

Aug. 10, 1937.

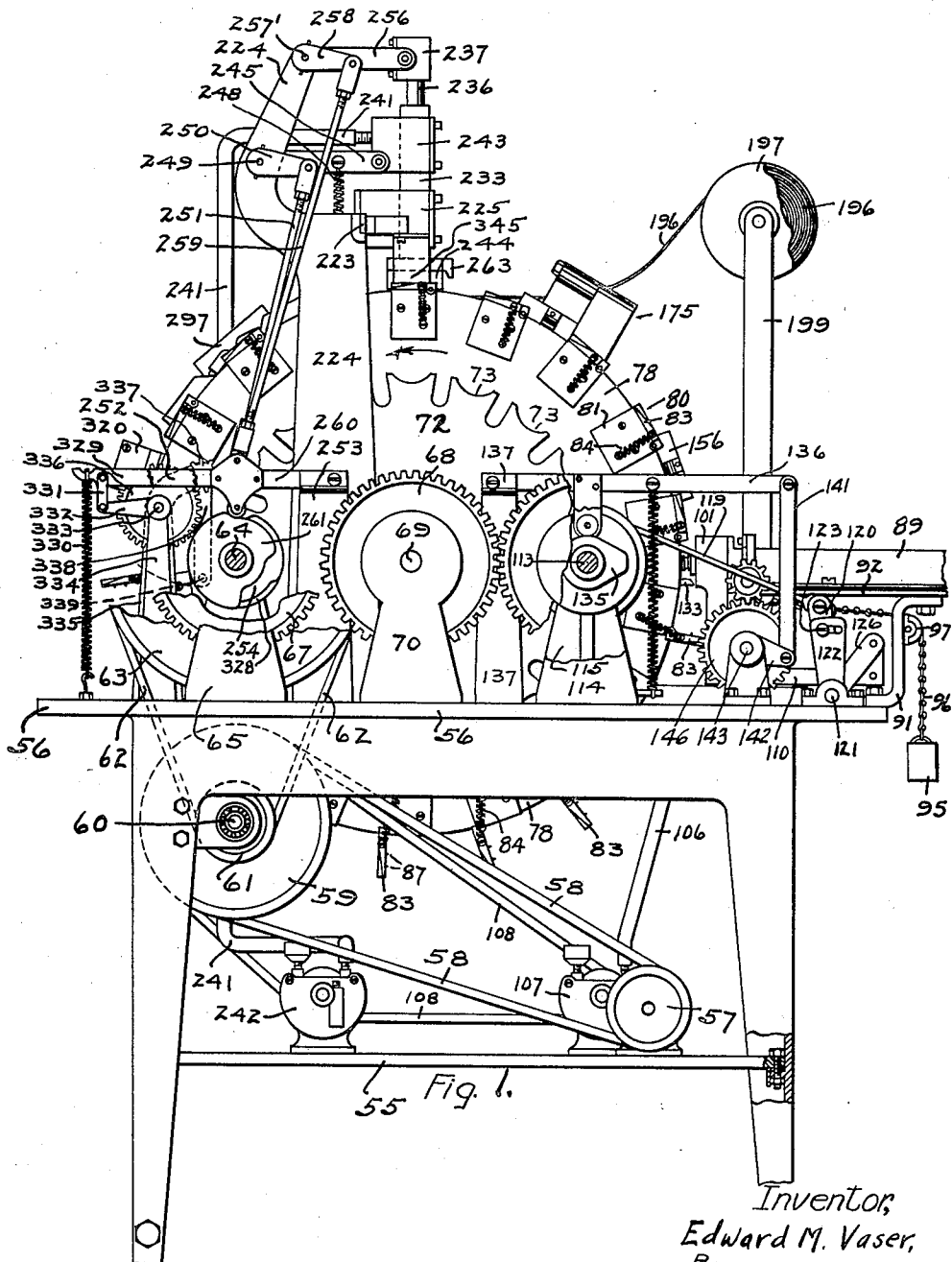
E. M. VASER

2,089,513

FOLDING AND WRAPPING MACHINE

Filed July 26, 1935

11 Sheets-Sheet 1



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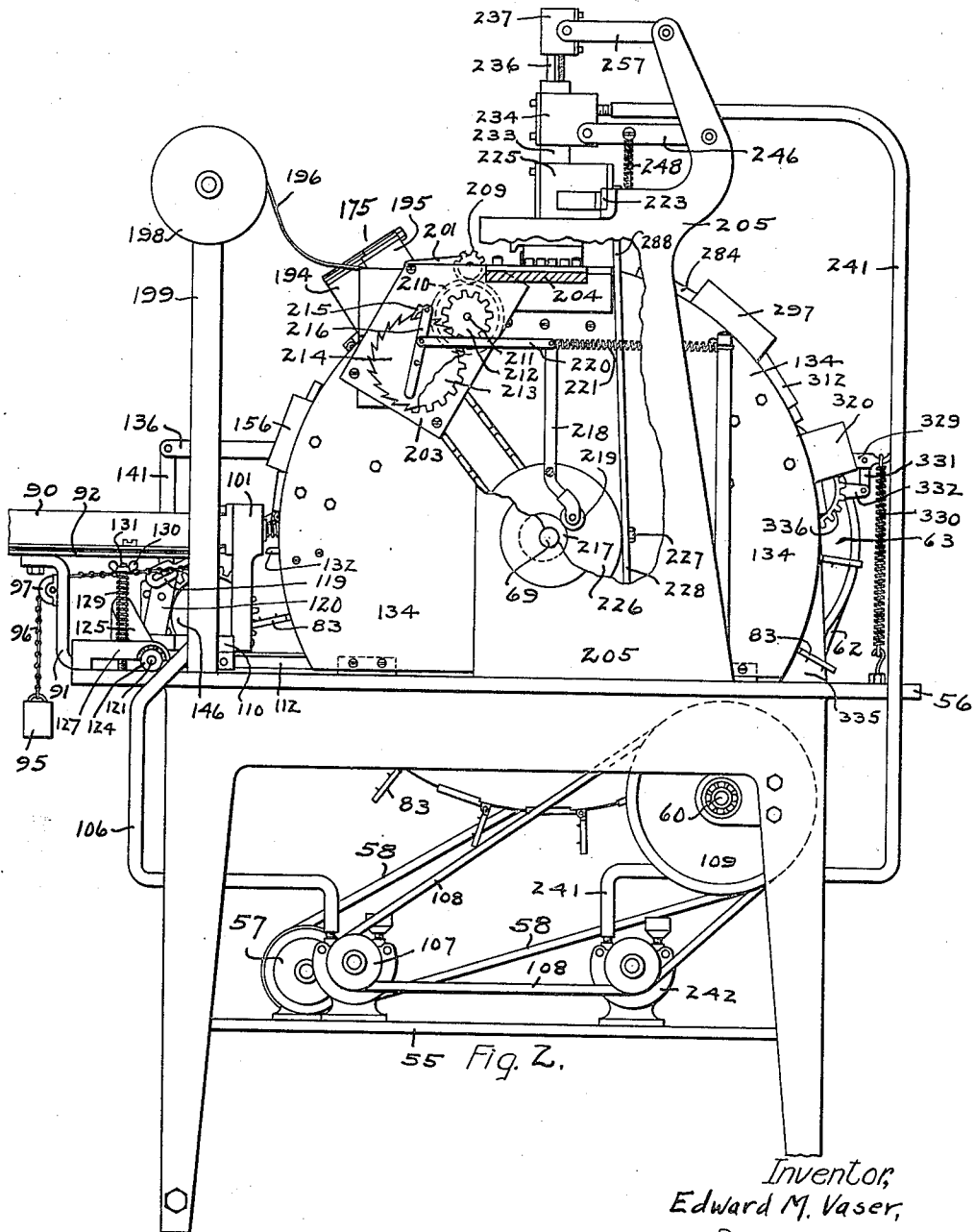
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11 Sheets-Sheet 2



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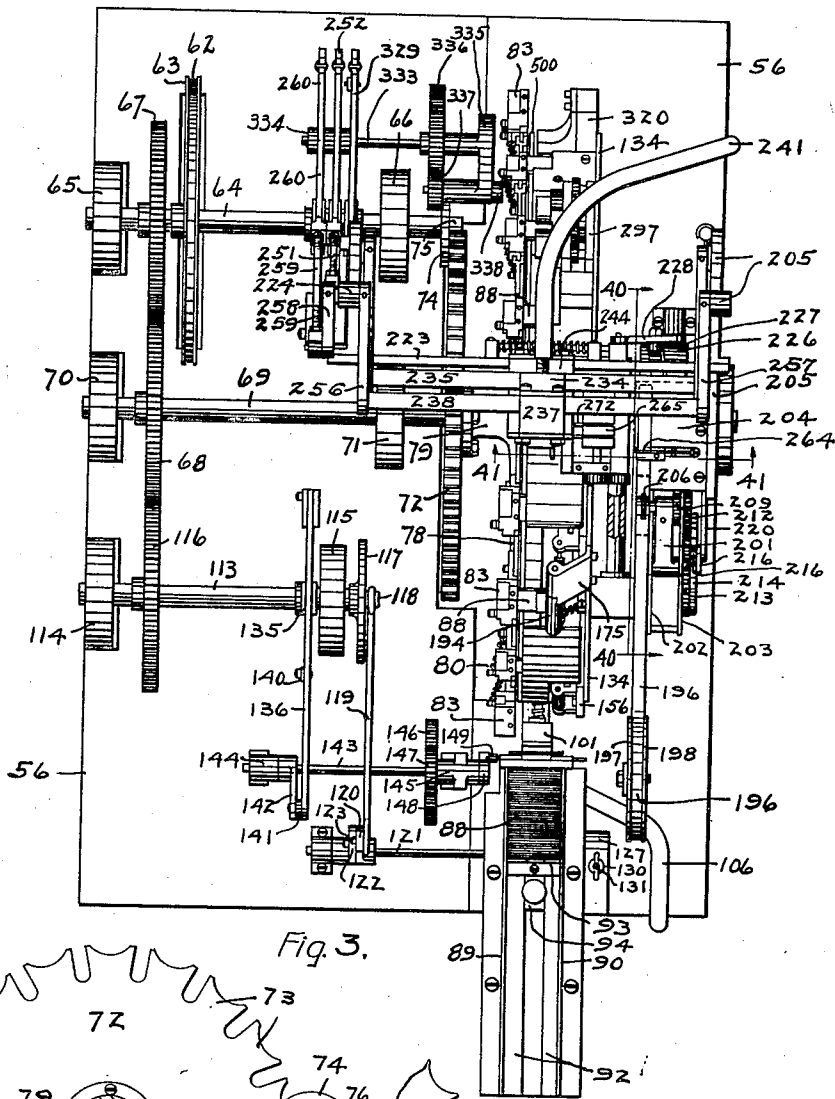


Fig. 3.

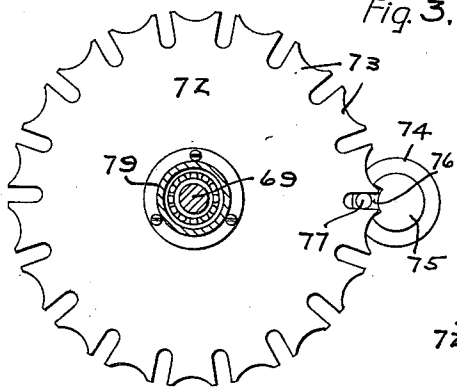


Fig. 4.

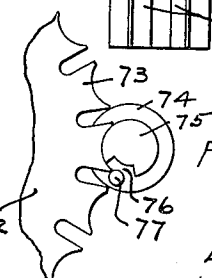


Fig. 5.

