its rearwardly extending portion a gear 34 which is positively driven by means hereinafter described. Shaft 32 is journaled in slide boxes 35 mounted in the bearings 33. Set screws 36 are threaded into the underside of the boxes 35 and rest upon the bracket 26 and serve to keep the scoring wheel 30 in contact with the under surface of the paper, thus allowing any desired depth of scoring.

After leaving the roll 29 and wheel 30, the paper advances to a second scoring operation, characterized as B′ similar to the scoring means B, which constitutes a scoring wheel 37 and a plain roll 38 adjustably mounted on shafts 39 and 40, respectively. Shaft 40 is mounted in bearings 41, and on its rearwardly extending end is fixed a sprocket 42 which is positively driven through a source to be hereinafter described. Shaft 40 has also on its rearwardly extending end a gear 43, in mesh with a gear 44 fixed on a shaft 45 which is supported in a bracket 46 mounted on the bracket 26. On the other end of shaft 45 is fixed a gear 47 which meshes with the gear 34, thereby imparting motion to shaft 31 and its roll 29.

In order that the desired depth of scoring is obtained, the shaft 39, which carries scoring wheel 37, is journaled in the slide boxes 48 and pressure against the paper is regulated by the screws 49.

After leaving the wheel 37 and the roll 38 the paper advances over the table 25 to the notching mechanisms, characterized as C and C′, and is guided in its advance by the paper guides 50 placed at suitable intervals and adjustably mounted on said table. As the notching mechanisms C and C′ do not vary in their functions other than to produce a different length of notch and as their construction is similar, I shall, in the interest of brevity, limit myself to the description of one, only.

Notch cutters or blades 51 are formed on a ring 52, mounted on a drum 53 which, in turn, is fixed on a shaft 54. Shaft 54 rotates in the adjustable arms 55 pivotally mounted on the driving shaft 56. The notch cutters or blades are preferably of the same diameter as the container desired. Therefore, as the diameter of the desired container varies, so must the notch cutter 51 be changed. It is obvious that the notches should be cut in the plane of the top face of the table 25. Therefore, as the diameter of the notch cutter 51 varies, the same must be moved toward or away from the table 25. To accomplish this, the arms 55 are provided with adjusting means 57 which operate in slots 58 of the

brackets 59. In order to complete the notching operation, a complementary drum 60 is provided whose diameter is the same as the notch cutter used, and, also, the same as that of the desired container. The diameters of the notch cutter 51, the drum 60 and the desired container being the same, it will be readily seen, by reference to Fig. 13, wherein a completed blank X is shown, that notches will be produced equal to the circumference or one layer, or ply, of a container. It will be further manifest from Fig. 13 that notching mechanism C for short notches and C′ for longer notches vary in their periods of operation through means to be hereinafter described. To effect perfect feeding of the paper between cutter 51 and drum 60 and the resultant correct notching of said paper, said cutter and drum operate in synchronism, and to this end there is provided a gear 61 fast on the shaft 54 and in mesh with a gear 62 to the shaft 56. Gear 62 meshes with an idler 63 loosely mounted on a rock shaft 64, said idler 63 being in mesh with a gear 65 fixed on the drum shaft 66, thereby effecting a synchronistic relation between the cutter 51 and the drum 60.

As heretofore stated, the notching mechanism C for short notches and mechanism C′ for longer notches vary in their periods of operation to produce the resultant blank shown in Fig. 13. It is, therefore, obvious that the cutter 51 and drum 60 in both mechanisms C and C′ should be inoperable at different predetermined periods. To this end there are provided cams 67 and 68 fixed to cam shaft 69 mounted in suitable bearings in the supports 28, and to which motion is suitably imparted. Riding in the grooves of the cams 67 and 68 are the rollers 70 and 71, respectively, mounted on suitable studs fixed in the arms 72 and 73, which are clamped on the rock shafts 64. Rock shaft 64 is supported in bracket 59 and bearing 74 mounted on the bed 27. Fixed to the rock shaft 64 is a hanger arm 75 which supports the shaft 66, and its drum 60, and gear 65.

In Fig. 13 is illustrated a completed blank X, from which a container is adapted to be formed. I have divided this blank by means of dotted vertical lines into seven sections of equal size, which sections are designated 20^a to 20^g, inclusive. Each section represents the portion of the blank required to form one ply of the container, the section 20^a being shown as adapted to serve as an innermost ply of a container embodying seven plies. It will be noted that the lower edge of blank X is serrated, or otherwise provided with interspaced lateral projections which, as hereinbefore stated, are adapted to be infolded to form the bottom of the container. To properly form this bottom, it is desirable to form these in opened series, some of which vary in size from others. *E. g.*, sections 20^b, 20^e, and 20^g are provided with relatively short projections and sections 20^d and 20^f with longer projections, whereas sections 20^a and 20^c are devoid of projections.

The forming of the projections referred to is accomplished by the mechanisms C and C′, which cut the short and long projections, respectively. It is, therefore, necessary to so actuate the mechanisms C and C′ that they will operate, only, at those periods during the passing of the paper strip 20 through the mechanisms C and C′, as it is required to produce the projections of the sizes referred to. This is regulated by a cam 67 in engagement with which is a roller 70, mounted on an arm 72, and operating a hanger arm 75, on which drum 60 is mounted. Cam 67 operates at predetermined intervals to move the drum 60 into engagement with the under side of paper strip 20, and force it into engagement with the notch cutter 51. In like manner the notching mechanism C′ will be operated from a cam 68, through a roll 71, an arm 73, and a hanger arm to force the drum 60^a against notch cutter 51^a.

In order to facilitate the forming of a recessed base in the completed container, as shown in Fig. 15, there are provided in the paper blank longitudinally extending slits 76, preferably adjacent and opening into the notched-out portions of the blank as shown in Fig. 13. To effect the registering of these slits with said notched-out portions of the blank, there is mounted upon the inner end of wheel 53, and rotating with the same, a ring 77 in which are fixed the slitting blades 78, whose edges aline with the points of cutters 51, see Fig. 12.

To allow the escapement of the waste material, resulting from the operations of notching mechanisms C and C′ there is provided in the table 25, openings 79 to allow said waste material to drop away from strip 20 as soon as severed therefrom. As the strip advances from the notching mechanisms C and C′, the spaced projections will ride up the inclined surfaces 80, and resume their initial positions upon the table 25. The driving shafts 56 of the notching mechanisms C and C′ are supported in the brackets 59 and bearings 780, mounted upon the bed plate 27, and are rotated from a source to be hereinafter described.

