

July 16, 1935.

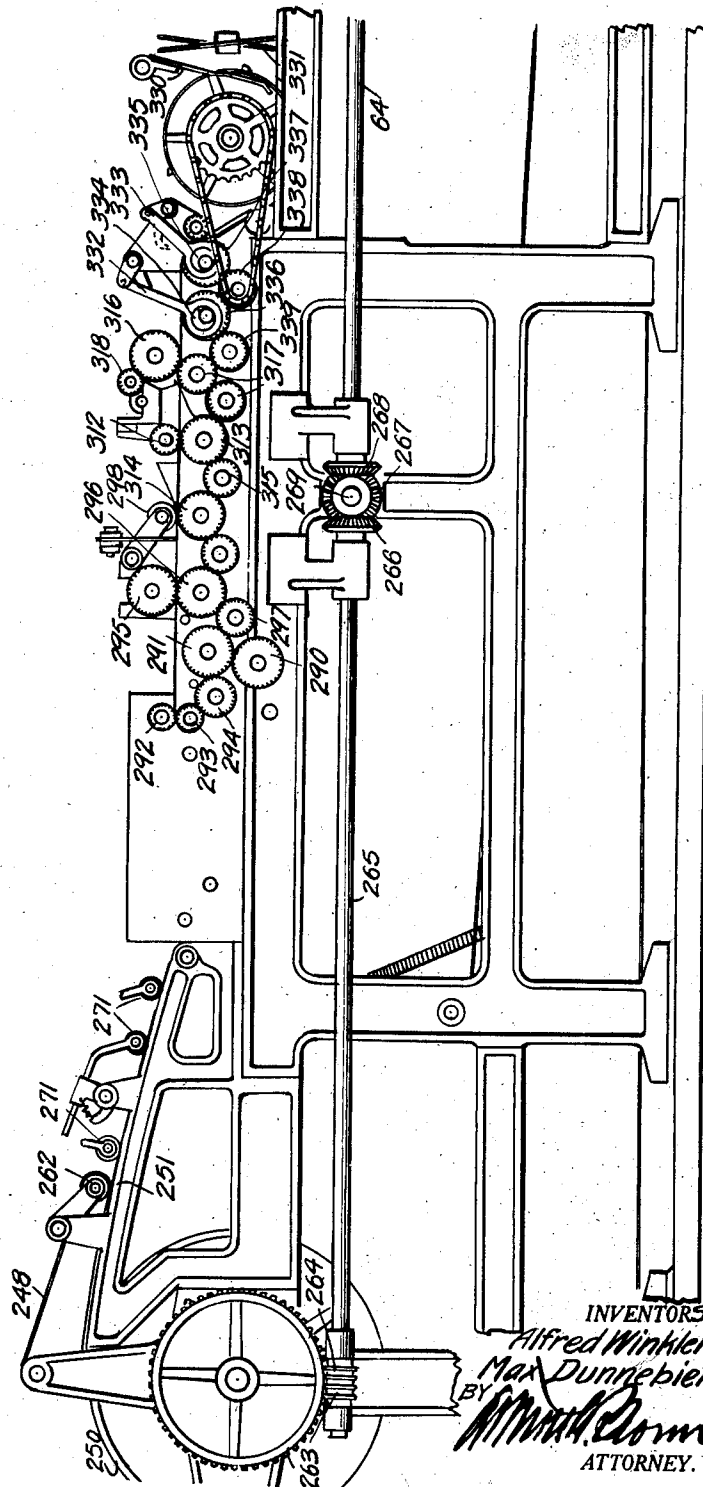
A. WINKLER ET AL

2,008,236

MACHINE FOR MANUFACTURING WINDOW ENVELOPES

Filed July 28, 1932

7 Sheets-Sheet 2



July 16, 1935.

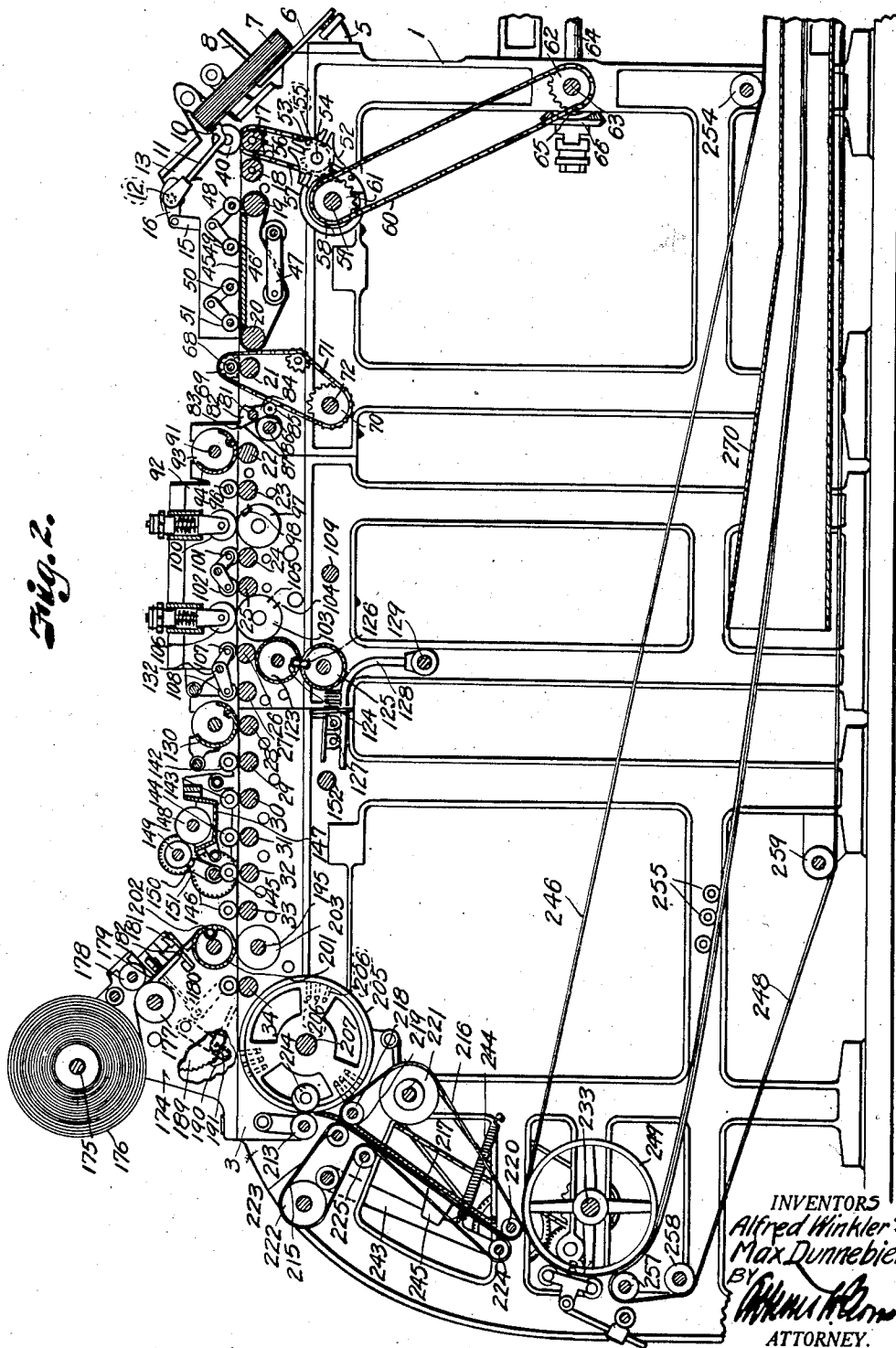
A. WINKLER ET AL

2,008,236

MACHINE FOR MANUFACTURING WINDOW ENVELOPES

Filed July 28, 1932

7 Sheets-Sheet 3



July 16, 1935.