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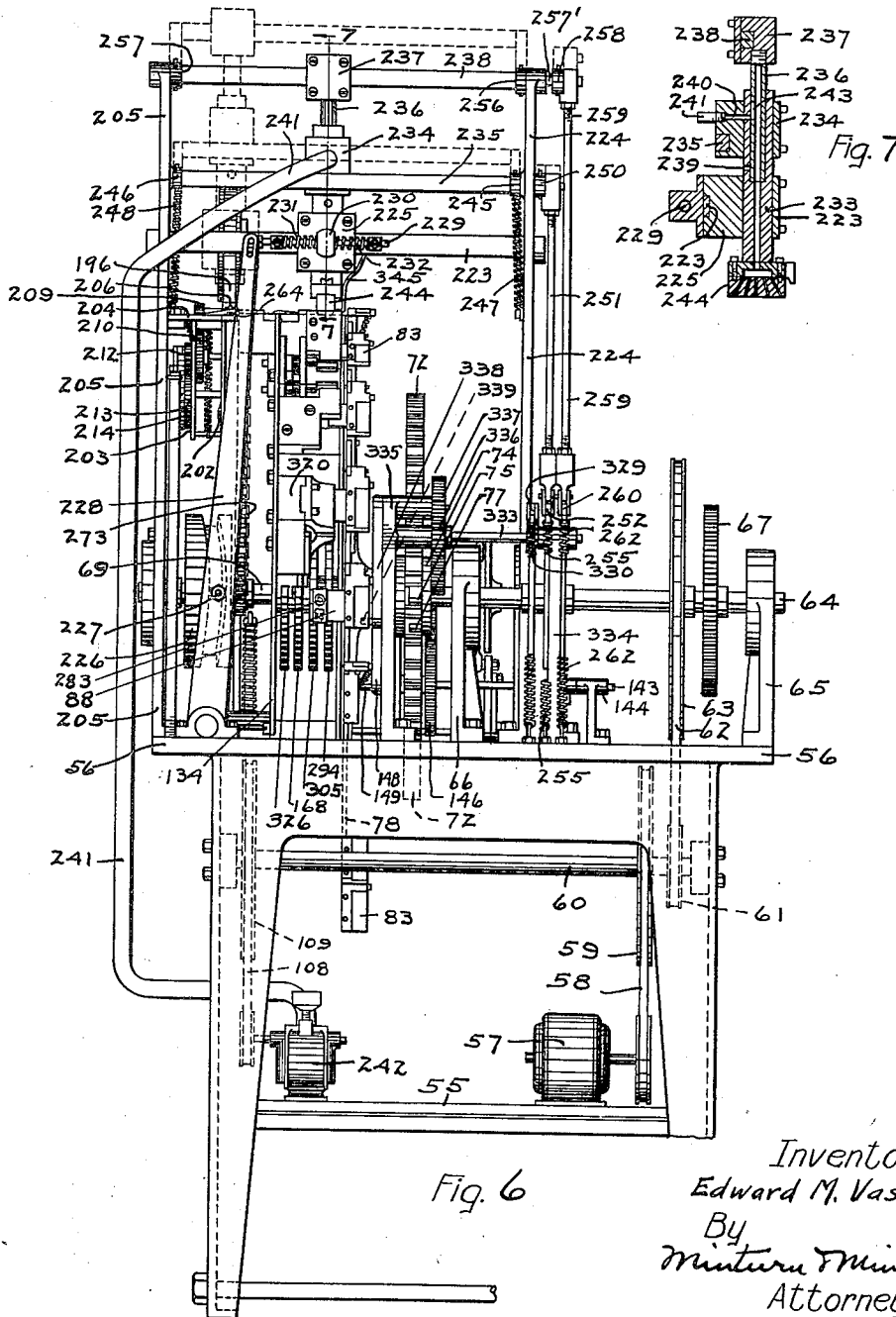
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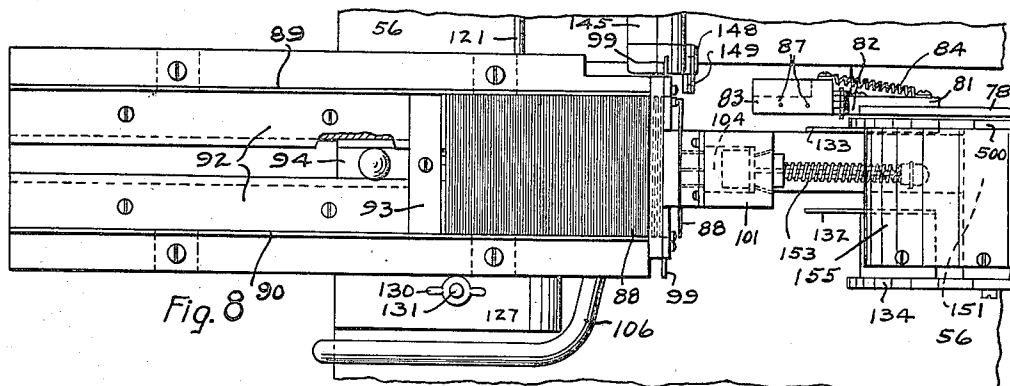


Fig. 8

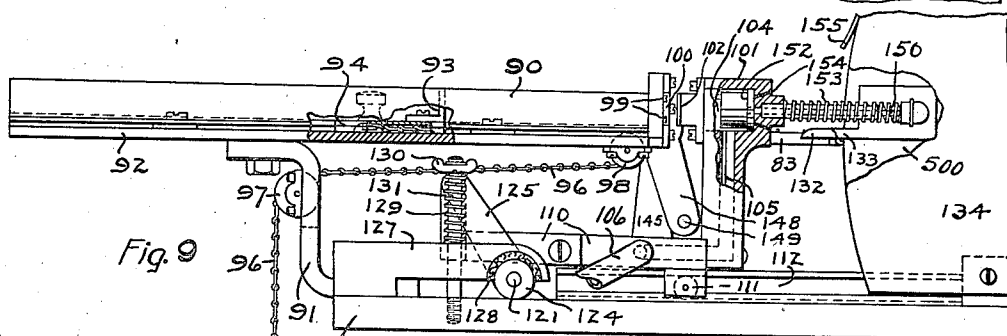


Fig. 9

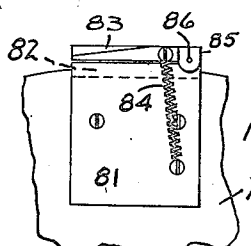


Fig. 13

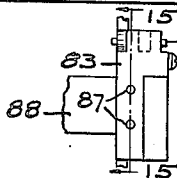


Fig. 14

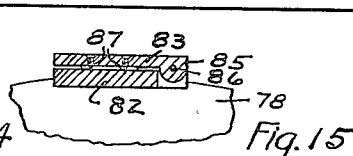


Fig. 15

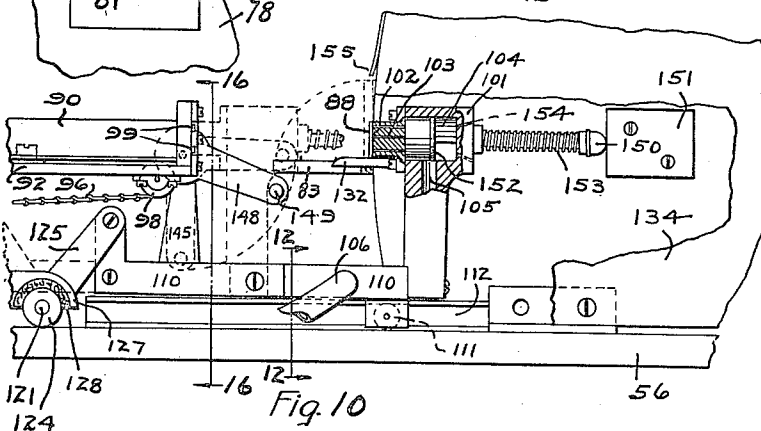


Fig. 10

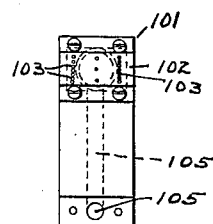


Fig. 11

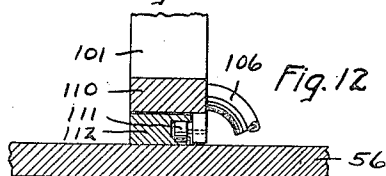


Fig. 12

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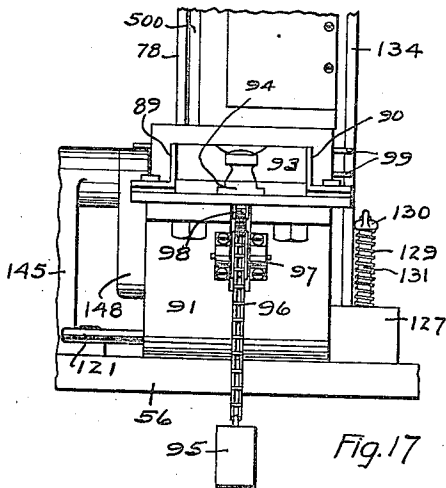


Fig. 17

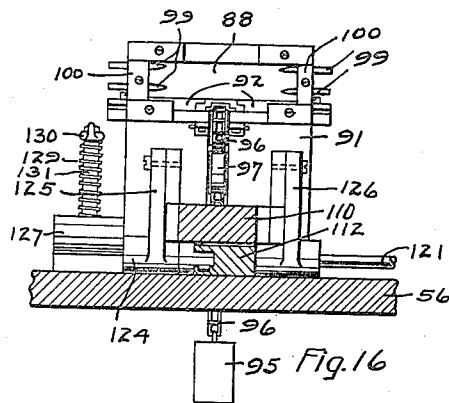


Fig. 16

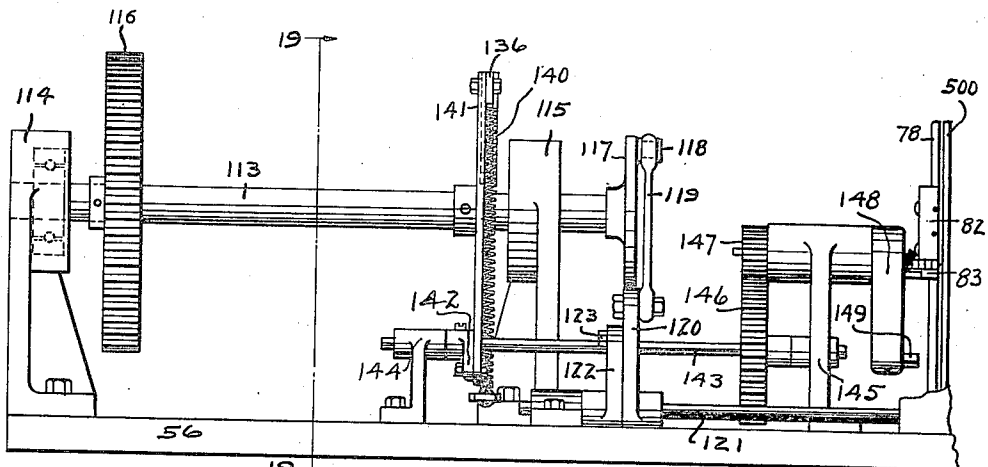


Fig. 18

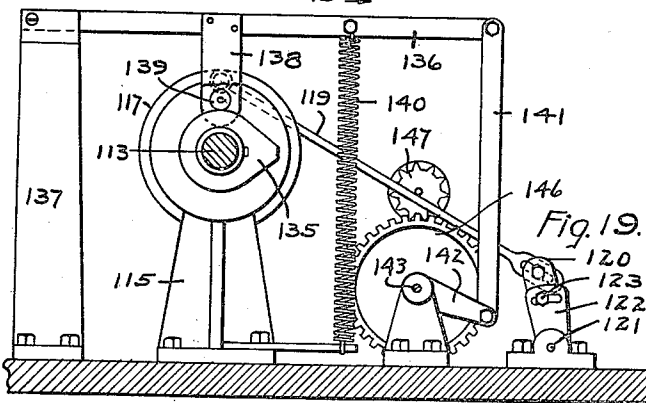


Fig. 19.

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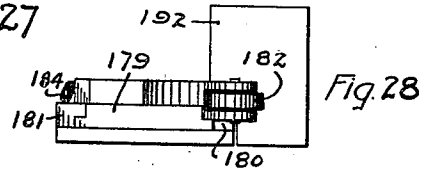
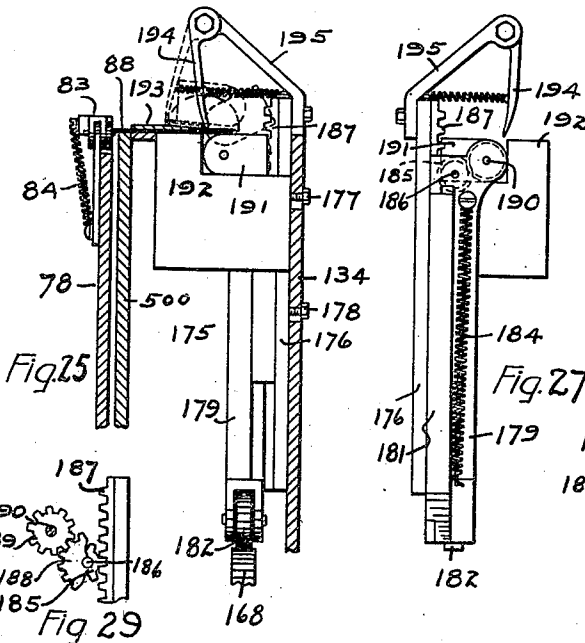
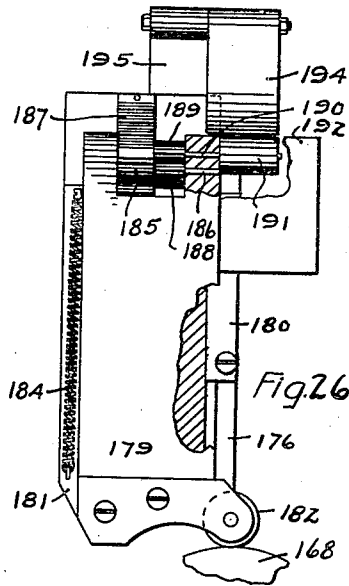
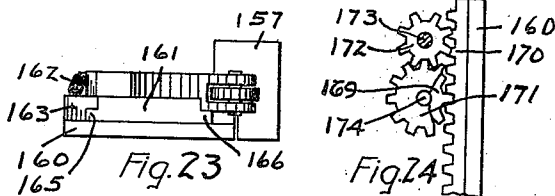
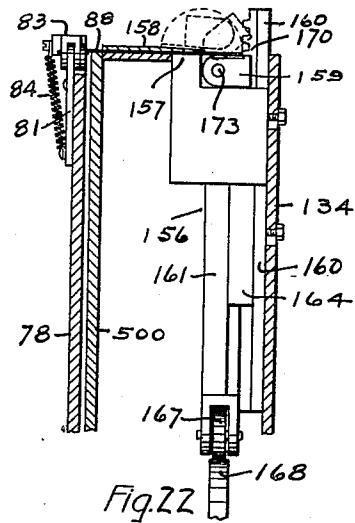
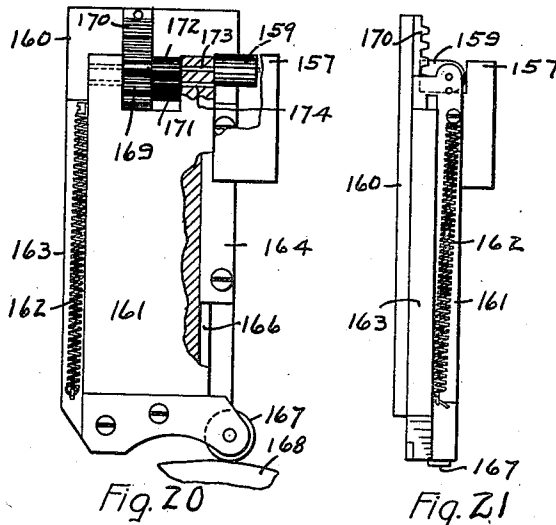
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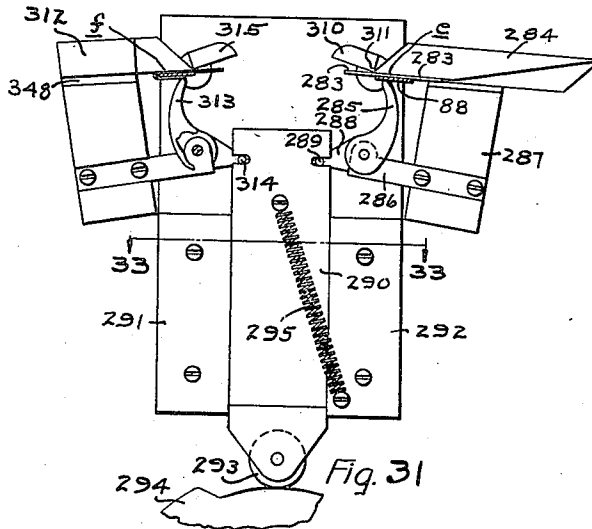


