M. DÜNNEBIER & A. WINKLER.

ENVELOP MAKING MACHINE.

APPLICATION FILED SEPT. 2, 1913.

1,153,293.

Patented Sept. 14, 1915.

4 SHEETS—SHEET 1.

Fig. 1.

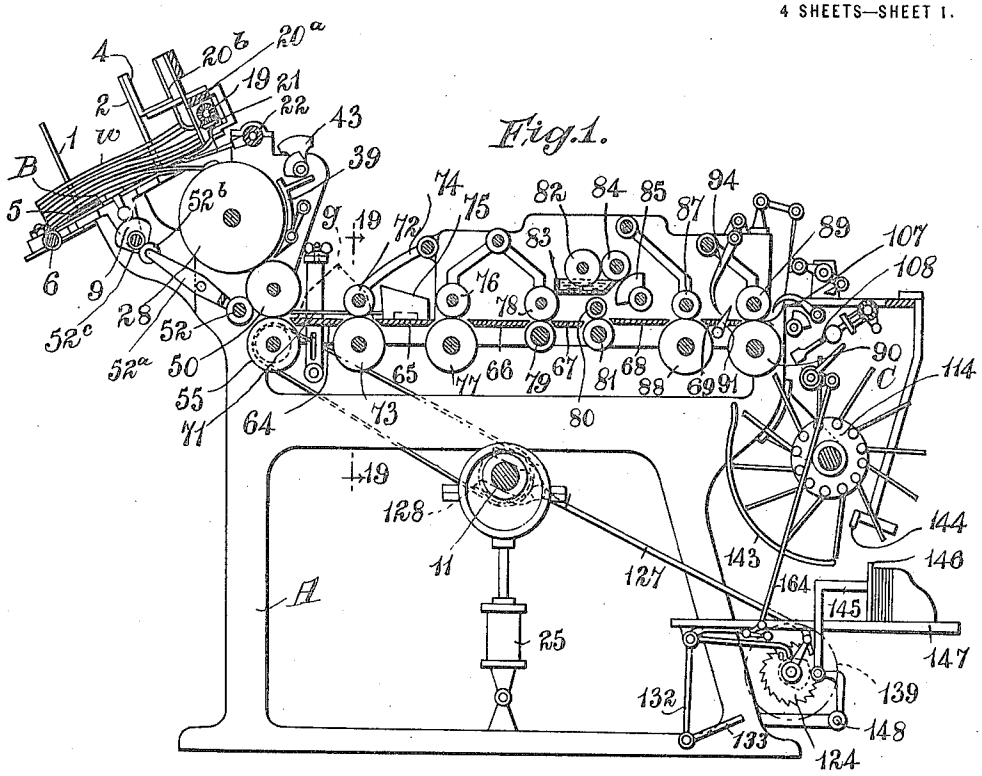
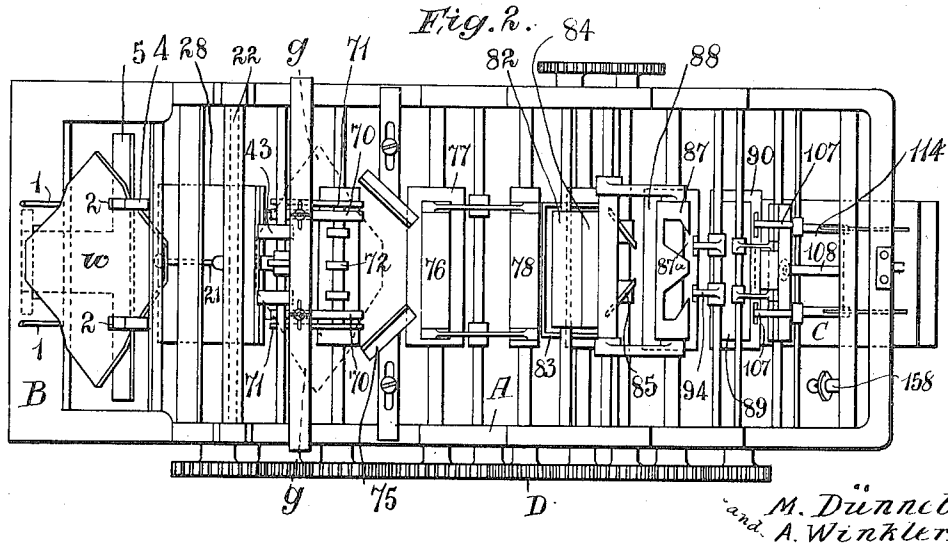


Fig. 2.