Referring again to Fig. 13, it will be observed that the sections 20^a and 20^c are cut entirely away for reasons to be hereinafter described. To effect this cutting or trimming of the blank, there is provided a mechanism D which includes a rotary trimming blade 81 fixed to a shaft 82, mounted on a bracket 83. In order that trimming blade 81 may be operable only at certain times, the bracket 83 is adjustably mounted on slide rods 84, operating in a suitable guide 85. At the lower ends of rods 84 is fixed a tie

86 with an outwardly extending pin 87, which pin engages the forked end of a lever 88, loosely mounted on a rock shaft 89, said shaft being suitably journaled in bearings in supports 28. The outer end of the lever 88 carries a roller 90 in engagement with a cam 91 mounted on a cam shaft 92, which is journaled in bearing in supports 28. Through the medium of the cam 91, the rotary trimming blade is moved in and out of engagement with a trimming plate 93 suitably mounted in the table 25. To allow the trimmed off waste material to drop away from the paper blank, an opening 94 is provided in the table 25. The rotary movement of the trimming blade 81 is derived through a pulley 95 fixed on the outer end of shaft 82. This pulley is connected by belt 96 to a driving pulley 97 fixed to the shaft 98 of the mechanism E.

Mechanism E embodies means for feeding the paper continuously to its future manipulations of forming the completed blank. These means include rolls 99 loosely mounted on a shaft 100, which is supported in the slide boxes 101 as shown in Fig. 8. Rolls 99 contact with corresponding rolls 102, springs 103 being positioned above boxes 101 to produce the pressure required upon the paper carried between the two sets of rolls and effect a positive feeding of said paper. Rolls 102 are fixed to the shaft 98 which runs in bearings in brackets 104 mounted on bed-plate 27, the upper portion of said brackets forming guide-ways 105 to carry the slide boxes 101.

The rearwardly extending end of shaft 98 is supported in a bearing 106, and is rotated through the gears 107 and 108, which, in turn, derive their motion from a source to be hereinafter described.

The paper having advanced through the previously described mechanisms, and having been operated upon by same, advances to the cutting-off mechanism F, where the completed blank will be severed from the following continuous feed of strip paper. Since the feed of paper is continuous, it is desirable that the cutting-off mechanism move forward with the paper during the cutting-off operation to prevent wrinkling or bending of strip 20. To this end, the lower blade 109 is mounted upon the forward end of a movable knife carriage 110, which carriage is guided in its movement in a slideway 111 mounted upon the bed 27, and is supported on its slides by rollers 112, mounted on studs 113, fixed on carriage 110, as is shown in Figs. 2 and 8. The rollers 112 are adapted to run on tracks 114, positioned on the table 27. The forward and return movement of the knife carriage 110 is obtained as follows:—

A rock-shaft 115 is mounted in bearings 116, which are fixed to the support 28. Fixed to rock-shaft 115 are arms 117 and 118, the latter of which carries a roller 119, which runs in a suitable groove in a cam 120, fixed on shaft 92. Shaft 92 has fixed to its rearwardly extending end a gear 121 which is actuated by means to be hereinafter described. The upper ends of arms 117 and 118 are forked, and engage pins 122, carried by suitably positioned lugs on the under part of knife carriage 110. Thus, it will be seen that the knife carriage is moved forward with the moving paper at a predetermined time and for a sufficient lapse of time to allow the descent and return of the upper blade 123, after which the cam 120 will return the carriage 110 to its initial position. It is also obvious that, during the forward movement of the carriage, a gap might be created between the paper table 25 and the carriage 110, thereby allowing the paper to sag, whereby it might be caught between the table 25 and the carriage 110, upon the return of said carriage to its initial position. In order to avoid such a condition, the end of table 25 adjacent to carriage 110, has longitudinally extending members 124, as shown in Fig. 4. These members overlap and rest upon the carriage 110, and are adapted to slide between and interlock with similar members 125 formed in the table 126 which is mounted upon the carriage 110, and is carried with said carriage in its forward and backward movement. These members 124 and 125 are of sufficient length to form a continuous support for the moving paper.

As has been previously mentioned, the descent and return of upper blade 123 is accomplished during the forward movement of the carriage 110. To effect this, there are provided arms 127 and 128 mounted upon the rock-shaft 89. About midway of the arm 127 is positioned a roller 129, suitably mounted to engage a groove in the cam 130. The arms 127 and 128 are forked on their outwardly extending ends, to engage pins 131 fixed in vertical slides 132. These slides are carried in the slide-ways 133, mounted on the under side of bed-plate 27. The slides 132 have longitudinally extending grooves 134 adapted to engage bowls 135. These bowls run on studs 136 fixed in supporting members 137 which, in turn, support and are fixed to plunger rods 138. Rods 138 are guided in their movement in the plunger ways 139 of carriage 110, and have fixed at their upper ends, a blade carrying member 140 which supports upper blade 123. Thus, it will be readily understood that as the knife carriage 110 begins its forward movement through its cam 120, the downward movement of the upper blade 123 also starts through the medium of its cam 130 and slide 132, while the groove 134 allows the free passage of the roller 135, which is

being carried forward by the travel of carriage 110. As knife carriage 110 reaches its extreme forward position, a blank has been severed and it is obvious that this blank has received the major part of its manipulations, and that the severed or forward end of paper strip, 20^a is in position, being positively fed by the rolls 99 and 102, to glide readily upon and across the paper table 141, and toward the adhesive applying mechanism characterized as G.

This mechanism embraces standards 142 for supporting an adhesive reservoir 143, an adhesive feeding roll 144, rotating partially within the reservoir, and fixed to a shaft 145 carried by said reservoir. An arm 146 is pivotally suspended from the shaft 145 and guides the shaft 147 on which rotates an adhesive applying roll 148, whose function is to transfer the desired amount of adhesive from feeding roll 144, and apply same to predetermined portions of blank X, as it is being fed between it and a table 149. The roll 148 also serves to crush or smooth out any lumps or particles that may be fed with the adhesive to feed roll 144. Fixed to the rearwardly extended end of the shaft 145 is a gear 150 in mesh with a gear 151 fixed to the shaft 147, whereby roll 148 is rotated with the advance of paper blank X.

In the adhesive reservoirs in general use it is found that the adhesive used, frequently clogs or hardens, especially if that mechanism is not in continuous operation. I, therefore, make the adhesive reservoir readily removable from its base of operation to allow of the proper cleansing thereof.

It will be apparent that in a completed sanitary container, it is undesirable to have any foreign substance upon the interior walls of the same. In Fig. 13, section 20^a will form the interior wall just mentioned, and it is, therefore, desirable that no adhesive be applied to that portion of the blank. With this object in view, there are provided arms 160, pivotally connected by studs 161 to arms 162, fixed to the rock shaft 163, as shown in Figs. 2 and 9. The arms 162 are so positioned upon rock shaft 163 that the forked ends of arm 160 engage the ends of shaft 147 overhanging either side of roll 148.