A. WINKLER ET AL

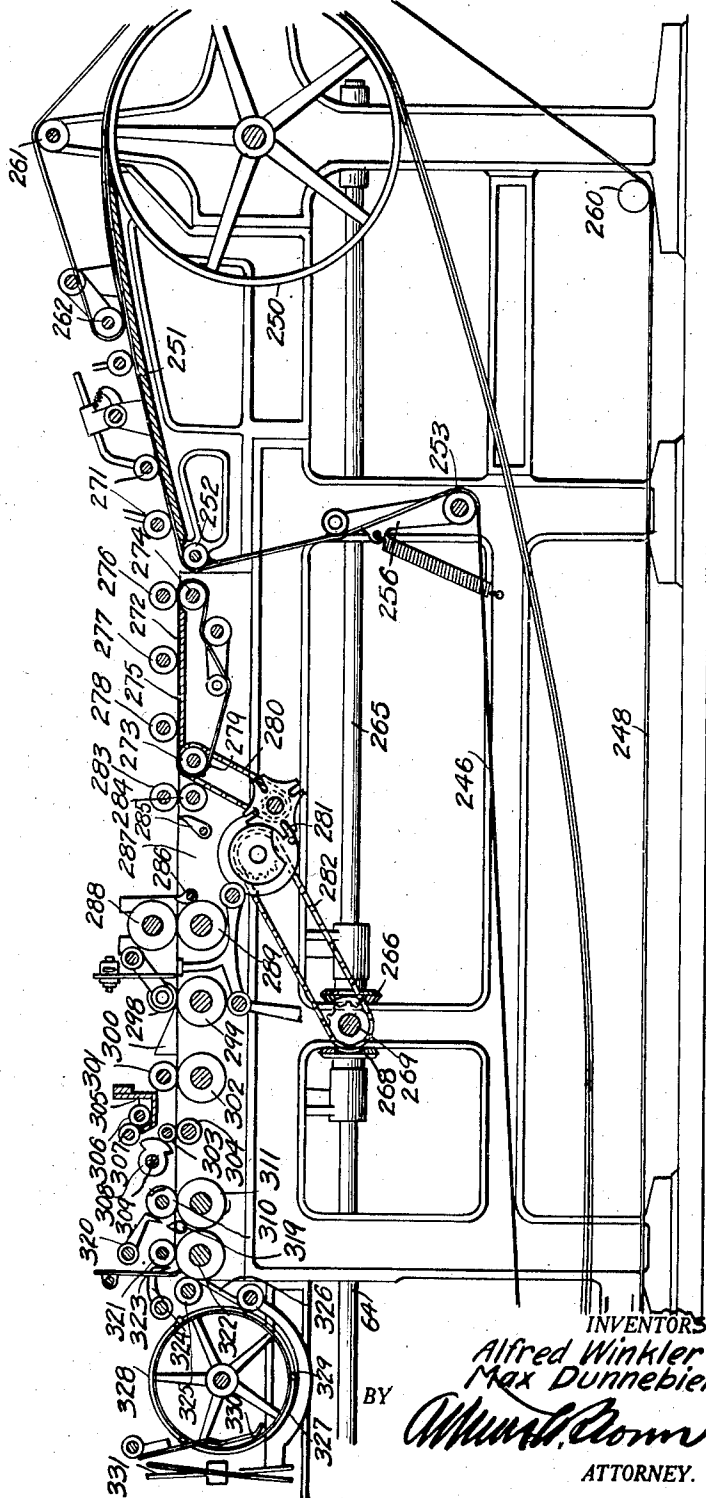
2,008,236

MACHINE FOR MANUFACTURING WINDOW ENVELOPES

Filed July 28, 1932

7 Sheets-Sheet 4

Fig. 2-A.



July 16, 1935.

A. WINKLER ET AL

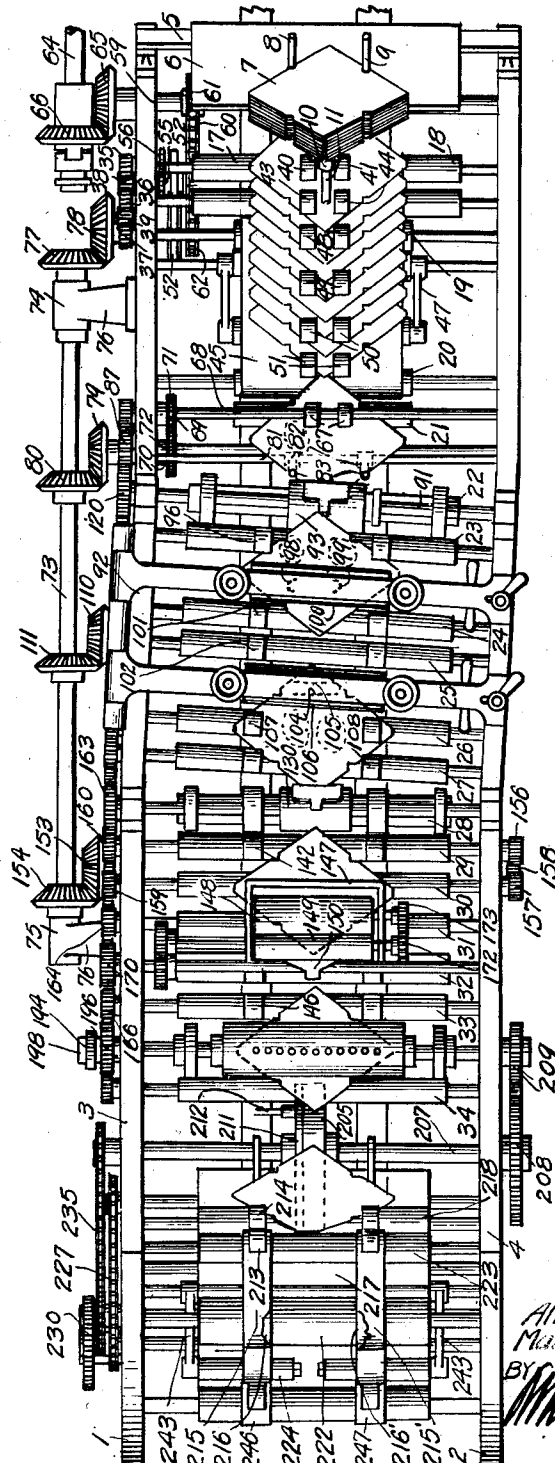
2,008,236

MACHINE FOR MANUFACTURING WINDOW ENVELOPES

Filed July 28, 1932

7 Sheets-Sheet 5

Fig. 3.



INVENTORS.
Alfred Winkler
Max Dimmeler.
BY *Wm. H. R. m.*
ATTORNEY.

July 16, 1935.