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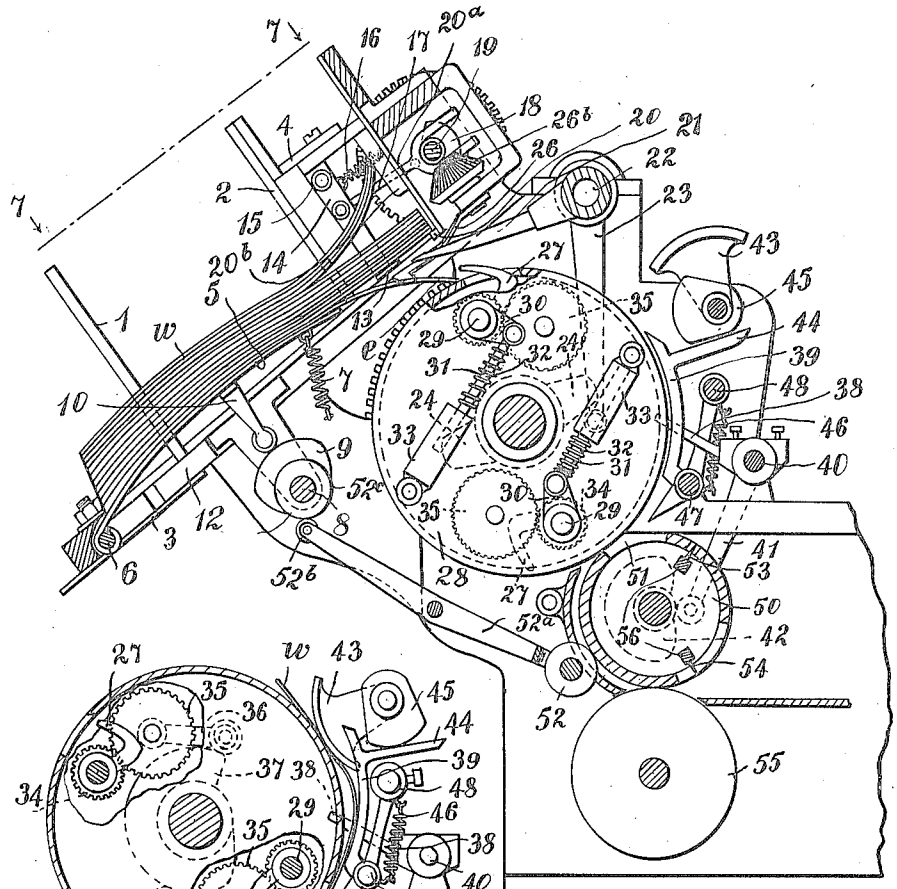


Fig. 3.

Fig. 4.

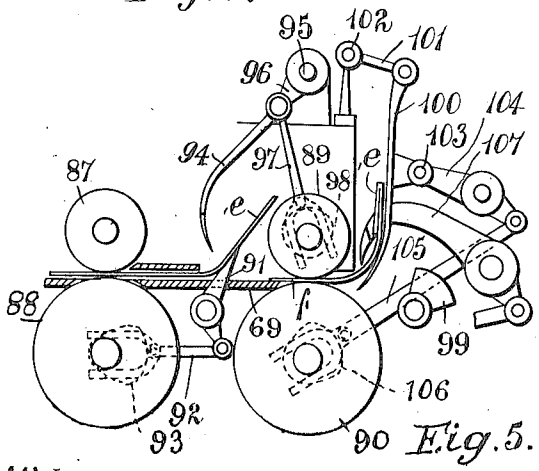


Fig. 5.