Fixed to the rock shaft 163 is an arm 164 on which is mounted a stud 165 and roll 166 which engages a cam track 167 on the outer face of a cam 168 fixed on cam shaft 169. It will thus be readily seen that the roll 148 may be raised at the proper time through its connections, by the cam track 167, to prevent the application of adhesive to the section 20^a, as blank X is passed beneath the glue applying mechanism.

Reference again being made to Fig. 13, it will be noted that the notched portion of section 20^b will form the initial or interior surface of the bottom or base of a completed container, and as hereinbefore mentioned, it is undesirable to allow any foreign substance to contact with same.

With this end in view, there is provided a deflecting or creasing plate 170 positioned immediately to the rear of the adhesive applying roll 148. Plate 170 is normally out of the path of the advancing paper blank, but is shifted to engage the notched portion of the section 20^b and fold same down to prevent engagement with the adhesive applying roll 148, thereby precluding the application of adhesive material to said notched portions.

To accomplish this, plate 170 is adjustably mounted on a rod 171 carried by an arm 172 which, in turn, is adjustably mounted on a rod 173 fixed in a slide 174, mounted on a slideway 175 positioned on bed-plate 27. Slide 174 is connected by stud 176 to a link 177 which is connected on its outer end by a stud 178 to a lever 179 pivoted at 180 to the bracket 181 mounted on a tie 182. To produce the required movement of the slide 174, lever 179 extends downwardly to its forked end, which engages a pin 183 fixed in an arm 184 which is pivotally attached at 185 to the bracket 181. Suitably mounted on the arm 184 is a bowl 186 positioned so as to engage a groove 187 in the cam 168. It will, thus, be readily seen that when the section 20^b of blank X approaches the adhesive applying roll 148, cam groove 187 will operate through its arm 184, lever 179, and link 177, to move slide 174 with plate 170 forward to the scored line b', shown in Fig. 13 and indicated by the dotted position 170′ in Fig. 4. Mounted upon the slide 174 is the paper table 141 which moves forward with the slide 174 to the position indicated by the dotted position 141′. Thus the notched portion of section 20^b of the paper blank will be folded downward on the scorded line b' between table 141 and plate 170 and creased to retain it from engagement with adhesive applying roll 148. Leaving the plate 170, this notched portion passes through a break 188 in the table 149.

At all times, whether the plate 170 is in or out of engagement, it is desirable to have a supporting surface for the paper, and to this end, table 141 is provided with a forked end 189, adapted to rest upon the table 190, and ride in suitable grooves 191 cut therein.

Mechanism H, embodies means whereby paper blank X is fed toward and into engagement with the rolling and finishing mechanism. This mechanism H embraces positively driven paper feeding belts 192, carried on pulleys 193 and running across a pivotally mounted frame 194, and over idler

pulleys 195, carried by said frame, and in close proximity to the rolling and finishing mechanism.

Frame 194 is mounted on a shaft 196 on which pulleys 193 are fixed and said shaft is, in turn, supported in suitable bearings 197 slidably mounted on bed-plate 27. When shaft 196 is rotated by suitable means, pulleys 193 operate feeding belts 192 to advance the blank X. To aid feeding belts 192 in feeding the paper, idlers 198, carried by arms 199, rest upon and ride over the surface of the paper, which arms 199 are carried on a rod 200 mounted in brackets 201 and 203. Bearing 197 is formed to slide over guide 204 fixed to the bed plate 27 and may be moved forward or backward through the rack 205 and segment 206 for reasons to be hereinafter described.

Segment 206 is fixed to a shaft 207 which, for convenience in operating, extends to the front of the machine and terminates at the hand wheel 208. Means are also employed for raising or lowering the forward end of the frame 194 and consists of a roll 209, riding in the upwardly projecting end of a rack 210 mounted in a suitable slideway 211 which is supported on bed-plate 27. Roll 209 is adapted to engage the under surface of the frame 194. The rack 210 is operated by a worm gear fixed to shaft 212 and resting on the bed plate 27. This shaft extends downwardly through said bed and is provided at its lower end with a gear 213 in mesh with a similar gear 214 fixed on a shaft 215 which, for convenience, extends to the front of the machine and terminates at a hand wheel 216.

Referring to Fig. 13, it may here be stated that the object in scoring the paper blank at b and b' is not only to facilitate the folding of the blank on these lines, but, also, to produce a permanent crease on said lines when folded. This folding or creasing is found to be necessary in preparing the paper blank for its final rolling, bottom or end forming and finishing operation. Means for effecting this folding or creasing is provided along the front edge of frame 194. Adjustably mounted on frame 194 is a bearing plate 217 and oppositely disposed to this plate is a deflecting or folding member 218. The space between this plate 217 and member 218 is sufficient to allow the passage of the deflected paper and is directly in the path of scored line b' on the upper surface of the paper blank. By these means, the projections of sections 20^d, 20^e, 20^f and 20^g of the paper blank shown in Fig. 13 are folded downwardly to the dotted position indicated by 20^h in Fig. 14. As this folding operation takes place after the application of adhesive to the upper surface of the paper blank, it is obvious that the folding member 218 will accumulate and retain a portion of the adhesive material deposited upon said upper surface of the paper blank.

As has been hereinbefore mentioned and described, the notched portion of the section 20^b of blank X is folded downwardly to avoid the application of adhesive material to that portion of the paper blank. As the blank advances and section 20^b approaches folding member 218, it is, therefore, desirable that said member 218 is kept out of engagement with said section 20^b, thereby precluding the possibility of any adhesive being applied to this circumference 20^b, and to this end there is provided means to move the folding member 218 outwardly and away from the path of the folding line b', during that period of time that the circumference 20^b is being fed past the member 218. This member 218 is adjustably mounted on a keyed shaft 219 slidably supported in an arm 220 adjustably mounted on the upright 201. Fixed to shaft 219 are the collars 221 adapted to engage a forked arm 222 fixed to a rock-shaft 223 supported on bracket 224.

On the outer end of the shaft 223 is fixed an arm 225, connected by a stud 226 to a link 227. This link is connected by a stud 228 to a lever 229 pivotally mounted on the bracket 224 and is provided at its lower end with a roller 230 held in engagement with the cam 168 by a spring 231. Thus, as the section 20^b approaches folding member 218, cam 168 operates to move, through intermediate mechanism, the member 218 outwardly and away from the path of the folding line b' thereby avoiding contact of the plate 218 with the circumference 20^b.