A. WINKLER ET AL

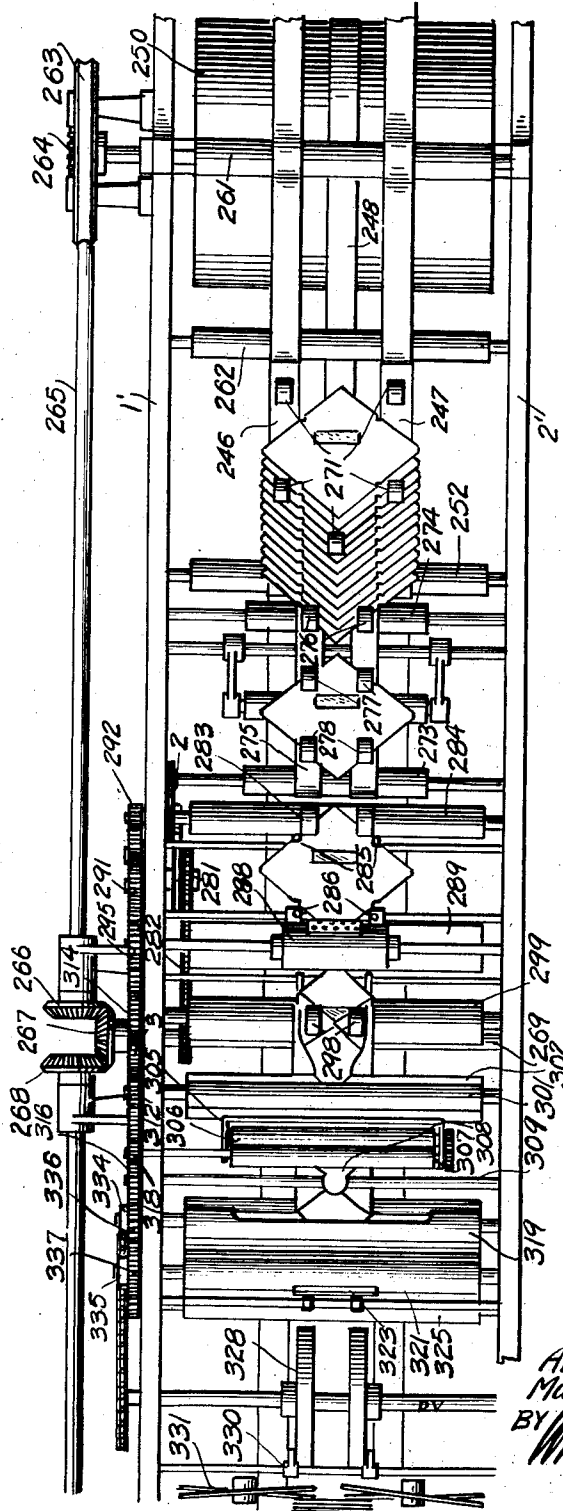
2,008,236

MACHINE FOR MANUFACTURING WINDOW ENVELOPES

Filed July 28, 1932

7 Sheets-Sheet 6

Fig. 3-A.



INVENTORS
Alfred Winkler and
Max Dunnebler.
BY *William H. Corm*
ATTORNEY.

UNITED STATES PATENT OFFICE

2,008,236

MACHINE FOR MANUFACTURING WINDOW
ENVELOPESAlfred Winkler and Max Dünnebier, Neuwied-
on-the-Rhine, GermanyApplication July 28, 1932, Serial No. 625,398
In Germany December 19, 1931

21 Claims. (Cl. 93—62)

This invention relates to a machine for the manufacture of envelopes, bags and the like from cut blanks, and more particularly to those of that character employing transparent panels or windows, and has for its principal object to provide mechanism whereby the operations performed on the blanks take place while they are being forwarded through the machine and without interruption to their travel except at the gauging stations, thereby greatly increasing the number of envelopes which may be produced in a given time.

Another important object of the invention is to provide a window-forming and pasting apparatus employing rotary principles in order that the various operations thereof may be actuated in synchronism and cooperation with the continuous progressive travel of the blanks through the machine.

By reason of these improvements we are, therefore, able to produce envelope blanks having transparent panels in sufficient numbers and at a speed corresponding with the capacity of a rotary envelope folding apparatus with which the window-forming mechanism is associated.

In accomplishing these and other objects of the invention, we have provided improved details of structure, the preferred form of which is illustrated in the accompanying drawings, wherein:—

Fig. 1 is a side elevational view of the window-forming and gumming section of a machine constructed in accordance with our invention.

Fig. 1A is an elevational view of the flap-folding section of the machine, and is a continuation of the left hand end of the section illustrated in Fig. 1.

Fig. 2 is a longitudinal vertical sectional view of the window-forming and gumming portion of the machine illustrated in Fig. 1.

Fig. 2A is a longitudinal vertical section through the flap-folding and gumming portion of the machine illustrated in Fig. 1A.

Fig. 3 is a plan view of the portion of the machine illustrated in Fig. 1 showing the supports for the upper sets of rollers removed to better illustrate mounting of the lower rollers which form the path of travel of the blanks.

Fig. 3A is a similar plan view of the flap-folding portion of the machine.

Fig. 4 is a diagrammatic view illustrating the different steps of operation performed on the blanks as they are being forwarded through the machine.

Referring more in detail to the drawings:—

1 and 2 designate right and left side frames of the window-forming portion of the machine, and supported on the upper edges thereof are roller bed plates 3 and 4. Mounted on the right hand end of the side frames, Figs. 2 and 3, and at a point below the bed plates is a bracket 5 carrying an upwardly inclined stack supporting plate 6 on which a stack of envelope blanks 7 is supported for delivery into the machine.

The stack of blanks is retained in position on the plate by spaced posts 8 and 9 so that the upper ends of the blanks project a sufficient distance above the rear edge of the plate to permit the lowermost blank in the stack to be engaged by a vacuum nozzle 10 to effect successive withdrawal of the blanks into the machine as later described.

The blanks may assume various shapes and sizes, but we have illustrated the machine as adjusted for forming ordinary envelopes, and the blanks include substantially rectangular sheets wherein the corners *a* and *b* constitute the side flaps and the corners *c* and *d* the top and bottom flaps of an envelope. In the form of blank illustrated the blanks are arranged diagonally of the supporting plate so that the upper flaps *c* are in position to be engaged by the vacuum nozzle and forwarded into the machine.

The vacuum nozzle 10 is carried at the end of an arm 11 that is mounted on a rock shaft 12 extending between upward projections 13 of the bed plates and which is actuated by a cam 14 through a lever 15 connected to an arm 16 on the rock shaft so that upon each rotation of the cam the nozzle is swung toward the stack to engage the bottom blank thereof and then away from the stack to carry the engaged blank into reach of the first of a series of upper and lower forwarding rollers located along the upper edges of the bed plates.

The lower forwardly rollers are designated 17 to 34, inclusive, and are mounted on horizontal shafts rotatably supported in suitable bearings in the bed plates and at an elevation so that the peripheries of the respective rollers will lie in a horizontal plane to constitute a rolling support or path for the blanks as they are moved through the machine. The shafts of the rollers 17, 18 and 19 carry gears 35, 36 and 37, respectively, which are interconnected by idler gears 38 and 39 so that they rotate together in an anti-clockwise direction (Fig. 2).