Fig. 31

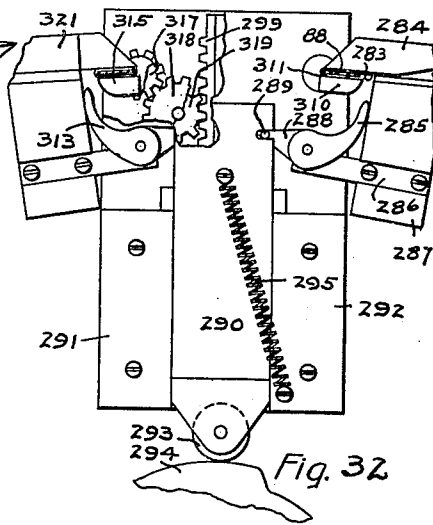


Fig. 32

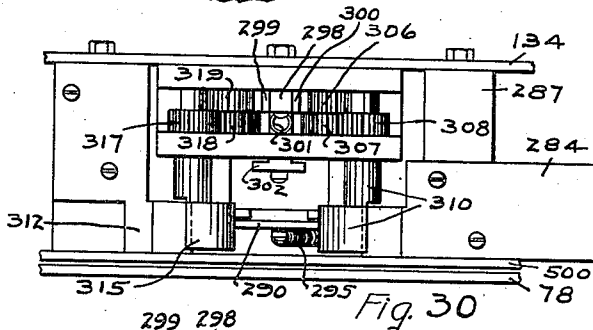


Fig. 30

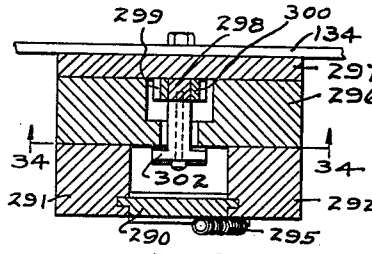


Fig. 33

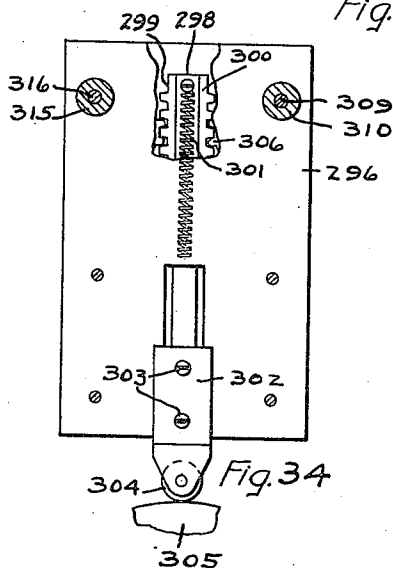


Fig. 34

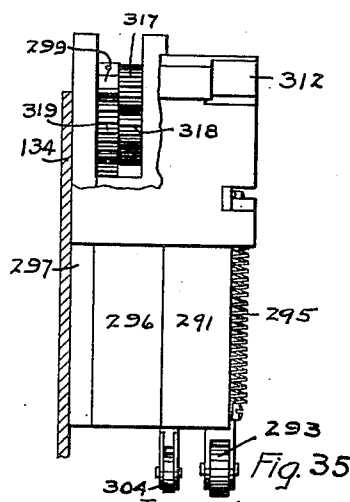


Fig. 35

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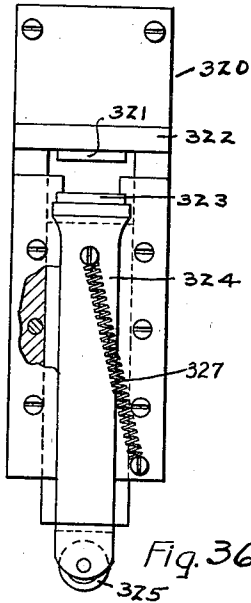


Fig. 36

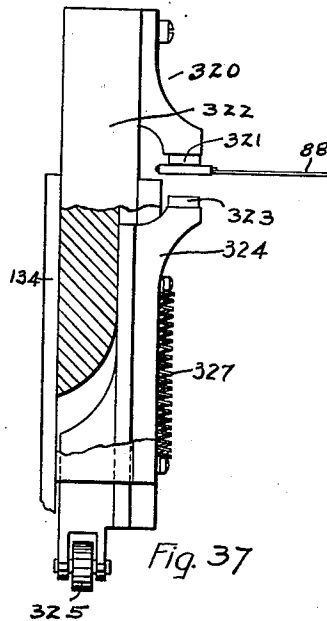


Fig. 37

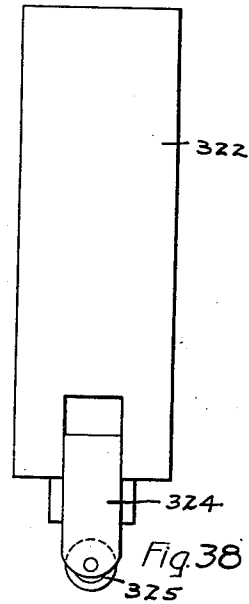


Fig. 38

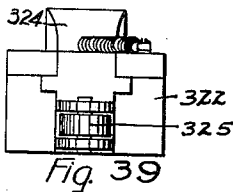


Fig. 39

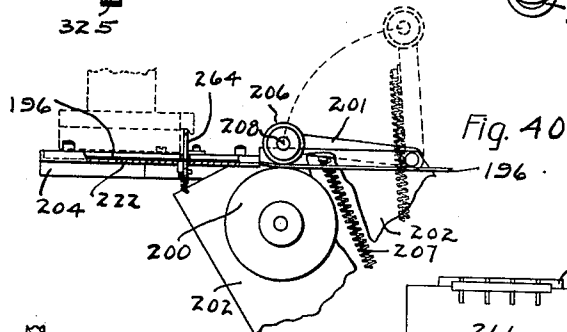


Fig. 40

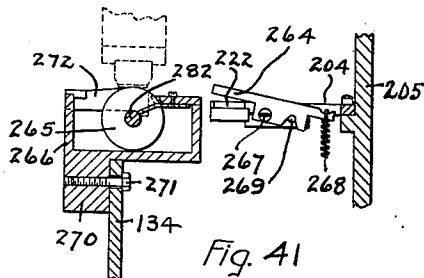


Fig. 41

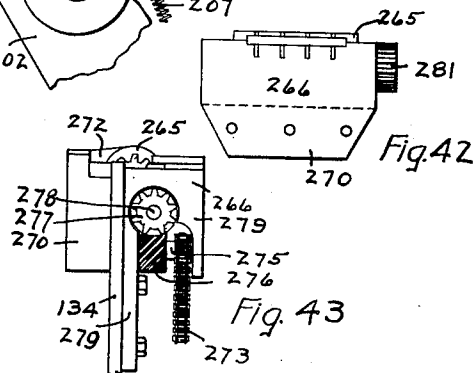


Fig. 42

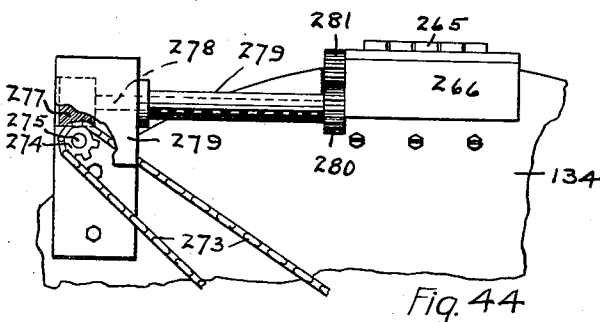


Fig. 44

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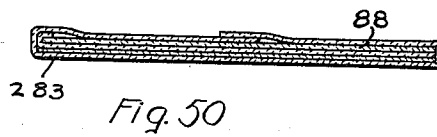
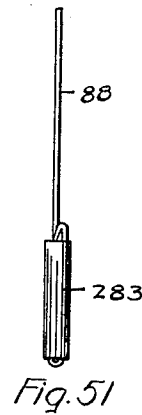
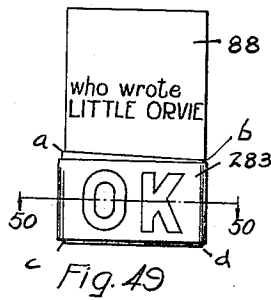
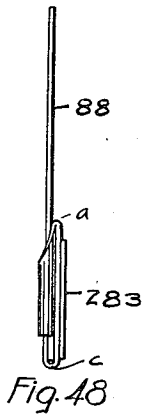
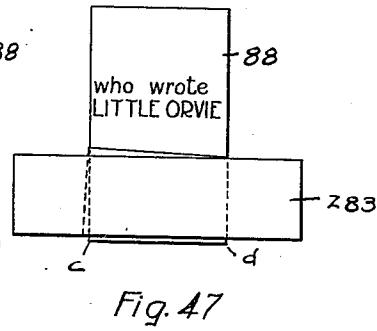
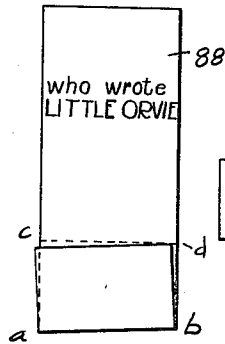
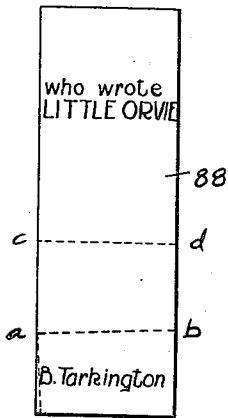
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FOLDING AND WRAPPING MACHINE