The paper blank then advances to another folding and creasing member 232 mounted upon the frame 194 directly in the path of the scored line b, illustrated in Fig. 13, which engages the paper blank on the scored line to fold the lateral projections of sections 20^b, 20^d, 20^e, 20^f and 20^g upwardly to the dotted position indicated by 20^j in Fig. 14. To insure the proper creasing and folding of the paper blank at this point, there is, adjustably mounted on shaft 200, an arm 233 carrying a suitable creasing member 234 oppositely disposed to the folding member 232.

The paper blank having now been folded and creased on its scored lines is now advanced by the belt 192 over the paper leader plate 235 to the rolling and finishing mechanism, I. This mechanism comprises means for gripping the advancing paper blank and thereafter guide, or carry, same around a container forming mandrel. Means are also provided whereby the notched portions of paper blank X are folded inwardly on the previously scored, folded and creased lines to form a base or end of a container.

Mechanism I includes a mandrel 236 of the same diameter as the container to be formed, which mandrel has suitably positioned about its circumference, guiding plates 237 and 238 mounted upon the support or upright 203.

Feed and pressure rolls 239 and 240, respectively, are positioned one above and one below the mandrel 236 and their circumferences engage with the circumference of the mandrel 236. These rolls serve to feed or lead the paper blank around the mandrel 236 and are aided by guiding plates 237 and 238. In order that rolls 239 and 240 may have the desired pressure against the mandrel 236, their shafts 241 and 242, respectively are slidably and adjustably journaled in slide boxes 243 supported on the uprights 201, 202, 203 and 244, and pressure is produced by the springs 245 mounted between the slide boxes 243 and spring supporting members 246. The proper tension on said springs is obtained by the adjusting screws 247.

As the paper blank X is advanced by the feed belts 192, the section 20^a is guided by leader plate 235, mounted upon the forward end of frame 194, to and between the mandrel 236 and the lower feed and pressure roll 240. From this point, section 20^a passed between the mandrel 236 and the guide plate 237, until it is engaged by the upper feed and pressure roll 239 which, in turn, advances the paper blank between the mandrel and the guide plate 238. Thus, the section 20^a is carried and wrapped entirely around the mandrel and forms the initial or interior wall of a container. Next follows the section 20^b the projections of which have, by their previous manipulations, been folded to positions indicated at 20^j in Fig. 14. As the paper advances, said projections are successively engaged by the outwardly deflected lip 248 of a folding or container bottom forming member 249, which serves to turn these projections upwardly to the dotted position indicated at 20^k of Fig. 14, and as shown at 20^b in Fig. 15. Thus the projections of section 20^b will be infolded to form the initial or interior surface of the bottom or base of a completed container. The unnotched portion of section 20^b, to which adhesive material has been applied, is carried around the mandrel 236, and over the section 20^a, to which it adheres and forms the second layer, or ply, of a container wall. Section 20^c follows section 20^b to form the third layer of a container. In order that the bottom, or base, of the finished container may be of sufficient strength, the sections 20^d and 20^f have notched portions of greater length than section 20^b, 20^e and 20^g, so that when folded in by the member 249, they will overlap, and adhere to each other, as shown in Fig. 15.

The sections of blank X, as they enter the container forming mechanism, and are wound around the mandrel, have been previously prepared as follows:—Section 20^a is devoid of adhesive so that adhesive will be absent from the interior of the finished container.

Section 20^b, the projections of which are so shaped that when rolled by member 249, they will form a circular finished interior container bottom, with their points meeting at the center of the bottom of the container. These projections are also free from adhesive material, but the wall forming portion of said section has received adhesive material, and is adapted to adhere to the outer surface of section 20^a.

Section 20^c is a duplicate of section 20^a, and acts as added stiffening means to the side wall of the container. Adhesive is, however, applied to this section. The projections are cut away in this section so that the short and long projection of the several sections will alternate to bring the short and smooth finishing projections on the interior and exterior of the finished container.

When the container has been completely infolded by folding member 249, it is desirable to remove said member from the longitudinal line of mandrel 236 in order that the container may be removed from the mandrel, and to this end, folding member 249 is carried by an arm 250 adjustably clamped to the shaft 251, which is slidably mounted in the uprights 202 and 203, see Figs. 4 and 7. Fixed to the shaft 251 are a pair of collars 252, which are engaged by a forked arm 253 pivoted at 254 in a bracket 255 suitably mounted on upright 203, and secured to the outer end of pivot 254 is an arm 256 connected by stud 257 to the upper head of a link 258. The lower head of this link is connected by a stud 259 to another arm 260 pivotally mounted at 261 in a bracket 262 suitably positioned on one of the bed-plate supports 28. A cam arm 263 is fixed on the other end of the pivot 261, and has on its lower end a stud 264 and roller 265 engaging cam track 266 of a cam 267 mounted on the power shaft 268, which may be rotated from any suitable power source. Cam 267, through the above described intermediate connections, and at the proper time, is adapted to move the shaft 251 forward, carrying the arm 250 and folding member 249 out of the recess bottom of the complete container and clear of same. As this outward movement is completed, the arm 250 and its member 249 are rocked sidewise and away from the longitudinal line of the mandrel 236, as shown in dotted lines in Fig. 2, to allow the removal of the container from said mandrel. To impart this movement to arm 250 and member 249 there is fixed to the shaft 251, a wide faced

segment 269 engaging a rack 270 carried in slideways 271 suitably mounted upon upright 202, as shown in Figs. 7 and 11. Fixed to rack 270 is a stud 272 engaging a link 273 connected at its upper end by a stud 274 to an arm 275 fixed on a rock shaft 276 carried in uprights 201, 203 and 244. On the rearwardly extending end of the shaft 276 is fixed an arm 277 connected by a stud 278 to the upper head of a link 279. This link extends downwardly and is connected by a stud 280 to an arm 281 mounted on a rock shaft 282 supported in the downwardly extending portions of uprights 201, 203 and 244. Appended to shaft 282 is an arm 283 supporting a roller 284 adapted to engage a cam track in cam 285 fixed to shaft 268. This cam, through its intermediate connections, thus serves to move the arm 250 and member 249 to the dotted position indicated at 249′ in Fig. 2, thereby allowing the free removal of the container from the mandrel 236 and the ejecting of same through the open space between uprights 201 and 202.

Referring to Fig. 2, pressure rolls 239 and 240 are slidably mounted in uprights 202, 201, 203 and 244. The slide boxes 243 carry studs 286 which engage slotted openings in rod supporting member 287 in which the rods 288 are fixed. These rods extend upwardly from roll 239 and downwardly from the roll 240, and are engaged by the clamping members 289 pivoted in the arms 290. Arms 290 are fixed to the upper rock shaft 276 and the lower rock-shaft 282. Thus, as folding member 249 is rocked outwardly, through its connections, by the cam 285, from the line of the mandrel 236, the rock-shaft 282 will also shift the arms 290, and through its connections, move the slide boxes 243 against the springs 245 and carry shafts 241 and 242 and their rolls 239 and 240 out of circumferential contact with the mandrel 236, until the finished container has been ejected.