Cooperating with the roller 17 and located at opposite sides of the nozzle 10 are spaced grip rollers 40 and 41 that engage the sides of the flap

as it is bent downwardly upon retractive movement of the nozzle to withdraw the engaged blank from the stack. The rollers 40 and 41 are mounted on a shaft rotatably supported in the projecting portions 13 of the side frame and are driven by a gear 42 meshing with the gear 35 on the lower roller. Cooperating with the roller 18 are spaced rollers 43 and 44 to feed the blanks onto a straightening and aligning belt 45 whereon the blanks are overlapped in shingle formation.

The belt 45 operates over the rollers 19 and 20 and over a horizontal plate 46 supported therebetween, as best illustrated in Fig. 2. The belt is tensioned over the table by a suitable tensioning device indicated at 47.

In order to retain the blanks in overlapped formation on the belt, we provide spaced sets of guide rollers 48, 49, 50 and 51, which are preferably yieldingly tensioned against the belt by suitable tensioning means (not shown). In order that the forwarding rollers 17 and 18, including the belt 45, may be operated intermittently between movements of the vacuum nozzle, the shaft for the roller 17 is intermittently actuated by means of a Geneva gearing 52 (Fig. 2).

The Geneva gearing 52 includes a Maltese cross member 53 mounted on the stub shaft 54 extending from the frame 1, and which carries a sprocket 55 for driving a sprocket 56 on the shaft of the roller 17 through a chain 57 running over the respective sprockets. The Maltese cross member is intermittently actuated by the Geneva block 58 that is fixed on a horizontal shaft 59 having its ends rotatably mounted in the side frames 1 and 2 and which is actuated by a chain 60 operating over a sprocket 61 thereon and over a sprocket 62 on a countershaft 63 extending between the side frames at a point below the shaft 59. The shaft 63 is operated from a longitudinally extending drive shaft 64 through bevel gears 65 and 66 on the respective shafts.

The roller 21 at the delivery end of the belt 45 cooperates with spaced driving wheels 67 which are mounted on a shaft 68 extending above the roller 21 and which is operated continuously at a desired speed by a sprocket 69 driven from a sprocket 70 by means of a chain 71. The sprocket 70 is mounted on a countershaft 72 rotatably mounted in the side frames 1 and 2 at a point in advance of the countershaft 59 and is driven therefrom through a longitudinally extending shaft 73. The shaft 73 extends along the upper edge of the side frame 1 and is rotatably mounted in bearings 74 and 75 carried by brackets 76 projecting from the side frame, as best illustrated in Fig. 3.

The shaft 73 is actuated by a bevel gear 77 meshing with a bevel gear 78 fixed to the end of the countershaft 59. The countershaft 72 is operably connected with the shaft 73 by intermeshing bevel gears 79 and 80 fixed to the respective shafts, as best illustrated in Figs. 1 and 3.

As soon as the blanks are engaged by the continuously running rollers 21 and 67, they are individually separated from the blanks being advanced by the belt 45 for separate travel through the window-cutting mechanism.

In order to time the blanks for proper admission to the window-forming mechanism, we provide a shaft 81 extending across the bed plates between the rollers 21 and 22 for mounting spaced stop members 82 having upwardly extending fingers 83 adapted to swing across the path of travel of the successive blanks to momentarily intercept

their movement until they are in correct timed relation with the window-cutting mechanism, so that the window will be formed at the proper location in the blanks.

The stop members 82 have depending arms 84 carrying rollers 85 having contact with cams 86 carried on a shaft 87 that extends between the bed plates. The cam shaft 87 is driven by a gear 88 meshing with a gear 89 on the countershaft 72 through a train of idle gears 90, as best illustrated in Fig. 1. The fingers thus described are preferably arranged to engage the blanks at opposite sides of the top flap c so that the point thereof is in position to be engaged by the roller 22, which is the first roller for aiding in advancement of the blank through the window-forming mechanism.

Cooperating with the roller 22 and mounted on a shaft 91, carried by upward extensions 92 of the bed plates, is a segmental roller 93 including an arcuate portion 94 extending substantially half the diameter thereof. The position of the arcuate portion of the roller is so timed relatively to the continued advance of the blanks that the point of the blank lies free upon the roller 22 until engaged by the forward edge thereof, at which time the stop fingers are moved out of engagement with the blank to allow its feed between the segmental roller and the roller 22. When the rear edge of the arcuate portion of the segmental roller moves into contact with the blank, it grips the blank and continues its forward travel through the machine.

From the rollers 22 and 93 the blank is forwarded over the roller 23, aided by pressure rolls 96, to a window-cutting mechanism now described.

Rotatably mounted in the bed plates between the rollers 23 and 24 is a roller 97 having arcuate cutting knives 98 and 99 spaced apart a sufficient distance to form end cuts of the window opening and which cooperate with a hardened spring tensioned roller 100 carried directly above the roller 97, as best illustrated in Fig. 2, to cut through the blank.

After the blank has been carried past the rollers 97 and 100, where it has received its initial cut, it is gripped by the rollers 24 and 25, aided by spring tensioned feed rollers 101 and 102, for transport across a second cutting roller 103 to effect the longitudinal side cuts of the window opening as now described.

The roller 103 is mounted in the bed plates between the rollers 25 and 26 and is provided with spaced, longitudinally extending knives 104 and 105 aligning with the terminals of the arcuate cuts made in the blank by the curved blades on the roller 97.

The roller 103 also cooperates with a hardened tension roller 106 to form the cuts in the blank. From the rollers 106 and 103 the blank is continued through the machine, aided by the rollers 26 and 27 and cooperating spring tensioned pressure rollers 107 and 108.

The rollers just described are driven from the longitudinal shaft 73 through a countershaft 109 extending parallel with the countershafts 59 and 72 previously described. The countershaft 109 has a bevel gear 110 meshing with a complementary bevel gear 111 on the longitudinal shaft. Also mounted on the shaft 109 is a gear 112 meshing with spaced idle gears 113 and 114 which in turn mesh with gears 115 and 116 fixed to the shafts of the cutting rollers 97 and 103.

The shaft for the roller 23 is provided with a

gear 117 which is driven from the gear 115 through an idle gear 116 and the feed roller shaft 22 with a gear 118 that is driven from the gear 117 through an intermediate gear 119, so that both roller shafts are driven in the same direction. The segment roller 93 carries a gear 120 meshing with the gear 118 on the shaft of the roller 22. The rollers 24 and 25 are driven from the gears 115 and 116 respectively through gears 121 and 122 mounted on the shafts of the rollers.

Attention is particularly directed to the angular arrangement of the knives relatively to the axis of the cutting rollers, as well as the angular relation of the rollers 22, 23, 97, 24, 25, 103, 26, 27, and the segment roller 93, which arrangement moves the blanks out of line with the normal line of travel through the machine. This is an important feature of the invention as the angular arrangement of the knives provides for a shearing cut through the blank in forming the window. Since the knives are located at right angles to the normal travel of the blanks, they will, therefore, begin their cut at one end; that is, the knife 98 begins to engage the blank before the knife 99 and the parallel knives begin their cutting action at the ends thereof, and the cutting continues along the knives as the knives are planetated. It is apparent that if the blanks continue in a straight path the window opening will be formed at an angle to its proper position, but by changing their direction of travel the blanks are shifted parallel to the cutting knives to compensate for the difference in the beginning of the cuts.