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11 Sheets-Sheet 10



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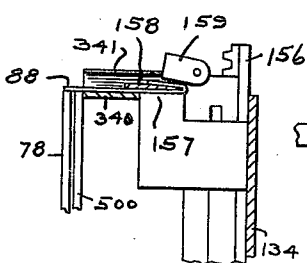
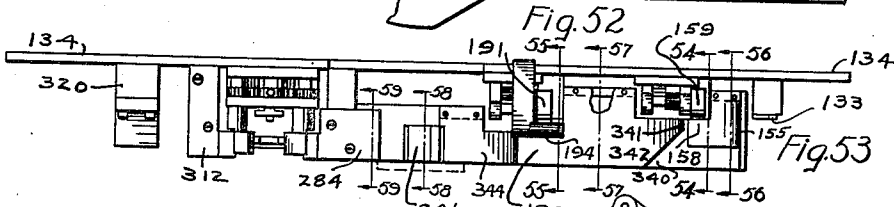
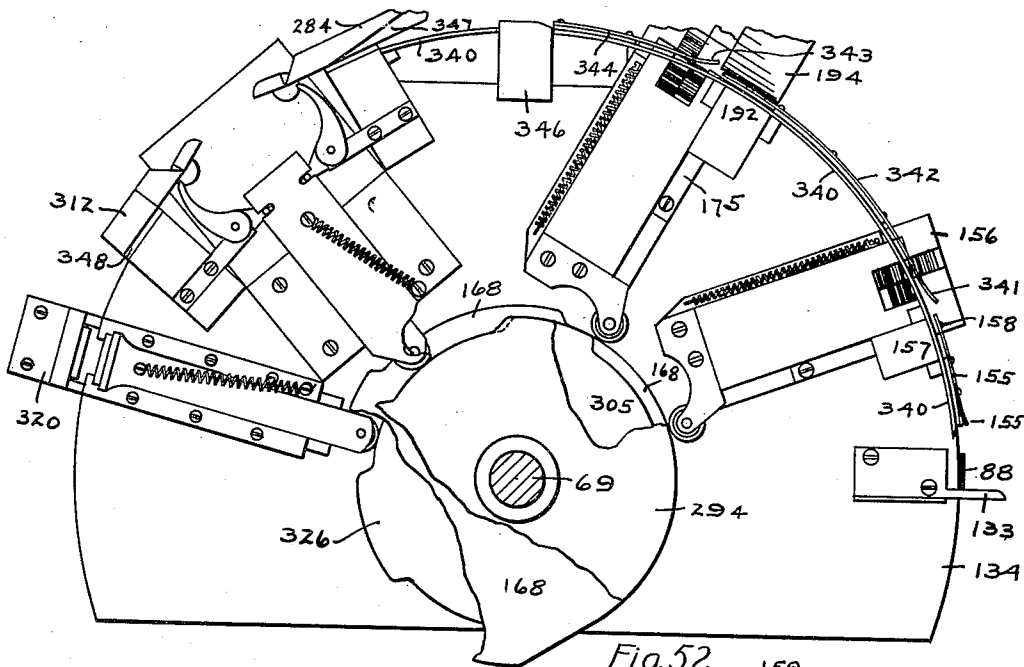


Fig. 54

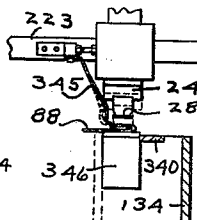


Fig. 58

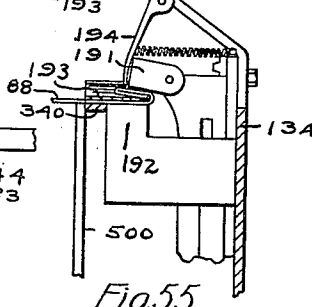


Fig. 55

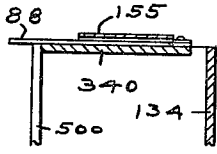


Fig. 56

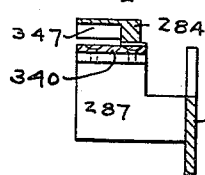


Fig. 59

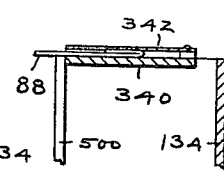


Fig. 57

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UNITED STATES PATENT OFFICE

2,089,513

FOLDING AND WRAPPING MACHINE

Edward M. Vaser, Indianapolis, Ind., assignor to
Emil K. Rahke, Indianapolis, Ind.

Application July 26, 1935, Serial No. 33,295

20 Claims. (Cl. 270—23)

This invention relates to the art of folding and wrapping paper articles. A primary object of the invention is to provide a mechanical combination which will perform one or more folding operations from an initial blank flat piece of paper in such a manner that the folds will be definitely and uniformly located in all of the folded papers and furthermore to have those folds creased down tightly so as to prevent bowing of the paper between adjacent folds.

A further primary object of the invention is to provide a mechanical device which will apply a wrapper to the folded articles in such manner that the wrapper will always be properly aligned on each article and will draw the folds thereof down snugly.

A still further primary object of the invention is to provide blank receiving means which will initially accept the blanks and retain the blanks throughout all of the various folding and wrapping operations. A still further primary object of the invention is to provide such blank holding means in a manner that will carry the blank from one station to another as the various operations are performed on the blank, all without disturbing the alignment of the blank so as to preserve accuracy in those various operations.

These and many other objects and advantages of the invention, such as reside in the particular folding mechanisms, the unique and novel combinations for accomplishing the above indicated objects, and the like, will become apparent to those versed in the art from the following description of one particular form of the invention as illustrated in the accompanying drawings, in which

Fig. 1 is a left hand side elevation of a machine embodying my invention;

Fig. 2, a right hand side elevation;

Fig. 3, a top plan view;

Fig. 4, a detail in longitudinal vertical section of an intermittent drive;

Fig. 5, a fragment of the intermittent drive in a shifted position;

Fig. 6, a front or discharge end of the machine;

Fig. 7, a detail in longitudinal vertical section on the line 7—7 in Fig. 6;

Fig. 8, a detail on an enlarged scale of the blank feeding means;

Fig. 9, a detail in side elevation of the blank feeding means;

Fig. 10, a similar detail in side elevation with the mechanism shifted to the end of its feeding motion;

Fig. 11, a rear elevation of the blank feeding head;

Fig. 12, a detail in vertical section on the line 12—12 in Fig. 10;

Fig. 13, a left hand side elevation of a blank retainer;

Fig. 14, a top plan view of the retainer;

Fig. 15, a vertical longitudinal section on the line 15—15 in Fig. 14;

Fig. 16, a detail in vertical transverse section on the line 16—16 in Fig. 10;

Fig. 17, a detail in rear end elevation of the blank carrier;

Fig. 18, a detail in rear elevation of the blank feeding drive mechanism;

Fig. 19, a vertical longitudinal section on the line 19—19 in Fig. 18;

Fig. 20, a detail in left hand side elevation of the first folding mechanism;

Fig. 21, a detail in front elevation of the first folding mechanism;

Fig. 22, a detail in rear elevation showing the first folder in operated positions in reference to adjacent members;

Fig. 23, a bottom plan view of that folder;

Fig. 24, a detail on an enlarged scale of the gear actuating mechanism in that folder;

Fig. 25, a detail in rear elevation of a second folding mechanism;

Fig. 26, a left hand side elevation of that second folding mechanism;

Fig. 27, a front elevation of the same mechanism;

Fig. 28, a bottom plan view of the same mechanism;

Fig. 29, a detail of the gear actuating mechanism in the second folder;

Fig. 30, a detail in top plan view of the wrapper folding mechanism;

Fig. 31, a left hand side elevation of the wrapper folding mechanism in an inoperative position;

Fig. 32, a similar elevation showing the mechanism in an operated position;

Fig. 33, a transverse section on the line 33—33 in Fig. 31;

Fig. 34, a vertical section on the line 34—34 in Fig. 33;

Fig. 35, a front elevation of the wrapper folding mechanism;

Fig. 36, a left hand side elevation of an embossing mechanism;

Fig. 37, a front elevation of the embosser;

Fig. 38, a right hand elevation of the embosser;

Fig. 39, a bottom plan view;

Fig. 40, a detail of the wrapper feed and cut-off mechanism in section on the line 40—40 in Fig. 3;

Fig. 41, a transverse section on the line 41—41 in Fig. 3;

Fig. 42, a left hand elevation of the wrapper glue pot;

Fig. 43, a detail in rear elevation of the glue pot driving mechanism;

Fig. 44, a detail in side elevation of the glue pot driving mechanism;

Fig. 45, a top plan view of a blank article before folding;

Fig. 46, a top plan view of the article having the initial fold;

Fig. 47, a top plan view of the article having the second fold;

Fig. 48, a side elevation of the article after the second fold;

Fig. 49, a top plan view of the article with the wrapper applied;

Fig. 50, a section on the line 6—6 in Fig. 45 on an enlarged scale;

Fig. 51, a side elevation of the folded article with the wrapper applied in the finished form;

Fig. 52, a detail in left hand side elevation of the various folding and embossing mechanisms in their operating positions;

Fig. 53, a development in top plan view of the mechanisms in the line of travel of the blank;

Fig. 54, a transverse section on the line 54—54 in Fig. 53;

Fig. 55, a transverse section on the line 55—55 in Fig. 53;

Fig. 56, a transverse section on the line 56—56 in Fig. 53;

Fig. 57, a transverse section on the line 57—57 in Fig. 53;

Fig. 58, a transverse section on the line 58—58 in Fig. 53, and

Fig. 59, a transverse section on the line 59—59 in Fig. 53.

Like characters of reference indicate like parts throughout the several views in the drawings.

I provide a shelf 55, Figs. 1 and 2, between the legs of a table 56 and mount thereon a driving motor 57, which, through a suitable belt 58, drives a pulley 59 fixed to the shaft 60 carried transversely across under the table top 56. A smaller pulley 61 is fixed to the shaft 60 and drives a belt 62 which passes up through an opening in the table top to drive the larger pulley 63 which is fixed to the transverse main drive shaft 64 revolvably carried by the brackets 65 and 66.

Between the pulley 63 and the bracket 65, I fix a spur gear 67 on the shaft 64 to mesh with a spur gear 68 fixed to the central shaft 69 which is revolvably carried by the brackets 70 and 71. Revolvably mounted on the shaft 69 is a disk 72 having a plurality of teeth, here shown as 18 in number. Each tooth 73, Figs. 4 and 5, is separated from its adjacent tooth by a radial slot, and each tooth is further provided with an arcuate periphery.

On the right hand end of the shaft 64 is fixed a disk 74 which has a cylindrical portion 75 in the path of the teeth 73 of the proper diameter to fit into the arcuate portion of each tooth upon suitable turning of both disks 72 and 74, as indicated in Fig. 5. On one side of the cylindrical portion 75, I cut away a portion to leave an arcuate slot 76. On a radial center line of this slot and extended beyond the circumferential line of the cylindrical portion 75 I fix a pin 77 of the proper diameter to permit it to slidably enter

into the slots between the teeth 73. The two disks 72 and 74 together with the cylindrical portion 75 and the post 77 form a Geneva stop. In operation, turning of the shaft 64, will cause the pin or post 77 to turn the disk 72 until the pin 77 leaves the slot, Fig. 5. The disk 72 will turn no further on account of the fact that the cylindrical portion 75 of the disk 74 has turned around into the arcuate outer face of the adjacent tooth 73 to prevent further travel of the disk 72, although the disk 74 continues to revolve as the shaft 64 turns. The next movement of the disk 72 will occur when the pin 77 comes on around in a counter-clockwise direction, Fig. 5, and enters into the next above slot in the disk 72.

The disk 72 has a plate 78 fixed thereto by means of a hub 79, Figs. 3 and 4. The table top 56 is cut away to permit the disk 72 and the attached plate 78 to extend therethrough.

Spaced around the periphery of the plate 78 are a plurality of blank carriers generally designated by the numeral 80, there being preferably the same number of carriers as there are teeth 73 in the disk 72. Referring to Figs. 13—15, each carrier comprises a plate 81 fixed to the plate 78 and has an anvil 82 extending over the peripheral edge of the plate 78. Hinged to the plate 81 is a finger 83, the free or open end of the finger 83 being turned in that direction toward which the plate 78 revolves. A spring 84 is fixed by one end to the finger 83 and by the other end to the plate 81 to normally retain the finger 83 in a closed position against the anvil 82. When the finger 83 is lifted to its open position, the heel 85 thereof strikes the peripheral edge of the plate 78 so as to swing the longitudinal axis of the spring 84 around slightly to the rear of the axis of the hinge pin 86, thereby permitting the spring 84 to hold the finger 83 in that open position. Each of these fingers 83 is provided with a plurality of needles 87, here shown as two in number, to extend from the under face of the finger and enter holes in the anvil 82.

The article to be worked upon in one particular instance comprises a rectangular piece of paper 88, Fig. 45. A supply of these blanks 88 is carried between two horizontally disposed, vertically extending guides 89 and 90 carried by the bracket 91 above the rear end of the table 56. A longitudinally slotted floor 92 provides the lower rest for the blanks 88. The blanks are aligned crossways over the floor 92 between the side guides to have each blank resting on its edge and maintained in vertical alignment one against the other. This alignment is preserved by means of a follower 93 which has a foot 94 fitted in the slot of the floor 92. A weight 95 by means of a cable or chain 96 passing up over a pulley 97 carried by the bracket 91 and thence forwardly around a pulley 98 and rearwardly back to and attached to the follower 94, serves to keep the follower 93 in compressive contact against the blanks 88.

The blanks 88 are prevented from sliding out the forward end of the trough formed between the guides 89 and 90 by means of a plurality of pins 99, Fig. 16, extending inwardly into the path of the blanks. In the form herein shown, two pins 99 extend inwardly from each of the guides 89 and 90 so that the ends of the blanks strike these pins and are not forced forwardly thereof by the pressure of the follower 93 therebehind. These pins 99 are adjustably carried by the retaining lugs 100 so that the pins may be posi-

tioned to extend by any desired length over the forward blank 83.

As above indicated, the plate 78 is intermittently moved through the Geneva stop mechanism by the motor 57 and the plate 78 revolves in a counter-clockwise direction as viewed from the left hand side, Fig. 1, or in that direction wherein the blank carriers 80 are moved from the rear of the machine and around over toward the front. The normal positions of each of the fingers 82 as they come from under the table top 56 up therethrough to appear thereabove at the rear of the plate 78 are indicated, Fig. 1, below the table top 56 wherein those fingers are lifted from their anvils to extend substantially radially from the periphery of the plate 78. In other words, the fingers are in what is termed the open positions.