It is desirable that the pressure rolls 239 and 240 be rotated positively and at the same speed as the mandrel 236, and the following means are provided to obtain this result:—Mounted in suitably positioned bearings on the uprights 203 and 244 is a counter shaft 291, which is rotated by the sprocket 292 fixed to the outer end of said shaft and driven from a source to be hereinafter described. Fixed midway on the shaft 291 is a gear 293 which at its upper face meshes with an idler 294 and at its lower face with an idler 295. These idlers rotate on studs 296 carried by arms 297 and 298 which, in turn, are supported by shafts 241, 242 and 291. Idler 294 meshes with and rotates the gear 299 fixed to the shaft 241. Idler 295 meshes with and rotates the gear 300 fixed to the shaft 242. By these means, the rolls 239 and 240 may be moved from circumferential contact with the mandrel 236, their gears remaining in mesh to allow of the uninterrupted rotation of said rolls. Another gear 301 is fixed to the shaft 291, which meshes with a gear 302, fixed to the mandrel shaft 303 and serves to rotate the mandrel in the proper relation and speed of the rolls 239 and 240.

It is desirable, at times, to vary either the diameter, the thickness of the side walls or the length of the container being made, and means are provided whereby this may be accomplished. In order to facilitate and avoid substitution and changing of the numerous parts of the device to produce various diameters of containers, the paper blank is maintained in the form shown in Fig. 13, the thickness of paper being varied rather than the number of layers or circumferences in the container. The length of the container will be established by the width of the paper roll 20 and adjustment made by the guide plates 50. It is obvious, moreover, that the diameter of the mandrel 236 upon which the container is formed will necessarily vary with the container to be formed. It has been previously stated that the mandrel 236 and rolls 239 and 240 should rotate at the same surface speed. In order to effect this, when the diameter of the mandrel is varied, and in order to avoid unnecessary substitution and changing of parts and gears, the rolls 239 and 240 are varied instead, their diameters corresponding to those of the various mandrels employed.

In the several views illustrating this device, I have shown means for producing containers of a large diameter. Therefore, as may readily be seen in Fig. 2, should a container of a smaller diameter be desired, corresponding mandrel and rolls will be substituted on shafts 303, 241 and 242. Clamping members 289 will then be loosened from the rods 288 and the slide boxes 243 will be moved toward the mandrel, until the circumferences of rolls again contact with the mandrel, after which clamping members 289 will be again tightened to engage the rods 288. Guide plates 237 and 238 will also be changed to conform with the new size mandrel. The leader plate 235 mounted on the forward end of the frame 194 in mechanism H, is likewise advanced and raised to lead the paper between the new mandrel 236 and new roll 240, by the hand-wheels 208 and 216 through their intermediate parts.

Reference now being had to Fig. 7, attention is called to the container bottom-forming end of the mandrel 236 in which is seated a circular plate 304 the dual purpose of which is to form an end to the mandrel, against which the notched portions of the paper blank are folded by the member 249, and to engage the finished bottom interior of

a container and move same off of and away from the mandrel. In order that this latter may be accomplished, the mandrel shaft 303 is hollowed out to allow the easy passage of a rod 305 therethrough, which rod has affixed to its interiorly disposed end a hub 306 which carries a plate 304. Rod 305 extends rearwardly beyond the end of shaft 303 and is supported in a bracket 307, suitably positioned on the extending table 308. (See Figs. 5 and 6.)

Suitably positioned on the rod 305 are bearing rings 309 and 310, which engage collars 311 and 312 also positioned on rod 305. Fastened to the under side of ring 310 is a flexible cord or wire 313, the other end of which is fastened to the edge and adapted to engage the grooved face of a pulley segment 314. Fastened to the under side of ring 309 is a coiled spring 315 to which is fastened another flexible cord or wire 316 and the other end of which is fastened to the edge and adapted to engage the grooved face of a second pulley segment 317. The bearing rings 309 and 310 preferably inclose ball or roller bearings to afford free riding of the rings around the rod 305 and prevent the tendency of the cords 313 and 316 toward winding around the rotating rod.

The pulley segments 314 and 317 are fixed to a rock shaft 318 which is supported in the bearing 319 suitably positioned upon the table 308. To the shaft 318 is also fixed a gear segment 320 which at the proper time supplies the rocking movement to the shaft, through the intermediate segments 321 and 322 fixed to a rock shaft 323 in suitable bearings on the table 308.

Also carried in suitable bearings on the table 308 is a rock shaft 324, to which is fixed a segment 325 in mesh with segment 322, and on the other end of which is fixed the arm 326. This arm carries a stud 327 engaging a link 328, the other end of which engages a stud 329 carried by the lever 330. Lever 330 is pivoted at 331 to a bracket 332, suitably mounted on one of the supports 28, and carrying on its downwardly extending member a roller 333 adapted to engage cam track 334 in a cam 335 fixed to the shaft 268.

It will thus be manifest, that at the proper time the cam track 334 will actuate the roller 333 and, through intermediate mechanism, serve to rock the shaft 318 and its pulley segment 314 and by pulling on the cord 313, throw the rod 305 forward with its plate 304 and remove or eject the finished container from the mandrel 236. As the shaft 318 rocks to make this forward movement it moves the pulley segment 317 and unwinds the cord 316. Immediately this forward movement is completed, cam track 334 actuates the above mentioned parts, causing the pulley segment 317 to pull on or wind up cord 316, and segment 314 to unwind or feed out the cord 313, thereby returning the plate 304 to its initial position in the end of the mandrel.

A spring 315 is included in the cord 316 to break the shock on the cords at the end of both the outward and return strokes, and said spring also assists in the proper seating of the plate in the end of the mandrel.

Having described the method and means for forming a one-piece container blank from a continuous roll of paper, manipulating and folding the blank into a container, I will now describe the several controlling and driving means for the several mechanisms.

The paper blank as previously described and shown in Fig. 13, consists of seven sections constituting a number of container circumferences or layers in a finished container.

It has also been explained that I preferably vary the thickness or weight of the paper for various sizes of containers rather than vary the number of plies, as is generally the case. I have chosen to illustrate the blank as composed of seven sections and have shown, in the drawings, a machine for forming and manipulating this blank into a finished container. It will be manifest, however, that I do not limit the present invention in this respect, as the number of sections in the blank may be varied, as desired.