By thus mounting the feed rollers in angular relation to the normal path of travel of the blanks and by locating the knives in transverse relation or at a slight angle to the longitudinal axis of the cutting rollers, we are enabled to provide a more positive and a cleaner cut for the window opening, as well as providing a more easily operated machine with less strain on the cutters.

During the continued travel of the blank the cut-out portion thereof is removed due to planation of the knives carried by the roller 103, and to clear the knives of the blank we provide a vacuum roller 123 mounted in contact with the revolving knives so that the nozzle 124 thereof will engage the cut-out section and remove it from between the knife blades.

Rotatably mounted in the side frames and in peripheral contact with the vacuum roller is a second vacuum roller 125 having a nozzle 126 which comes into contact with the cut-out section and stacks it against a plate 127 that is carried by an arm 128 supported from the side frames on a horizontal shaft 129.

At the roller 27 the blank is again straightened to continue its travel through the machine parallel with the center line thereof by means of a segment roller 130 similar to the segment roller 93 previously described and which cooperates with the forwarding roller 28.

In order to avoid tearing of the blanks as their direction of travel is changed, the rollers 107 and 108 are lifted to allow freedom of the blanks. These rollers are pivotally supported on a cross shaft 132 pivotally mounted in the bed plate extensions supporting the rollers 100 and 106. The shaft 132 is rocked to lift the rollers by an arm 133 which is actuated from a cam 134 carried on the shaft of the vacuum roller 123, as best illustrated in Fig. 1, the arm 133 being operably con-

nected with the cam through a fork-shaped arm 135. The timing of the cam is so arranged that when the point of the blank is about to be engaged by the vacuum roller the rollers 101 and 102 are raised to relieve the pressure on the blank until it has passed entirely therefrom to permit its free change of travel under influence of the vacuum roller 130.

The shaft of the vacuum roller 123 is provided with a gear 136 meshing with the gear 116 on the cutting roller 103, and the shaft for the lower vacuum roller is provided with a gear 137 meshing with a gear 136, as illustrated in Fig. 1. The rollers 26 and 27 are provided with gears 138 and 139; the gear 138 meshing directly with the gear 136 while the gear 139 meshes with the gear 136 through idler gears 140 and 141.

Cooperating with the rollers 29, 30, 31, 32 and 33 are pressure rolls 142, 143, 144, 145 and 146, respectively, for guiding the blank through the closure flap-gluing mechanism now described.

Supported above the pressure rollers 143 and 144 by upward extensions of the bed plates is a glue pan 147 having rotatably mounted therein a glue pick-up roller 148 for depositing glue on a transfer roller 149 rotatably supported above the rear edge of the pan and in contact with the roller 148. The glue is removed from the transfer roller and applied to the blank as it emerges from under the pan by an applicator 150 carried on the end of a rotating arm 151.

The arm 151 is mounted on a shaft spaced above the pressure rolls 145 and is carried in the extensions of the bed plates supporting the glue pan.

The rollers 28 to 33, inclusive, and the vacuum roller 130, together with the glue applicator shaft 151, are driven from a fourth countershaft 152 mounted directly below the rollers 29 and 30. The countershaft 152 projects entirely through the side frame and carries on its end adjacent the longitudinal shaft 73 a bevel gear 153 meshing with a bevel gear 154 on the shaft 73. The opposite end of the countershaft 152 carries a gear wheel 155 that meshes with gears 156 and 157 on the shafts of the rollers 29 and 30, respectively, through an idle gear 158. The opposite ends of the last named shafts are provided with gears 159 and 160, respectively, to drive the remaining rollers.

The roller 28 is driven from the gear 159 through an idle gear 161 meshing with a gear 162 on the shaft of the roller 28, and the segmental roller 130 is provided with a gear 163 which meshes with the gear 162. The shafts of the rollers 31, 32 and 33 are provided with gears 164, 165 and 166, and are interconnected by idle gears 167, 168 and 169, the gear 167 meshing with the gear 159 on the shaft of the roller 30 to transmit motion to the other gears of the train.

The glue applicator shaft is provided with a gear 170 meshing with the gear 165, and the shaft for the transfer roller 149 is driven by a gear 171 meshing with the gear 170. The opposite end of the transfer roller shaft carries a gear 172 meshing with a gear 173 to drive the glue pick-up roller 148. The forwarding rollers, as well as the vacuum roller 130 and the glue applicator shaft, are thus operated in timed relation with the rollers previously described so that the blank continues its forward travel through the machine at the same rate it travels through the window-forming mechanism.

The rollers 33 and 146 continue the travel of

the blank to a point where a transparent window strip is applied, as now to be described.

Rotatably supported on extensions 174 mounted on the left hand ends of the bed plates (Fig. 2) is a shaft 175 supporting a roll of transparent paper or the like 176 from which the windows are formed. The end of the paper strip is threaded between feed rollers 177 and 178 and across a downwardly inclined table 179 toward the path of the blanks and between shear blades 180 and 181 respectively mounted above and below the table 179 and operating through a slot 182 therein. The feed roller 177 is intermittently operated and partially rotated in timed relation with the feed rollers so that the required amount of strip is fed at each rotative operation of the machine, as now described.

Fixed on the end of the shaft carrying the roller 177 is a gear 183 that meshes with a drive gear 184 rotatably mounted on the stub shaft 185 extending from the frame extension 174. Fixed in driving relation with the gear 184 is a smaller gear 186 meshing with a gear 187 rotatably supported on a stub shaft 188 mounted on the frame extension at a point below the shaft 185.

Fixed in driving relation with the gear 187 is a ratchet wheel 189 intermittently operated by a pawl 190 carried at the end of an arm 191 swingingly mounted on the shaft 188. The arm carrying the pawl is operated by a pitman 192 having a ring 193 operating over an eccentric 194 carried on the projecting end of a roller shaft 195. The roller shaft 195 is driven from the gear 169 previously described by means of a gear 196 meshing with an idle gear 197 so that the eccentric is rotated in timed relation with the forwarding rollers. Rotation of the eccentric swingingly reciprocates the arm to intermittently actuate the ratchet wheel between each operation of the machine to rotate the chain of gears driving the strip feeding roller 177 to feed the proper amount of strip through the shear blades to cover the window opening. The shear blades are then actuated from the shaft 195 by a cam 198 that actuates a crank lever 199 operably connected with the shear blades through a pitman 200 to sever the measured section of the strip.

Rotatably mounted under the lower edge of the shear table 179 and in position to engage the strip is a vacuum roller 201 having a series of openings 202 through which a vacuum is drawn to engage the forward edge of the strip section directly after the cut is made. The roller 201 operates in timed relation with the knives and with the movement of the blank so that the vacuum roller carries the window strip into contact with the blank at the time the window opening is passing over a roller 203 which is carried on the shaft 195 previously described. In order to drive the vacuum roller 201, it is provided with a gear 204 that meshes with the gear 196 on the shaft 195 previously described.

The blanks with the transparent panels applied to the window openings are now brought to a station for gumming the closure flaps c of the envelopes in order that the gumming of the closure flaps and the transparent panels may be dried at the same time. To gum the closure flaps it is desirable to bunch the blanks in overlapped formation in such a manner that only the portions of the flaps to receive the glue are exposed. To accomplish this we provide a rotary vacuum disk 205 having approximately three times the diameter of the vacuum rollers previously de-

scribed. The vacuum disk 205 is equipped at equal distances about its circumference with sets of apertures 206 through which a vacuum is drawn to engage the blanks as they are delivered across the roller 34.