The mechanism is so arranged that in each successive stopped position of the plate 78, one of these fingers 83 will be positioned substantially horizontally on the rear side of the plate 78 as indicated in Figs. 8-10.

Now in order to carry a paper blank 88 from the supply and over against the anvil 82 to be subsequently gripped thereagainst by the finger 83, I provide a head, generally designated by the numeral 101. This head has a vertically disposed face 102 with a plurality of perforations 103 therethrough, here shown as being a series of holes in vertical rows toward each end of the face with a few holes in the center thereof. This face is arranged to be of that size which will bear against the foremost blank 88 between the pins 99 when the head is carried thereagainst. These holes 103 extend through from the face into the head into a chamber 104 therein which is normally substantially evacuated through a passage 105 leading therefrom down into the base of the head. A hose 106 connects with the base to communicate with that passage 105 and is carried on down to a vacuum pump 107 which is driven by the belt 108 from the pulley 109 fixed to the shaft 60.

The head 101 is supported through a base 110 which in turn is carried by a roller 111 which runs in a slotted guide 112 thereby not only supporting the head but also guiding it and limiting it to reciprocating travel longitudinally of the table 56.

In order to reciprocate the head 101, I provide a mechanism which will now be described. A shaft 113 is mounted transversely of and above the table 56 to be carried by bearings in the brackets 114 and 115, Fig. 18. The shaft is driven by the gear 116 which meshes with the gear 63, Fig. 1, Fig. 3. On the inner end of the shaft 113 is fixed a disk 117 to have a pin 118 extending inwardly therefrom near its outer edge. A connecting rod 119 is pivotally connected to the pin 118 by one end and is carried rearwardly to have its rear end connected pivotally to a lever 120 which is rockably mounted on a transverse shaft 121. Another lever 122 is fixed rigidly on the shaft 121 to extend upwardly alongside the lever 120 and is provided with an arcuate slot in its upper end through which a screw 123 slidably passes to screwthreadedly engage the lever 120, thereby adjustably securing together the two levers 120 and 122.

The rear end of the connecting rod 119 is slotted, Fig. 19, so that the rod 119 may travel in either direction as the case may be with an initial motion before shifting the lever.

The shaft 121 extends across the rear end of

the table top 56 to have an end thereof engaged by the hub 124, Fig. 10, of a lever 125. This lever 125 is turned upwardly to have its upper end pivotally engaged with an upturned ear on the rear end of the base 110.

The lever 125 is on the right hand side of the base. On the left hand side of the base 110, Fig. 16, is another lever 126 which has its upper end likewise pivotally connected to an upturned ear on the base 110 and its lower end fixed to the shaft 121.

Over the hub 124 is placed a shoe 127 which has a friction lining 128 thereunder yieldingly carried against the hub by means of a compression spring 129 forced against the shoe by a thumb screw 130 on the upper end of a stud 131 carried by the table top 56 and passing through the shoe.

Now as the motor 57 drives the train of gears 67, 68, and 116, the connecting rod 119 will reciprocate the lever 120 and in turn reciprocate the shaft 121 to cause corresponding reciprocation of the head 101. The levers 120 and 122 are relatively adjusted by means of the screw 123 to give that travel whereby when the lever 120 is rocked to its rearmost position, the face 102 of the head 101 is brought up into compressive contact with the foremost blank 88, the weight 95 permitting a yielding contact. In this position, the connecting rod 119 has traveled to the forward end of the slot in the rear end thereof against the connecting pin in the lever 120. Therefore by reason of the slotted end, there will be a delay in the forward movement of the head 101 through continued revolving of the shaft 113. The head will be moved, however, by the time the connecting rod 119 is pulled forwardly sufficiently to have the rear end of its slotted connection brought into contact with the connecting pin on the lever 120 so that the head 101 will then be carried from the position shown in Fig. 9 and also the dash line position shown in Fig. 10 forwardly to the solid position shown in Fig. 10, the position in Fig. 9 being that just before the head 101 has reached its rear limit of travel, the dash line position in Fig. 10 being the rearmost position.

Since there is a high degree of vacuum in the chamber 104 in the head 101, air will be rushing in through the face 102 through the holes 103. By reason of this condition, when the head 101 starts travelling forwardly, a single blank 88 will be across the face 102 and the vacuum will hold the blank in that position so that as the head moves forwardly, the ends of the blank will be slipped from under the pins 99 and the blank will be retained on the face as the head travels.

A pair of fingers 132 and 133 are mounted in parallel relation, one on a plate 134 carried in spaced parallel relation to the plate 78 and the other finger, finger 133, on the plate 500 adjacent the plate 78, Fig. 8. The upper edges of these fingers 132 and 133 are located in that elevation such that when the blank 88 is carried forwardly it will be carried up over these fingers with the ends of the blank extending beyond the respective fingers. Thus one end, the left hand end, of the blank 88 will be carried over the finger 83 against the anvil 82. Immediately the head 101 reaches that position where the blank 88 has come into contact with the anvil 82, the finger 83 is kicked upwardly to come around and grip that end of the blank 88.

This movement of the finger 83 is accomplished by means of the following mechanism. A

cam 135 is properly fixed to the shaft 113, Fig. 19, and an arm 136 is rockably mounted by its forward end on a bracket 137 to extend over and above the cam 135 to have a depending foot 138 in the path of the cam with a roller 139 resting on the cam. A spring 140 normally holds the arm 136 in its lower position. A connecting link 141 extends downwardly from the rear end of the arm 136 to rockably engage a lever 142 which is fixed on a shaft 143 extending transversely across the table top 56 between the bearings 144 and 145, Fig. 18. A spur gear 146 is fixed to the shaft 143 and meshes with a smaller gear 147 thereabove which in turn is fixed to a shaft 148 extending through the upper end of the bearing 145 to carry the crank arm 148 which in turn has a projecting pin 149. As the cam 135 lifts the arm 136, the crank arm 148 is given a rapid movement to swing around, Fig. 10, to carry the pin 149 up under the finger 83 a sufficient distance to permit the spring 84 to flip the finger on around to the closed position as indicated by the dash lines. As this finger 83 snaps into the closed position, the needles 87 puncture the blank 88 so that the blank is then held in a fixed position as indicated in Fig. 14.

Immediately the finger 83 is in its closed position, the head 101 has traveled forwardly sufficiently to have the forward end of the plunger rod 150 strike a stop 151, Fig. 10. This plunger rod 150 slidably extends into the head 101 to carry a piston valve 152 thereon within the chamber 104. Normally, a spring 153 around the projecting end of the rod 150 retains the rod in the extended position whereby the piston valve 152 is in the forward end of the chamber 104 as indicated in Fig. 9, but when the rod has been stopped by the stop 151 as in Fig. 10, the head 101 continues to move forward thereby giving the relative effect of the valve 152 moving rearwardly in the chamber 104 toward the passages leading to the holes 103 and to uncover in part the passage 105. One or more passages 154 lead from the chamber 104 through the rear side of the head 101 to discharge therefrom, the valve 152 in its normal position closing off these passages but in the rearmost position as in Fig. 10, leaves these passageways open thereby destroying the vacuum within the chamber 104 to some extent behind the valve 152. Therefore by the time the head 101 reaches its foremost limit of travel, the vacuum which has retained the blank 88 against the face 102 has been destroyed insofar as any holding effect of the blank 88 is concerned. Now due to the slotted arrangement of the connection between the rod 119 and its lever 120, the head 101 will again be allowed to remain in that forward position for a period of time before it is again carried rearwardly to repeats its operation.

While the head 101 is thus retained in the forward position, the plate 78 is advanced by the Geneva stop mechanism to carry the blank on up and away from the head. In this upward travel, the blank 88 which extends from the retainer 80 passes upwardly under a guide 155 and comes to rest at its first folding position. At this location, a folding mechanism, generally designated by the numeral 156 is mounted by being attached to the inside of the right hand plate 134. The blank 88 is brought around over an anvil 157 and under a plate 158, Fig. 22, whereupon a block 159 normally carried below the blank 88 so as to permit the blank to pass thereover, is pushed upwardly and rocked around

and over the plate 158 so as to push that portion of the blank 88 extending beyond the plate 158 upwardly, around and over and down onto top of the plate. Immediately upon accomplishing this folding operation, the block 159 is revolved around and back and then pulled downwardly to its original position. The mechanism for operating the block 159 is indicated primarily in Figs. 20-24. A body 160 is secured to the inner side of the plate 134 and carries a slide 161 thereon normally pulled to a lower position by means of a spring 162. The slide is retained in position by means of side plates 163 and 164 fixed to the body 160 to lap over in part tongues 165 and 166 respectively of the slide, Figs. 20 and 23. The lower end of the slide 161 carries a roller 167 which rides on a cam 168 which is fixed to the shaft 69 and is positioned between the plates 78 and 134. As the cam 168 revolves with the shaft 69, it has a proper peripheral contour such that the slide 161 is lifted as soon as the blank 88 is brought up to the position over the anvil 157 and is stopped. The slide 161 carries a spur gear 169, Fig. 24, which meshes with a rack 170 fixed on the body 160 between it and the slide. The gear 171 on the side of the gear 169 in turn meshes with an upper gear 172 which is fixed on the spindle 173 revolvably carried in the upper end of the slide 161 to extend therethrough and to carry the block 159 thereon. The gear 171 is larger than the gear 172 so as to give on increased speed to the spindle 173 as compared to the spindle 174 which carries the gears 169 and 171.

As the cam 168 revolves, the slide 161 is lifted and thereby causes the gears above indicated to revolve to initially lift and simultaneously rock the block 159 as above indicated and as shown by dash lines in Fig. 22. The block 159 is so formed as to have a semi-cylindrical heel with an extending rectangular portion, the cylindrical portion in effect being rolled upwardly and around over the edge of the plate 158 to crease the blank 88 at the fold. The slide is then returned by the spring 162 upon continued travel of the cam 168 so as to bring the block 159 back down out of the path of the next blank 88 to come thereover.

This first fold is that as indicated to be made along the dash line *a*, *b*, Fig. 45, and as completed in Fig. 46. In the form therein shown, the line *a*, *b*, is not at right angles to the edges of the blank, although the fold may be made to be square by varying the slope of the edge of the plate 153 as desired.

Immediately upon completion of the folding operation as above described and the return of the block 159 to its initial position, the plate 78 is moved another step to carry that blank 88 on to the next folding position where the blank 88 again comes to a complete stop. It is to be remembered that throughout the various operations described and hereinafter to follow, the blank 88 is rigidly gripped by the finger 83 pressing the blank against the anvil thereunder. At this second folding station, there is a folding mechanism positioned which is generally designated by the numeral 175.

This second folding mechanism has a back 176 which is attached to the stationary plate 134 by the screws 177 and 178, Fig. 25. The structure of this second folding mechanism resembles closely that of the first folder 156. Slidably engaged to the back 176 is a slide 179 by means of the

side plates 180 and 181. The lower end of the slide 179 has a roller 182 in the path of the actuating cam 168 which is the same cam that operates the first folding mechanism. A return spring 184 attached to the slide by one end and to the back 176 through the side plate 181 normally retains the slide in a lowered position with the roller 182 in contact with the periphery of the cam 168. The slide 179 carries a spur gear 185 on a pin 186 to have the gear 185 mesh with a rack 187 secured to the back 176. A larger spur gear 188 is likewise fixed on the pin or shaft 186 to revolve therewith and is meshed with a smaller spur gear 189 carried on a second shaft 190 which passes through a part of the slide 179 as a bearing to extend outwardly therefrom to receive in fixed position thereon the revolving folding block 191.

The folding block 191 is thus revolved upon travel of the slide 179 as it is reciprocated up and down by the cam 168 and the spring 184. Referring to Fig. 25 in particular, the block 191 is normally turned to lie within a recess in the anvil 192 so as to permit the blank 88 to come around and over and under a plate 193 immediately thereabove. This plate 193 is so located that its edge directed toward the plate 134 terminates along a line on which the second fold is to be made, being that line in the present instance as indicated in Figs. 45 and 46 by the letters *c*, *d*, this line in this case being at right angles to the edges of the blank. The blank 88 remains stationary when the slide 179 is raised by the cam 168 to cause the folding block 191 to be lifted and simultaneously revolved around and over toward the top side of the plate 193 thereby carrying the projecting portion of the blank 88 upwardly and around and down into compressive contact with that top side of the plate 193, the travel being indicated by the dash lines in Fig. 25.

It is to be remembered that when the blank 88 has reached this second folder, the initial fold has already been made and in order to prevent the inner end of the blank from interfering with the second fold, I provide a finger 194 which is hinged by its upper end to a bracket 195 secured on the top end of the back 176. A spring normally retains this finger in positions indicated in Figs. 25 and 27 which is that position wherein the under edge of the finger initially is above the innermost end of the folded over end of the blank 88 so as to prevent that end from interfering with the second fold or actually sliding back thereover when the second fold is being made. Thus when the folding block 191 starts upwardly, the lower end of the finger 194 initially retains that free overturned end of the blank 88 sufficiently long to permit the projecting end of the blank 88 to be turned upwardly while that free end is held against the under portion of the blank being raised thereagainst, following which, the block 191 pushes the finger on back over the plate 193 as indicated in the dash lines in Fig. 25 so as to permit the completion of the second fold without further interference.