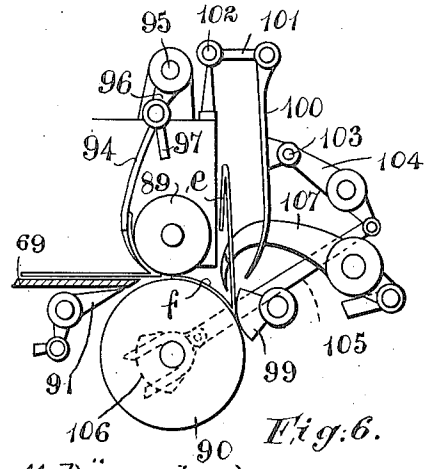


Fig. 6.

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4 SHEETS—SHEET 3.

Fig. 7.

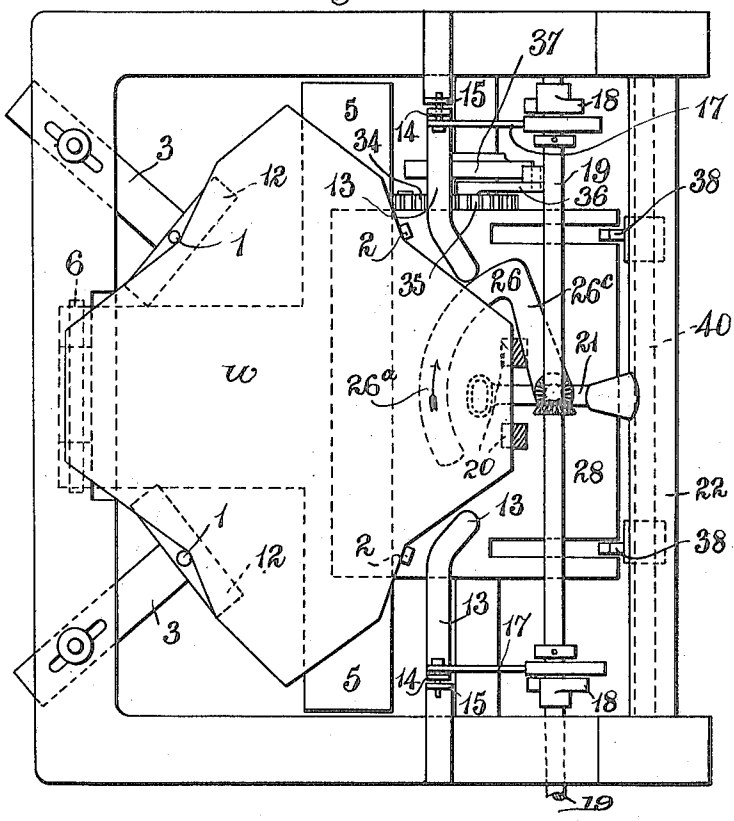
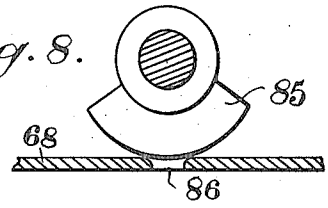


Fig. 8.



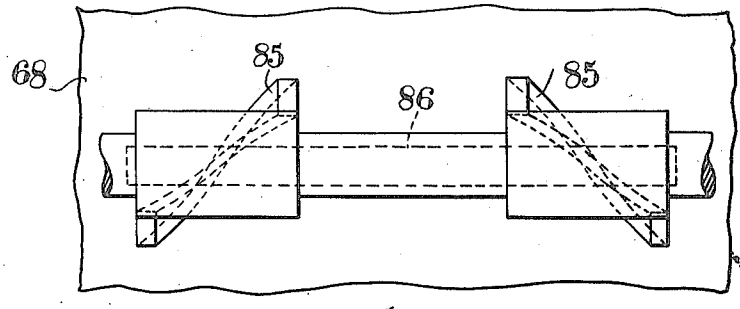


Fig. 9.

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ENVELOP MAKING MACHINE.

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4 SHEETS—SHEET 4.

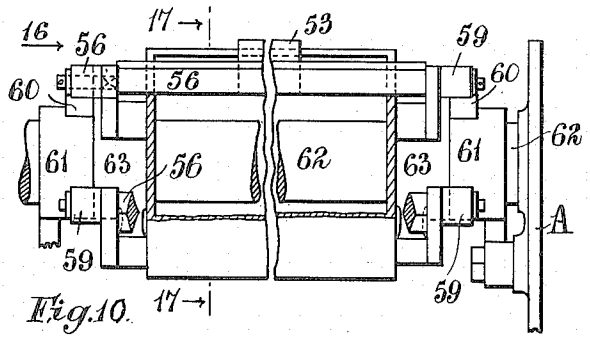


Fig. 10.