The disk 205 is mounted on a countershaft 207 rotatably carried in the side frames, and is driven by a gear wheel 208 that meshes with a gear 209 on the shaft of the roller 203 which in turn is driven from the gear 196 by a gear 210 meshing therewith at the opposite side of the machine. The gears are so timed that the vacuum wheel makes one revolution during one revolution of the forwarding rollers. Therefore, three successive blanks are engaged upon each revolution of the vacuum disk in order that the envelopes may be delivered thereby to the gumming belts in overlapped relation with the required amount of flap exposed for the gumming.

The disk 205 rotates in contact with a fixed disk 211 having a connection 212 with the vacuum pump (not shown) and over which the channels 206' connecting the ports 206 rotate to make them effective for gripping the blanks to carry them through feed rollers 213 and 214 which are driven at substantially the speed of the forward rollers as later described. The rollers 213 and 214 deliver the blanks in overlapped formation between spaced sets of upper and lower endless belts 215—215' and 216—216', respectively. The sets of belts are spaced apart to engage the side flaps of the blanks and operate over a downwardly inclined table 217 carried between the side frames 1 and 2 at a point below the vacuum disk 205.

The belts 216—216' operate over a roller 218 working through a slot 219 in the table, over the table 217, over a roller 220 carried by the side frames, and over a driving roller 221 operable in timed relation with the rollers for the belts 215—215'. The belts 215—215' operate over a drive roller 222, over a roller 223 supported above the table in parallel relation with the roller 218, over a roller 224, and over an idling roller 225, as best illustrated in Fig. 2.

The driving pulley for the belts 216—216' is provided with a sprocket 226 that is driven by a chain 227 operating over a sprocket 228 carried on a stub shaft 229 projecting from the side frame 1. Supported on the stub shaft in driving relation with the sprocket is a gear 230 meshing with a gear 231 driven by a gear 232 carried on a pulley shaft 233 extending horizontally between the side frames. The shaft 233 is driven from the shaft 207 by a chain 235 running over sprockets 236 and 237 on the respective shafts.

The drive roller 222 for the belts 215—215' carries a gear 238 which meshes with a gear train 239 driven by a gear 240 meshing with the gear 241 on the shaft of the drive roller for the belts 216—216', as best illustrated in Fig. 1. The feed roller 213 previously mentioned is driven from the gear 239 by a gear 242 on the roller shaft.

The lower run of the belts 215—215' carried by the roller 224 is preferably yieldingly tensioned against the run of the belts 216—216' operating over the table 217, and we have, therefore, mounted the roller 224 at the ends of arms 243 that are suspendingly supported by the side frames, the arms being connected with the side frames by springs 244.

While the overlapped blanks are conveyed between the runs of the belts thus described the tops of the flaps are exposed to receive the gum which is applied by an applicator 245 (Fig. 2) carried above the table between the arms 243. When

the blanks are delivered from the ends of the belts they are discharged between a second pair of spaced belts 246 and 247 and an intermediate belt 248. These belts operate at slightly greater speed than the speed of the belts previously described in order to effect slight separation of the blanks to prevent the gum on one blank sticking to the gum of an adjacent blank.

The belts 246 and 247 operate over a pulley 249 loosely mounted on the shaft 233 previously mentioned in such a manner that the peripheries of the belts operate in line with the blanks discharged between the belts 215—216. The belts 246 and 247 extend to the opposite end of the machine (Fig. 2A) and operate over a somewhat larger pulley 250 and over a table 251 and guide rollers 252, 253, 254 and 255, the belt being tensioned by a tightening device indicated at 256 (Fig. 2A). The lower run of the belts 246 and 247 cooperates with the upper run of the belt 248 to retain the blanks therebetween. The lower belt 248 is, therefore, retained in operative position by guide rollers 257, 258, carried by the side frames adjacent the pulley 249, over a guide roller 259 positioned below the rollers 255, over a roller 260 carried by the side frames of the folding section of the machine, over a roller 261 carried by the side frames above the pulley 250, over a tensioning roller 262 carried above the table 251, and back over the larger drive pulley 250.

The roller 257 and the pulley 249 are arranged relatively to each other to form a gradually closing throat between the runs of the belts to receive the blanks as they are discharged from the belts 215 and 216.

The belts thus described are driven by the pulley 250 which is actuated by a worm gear 263 that meshes with a worm 264 on an extension 265 of the shaft 64 previously described. The extension 265 and the shaft 63 are coupled through intermeshing bevel gears 266, 267 and 268, as best illustrated in Figs. 1A and 3A. The intermediate bevel gear 267 is driven by a power shaft 269 extending between the side frames 1' and 2' of the folding section of the machine.

The lower runs of the belts 246 and 247 and upper run of the belt 248 carrying the blanks therebetween travel through a drying tunnel 270 into which warm air is discharged against the glue portions of the blanks to aid in their drying.

After the blanks have been delivered from between the belts at the right hand end of the machine (Fig. 2A), they pass between guide rollers 271 onto a belt 272 that is intermittently actuated in the same manner as the belt 45 previously described to reassemble the blanks in overlapped formation in case some of them have lost their position and spacing in the drying belts.

The belt 272 operates over spaced rollers 273 and 274 and over a table 275 on which operate pressure rollers 276, 277 and 278. The belt is driven from the roller 273 which is provided with a sprocket 279 actuated by a chain 280 from a Geneva gearing 281 that is operated from the countershaft 269 through a chain 282.

From the belt 272 the blanks are delivered through continuously moving rollers 283 and 284 operating at the same peripheral speed as the following rollers to allow spacing thereof for readjustment by stop fingers 285 and 286 similar to the stop fingers previously described. These stop fingers are operated by a cam shaft 287 in such a manner that the finger 286 moves into the path of the blanks to momentarily intercept their

travel until they are in timed relation with the flap-gluing and folding mechanism later described, whereupon the stop fingers 286 are retracted and the fingers 285 are moved into position to push the blank between creasing rolls 288 and 289 where the side flaps *a* and *b* and the closure and bottom flaps *c* and *d* are scored preparatory to folding.

The cam shaft operating the stop fingers is actuated from a gear 290 fixed in driving relation with the continuously rotating member of the Geneva gear which meshes with a driving gear 291 on the cam shaft. The feed rollers 283 and 284 are driven by intermeshing gears 292 and 293 that are rotated by an intermediate gear 294 meshing with the gear 291. The scoring rollers 288 and 289 are provided with gears 295 and 296 that are driven from the gear 291 through an idle gear 297.

After the blanks have been scored they are forwarded by rollers 298 and 299 across side flap folders 300 which fold the side flaps on the score lines over on the body portion of the blanks, as best illustrated in Fig. 3A. The blank then passes between pressure rolls 301 and 302 operating over the folded edges of the side flaps to press them flat against the body portion of the blank. The blank then continues between pairs of rollers 303 and 304.

Supported above the rollers 303—304 is a glue pan 305 having a glue pick-up roller 306 and a glue transfer roller 307 for applying glue to an arcuate segment 308. The arcuate segment conforms to the shape of the lower edges of the side flaps and applies adhesive thereto as the blank passes from between the rollers 303 and 304. The applicator segment is carried on a shaft 309 supported by the side frames in position to receive glue from the transfer roller. The blank then passes between pressing rollers 310—311 which deliver the blanks to flap-bending mechanism later described.