As soon as the cam 168 has been turned sufficiently to permit the spring 184 to return the slide 179 to its normal lower position, the plate 178 is then moved to its next position and there stopped. By the time the blank reaches this third position, it has been folded to the form shown in Figs. 47 and 48. In this third position, a wrapper is applied.

A roll of paper 196 is revolvably mounted between a pair of plates 197 and 198, Fig. 3, which are supported by a standard 199 from the table

top 56. This paper roll 196 is essentially a tape in rolled form, the width of the tape being substantially that of the distance between the two folds of the blank 88. The end of the tape is drawn from the roll 196 and laid over a roller 200, Fig. 40. An arm 201 is hinged between the vertical plates 202 and 203 which hang from the horizontally disposed plate 204 which in turn is secured to the vertical standard 205 which extends upwardly from the table top 56, Figs. 2, 3, and 6. On the forward end of the arm 201 is mounted a knurled roller 206 to come down on top of the tape 196 to grip the tape between it and the under roller 200. A spring 207 normally pulls the roller 206 against the tape. In order to thread the tape 196 between the rollers 200 and 206, the arm 201 may be swung upwardly as indicated by the dash lines in Fig. 40 and then allowed to return under the influence of the spring 207. The shaft 208 on which the roller 206 is mounted extends revolvably through the front end of the arm 201 and has a spur gear 209 fixed on its other end. This gear 209 is meshed with the gear 210 when the arm is in its lowered position and the gear 210 is on the shaft 211 which extends through the plate 203 to carry another spur gear 212 on its outer end. A spur gear 213 meshes with this gear 212. The gear 213 is given an intermittent motion by means of a ratchet wheel 214 being mounted on the same gear shaft and having a pawl 215 mounted on the upper end of a lever 216, Fig. 2, intermittently reciprocated across the top side of the wheel 214 by means of a cam 217 fixed on the shaft 69 and rocking the lever 216 by contact with its lower end through a roller 219 and a connecting link 220 between the arm 216 and the upper end of the lever 218. A spring 221 causes the roller 219 to follow the periphery of the cam 217 as it revolves.

Therefore in timed sequence as determined by the cam 217 and the constantly revolving shaft 69, the knurled roller 206 is caused to revolve to give a definite length of feed of the tape 196. The forward end of the tape is fed up onto a table 222, Fig. 40. The feed of the tape is arranged so that for every feeding operation, there is a length of tape fed onto the table 222 of the desired length to be wrapped around the blank 88.

In order to transfer the desired length of tape from the table 222 to the blank 88, I employ in general a pneumatic head which lifts the tape length by means of a vacuum, carries the tape length across a glue applying roller, and then presses it into position on the blank 88. The mechanism for accomplishing this operation is now to be described.

On a transverse bar 223 carried between the standard 205 and a standard 224 extending vertically from the table top 56, I slidably mount a cross head 225 so that it may be reciprocated transversely across the mechanism thereunder. In order to accomplish this reciprocating travel, I fix a cam wheel 226 to the shaft 69 toward the left hand end thereof, Fig. 6. This cam wheel 226 has a groove cut around its periphery curving from one side of the wheel to the other to receive a pin 227 therein from the rocker 228 which is pivotally mounted on the table top 56. The upper end of the rocker 228 is attached through a slotted end to a rod 229 which slidably passes through a boss 230 on the front side of the head 225. This rod 229 is normally held in a central position by means of springs 231 and 232 on either side of the boss 230. Now as the shaft 69 revolves, the pin 227 in following the groove

in the periphery of the wheel 226 will cause the arm 228 to swing transversely and thereby reciprocate the head 225 accordingly. The springs 231 and 232 are employed to prevent jerking of the head as the travel thereof is reversed, the springs forming a resilient connection between the rocker 228 and the head.

A hollow shaft 233, Fig. 7, is vertically guided through the rear portion of the head 223 to permit vertical reciprocation. The shaft 233 is secured against vertical travel therethrough in a lifting head 234. This lifting head 234 is slotted transversely across its forward side to receive thereacross and in the slot the bar 235, the lifting head 234 being free to slide along the bar 235 as the head 225 is moved.

The upper end of the shaft 233 is counter-bored to receive therein a tube 236 and the upper end of this tube 236 is supported by a lifting head 237 which in turn is slidably secured on a transverse bar 238.

The shaft 233 is provided with a port 239 affording a discharge into the atmosphere from the lower end of the counterbore. Also a passageway 240 leads from near the upper end of the shaft counterbore out through the lifting head 234 to have a flexible hose 241 leading therefrom around down to a vacuum pump 242. This vacuum pump 242 is driven by the belt 108, the belt driving both pumps 107 and 242. The tube 236 is closed off at its upper end by the head 237 but has an opening 243 in its side adapted to register with the passage 240 when the tube is in its lower position. In this position the port 239 is closed.

A head 244 is attached to the lower end of the shaft 233 to have an under face horizontally disposed with a plurality of orifices forming passages leading back into the head to be in communication with the central passage in the shaft.

The transverse bar 223 is fixed in position but the transverse bar 235 is carried in the outer ends of arms 245 and 246, the rear ends of which are rockably supported respectively by the standards 224 and 205. Springs 247 and 248 extend respectively from the arms 245 and 246 down to the standards so that the bar 235 is normally urged to the lower position as indicated by the solid lines in Fig. 6. The lever 245 is mounted on a shaft 249, Fig. 1, which extends through the standard 224 and has a lever 250 secured on its outer end. A connecting rod 251 pivotally connects with the rear end of the lever 250 and extends downwardly to an arm 252, the rear end of which is pivotally supported in a bracket 253 carried by the table top 56 and extends forwardly therefrom over a cam 254 which is fixed on the shaft 64. A roller carried by the arm 252 is pulled into rolling contact with the periphery of the cam 254 and there yieldingly retained by means of a spring 255 extending from the outer end of the arm down to the table top.

The transverse bar 238 is likewise carried between the rear ends of arms 256 and 257 rockably supported by their forward ends by the standards 224 and 205. The arm 256 is fixed on a shaft 257' which extends through the standard 224 and carries a lever 258 on its outer end and turned rearwardly to have attached thereto the connecting rod 259 which is carried downwardly to have its lower end rockably attached to the arm 260, the rear end of which is rockably supported by the bracket 253. The arm 260 extends forwardly over a cam 261 which is fixed on the shaft 64 next adjacent the cam 254. The

arm is brought to bear against the cam 261 through a roller by means of a spring 262 attached to the forward end of the arm and also the table top 56.

The operation of the feeding head will now be described. Assuming that the head 244 is in the solid line position as shown in Fig. 6 wherein operation has just been completed, rotation of the shaft 64 will cause the cam 261 to push upwardly on the connecting rod 259 to in turn lift the head 237 sufficiently to cause the lower end of the tube 236, Fig. 7, to be lifted above the port 239 so as to destroy the vacuum that may exist within the shaft 233 and consequently at the head 244. Immediately following this initial move, the cam 254 has come around in its cycle of rotation and then lifts the connecting rod 251, and consequently the head 234 which pulls the vacuum head 244 upwardly toward the cross head 225. The two cams 254 and 261 continue to hold the heads 237 and 234 in the upper positions as indicated by the dash lines, Fig. 6, while the cam 226 pulls the rocker 228 over toward the right hand side of the machine so as to shift the cross head 225 over to the right as indicated by the dash line position. As soon as this position is reached, the cams 254 and 261 have revolved sufficiently to permit the heads 237 and 234 to be lowered and consequently bring the vacuum head 244 down toward the table 204, Fig. 40. The alignment is such that the head 244 will be lowered directly down onto the end of the tape 196 which has previously been fed onto the table as heretofore indicated.

When the head 244 has thus been lowered, the tube 236 has been lowered into the shaft 233 also so as to close off the port 239 and also to bring the opening 243 into registry with the passageway 240 in the head 234 so as to permit an evacuation of the bore within the shaft 233 and consequently the head 244. The result is that the length of tape 196 then under the head is brought into intimate contact with the under face of the head and there retained as a closure to the orifices in that face. However as the head 244 descends into position onto that length of tape, a hook 263 attached to the side of the head 244 strikes a knife 264 which extends transversely across the tape 196 so that by the time the head 244 has come into contact with the tape, that length of tape thereunder has been sheared by that knife and therefore the length thus cut off is free to be lifted by the head 244 under the influence of the vacuum.

The knife 264, Fig. 41, is rockably supported by a screw 267 within a slot in the table 204 and has a spring 268 normally pulling down on the rear end of the knife so as to rock the other end upwardly as indicated, the spring normally holding the knife in the open position by a stop 269.

The contours of the cams 254 and 261 are so shaped that as soon as the head 244 has picked up the cut off length of tape, the two lifting heads 234 and 237 move upwardly in unison a slight distance, still maintaining the vacuum at the head 244. While in this slightly elevated position, the cam 226 through the rocker 228 starts shifting the cross head 225 to the left so as to bring the piece of tape into wiping contact over a roller 265, Fig. 41, which roller is revolved within a glue pot 266.

The glue pot 266 is a more or less rectangular vessel having a depending leg 270 which extends down on the inside of the plate 134 to be attached thereto by means of the screws 271. The roller 265

is slotted to, in effect, provide a plurality of rollers. Fingers 272 secured to the inner side of the pot 266 extend across into the slots of the roller 265 to have their upper sides substantially tangent to the periphery of the roller so that as the head 244 carries the tape on across over the roller, the tape will not be permitted to adhere to the roller and be pulled away from the head, but will be stripped from the roller by means of these fingers so that the under side of the tape becomes coated with glue which is carried up out of the pot on the periphery of the roller and the tape remains pulled against the under side of the head to be carried on past the roller.

The glue applying roller 265 is mechanically driven by means of a chain 273 passing around a sprocket on the shaft 69 and carried up around an upper sprocket 274, Fig. 44, on the end of a shaft 275 which carries a worm 276, Fig. 43, meshed with the worm gear 277 carried on the end of a longitudinal shaft 278. This shaft 278 extends through a supporting housing 279, Fig. 44, to have a spur gear 280 on its forward end meshing with the spur gear 281 which is fixed on the end of the shaft 282 which carries the glue roller 265.

The glue roller 265 is thus constantly driven from the shaft 69 whereby a fresh supply of glue is always carried around the periphery of the roller ready to be contacted by the tape as it is carried thereover. The glue roller revolves to have its upper side travel in the direction of and with a peripheral speed the same as that of the moving tape carried thereover.

From the glue roller, the head 244 carries the tape on over to the left until the tape is immediately above the folded end of the blank 88 then positioned thereunder. When the head 244 reaches this left hand position, the cams 254 and 251 then revolve to have their contours drop the heads 237 and 243 so that the head 244 presses the tape into position on the folded end of the blank 88, the tape then being in that position as indicated in Fig. 47. For convenience this length of tape will hereinafter be termed a wrapper, designated by the numeral 283. It is to be noted that the wrapper 283 then adheres to that portion of the blank 88 which lies between the first and second folds and projects laterally from the blank by both ends.

The lifting head 237 then lifts to open the port 239 and thereby destroy the vacuum at the head 244 so that the head releases the wrapper 283. Following that operation, the lifting head 234 lifts the head 244 from the wrapper and the head is carried to the right again to repeat the entire operation above described.

As soon as the head 244 has lifted from the applied wrapper 283, the plate 78 advances the blank then carrying the wrapper on around to the next stopped position where the wrapper is to be folded by its ends down around and under and back up against the blank 88. At this position, there is a wrapper folding mechanism as shown on an enlarged scale in Figs. 31-35. Referring to Figs. 31 and 32, the blank 88 with the adhering wrapper 283 on its top side is brought under the guide block 284 and stopped at the position *e*. In this position, the blank 88 is stopped to have its left edge immediately below the left hand corner of the block 284 and the end of the wrapper 283 projects therebeyond. A finger 285 is pivoted on the end of an arm 286 which is set in a block 287 depending from the upper guide block 284. A foot 288 extends from the arm and carries

a pin 289 which enters a slot in the reciprocable slide 290 carried by tongues between the side blocks 291 and 292. The lower end of the slide 290 carries a roller 293 which is maintained in rolling contact with the periphery of the cam 294 by means of a spring 295 secured to the slide by one end and by its other end to the block 292. Cam 294 is fixed to the shaft 69 and its contour is so formed that the slide 290 is allowed to remain in a normal lowered position under the influence of the spring 295 so as to have the upper end of the finger 285 then positioned as indicated in Fig. 32.

The slide retaining blocks 291 and 292 are secured to a cover plate 296 which in turn is fastened to a back plate 297 that is secured to the plate 134. The cover plate 296 is provided with an internal cut away portion within which a bar 298 carrying a rack gear 299 and 300 on its edges may reciprocate. A spring 301 secured to near the upper end of the bar 298 passes downwardly within the cover plate 296 to be attached to its inside wall as a means of normally retaining the bar 298 in a lowered position. The lower end of the cover plate 296 is slotted to afford an entrance into the interior opening or chamber within the plate and a T-shaped block 302 has its shank inserted through the slot to abut against the bar 298 and is there secured by means of the screws 303 to have a head of the block in sliding contact with the outer face of the plate 296. A roller 304 is carried in the lower end of the block 302 and rides on the periphery of a cam 305 which is fixed on the shaft 69 to the right of the cam 294.