After the major portion of the blank has been fed around the mandrel 236 of mechanism I, it is desirable that the feeding of the strip 20 ceases, just previous to entering mechanism I, until this mechanism has completed and ejected the container upon which it is operating, after which the mechanisms A, B, B′, C, C′, D, E, F, G and H will resume operation, and feed the succeeding blank toward and into engagement with mechanism I.

To this end there is provided on the power shaft 268 and fixed thereto a gear segment 336 in mesh with a gear 337 fixed to a shaft 338 and carrying a sufficient number of teeth to complete one revolution of the gear 337. Suitably positioned upon the segment 336 is a locking plate 339 adapted to engage an oppositely disposed plate 340 mounted on the gear 337. After the segment 336 has completed one revolution of the gear 337, plate 339 engages and locks plate 340 and consequently gear 337 and its depending mechanisms A, B, B′, C, C′, D, E, F, G, and H against further operation, until mechanism I has completed and ejected the container upon which it has been operating, after which the locking plates rotate out of engagement and the segment 336 again rotates the gear 337 to operate its depending mechanism. One revolution of gear 337 is sufficient to complete and prepare the paper

blank to be operated upon by the mechanism I.

Fixed to the shaft 338 is a gear 341 in mesh with an idler 342 running on a stud 343 suitably positioned on the support 28. Idler 342 meshes with an idler 344 carried by a stud 345 supported in a bracket 346, positioned on the support 28. Idler 344 meshes with spur gear 347 fixed on the shaft 348 which rotates in the brackets 346. This shaft extends to the rear of the device at which point it has fixed a bevel gear 349. Bevel gear 349, with its complementary spur gear 350, provides the power for, and times the driving of the mechanisms A, B, B′, C, C′, D, E, G, F, and H, through means now to be described.

Spur 350 is fixed to drive shaft 351 which rotates in suitable bearings positioned on supports 28 and frame 182 and which extends to the left end of the device. Midway of the device and fixed on the shaft 351′ is a gear 352 in mesh with a gear 353 fixed to a vertical shaft 354 located on the dividing line X′ of Figs. 1, 2, 3 and 4 and also shown in Fig. 8. Shaft 354 rotates in the lower bearing 355 positioned on the support 28 and upper bearing 106 positioned on bed-plate 27. This shaft has fixed to its upper end, gear 108 which meshes with gear 107 fixed on shaft 98, whereby driving mechanism E is actuated. Fixed to the shaft 98 is a sprocket 356 carrying a rearwardly extending chain 357 engaging a sprocket 42 fixed to the shaft 39 previously described. This chain, therefore, serves to drive mechanism B′, and, through the gears 43, 44, 47 and 34, will also serve to actuate mechanism B.

Again referring to mechanism E, and more particularly to shaft 98, there is fixed on this shaft a sprocket 358, carrying a forwardly extending chain 359, which engages a sprocket 152 supported in the bearing 155 of mechanism G. This chain 359, therefore, serves to actuate mechanism G.

On shaft 98 is fixed a sprocket 360 carrying a forwardly extending chain 361, which engages a sprocket 362, fixed on shaft 196 of mechanism H. Mechanism H is actuated through this chain.

Referring now to mechanism C and C′, shown in Figs. 1 and 3, drive shaft 351 has properly positioned and fixed thereon gears 363, in mesh with gears 364 fixed to the vertical shafts 365. These shafts are carried in bearings 366, positioned on the supports 28, and bearings 78, positioned on the bed 27. To the upper ends of these shafts are fixed the gears 368 which mesh with gears 369 fixed on the shafts 56. Thus, the shafts 56 are enabled to rotate and drive the several parts of mechanism C and C′.

As hereinbefore mentioned, one revolution of the gear 337 shown in Fig. 2 is sufficient to rotate and drive the mechanisms A, B, B′, C C′, D, E, F, G and H to complete and sever a paper blank. This also is true with the cams provided to operate these mechanisms, and is accomplished by means of gear 341, fixed to shaft 338, and meshing with a similar gear 371, fixed on the shaft 169.

As shown in Fig. 9, the shaft 169 extends rearwardly and on its end is fixed a gear 372 in mesh with a similar gear 373 fixed on the longitudinally extending countershaft 374 which is carried by suitable bearings 375 positioned on the tie 182 and support 28. On the extreme left end of shaft 374, a gear 376 is fixed which meshes with a similar gear 377 fixed on the cam shaft 69. Thus, the shaft 69 is rotated with its cams 67 and 68, to operate the mechanisms C and C′, as hereinbefore described.

Midway of the shaft 374, is fixed a gear 378, which meshes with a similar gear 121 on the cam shaft 92. Thus, the shaft 92 is rotated with its cams 91, 130 and 120, to operate the mechanisms D and F. Mechanisms G and H are operated by the cam 168 fixed on the shaft 169 and rotated by means hereinbefore described.

As has been hereinbefore stated, it is desirable that the mechanisms A, B, B′, C, C′, D, E, F, G and H cease operation while mechanism I continues to operate until the container has been completed, the several parts moved to allow the container being ejected, the ejecting completed, and the several parts returned to their initial position, ready to receive the next succeeding paper blank. In order to accomplish this continued operation of mechanism I, there is provided on the power shaft 268 and fixed thereto a gear 379 as shown in Fig. 7, and which meshes with a spur gear 380 fixed to shaft 381 suitably journaled in the rear supports 28 as shown in Figs. 6 and 7. The gear 379 has sufficient teeth to continue rotating gear 380 after the locking plate 339 has engaged and locked the plate 340, and its gear 337 with its depending mechanisms, which rotation will continue until the container has been completed and ejected.

Fixed to shaft 381 is a gear 382 in mesh with a spur gear 383 fixed on the shaft 384 suitably journaled in rear supports 28. Also fixed on the shaft 384 is a sprocket 385 which carries an upwardly extending chain 386 the upper end of which engages the sprocket 292 to rotate the shaft 291, as described.

As in the operation of the other mechanisms, one revolution only of each cam included in these mechanisms, is required to prepare a container blank, and so with mechanism I, one revolution only of the cams is required to complete and eject a container. Therefore, it is preferable that

the cams 267, 285 and 335 be mounted on and operate with and during the one revolution of the powershaft 268 as shown.

As has been hereinbefore stated, as the diameter of the desired container varies, the thickness of the paper used may also be varied to produce the desired thickness of the container side wall and bottom, but the seven circumferences will be maintained as a standard of the various diameters that this device is capable of producing.

As it would be a complicated and undesirable course, to substitute these cams and their several parts for each variation in the diameter of the desired container, it is found that a more simple method is to vary the diameter of the cutters 51 and drums 60 of mechanisms C and C′ and the mandrel 236 and rolls 239 and 240 of mechanism I to agree with the diameter of the desired container. Moreover, it will be obvious that the gears leading to and actuating mechanisms C and C′ are arranged to produce seven revolutions of the cutters 51 and drums 60, and that if these cutters and drums were not changed so that their diameters were the same as the desired container, numerous changes in the above mentioned gears would be necessary to effect the seven revolutions of said cutters and drums. I, therefore, preferably maintain a constant number of plies, but vary the weight of the paper for different sizes of container.