The shafts of the rollers 301 and 302 are provided with intermeshing gears 312 and 313 which are driven from the gear 314 on the shaft of the roller 299 through a gear 315 meshing with the gear 313. The applicator shaft is driven by a gear 316 driven from the gear 313 through a train of gears 317, and the transfer roller is driven from the gear 316 by means of a gear 318.

After the passage of the bottom flap from between the rollers 310 and 311 a swinging finger 319 moves upwardly to raise the flap so that it is in position to be engaged by a finger 320 operable above the path of travel of the blank to fold the bottom flap over the side flaps.

When the sealing flap of the envelope emerges from beneath the next pair of rollers 321 and 322 it is directed by a guide plate 323 upwardly, but at this time a tucking finger 324 swings into position to bend the closure flap on its crease line to tuck it under the roller 325 which engages against the roller 322.

The completed envelope is then dropped from the rollers 325 and 322 onto an inclined plate 326 to a stacking mechanism indicated at 327. This mechanism includes a wheel 328 having peripheral lugs 329 for engaging the rear edge of the folded blank and for carrying it into a substantially vertical position in the rear of oscillating fingers 330 which advance the blank in vertical position for engagement between the flights of a pair of gathering disks 331 that move the completed envelopes into stacked relation against an abutment plate (not shown), after which the

stacks of completed envelopes may be removed and boxed for shipment.

The fingers 320 and 321 are operated by pitmen 332 and 333 actuated by cams 334 and 335 on the shafts of the rollers 311 and 322, respectively. The rollers are rotated by gears 336 and 337 intermeshed with a gear 338 and actuated by an idle gear 339 meshing with the gear 317.

In operating a machine constructed and assembled as described, the blanks are placed in a stack on the plate 6 and adjusted in position by the posts 8. The various operating parts of the machine are then adjusted to perform the various operations on the blanks. Upon starting the machine the sucker arm 11 will engage the top flap of the undermost blank in the stack and draw it downwardly within reach of the rollers 40 and 17. The roller 40 will then engage the diverging side edges of the flap to feed the blank onto the straightening and aligning belt 45 in such a manner that the blanks are in overlapped formation, as shown diagrammatically in Fig. 4.

The blanks are then intermittently advanced by the belt to the faster, continuously revolving rollers 68 and 21, which increases the speed of the successive blanks and forwards them into engagement with the stop fingers 83 which are timed to swing into position to momentarily stop each blank until it is in timed relation with the cutters.

The blank will then be forwarded by the segment roller 93 through the rollers 96 and 23 to the first set of cutting rollers, where the end cuts *e* and *f* are formed in the blank, as illustrated in Fig. 4. The blank is then forwarded onto the next set of cutting rollers, where the longitudinal cuts *g* and *h* are made in the blank aligning with the terminals of the cuts *e* and *f*.

Prior to the operation of the cutting rollers, the blanks are shifted at an angle to the normal path of travel in order that the windows are formed in the proper place as previously described. Upon operation of the last cutter the vacuum nozzles, carried by the rollers 123 and 125, move into position to remove the cut section *i* from the blank and stack it on the support 27.

After passing the last cutting roller, the blank is again straightened relatively to the center line of the machine and is passed by the segment roller 130 into and through the gumming mechanism for applying gum about the window opening, as indicated at *j*, Fig. 4.

The rollers 146 and 33 then forward the blank between the vacuum roller 201 and the roller 203, where the transparent strip *k* is applied over the window opening and is pressed into sealing engagement with the adhesive *j*. The vacuum disk 205 then moves into position to assemble the blanks in overlapped formation between the belts 215 and 216, where adhesive is applied to the closure flap indicated at *l*, Fig. 4.

The blanks are then delivered to the drying belts 246, 247 and 248 to be carried back underneath the window-forming mechanism to the folding section of the machine. During their carriage by the belts they pass through the drying tunnel 270, where the adhesive on the closure flap and the window opening is dried.

After the blanks are delivered from the drying belts they are discharged onto the belt 275, where they are reassembled in overlapped formation, as shown in Fig. 4, for individual delivery into and through the flap-folding mechanism.

The blanks, on being discharged from the belt 275, are aligned and properly spaced by the fin-

gers 285 and 286 for travel between the rollers 288 and 289, where they are scored and delivered to the side flap closing members 300 to fold the side flaps over the body portion of the envelope, as shown in Fig. 4.

The blanks are then passed onto the next station where the adhesive is applied by the applicator 308 to the side flaps indicated at *m*, Fig. 4. The blank is then advanced to the flap-folding station where the arms 324 and 320 fold the bottom and closure flaps, respectively.

The folded blanks are then dropped down the inclined plate 326 to the stacking mechanism where they are stacked preparatory to boxing.

What we claim and desire to secure by Letters Patent is:

1. In a machine of the character described, means for supporting a stack of blanks, means associated with the supporting means for successively withdrawing blanks from the stack, forwarding means for moving the withdrawn blanks through a fixed path, rotary cutters cooperating with the forwarding means for forming a window opening in the blanks, means cooperating with the forwarding means for angularly shifting said withdrawn blanks relatively to their normal path of travel prior to formation of said window opening whereby the rotary cutters effect a shearing cut through the blanks, and means acting in synchronism with the forwarding means for applying a transparent strip to the blank over said window opening.

2. In a machine of the character described, means for successively forwarding blanks through a fixed path, rotary cutters cooperating with the forwarding means for forming a window opening in the blanks at the time they are being moved by said forwarding means, and means acting in cooperation with the forwarding means for angularly shifting the blanks through the cutters whereby the cutters produce a progressive shearing cut through the blanks.

3. In a machine of the character described, a train of forwarding rollers, means for supporting a stack of blanks at one end of said train, means for successively withdrawing blanks from the stack for deposit on said train, a rotary cutter cooperating with a selected forwarding roller for forming spaced arcuate cuts in the blanks, a second rotary cutter cooperating with another of said forwarding rollers for forming cuts in the blanks connecting the first named cuts to complete a window opening in the blanks at the time they are being forwarded by said train of rollers, and means cooperating with the forwarding means to time the blanks for delivery to said cutters.

4. In a machine of the character described, a train of forwarding rollers, means for supporting a stack of blanks at one end of said train, means for successively withdrawing blanks from the stack for deposit on said train, rotary cutters cooperating with selected rollers for forming a window opening in the blanks at the time they are being forwarded by said train of rollers, and means for diverting the blanks to effect shearing cuts by said cutters.

5. In a machine of the character described, a train of forwarding rollers, means for supporting a stack of blanks at one end of said train, means for successively withdrawing blanks from the stack for deposit on said train, a pair of knives cooperating with a selected roller for forming cuts in the blanks, a second pair of knives cooperating with the first pair of knives to complete a window

opening in the blanks at the time they are being forwarded by said train of rollers, and means acting in cooperation with said cutters for removing the sections cut from the blanks.