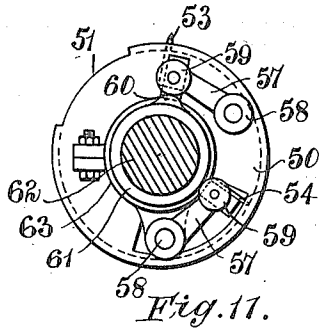


Fig. 11.

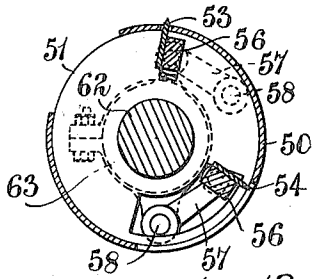


Fig. 12.

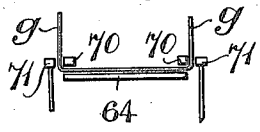


Fig. 14.

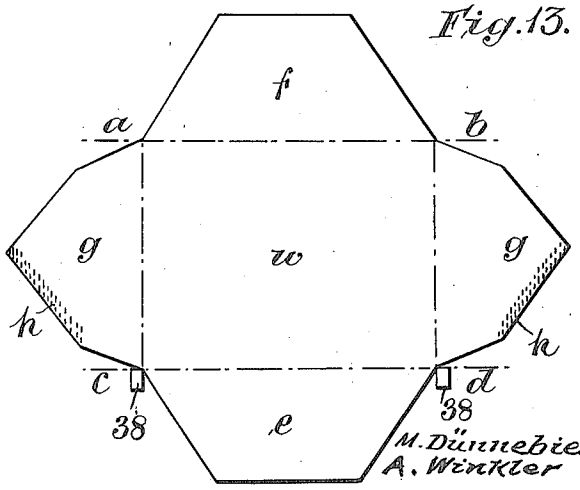


Fig. 13.

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UNITED STATES PATENT OFFICE.

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ENVELOP-MAKING MACHINE.

1,153,293. Specification of Letters Patent. Patented Sept. 14, 1915.

Application filed September 2, 1913. Serial No. 787,745.

To all whom it may concern:

Be it known that we, MAX DÜNNEBIER and ALFRED WINKLER, citizens of the German Empire, both residing at Neuwied-on-the-Rhine, Germany, have invented certain new and useful Improvements in Envelop-Making Machines, of which the following is a specification.

This invention relates to rotary machines for folding envelop blanks of the type in which the blanks with their closing flaps gummed are taken separately by a suction device from a pile, accurately adjusted and conducted through a set of rolls where the folds are creased, the flaps turned over, gummed, and pressed in position.

The term rotary machine is here used in the manner customary in this art to distinguish the type of machine in which the blank is kept moving through a set of rolls during its manipulation, from the much slower operating type in which the envelop blank is operated upon at a fixed station and by dies and folders.

The invention relates more particularly to improved devices for removing the blanks from the pile, for adjusting the blanks so removed, for creasing the transverse edges, gumming, turning over the blanks before the folding of the closing flap, and also to the devices for removing and counting the finished envelops.

The sequence of operations is as follows:—

I. The single blank is first removed from the pile; II, adjusted in position; III, the transverse edges are creased and the blank enters the set of rolls; IV, then the side flaps are folded and gummed. As these steps following quick succession, and immediately after the adjustment of the blanks, accuracy is assured, and the folding takes place along the correct lines.

V. The bottom flap is then folded over the gummed portions and the blank reversed and the closing flap pressed down along its crease line.