It may here be observed that in mechanisms B, B′, E, G, and H the wheels 29, 30, 37, 38, 99, 102, 144, 148 and 193, respectively, are of the same diameter and are rotated from the same source, such as gears 352 and 353 mounted on the shafts 351′ and 354, respectively, and through their intermediate parts rotation is transferred to the shafts of the above mentioned wheels. It will, therefore, be observed that as the diameter of the cutters 51, drums 60, mandrel 236 and rolls 239 and 240 is varied to agree with the container desired, so must the surface speed of the wheels 29, 30, 37, 38, 99, 102, 144, 148 and 193 be increased or decreased to operate in unison with the seven revolutions of cutters 51 and drums 60, mandrel 236 and rolls 239 and 240, and to this end there may be provided substitutes for gear 352 on shaft 351′ and gear 353 on shaft 354 in mechanism E.

To facilitate this substitution, the drive shaft 351 is broken at 387 and 388, as shown in Figs. 1, 2, 3 and 4, to form a detachable shaft 351′. This is coupled to the end of shaft 351 by the couplings 389. To substitute gears 352 and 353, it will then be necessary only to unclamp the couplings 389 and slide them along the shaft, take out the shaft 351′, and substitute the gears required for the container desired.

Briefly, described, the varying of the diameter of the container desired, necessitates the substitution of cutters 51 and drums 60 in mechanisms C and C′, gears 352 and 353 in mechanism E, mandrel 236 and rolls 239 and 240 in mechanism I. The remaining parts of the machine operate without change in the production of containers of any desired size.

It will be manifest from the foregoing description of one practical embodiment of the invention that the machine is operable to automatically construct or form a one-piece multi-ply container from a strip of paper by a continuous operation, and that the machine is not restricted in its use to containers of any given size. It may be readily manipulated to allow of the formation of containers of widely varying sizes. Containers made by the machine are strong, rigid, and durable, and may, if desired, be employed for continuous use. Moreover, the machine operates at a high rate of speed so that a larger number of containers may be made per minute, thereby rendering the same economical to manufacture. The parts of the machine described are positive in their operation, and not apt to get out of order, and while said machine may appear, at first glance, to be rather complicated, a closer scrutiny will show that, in reality, it is composed of extremely simple forms of mechanisms.

A machine of the present invention may be briefly summarized as embodying paper feeding means, blank forming means, and means for manipulating said blank into the shape of the container desired. While I have carefully illustrated and described the various mechanisms for carrying out these results, it will be understood that the specific construction set forth is but typical of the invention, and I do not limit the invention to the use of the specific construction shown, but consider the same as broadly novel as commensurate with the appended claims.

The hereinbefore described series of operations for producing a container of the character set forth constitutes a novel process, and I reserve the right to hereafter apply for a separate patent covering such process.

Having thus fully described the invention, what I claim as new, and desire to secure by Letters Patent is:—

1. In a machine of the class described, the combination of means for forming a blank with projections along one of its edges, means for rolling said blank to form a container having a plurality of plies, and means for infolding the projections on the blank to form the bottom of the container.

2. In a machine of the class described, the combination of means for forming a blank with projections along one of its edges, means for rolling said blank to form a container having a plurality of plies, and means

for simultaneously infolding the projections on the blank in succession to form the bottom of the container.

3. In a machine for making paper containers from blanks having projections along their edges, embodying, in combination, means for winding the bodies of the blanks to form the sides of the containers, and means for infolding the projections to form the bottoms of the containers.

4. In a machine of the class described, scoring mechanism, notching mechanism, and mechanism for cutting into blanks the material thus scored and notched, in combination with glue applying mechanism, and means for forming blanks into containers the sides and bottoms of which are integral and contain a plurality of plies of material.

5. In a machine of the class described, scoring mechanism, notching mechanism, and mechanism for cutting into blanks the material thus scored and notched, in combination with glue applying mechanism, means for forming blanks into containers the sides and bottoms of which are integral and contain a plurality of plies of material, and means for ejecting the containers thus formed from the machine.

6. In a machine of the class described, means for serrating one edge of a strip of paper, means for cutting the serrated paper into sections in combination with means for forming said sections into containers having their sides and bottoms integral and containing a plurality of plies of material.

7. In a machine of the class described, means for forming material into blanks, means for forming said blanks into containers having a plurality of plies of material and the sides and bottoms integral, and means for infolding portions of the blanks to form the bottoms of the containers during the formation of the sides thereof.

8. In a machine of the class described, means for forming a strip of paper into blanks, means for winding a portion of said blank so as to form the body of a container with a plurality of plies, and means for infolding the other portion of the blank during the body winding operation, whereby the bottom of the container is formed from a plurality of plies integral with those forming the sides of the container, said latter means being so formed as to position the bottom intermediate the ends of the container.

9. In a machine of the class described, means for forming a strip of paper into blanks, means for winding a portion of said blank so as to form the body of a container with a plurality of plies and means for simultaneously infolding the other portion of the blank into a position intermediate the ends of the wound portion, whereby a recessed bottom is formed for the receptacle from a plurality of plies integral with those forming the sides of the container.

10. In a machine of the class described, means for forming a blank from a strip of paper, and means for severing the completed blank from said strip, in combination with a mandrel, means for rolling the blank upon said mandrel, whereby the body of the container is formed from a plurality of plies and means for folding a portion of said blank over the end of said mandrel, whereby a bottom integral with the sides of the container is formed simultaneously with the formation of the body.

11. In a machine of the class described, means for forming a strip of paper into blanks having interspaced projections along one edge, means for winding the blank so as to form the body of a container with a plurality of plies, and means for infolding the projections of said blank, whereby the bottom of the container is formed.

12. In a machine of the class described, means for forming a strip of paper into blanks having interspaced projections along one edge, means for winding the blank so as to form the body of a container with a plurality of plies, and means for infolding the projections of said blank overlapping relation, whereby the bottom of the container is formed.

13. In a machine of the class described, means for cutting a strip of material into blanks from which containers are to be made, means for cutting out portions of said blanks to form projections along the edges thereof, means for forming said blanks into containers, and means for intermittently feeding the finished blanks to the container forming means.

14. In a machine of the class described, means for forming a strip of paper into blanks, means for winding a portion of said blank so as to form the body of the container with a plurality of plies, means for infolding the other portion of the blank, whereby the bottom of a container of a plurality of plies integral with those forming the sides of the container is formed, means for actuating said means, and means operable to intermittently actuate the blank forming means, and constantly operate the container forming means.