A spur gear 306 meshes with the rack 309 and in turn carries a larger diameter gear 307 on its left side which meshes with a smaller spur gear 308 fixed on a shaft 309 which extends through the cover plate 296 to carry a folding finger 310.

The initial operation in folding the wrapper 283 is that of the arm 285 which is brought from the position as indicated in Fig. 32 around to the position as shown in Fig. 31 to have the upper end of the finger then pressing the folds of the end of the blank 88 snugly one against the other and upwardly against the wrapper 283, all in compressive contact against the under side of the block 284. This movement of the arm 285 is occasioned by suitable rotation of the cam 294 to permit the roller 293 to drop on down to a lowered portion of the periphery under the influence of the spring 295.

The folding finger 310 is shaped to have a flat under face terminating at a heel 311 which is at the center of rotation of the finger and which is mounted to be at the forward end of the block 284 immediately above the edge of the blank 88 then below the end of the wrapper 283. The cams 294 and 305 have the proper peripheral form such that the finger 310 is revolved first counterclockwise, Figs. 31 and 32, to cause the finger to come around into contact with the projecting end of the wrapper 283 and bend it around therewith. As soon as the finger 310 has turned the wrapper 283 around under and started backwardly and upwardly to approach the under side of the blank 88, the finger 285 is then rocked rearwardly by means of the slide 290 being lifted so that as the finger 285 moves out from under the blank 88, the finger 310 may then continue its travel around upwardly to bring the end of the wrapper 283 snugly against the under side of the blank 88 as indicated in Fig. 32. As soon as

that position is reached, the contour of the cam 305 is such that the finger 310 is then reversed in travel to come back to its normal position as shown in Fig. 31 and the finger 285 remains in 5 the rocked position as indicated in Fig. 32 until the next blank 88 is brought around for the wrapper folding operation.

Upon completion of the folding of the forward end of the wrapper 283 around the blank 88, the 10 plate 78 is then given its next successive degree of travel and brought to a standstill again to have the wrapper 283 brought to the position *f*, Fig. 31, wherein the blank 88 is stopped to have its rear edge aligned with the rear end of a block 15 312 so as to permit the trailing end of the wrapper 283 to extend freely therebehind. A second tucker finger 313 is carried in the manner of the finger 285 but on the forward side of the slide 290 to have a pin 314 engaged within a slot in the 20 slide so that when the slide 290 is allowed to drop under the influence of the spring 295 by suitable rotation of the cam 294, the finger 313 is brought from its normal position as indicated in Fig. 32 around to have its upper end wipe over the under 25 folded end of the wrapper 283 and then stop so as to retain the blank 88 in compressive contact with the under side of the block 312.

Another folding finger 315 is rockably carried 30 to extend normally upwardly and rearwardly from the rear corner of the block 312 to have a heel at the center of rotation of the finger immediately at the rear lower corner of the block 312. This finger 315 is mounted on a shaft 316 35 which extends through the cover plate 296 to carry therebehind a spur gear 317 which is meshed with a larger gear 318 secured to a third gear 319 which is meshed with the rack 299 as best illustrated in Fig. 32, the arrangement of the 40 gearing between the finger and the rack being exactly the same as that for the finger 310.

Following the initial movement of the finger 313, the cam 305 then pushes upwardly on the 45 bar 253 to cause rotation of the folding finger 315 downwardly and around toward the under side of the blank 88, following the initial travel of which, by the time the rear wrapper end has been carried around the edge of the blank 88, the cam 294 has then revolved sufficiently to raise the 50 slide 290 again and thus rock the finger 313 back to its normal position as indicated in Fig. 32 so that the finger 315 can travel on around to its final terminal position to complete the fold as indicated in Fig. 32. The cam 305 then 55 has the proper periphery to permit the rack gear to follow and return the finger 315 to its normal position as indicated in Fig. 31. In describing the operations incident to the folding of the wrapper 283 about the end of the band 283, it 60 is to be understood that first the forward end of the wrapper is folded in one station *e* and then the blank 88 is advanced to the station *f* where the rear end of the wrapper is folded. However these operations occur simultaneously on differ- 65 ent blanks 88, there being a blank at each position when the operations take place.

The plate 78 is then given its next degree of travel whereupon the blank with its wrapper then 70 carried therearound and sealed on the blank as indicated in Figs. 49, 50, and 51, is shifted to the next station for a final operation of applying some identification mark to the wrapped blank. In the present instance, I employ an embossing device, generally designated by the numeral 320, 75 see Figs. 36, 37, 38, and 39, which is mounted on

the inside of the plate 134 at the position where the wrapped blank 88 stops. In this position, the blank 88 is between an upper fixed die 321 which is supported from the body 322 and a lower movable die 323 which is mounted on a slide 324 5 guided by the body to extend inwardly therefrom to carry a roller 325 which rides on the periphery of the cam 326. The slide 324 is normally held in the lowered or inner position by means of a spring 327 secured by one end to the slide and the other 10 end to the body. Any suitable characters or marking may be, of course, provided in the dies 321 and 323 but in any event, when the blank 88 comes to rest therebetween, the cam 326 revolves to press the slide 324 upwardly to force the lower 15 die 323 against the under side of the wrapper 283 to emboss therein in cooperation with the other die 321, the markings, herein shown as the letters "O. K.", Fig. 49. The cam 326 continues to revolve with the shaft 60 and thus per- 20 mits the spring 327 to lower the slide 324 and remove the die 323 so as to release the blank 88.

Thereupon the plate 78 is given its next degree of rotation to again stop. In this position, 25 all operations on the blank 88 have been completed and all that remains to be done is to release the blank from the retainer finger 83. This is accomplished by a mechanism for lifting the finger 83 so that the blank may drop from the 30 needles 87 and fall from the machine ready for use. The mechanism for releasing the blank will now be described.

On the shaft 64 is fixed a cam 328, see Fig. 1, over which passes an arm 329 having its rear end 35 carried by the bracket 253. The arm rides by a suitable bearing against the cam 328, such bearing being the same as that shown for the arms 252 and 260. The forward end of the arm 329 is normally pulled downwardly by means of the spring 330 attached to the table top 56. 40

Through a link 331, the forward end of the arm 329 is connected to the forward end of the 45 lever 332 which in turn is fixed to a shaft 333 carried by the standards 334 and 335, the shaft 333 extending transversely therebetween. Near the standard 335, a spur gear 336 is fixed to the 50 shaft 333 to mesh with another spur gear 337 carried thereabove, see Fig. 3, and slightly behind on a stub shaft which extends through the upper end of the standard 335 to have a lever 338 fixed 55 on the right hand end of this shaft to hang normally downward. Extending from the right side of the lever 338 is a pin 339. When the shaft 64 carries the cam 328 around to the proper position, the arm 329 is allowed to lower, whereupon 60 the lever 338 is swung forwardly by its lower end and the pin 339 is brought sharply up against the then rear side of the retainer finger 83 to knock it open. By reason of this sharp impact, the inertia of the blank 88 and its attached wrapper 283 is 65 sufficient to permit the needles 87 to be withdrawn from the blank so that the blank thereupon falls from the finger to the floor or into any suitable receiving receptacle (not shown).

While the mechanism has thus far been described as applying to a single blank 88 and the 70 sequence of operations followed through as applying to that single blank, it is to be understood of course, that a single blank 88 is placed under each finger 83 as the plate 78 revolves from one position to the next so that while one operation is being conducted, other operations are being performed on the other blanks as well, all in the sequence as above indicated. In summary, I have provided a mechanism which essentially 75

grips a blank and never releases that blank until the final operation has been completed. The gripped blank is moved from one position to the other for succeeding operations. First one end is folded and then a second fold is performed on that end with means being provided to form sharp definite lines of folding. A wrapper is cut from a strip of paper, glue is applied to one side of the wrapper, and then the wrapper is set down on the folded end of the blank. First one end of the wrapper is folded around the blank and then the other end by mechanism simulating the operation of the fingers of one's hand. A final operation, if preferred, is provided for in that an identifying mark may be applied by suitable means to the wrapper. Finally the blank thus folded and wrapped and marked, is released from the original gripping means without further operations being required on it.

In further reference to the blank folding operations above described, it is to be noted that the fold lines *ab* and *cd* of the blank 88 are properly located by widths of the fold plates 158 and 193, as indicated by comparison of Figs. 22 and 25, the first folder having its plate 158 longer and the finger 159 nearer the mounting plate 134 and the corresponding second fold plate 193 and its folding finger 191.

The method of guiding the blank from one operating position to another is easily traced in Figs. 52-59. Beginning with the initial receiving position of the blank at the finger 133, Fig. 52, the blank 88 is started on its circumferential travel around the periphery of the plate 134 to have the blank enter under the lower out-turned end of the guide 155 and over a metal floor 340. The blank 88 travels therebetween until as above indicated, the plate 78 comes to a stop to have the blank then positioned by its outer free end over the anvil 157, Fig. 22, under the plate 158. In fact in the form herein shown, the plate 158 is integral with the guide 155 and is in effect a portion of the guide 155 reduced in transverse length by having a notch cut out of the guide 155, Fig. 53, the notch being immediately above the folding block 159.

The folding block 159 comes up and wraps the free end of the blank over the inner or right hand end of the plate 158. As indicated in Fig. 54, the block 159 returns slightly from its extreme folding position and there remains a time interval while the blank 88 is being shifted on around circumferentially. While the block 159 thus remains in that position, the fold of the blank 88 is so retained that as the blank progresses, the fold comes under the upturned lip 341 of a guide band 342 which is spaced from the floor 340 a sufficient distance to permit the folded end of the blank to travel therebetween. Of course after the blank 88 has entered under the lip 341, the block 159 may then and does turn on back to its position within the recess in the anvil 157.

In approaching the second folding mechanism 175, the guide 342 is cut away on its forward right hand corner over the anvil 192 to leave the plate portion 193 to the left thereof. The finger 194 is normally positioned as indicated in Fig. 29 within this notched portion of the guide 342 so that as the folded end of the blank comes within this cut away portion, the fold passes under the finger 194 and although free from retaining influence of the guide 342, the finger retains the folded over end of the blank firmly against the blank itself. It is in this position

that the folding block 191 then comes over the end of the blank to form the second fold therein by turning the blank end over the plate 193. The block 191 remains for a time interval in a slightly elevated position from its extreme folding position while the blank 88 is being then moved to its next position and at least for a sufficient time interval to permit the folded end of the blank to enter under the lip 343 of the guide 344 so that as the blank then continues moving, the folds are retained in their compressed positions.

In reference to the head 244 which is employed to transfer the wrapper band 293 to the folded blank, I employ a flexible arm 345 fixed to the bar 223, Figs. 1 and 6, to be spaced therefrom to have its lower end turned around horizontally to be initially at the end of the guide 344 over a block 346 which is fixed to the plate 134 at the position where the blank 88 stops to receive the wrapper band 283. Thus as the folded end of the blank 88 emerges from the forward end of the guide 344, that folded end passes up onto the top side of the block 346 and under the end of the arm 345, Fig. 58. Then when the head 244 descends to deposit the wrapper 293 on the blank 88, a portion of the head 244 comes down against the arm 345 and springs it back out of the way to permit the application of the wrapper band. Then as the head 244 lifts, the arm 345 springs back into position over the blank to maintain the folded condition.

The next movement of the blank 88 slides the blank along under the arm 345 to carry the blank and its attached band under the block 284 to enter under the inclined portion 347 thereof so that continued movement of the blank tends to bring the band downwardly with greater pressure against the folded end of the blank. The blank then continues on to the stop position at *e*, Fig. 31, where the initial band fold is completed.

From that position *e*, the blank is carried on over to the position *f* without any guide means between those two positions. From the position *f*, the folded and wrapped end of the blank passes on through the groove 348 in the block 312 and then without further guidance between the dies in the embossing device 320 from which the blank end emerges to be free from further guiding influences.

While I have herein shown and described my invention in the form as now best known to me, it is obvious that structural changes may be made without departing from the spirit of the invention, and I, therefore, do not desire to be limited to that precise form beyond the limitations as may be imposed by the following claims.

I claim:

1. In a machine for folding blanks, means for carrying individual blanks through the machine in fixed alignment comprising a revolving member, a plurality of circumferentially spaced apart blank retainers around the member, each of said retainers comprising an anvil having holes therein, a hinged finger having needles, and spring means yieldingly closing the finger to enter its needles in holes of the anvil to pierce and grip a blank against the anvil and means for presenting an end of a blank in the path of the needles before the finger closes against the anvil.

2. In a machine for folding blanks, means for carrying individual blanks through the machine in fixed alignment comprising a revolving member, a plurality of circumferentially spaced apart

blank retainers around the member, each of said retainers comprising an anvil, a hinged finger, and spring means yieldingly closing the finger to grip a blank against the anvil, and one or more needles between the finger and the anvil for piercing the blank to fix and hold its alignment.