VI. The envelops are then collected in bundles, counted and delivered.

The novel features of this invention will be more readily understood from the following description of one convenient form illustrated by way of example in the accompanying drawings, in which:—

Figure 1 is a diagrammatic sectional elevation of the entire machine. Fig. 2 is a plan view of the machine with various parts of the upper structure such as the carrier arms 74 and the flexing mechanism for the blank omitted to reveal more clearly the series of rolls through which the blank traverses. Fig. 3 illustrates the entire mechanism for introducing the blanks and making the preliminary folds on the two transverse edges, this view being a vertical sectional elevation to a larger scale than Fig. 1. Fig. 4 shows in a detail a part of the mechanism illustrated in Fig. 3, the parts being in a different position to Fig. 3. Figs. 5 and 6 are separate views of the device for removing the envelops from the set of rolls, and for the final folding of the closing flap. Fig. 7 is a view of the pile of blanks and the parts immediately coöperating therewith, the view being taken in the direction of the arrows 7—7 in Fig. 3. In this figure the transverse bridge holding the brackets 4 and these brackets have been omitted to reveal the shaft 19 and its parts. Figs. 8 and 9 are vertical section and plan, respectively, of the gumming device. Fig. 10 is a view of the creasing roll 50, in Fig. 3, part of the periphery being broken away to reveal the interior. For the sake of clearness certain parts are omitted in this view, which is on a larger scale than Fig. 3. Fig. 11 is an end view looking in the direction of the arrow 16, in Fig. 10. Fig. 12 is a cross-section on the line 17—17 of Fig. 10. Fig. 13 is a plan of a blank with the lines of fold and the portions to be gummed indicated thereon. This figure also illustrates the method in which the adjusting fingers 38 engage the blank. Fig. 14 is a section on the line 19—19 of Fig. 1, and illustrates the method of folding the side flaps *g*, *g*.

In a general way the machine herein described comprises side frame parts A, which support the various rolls and mechanism, and an inclined table B at the left hand end in Fig. 1. The table B is located at the rear of the machine and the finished envelops are discharged in counted bundles at the forward end C. The various rolls are driven by intermeshing gear wheels D at one side of the machine and these gear wheels are operated from the main shaft 11.

We shall now proceed to describe this invention in the sequence set out above.

1. Blanks and their removal from the

pile.—The blanks *w*, are stamped out in any ordinary form, as, for instance, shown in Figs. 7 and 13, and are already gummed on their closing flaps. In the machine the transverse fold lines *a*—*b*, and *c*—*d*, are first creased to facilitate at a later stage the folding of the bottom flap and the closing flap *f*. After this the side flaps *g*, are folded over along the lines *a*—*c*, and *b*—*d*. The blanks *w*, are laid on top of one another on a table 5, and between four standards or posts 1, 1, and 2, 2, (Figs. 3 and 7), while the separate blanks are removed from the bottom of the pile by means located beneath the table for that purpose. The rear posts 1, 1, are carried by adjustable arms 3, 3, while the front posts 2, 2, are carried by angle brackets 4, 4, the arms 3, 3, and brackets 4, 4, being so set that the posts nest in the edges or corners of the blank. The rear posts 1, 1, are supported at their lower ends and are free at their upper ends, while the front posts 2, 2, are supported at their upper ends and are free at their lower ends.

The pile of blanks is supported on a plate 5, which, as seen in Fig. 7, is of T-shape in plan and, as seen in Fig. 3, is bent to a curved form, so that the blanks are partially flexed. The table 5, does not extend the whole length of the blanks, but leaves them with their forward ends overhanging and free to be flexed as will be understood from the following description. This plate or table 5, is adapted to swing about its pivot 6, and is acted upon by a spring 7 suitably anchored to the frame of the machine. The spring 7 causes the roller supported on the bracket 10 and supporting table 5 to follow the contour of the cam 9, carried by the transverse shaft 8. When the transverse shaft 8 rotates, the plate 5 rises and falls swinging about its pivot 6. The shaft 8 is supported in the side frames of the machine and is driven from the main driving shaft 11 (Fig. 1) so as to rotate at the same speed as the driving shaft. At each oscillating movement of the table 5, the ample supporting surface offered by this table is temporarily removed, and the left hand end of the pile of blanks rests temporarily on the portions or ledges 12 of the arms 3, which are seen in dotted lines in Fig. 7. The pile is also supported by members 13, which operate like fingers and do not engage the lowest blank, as is more fully explained hereafter. The fingers 13, are mounted on arms 14 which are pivoted at 15, to fixed points in the side frames of the machine. The arms 14, are held away from the pile of blanks by means of the springs 16, and are moved toward and under the blanks by rods 17 and eccentric driving mechanism 18, on the cross shaft 19, which is driven in a similar manner to the shaft 8. The fingers 13 swing beneath the ends of the rods 2, and beneath the edges of the blanks.