5 6. In a machine of the character described, a train of forwarding rollers, means for supporting a stack of blanks at one end of said train, means for successively withdrawing the blanks from the stack to be forwarded by said train of rollers, a roller cooperating with one of said rollers and having spaced cutters for forming spaced cuts in said blanks, a second roller having longitudinally spaced cutters cooperating with another of said rollers for forming longitudinal cuts in the blanks extending between said first named cuts, means 10 for removing the portion of the blank within said cuts, and means acting in synchronism with the train of rollers for applying a transparent strip over said opening.

20 7. In a machine of the character described, a train of forwarding rollers, means for supporting a stack of blanks at one end of said train, means for successively withdrawing the blanks from the stack to be forwarded by said train of rollers, a roller cooperating with one of said rollers and having spaced cutters for forming arcuate cuts in said blanks, a second roller having longitudinally spaced cutters cooperating with another of said rollers for forming longitudinal cuts in the blanks extending between said arcuate cuts, means for removing the portion of the blank within said cuts, means for applying an adhesive to the blanks for attaching a transparent strip, and means acting in synchronism with the train of rollers for applying said strip over said adhesive.

8. In a machine of the character described, means for supporting a stack of blanks, having sealing flaps, means associated with the supporting means for successively withdrawing blanks from the stack, forwarding means for moving the withdrawn blanks through a fixed path, means cooperating with the forwarding means for forming a window opening in the blanks at the time they are being moved by said forwarding means, means for gluing a strip over said opening, means for applying adhesive to said flaps, means for simultaneously drying said strips and flaps, and means for folding the flaps.

50 9. In a machine of the character described, means for supporting a stack of envelope blanks, means associated with said supporting means for successively withdrawing blanks from the stack, forwarding means for moving the withdrawn blanks through a fixed path, rotary means cooperating with the forwarding means for forming a window opening in the blanks at the time they are being moved by said forwarding means, means acting in synchronism with the forwarding means for applying a transparent strip to the blank over said window opening, means for drying the blanks, and means for folding the blanks to form envelopes.

65 10. In a machine of the character described, means for supporting a stack of blanks, means associated with the support for successively withdrawing blanks from the stack, forwarding means for moving the withdrawn blanks through a fixed path, means for aligning and straightening said blanks on the forwarding means, rotary cutter means cooperating with the forwarding means for forming a window opening in the blanks at the time they are being moved by said forwarding means, means acting in synchronism with the forwarding means for applying adhesive to the blank

about said opening, rotary means cooperating with the forwarding means for applying a transparent strip over said window opening, means for gumming closure flaps of the blanks, and means for simultaneously drying the closure flaps and the adhesive applied to the window opening.

11. In a machine of the character described, forwarding means for moving blanks through a fixed path, rotary cutter means cooperating with the forwarding means for forming a window opening in the blanks at the time they are being moved by said forwarding means, means acting in synchronism with the forwarding means for applying adhesive to the blank about said opening, rotary means cooperating with the forwarding means for applying a transparent strip over said window opening, means for gumming closure flaps of the blanks, and means for simultaneously drying the closure flaps and the adhesive applied to the window opening.

12. In a machine of the character described, a train of forwarding rollers, means for successively delivering blanks to be forwarded by said train of rollers, a window-forming roller cooperating with one of said rollers and having spaced cutters arranged at offset points on the periphery of said window-forming roller for forming arcuate cuts in said blanks, a second roller having longitudinally spaced cutters arranged at an angle to the axis of said second roller and cooperating with another of said rollers for forming longitudinal cuts in the blanks extending between said arcuate cuts, and means for diverting the blanks to position them relatively to said cutters to form said cuts in selected location on the blanks.

13. In a machine of the character described, forwarding means for moving blanks in successive order through a fixed path, cutters cooperating with the forwarding means for forming a window opening in the blanks at the time they are being moved by said forwarding means, and means acting in cooperation with the forwarding means for shifting the blanks for angular travel through the cutter whereby the cutters produce a progressive shearing cut through the blanks.

14. In a machine of the character described, a train of forwarding rollers for moving blanks through a fixed path, a rotary cutter member cooperating with a selected forwarding roller for forming spaced cuts in the blanks, a second rotary cutter member cooperating with another of said forwarding rollers for forming cuts in the blanks connecting the first named cuts to complete a window opening in the blanks at the time they are being moved by said forwarding rollers, and means cooperating with the forwarding rollers to time the blanks for delivery to the cutter members.

15. In a machine of the character described, a train of forwarding rollers for moving blanks through a fixed path, means cooperating with a selected roller for forming cuts in the blanks, a second means cooperating with another of said rollers to connect said cuts to form a definitely shaped opening in the blanks at the time they are being moved by said forwarding rollers, and means cooperating with said forwarding rollers to time the blanks for delivery to said cutting means.

16. In a machine of the character described, the combination of forwarding means for moving blanks through a fixed path, means cooperating with the forwarding means for forming a window opening in the blanks at the time the blanks are being moved thereby, means subsequent to the window forming means and acting in synchro-

nism with the forwarding means for applying adhesive to edges of the window opening, means for applying a transparent strip to the adhesive to cover the window opening, means for gumming closure flaps on the blanks, means for simultaneously drying the closure flaps and the adhesive securing the transparent strip while the blanks are in flat condition, and means acting in synchronism with the forwarding means for folding the flaps after the adhesive is dried.

17. In a machine of the character described, forwarding means for moving blanks successively through a fixed path, a pair of window forming rollers, means for supporting said rollers in the path of the blanks, spaced knives arranged on one of said rollers at offset points on the periphery thereof for forming cuts in the blanks, spaced parallel knives on the other roller arranged at an angle to the axis of the roller for forming parallel cuts in the blanks, and means for diverting the blanks to position them relatively to said knives to form said cuts in selected location on the blanks.

18. In a machine of the character described, forwarding means for moving blanks through a fixed path, knives supported in the path of the blanks at an angle to the normal travel of the blanks, and means cooperating with the forwarding means to shift said blanks whereby the cut made by said knives is at right angles to the normal direction of travel of the blanks.

19. A machine of the character described, a train of forwarding rollers for moving blanks through a fixed path, a pair of laterally spaced rotating knives supported above the path of the blanks for forming cuts in the blanks extending in the direction of travel of the blanks, a second pair of rotating knives, and means for supporting the second pair of rotating knives in advance of

and intermediate planes extending through said first knives for forming cuts in the blanks extending at right angles to the travel of the blanks and interconnecting the first named cuts to produce window openings in the blanks.

20. In a machine of the character described, the combination of means for moving blanks in successive order through a fixed path, means cooperating with the forwarding means for forming a window opening in the blanks at the time they are being moved by said forwarding means, means subsequent to said window opening forming means for forwarding a transparent strip in timed relation with the forwarding means, means for cutting a section from said strip, means for applying adhesive to the blank about said window opening, rotary means cooperating with the forwarding means for applying said section to the blank over said window opening for attachment by the adhesive, means for drying the adhesive, and means acting in synchronism with the forwarding means for folding the blanks after the adhesive has been acted upon by the drying means.

21. In an envelope forming machine, means for moving envelope blanks through a fixed path, a cutter cooperating with said forwarding means for forming spaced cuts in the blanks, a subsequent cutter member cooperating with the forwarding means for forming cuts in the blanks interconnecting the first named cuts to complete a window in the blanks at the time they are being moved by said forwarding means, and means cooperating with said blank moving means to time the blanks for delivery to said cutters.

ALFRED WINKLER.
MAX DÜNNEBIER.