3. In a machine for folding blanks, blank supply means; a revoluble plate; a plurality of blank grippers mounted circumferentially about the plate; transfer means transferring blanks from said supply means to said grippers; means operating said grippers to cause them to close over and grip the transferred blanks to have the major portion of a blank project from each gripper; a folding mechanism next adjacent said blank supply means and having a stationary plate and a revoluble finger for folding the projecting end of the blank over the plate to produce a fold therein; a second folding mechanism next adjacent the first folding mechanism, the second folding mechanism having a first fold retaining finger and a folding finger for turning over the blank projecting end to enclose the initially folded end; a wrapper supplying mechanism for cutting wrapper lengths and applying them to the folded blank at a position following the second folding mechanism; a wrapper folder next adjacent the applying position, said wrapper folder having a tucking finger first operating to compress the folded end of the blank and the applied wrapper against a block, and a wrapper folding finger operated to fold one end of said wrapper around the edge of the blank from its applied side and around against the other side, said tucking finger being removed as the folding finger advances to fold, said wrapper folder having a second tucker finger and a second folding finger at a position removed from the first ones for folding the other end of the wrapper around the folded blank end; and means for intermittently moving said plate to shift said retainers successively from one position to another, and means for opening said retainers to permit discharge of the finished folded and wrapped blanks.

4. In a blank folding machine, a shiftable plate; a blank supply means, a plurality of blank retainers mounted on the plate; a blank folding mechanism spaced from said carrying means, said mechanism including a plate under which a blank end is to be placed, a finger rockably supported adjacent the plate, and means for rocking the finger around over an edge of the plate to fold a part of the blank therearound; a wrapper applying mechanism adjacent said folding mechanism; a wrapper folding mechanism, including a rockable tucker finger for initially retaining the blank in a folded position, a folding finger for folding an end of the wrapper around the edge of the folded blank, and means for actuating the tucker and folding fingers in timed sequence; and means intermittently shifting said shiftable plate to successively move said retainers from stopped positions respectively at said carrying means, said folding mechanism, said wrapping applying mechanism, and said wrapper folding mechanism; each of said blanks being fixed and held in positive alignment in said retainers for proper presentment in each of said mechanisms.

5. In a blank folding and wrapping machine, a rotary plate; a plurality of circumferentially spaced apart fingers hingedly carried by the plate; an anvil under each of the fingers; means for placing a blank against each anvil; spring means for closing said fingers to grip the blanks

against the anvils; a stationary plate mounted parallel to said rotary plate; a plurality of mechanisms spaced around said plate for performing operations on said blanks; and an intermittent drive mechanism connecting with said rotary plate shifting the plate to advance the plate step by step from one mechanism to the next.

6. In a blank folding and wrapping machine, a rotary plate; a plurality of blank retaining devices spaced around the plate; means for placing a blank in each retainer, each of said retainers being formed to grip a blank by one end to allow the major portion of the blank to extend therefrom transversely of the direction of travel of said plate; a folding finger at least as wide as said blank rockably supported adjacent said plate; a fold determining plate between said finger and said plate proportioned to have that length of said projecting blank extend therebeyond which is desired to be folded back onto the blank; means for lifting and rocking said finger around the end of said plate to fold said blank length therearound; and means intermittently shifting said plate to bring said retainers around and to stop them at said finger and then move the retainer on past the finger after said folding operation whereby the folded blank is carried thereaway.

7. In a blank folding and wrapping machine, a rotary plate; a plurality of blank retaining devices spaced around the plate; means for placing a blank in each retainer, each of said retainers being formed to grip a blank by one end to allow the major portion of the blank to extend therefrom transversely of the direction of travel of said plate; a folding finger at least as wide as said blank rockably supported adjacent said plate; a fold determining plate between said finger and said plate proportioned to have that length of said projecting blank extend therebeyond which is desired to be folded back onto the blank; means for lifting and rocking said finger around the end of said plate to fold said blank length therearound; and means intermittently shifting said plate to bring said retainers around and to stop them at said finger and then move the retainer on past the finger after said folding operation whereby the folded blank is carried thereaway; said finger operating means comprising a slide carrying the finger, a stationary rack, a gear train carried by the slide between the finger and the rack, and a cam operating said slide, whereby the finger is lifted and rocked simultaneously.

8. In a blank folding machine, a fold line determining plate, means for retaining a blank in predetermined alignment with said plate to have an end extend therebeyond, a relatively fixed rack gear, a slide shiftable in relation to the rack gear, a folding finger rockably carried by the slide adjacent the fold line edge of said plate, a gear train meshing with said rack gear and carried by the slide driving said finger upon reciprocation of the slide, and means for reciprocating the slide, said finger being normally turned to be out of the path of a blank applied to said plate, and operation of said reciprocating means causing the slide to travel and carry the finger around and over the fold line edge of said plate to fold said blank projecting end therearound.

9. In a blank folding machine, a fold line determining plate, means for retaining a blank in predetermined alignment with said plate to have an end extend therebeyond, a relatively fixed rack gear, a slide shiftable in relation to the rack

gear, a folding finger rockably carried by the slide adjacent the fold line edge of said plate, a gear train meshing with said rack gear and carried by the slide driving said finger upon reciprocation of the slide, and means for reciprocating the slide, said finger being normally turned to be out of the path of a blank applied to said plate, and operation of said reciprocating means causing the slide to travel and carry the finger around and over the fold line edge of said plate to fold said blank projecting end therearound, and a swingable arm in the path of said folding finger, said arm being mounted to have its outer end sweep over in contact with said blank projecting end, whereby a previously formed fold in the blank is prevented from lifting while said finger is turning over said end about said plate edge.

10. In a folding and wrapping machine for blanks having wrappers with ends projecting beyond the blank, a wrapping mechanism comprising a blank retaining and aligning carrier, a block under which said blank and wrapper is carried and stopped by said carrier to have the wrapper between the blank and the block, the edge of the blank stopping in substantial alignment with an edge of the block, a tucking finger rockably supported to swing around under the blank and push it against said wrapper as stopped by said block thereabove, means for initially rocking said tucking finger to produce said swinging action, a folding finger rockably supported and having a face terminating in a heel the line of which coincides with the axis of rotation of the folding finger, said axis being substantially across said block edge but permitting the finger to rock therearound, means for rocking said folding finger from an initial upper position around said block edge and up under said blank to turn the extending end of said wrapper therewith, said tucking finger rocking means being operated as the folding finger approaches it to rock the tucking finger back out of the way to permit the folding finger to press the wrapper end firmly against the under side of the blank.

11. In a folding and wrapping machine for blanks having wrappers with ends projecting beyond the blank, a wrapping mechanism comprising a blank retaining and aligning carrier, a block under which said blank and wrapper is carried and stopped by said carrier to have the wrapper between the blank and the block, the edge of the blank stopping in substantial alignment with an edge of the block, a tucking finger rockably supported to swing around under the blank and push it against said wrapper as stopped by said block thereabove, means for initially rocking said tucking finger to produce said swinging action, a folding finger rockably supported and having a face terminating in a heel the line of which coincides with the axis of rotation of the folding finger, said axis being substantially across said block edge but permitting the finger to rock therearound, means for rocking said folding finger from an initial upper position around said block edge and up under said blank to turn the extending end of said wrapper therewith, said tucking finger rocking means being operated as the folding finger approaches it to rock the tucking finger back out of the way to permit the folding finger to press the wrapper end firmly against the under side of the blank, said tucking finger rocking means comprising a slide interconnecting with the finger, and a cam to shift the slide.

12. In a folding and wrapping machine for blanks having wrappers with ends projecting be-

yond the blank, a wrapping mechanism comprising a blank retaining and aligning carrier, a block under which said blank and wrapper is carried and stopped by said carrier to have the wrapper between the blank and the block, the edge of the blank stopping in substantial alignment with an edge of the block, a tucking finger rockably supported to swing around under the blank and push it against said wrapper as stopped by said block thereabove, means for initially rocking said tucking finger to produce said swinging action, a folding finger rockably supported and having a face terminating in a heel the line of which coincides with the axis of rotation of the folding finger, said axis being substantially across said block edge but permitting the finger to rock therearound, means for rocking said folding finger from an initial upper position around said block edge and up under said blank to turn the extending end of said wrapper therewith, said tucking finger rocking means being operated as the folding finger approaches it to rock the tucking finger back out of the way to permit the folding finger to press the wrapper end firmly against the under side of the blank, said folding finger rocking means comprising a rack gear reciprocably mounted, gear means between the rack gear and the folding finger, and cam means to shift said rack gear.

13. In a folding and wrapping machine for blanks having wrappers with ends projecting beyond the blank, a wrapping mechanism comprising a blank retaining and aligning carrier, a block under which said blank and wrapper is carried and stopped by said carrier to have the wrapper between the blank and the block, the edge of the blank stopping in substantial alignment with an edge of the block, a tucking finger rockably supported to swing around under the blank and push it against said wrapper as stopped by said block thereabove, means for initially rocking said tucking finger to produce said swinging action, a folding finger rockably supported and having a face terminating in a heel the line of which coincides with the axis of rotation of the folding finger, said axis being substantially across said block edge but permitting the finger to rock therearound, means for rocking said folding finger from an initial upper position around said block edge and up under said blank to turn the extending end of said wrapper therewith, said tucking finger rocking means being operated as the folding finger approaches it to rock the tucking finger back out of the way to permit the folding finger to press the wrapper end firmly against the under side of the blank, said wrapping mechanism further comprising a second tucking finger and a second folding finger similar to the first fingers but mounted reversely to fold the other end of said wrapper around said blank, said second fingers being spaced from the first fingers adjacent a second block under which the blank is carried by said carrier following the folding of the first wrapper end, said second fingers being actuated in common with said first fingers by the same actuating means.

14. A wrapper folding mechanism comprising a relatively stationary back, a pair of spaced apart folding fingers revolvably mounted on axes fixed relative to said back, a presser block at each finger to have opposite ends respectively terminate substantially at the respective finger axis, a rack gear reciprocably carried over said back, gear means interposed between the rack gear and one of said fingers, and other gear

means actuated by travel of said rack gear to cause the other of said fingers to revolve, a tucker finger swingably mounted under each of said blocks, and slide means interconnecting with both of said tucker fingers, whereby shifting of the slide means sets up opposite travel of each tucker finger.

15. A wrapper folding mechanism comprising a relatively stationary back, a pair of spaced apart folding fingers revolubly mounted on axes fixed relative to said back, a presser block at each finger to have opposite ends respectively terminate substantially at the respective finger axis, a rack gear reciprocally carried over said back, gear means interposed between the rack gear and one of said fingers, and other gear means actuated by travel of said rack gear to cause the other of said fingers to revolve, a tucker finger swingably mounted under each of said blocks, and slide means interconnecting with both of said tucker fingers, whereby shifting of the slide means sets up opposite travel of each tucker finger, and cam means operating said rack gear and said slide means in timed relation whereby each of said tucker fingers is normally retained in a position removed from its said respective block and is swung initially from that position to have its free end come up under said block in close proximity thereto and then remain for a time interval while each of said folding fingers is revolved to turn around and start up under the blocks, said tucking fingers then being swung back to said normal positions as said folding fingers advance to the blocks.

16. In a machine for folding blanks, means for carrying individual blanks through the machine in fixed alignment comprising a revolving member, and one or more clamps fixed to and around the member, each gripping a blank by its end to have the major portion of the blank project laterally from one side only of the revolving member, each of said clamps comprising an anvil having a plurality of holes, a finger hinged to fold against the anvil, said finger having a plurality of needles, means presenting an end of a blank across the holes in the anvil and spring means yieldingly closing the finger and driving its needles through the blank into the holes in the anvil.

17. In a machine for folding blanks, a blank supply carrying means, a revolving member,

means comprising a vacuum for transferring blanks from the carrying means to the revolving member and clamp means on the revolving member to grip the blanks at their ends to have the major portion of each blank project from one side only of the revolving member, each of said clamps comprising an anvil having a plurality of holes, a finger hinged to fold against the anvil, said finger having a plurality of needles, means presenting an end of a blank across the holes in the anvil and spring means yieldingly closing the finger and driving its needles through the blank into the holes in the anvil.

18. In a machine for folding blanks, means for carrying individual blanks through the machine comprising a revolving disk, a plurality of blank retainers fixed to and around the revolving disk, means for folding an end of a blank back upon the body of the blank comprising a reciprocating slide and a folding-block hinged to the slide, a like means for folding the folded part upon the rest of the blank and means to prevent the first fold from interfering with the making of the second fold.

19. In a machine for folding blanks, means for carrying individual blanks through the machine comprising a revolving disk, a plurality of blank retainers fixed to and around the revolving disk, means for folding an end of a blank back upon the body of the blank comprising a reciprocating slide and a folding-block hinged to the slide, a like means for folding the folded part upon the rest of the blank and means to prevent the first fold from interfering with the making of the second fold comprising a hinged finger pressing initially against the outer end of the first fold and moved therefrom against the pull of a spring by the folding movement of said folding block.

20. In a blank folding and wrapping machine, a rotary member, a plurality of blank retainers spaced apart around the member, each of said retainers comprising an anvil having indents and a hinged finger having needles entering the indents when the finger is lowered against the anvil, means for presenting one end of a blank in the path of the needles before they enter the indents, and means for rotating the rotary member.

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