15. In a machine of the class described, means for forming a blank from a strip of paper, and means for severing the completed blank from said strip, in combination with means for forming the blank into a finished container, and means for intermittently actuating the means operating upon the blank prior to its severing from the strip, said means being operable to constantly operate the container forming means.

16. In a machine of the class described,

means for feeding a strip of paper, means for forming interspaced projections along one edge thereof to form a blank, and means for severing the completed blank from the strip of paper, in combination with means for winding said blank to form the body of a container, and means for infolding the interspaced projections to form the bottom of the container.

17. In a machine of the class described, means for forming a strip of paper into blanks having interspaced projections along one edge thereof, means for winding said blank to form the body of a container, and means for infolding the interspaced projections to overlapped relation to form the bottom of the container, said bottom being positioned intermediate the ends of the container.

18. In a machine of the class described, means for forming a strip of paper into blanks having interspaced projections along one edge thereof, means for severing said blanks from said strip, and means for folding portions of the interspaced projections at predetermined angles to the body of the blank in combination with means for winding the body of the blank to form the body of a container with a plurality of plies, and means for infolding the interspaced projections of said blank to form a bottom of the container.

19. In a machine of the class described, means for forming a strip of paper into blanks having interspaced projections along one edge thereof, means for scoring said projections, and means for severing the completed blank from the strip, in combination with means for folding the projections on the blank along the lines of the scoring thereon, means for winding said blank to form the body of a container having a plurality of plies, and means for infolding the interspaced projections of said blank to form the bottom of the container.

20. In a machine of the class described, means for forming a strip of paper into blanks having interspaced projections along one edge thereof, means for scoring said projections, and means for severing the completed blank from the strip, in combination with means for folding the projections on the blank along the lines of the scoring thereon, means for winding said blank to form the body of a container having a plurality of plies, and means for infolding the interspaced projections of said blank into overlapping relation to form the bottom of the container.

21. In a machine of the class described, means for forming a strip of paper into blanks having interspaced projections along one edge thereof, means for severing the completed blank from the strip, and means for winding said completed blank to form the body of a container having a plurality of plies, and means for simultaneously infolding the interspaced projections into overlapping relation to form the body of the container, means for securing the blank previously to the severing of the same from the strip being adapted to cease operating during the winding of said blank and the infolding of the plies of the projections thereof.

22. In a machine of the class described, means for forming material into blanks having interspaced projections along one edge thereof, means for winding said blanks to form a container having a plurality of plies, and means for infolding the interspaced projections into overlapping relation to form an impervious bottom for said container, in combination with means for ejecting the completed containers from the machine.

23. In a machine of the class described, means for supporting a roll of paper, means for unrolling and advancing the paper from said roll, means for longitudinally scoring the same, means for forming interspaced projections along one edge thereof, and means for severing predetermined lengths of said paper to form blanks from which a container may be made, in combination with means for applying an adhesive to said blanks, a mandrel, means for winding said blanks upon the mandrel to form a container having a plurality of plies, means for infolding the interspaced projections of said blanks into overlapping relation to form the bottoms of the containers, and means for ejecting said finished containers from the machine.

24. In a machine of the class described, means for supporting a roll of paper, means for unrolling and advancing the paper from said roll, means for longitudinally scoring the same, means for forming interspaced projections along one edge thereof, and means for severing predetermined lengths of said paper to form blanks from which a container may be made, in combination with means for applying an adhesive to predetermined portions of said blanks, a mandrel, means for winding said blanks upon the mandrel to form a container having a plurality of plies, means for infolding the interspaced projections of said blanks into overlapping relation to form the bottoms of the containers, and means for ejecting said finished containers from the machine.

25. In a machine of the class described, means for producing blanks from which containers are to be made, means for winding said blanks to form the bodies of containers, means for infolding portions of said blanks to form the bottoms of said containers simultaneously with the body winding operations,

and means for ejecting the finished containers in combination with means for intermittently feeding the finished blanks to the container forming means.

26. In a device of the class described, a mandrel provided at one end with a recess, a piston in said recess, means for periodically operating the piston, in combination with means for winding a blank upon a mandrel, and means for infolding a portion of the blank over the end of the mandrel and into engagement with the piston simultaneously with the winding operation, whereby the container thus formed may be removed from the mandrel by the piston subsequent to the container forming operation.

27. In a device of the class described, a mandrel provided at one end with a recess, a piston in said recess, means for periodically operating the piston, in combination with means for winding a blank upon a mandrel, means for infolding a portion of the blank over the end of the mandrel and into engagement with the piston simultaneously with the winding operation, said means being normally positioned at the end of the mandrel and in the path of the piston, whereby the container thus formed may be removed from the mandrel by the piston subsequent to the container forming operation, and means for removing the infolding means from the path of the piston to allow of the removal of the finished container.

28. In a machine of the class described, means for advancing a paper strip, means for cutting said strip to form interspaced projections along its edge, means for successively severing the blanks thus formed from the strip, and means for intermittently advancing the finished blanks, in combination with means for applying an adhesive to said blanks.

29. In a machine of the class described, means for advancing a paper strip, means for forming said strip into blanks, means for successively severing the blanks from the strip, means for intermittently advancing the finished blanks, in combination with means for applying an adhesive to said blanks, and means for subsequently forming the blank into a finished container.

30. In a machine of the class described, means for advancing a paper strip, means for forming said strip into blanks, means for successively severing the blanks from the strip, means for intermittently advancing the finished blanks, in combination with means for applying an adhesive to said blanks, means for rolling said finished blanks into tubular form, and means for turning in the ends of the tube to form finished containers.

31. In a machine of the class described, means for advancing a paper strip, means for forming said strip into blanks, means for successively severing the blanks from the strip, means for intermittently advancing the finished blanks, in combination with means for applying an adhesive to said blanks, means for rolling said finished blanks into tubular form, means for turning in the ends of the tube to form finished containers, and means for ejecting said finished containers from the machine.

32. In a machine of the class described, means for winding a blank into the form of a tube, and means for infolding a portion of the blank to close one end of the tube during the winding operation, in combination, with means for applying an adhesive to certain portions of the blank to the exclusion of other portions thereof previously to the feeding of the blank to the container forming means.

33. In a machine of the class described, a mandrel on which is adapted to be wound a blank, adjustable pressure rollers coöperating with said mandrel, means for turning in a portion of the blank over the end of the mandrel during the winding operation, and means for applying an adhesive to the blank previous to the winding operation.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRANK H. VICK.

Witnesses:

HENRY WOOG,

ALONZO W. FISK.