The short transverse edges of the blanks on the right hand in Fig. 7 are continually supported by the fixed ledge or arm 20. When the table 5 swings downwardly the pile rests as regards the left hand corners, that is to say their rear edges, on the ledges or shelves 12, and at the right hand the cross or transverse edge rests on the arm 20. The ledge or arm 20 and the fingers 13, engage on the bottom of the second lowest blank and support the superincumbent pile, while they leave the lowest blank free. This is due to the peculiar formation and arrangement of the movable table 5, which raises the pile free of the ledge 20, when the nozzle 21 comes up to take a sheet. To insure this raising, the arms 20^a, supporting the ledges 20, are provided with shoulders 20^b, which terminate a short distance from the foot of the pile and face the pile so that the upper blanks rest against the shoulder part, as can be seen in Fig. 1. This prevents an excessive weight being put upon the fixed rigid ledges 20, and enables the table 5 to lift the comparatively small lower part of the pile clear of the ledge to facilitate withdrawal of the lowest blank by the suction device 21.

The lowest blank is engaged or seized by the suction nozzle 21 before the table 5 is oscillated downward, and this blank is swung downward past the side fingers 13, by flexing or bending the part which overhangs the forward edge of the table 5. The part which is so engaged by the suction nozzle 21, is preferably the flap *e*. The suction nozzle 21 thus draws the lowest blank from beneath the arm or finger 20 which, as seen in Fig. 3, only engages the edge of the flap and is relieved of weight during the withdrawal. The suction nozzle 21 is mounted on a hollow spindle 22 and this spindle is oscillated at the proper time by a lever 23, which engages a cam 24, so as to cause the lever 23 to swing once for each rotation of the shaft 8, and the main shaft 11. This nozzle is mounted on the hollow shaft 22, which is connected in any convenient and well-known manner to the suction pump 25. When the suction nozzle closes on the lowest blank, this blank is drawn downward so as to move with the oscillating nozzle 21. The end of the shaft 22, is conveniently connected by a flexible piping to the pump 25. The action of the pump is intermittent so as to facilitate the taking up and releasing of the blanks.

When the flap *e*, is drawn down by the suction nozzle a helical wing 26, shaped somewhat like a sickle, swings around between the lowest sheet and the second lowest, thereby completing the downward move-

ment of the flap *e*, and insuring its engagement by one of the grippers 27, as hereinafter described. The sickle is mounted to rotate about an axis transverse to the axis of the roll 28, and the oscillating nozzle 21. The sickle thus rotates in the plane parallel to the blanks. The rotation of the sickle takes place continuously in the direction of the arrow 26^a, in Fig. 7, and it is driven by the bevel gearing 26^b, seen in Fig. 3. When the arm 26^c has passed the nozzle 21, this nozzle is then free to pass upward in the arcuate space inclosed by the sickle to take the next blank. The wing or sickle 26, is of helical or screw form, so that on rotation it completes the bending or flexing movement initiated by the nozzle 21. This will be understood on reference to Figs. 3 and 7. The sickle 26, thus takes the blank from the nozzle, swings the flap *e*, about the upper edge of the table 5, and brings this flap into the region where it is caught by the grippers on the roll 28.

It will be seen that by initiating the downward flexing movement of the flap *e*, of the lowest blank by the suction nozzle and completing it by means of the wing 26, the suction nozzle need not swing far downward into the region of the roll, nor need it hold the paper blank for such a protracted period. The nozzle 21 can return to take up the next blank during the completion of the flexing movement by the sickle 26. This division of the flexing operation thus simplifies the construction and enables the machine to operate at a greater speed.

The gripper roll 28, (see Figs. 3 and 4) is provided with gripping fingers or grippers 27, and rotates continuously at half the speed of the main shaft, and also at half the speed of the shaft 8. A feature of the present construction is that the gripper roll is large and is provided with two sets of grippers 27, hence its rotation at half the speed of the main shaft. The top of the gripping roll is slightly higher than and in advance of the front or forward edge of the table and the paper blank is drawn over the top of the roll and from under the pile. This enables all the adjusting and other mechanism to be readily accessible for cleaning, inspection and repairs. It also enables the adjusting or straightening mechanism hereafter described to be arranged exterior to the roll and to act on the blank during the forward movement. There is no loss of time by stopping the blank till it has been adjusted. As the gripper roll is continuously rotating the gripping of the transverse edge of the lowest sheet has to take place quickly. This gripping action is assisted by the dropping of the table 5, which has the effect of straightening the previously bent sheet. The sheet finds an abutment at its rear edges on the rear posts 1 and thereby the edge of the flap *e*, is caused to move rapidly toward the grippers 27 when the sheet straightens. In other words the rapid joggling down of the table 5 causes the forward edge of the blank to move more quickly than the peripheral speed of the gripper roll 28, and this rapid movement or acceleration is timed to bring the edge of the blank properly under the grippers 27. The arrangement and shape of the table 5, and its oscillating movement, thus coöperate, not only to facilitate the removal of the lowest sheet, but also to insure this sheet being gripped properly by the fingers 27 of the gripper roll 28.

Each pair of grippers 27 is mounted on a common axis 29, and on each axis or spindle 29, and externally to the roll 28, there is provided an arm 30, which is acted upon by a spring 31 (see Fig. 3). The spring is coiled around a rod 32, and abuts on a sleeve 33 pivotally mounted on the roll. This sleeve 33 receives the end of the rod 32. At the opposite end of the roller (see Fig. 4) to that at which the springs 31 are provided, each of the spindles 29, has a toothed wheel 34 mounted thereon, and each of these toothed wheels is in engagement with a second toothed wheel 35. The toothed wheel 35 is adapted to move or oscillate with an arm 36 carrying a roller, which engages a cam 37. The cam 37 is seen in Fig. 4, and is a fixture, being mounted clear of the end of the roll 28. By the oscillation of the arm 36, and toothed wheel 35, the toothed wheels 34, are also oscillated, and the grippers 27 are caused to swing inwardly against the action of their springs 31, which tend to hold them in gripping position. The grippers 27, engage the sheet and carry it, with the flap *e*, foremost, around, over and with the roll 28, until the corners *c*, *d* (Fig. 13) engage on the movable fingers 38, which project into grooves in the roller 28. The arcuate guide plate 39, is arranged concentric to the roller 28, and serves to guide the blank during this operation.

II. Adjustment of the blank.—Before the blank passes to the manipulating parts proper of the machine, it must be accurately adjusted, so that the folding lines lie accurately along the lines indicated in Fig. 13. This is effected by means of the mechanism now to be described more particularly with reference to Figs. 3 and 4.

The fingers 38 are mounted on the transverse spindle 40, which is supported in suitable brackets on the side frames of the machine. This transverse spindle has fixed on it an arm 41, having a roller at its lower end which contacts with a cam 42, mounted on the axis of the roller 50. The cam 42 rotates with this axis at the same speed as the driving shaft 11. The arms 38, however, do not move downwardly so quickly as the pe-

ripheral speed of the roll 28, that is to say the speed of the points of contact of the arms or fingers 38, with the blank is not so great as the peripheral speed of the roller 28. The grippers 27 are timed to release the front edge of the sheet just as a sector 43 comes into coöperation with the sheet to continue the transportation of the same. The sector 43, when it comes opposite the roll 28, is moving at the same peripheral speed as the roll and consequently the rear of the blank gripped between the sector 43 and the surface of the roll 28, is moved forward more rapidly by the sector and the roll, which constitute rotary feeding parts, than at the forward edge engaged by the fingers 38. The blank is thus properly pressed forward from the rear, so as to nest with its corners closely in contact with both fingers 38. The part of the blank, however, between the fingers 38 and the segment 43, is bellied out as shown in Fig. 4. To permit of this bellying action the guide plate 39, is swung outwardly from the position shown in Fig. 3, to that shown in Fig. 4. The arcuate guide plate 39 is pivotally mounted on a fixed axis 47, and has a rearwardly projecting arm 44, adapted to coöperate with a cam 45 fixed to rotate with the sector 43. A spring 46 may be used to maintain the arm 44 in contact with the cam 45. The amount of the bellying shown in Fig. 4 is dependent upon the dimensions and shape of the blank and the amount of the oscillation of the arcuate guide 39 must be sufficient to accommodate any amount of bellying action which will be met with in practice.

The arrangement of the arcuate guide 39 just described enables a certain amount of latitude to be used as regards the period at which the grippers 27 release the blank. In all cases the gripper should preferably carry the blank forward under the arcuate guide 39, which is only swung away from its position close to the roll 28 (see Fig. 3) at or about the time when the sector 43 comes into operative position. If then the grippers 27 release the blank sooner than the segment 43 engages with the same, the proper guiding of the blank is taken up by the arcuate guide 39, until such time as the sector does come into operation. These provisions enable the machine to be used with a widely varying size and shape of blanks.

In addition to the above described parts, a fixed finger, or pair of fingers 49, is mounted on a cross bar 48. The purpose of this finger is to direct the oncoming blank properly into the bite of the rolls 28 and 50. The pivot 47, for the arcuate guide 39, is conveniently mounted as shown on the fixed fingers 49.

III. The creasing of the transverse edges on the introduction of the blank into the set of rolls.—The roll 50 (Figs. 3 and 10) rotates continuously in the ratio of 1—1 to the main shaft, but is provided with a break or opening 51, in its circumference, so that it is only effective after this opening 51 has passed the roll 28. The rolls are set and timed so that the break 51 has just passed the full circumference of the roll 28 when the fingers 38 swing rapidly downward, that is to say, after the blank has been properly adjusted. These fingers swing down at an accelerated rate during the latter part of their movement. The roll 50 coöperates with the roll 28 merely to transport the blank forward. In advance of the bite between the rolls 28 and 50, there is provided a transverse soft rubber or the like roll 52. The roll 50 has openings in its circumference through which there may project blades 53 and 54. The blade 53 is spaced from the edge of the opening 51 in the roll. These blades are movable radially so that when they pass the bite between the roll 50 and the soft roll 52, they are moved outward to project beyond the circumference of the roll 50. During the time that the roll 50, is in contact with the roll 28, however, the blades 53 and 54 lie within the circumference of the roll 50. In order to prevent the roll 52 from pressing the blank into the opening or openings of the creasing roll 50, means are provided for moving the soft roll 52 toward and away from the apertured creasing roll during its operative and inoperative periods. The means shown consist of centrally pivoted levers 52^a, which carry the roll 52 and have rolls 52^b, at their other ends which coöperate with cams 52^c on the transverse shaft 8. The movement of the roll 52 toward the roll 50, for operative purposes also has the effect of accentuating the crease. The carrying bars 56 of the creasing blades are supported on arms 57 (see Figs. 10 to 12). The arms 57 are pivoted at the sides of the roll 50, on pivots 58, and are provided with rollers 59 resting on fixed cam plates 60. Sleeves 61, which carry the cams 60, are mounted loosely on the axis 62 of the roll 50, and are prevented from rotating by being suitably fixed to the machine frame. With various sizes of blanks the distance between the lines of fold *a*—*b* and *c*—*d*, also varies. To enable the proper adjustment to suit these lines of fold, one of the creasing blades 54 has the pivot 58 of its arm 57 mounted on an eyepiece carried by a sleeve 63, which projects out at the ends of the roll 50, and may be adjusted as regards its position so as to alter the distance between the creasing blade 53 and the creasing blade 54. The sleeve 63 is located between the sleeve 61 carrying the cam 60, and the end of the roll as can be seen in Fig. 10.

The creasing of the lines of fold is effected

by the blades 53 and 54 in the known manner, and no claim is made to the use of such blades for creasing the lines of fold.

IV. The manipulation of the blank in the set of rolls.—The rolls 50 and 55 form the first pair of a set (Figs 1 and 2) in which the rolls coöperate with members hereinafter described for completing the operations upon the blank. Between the separate pairs of rolls there are arranged bridges 64, 65, 66, 67, 68 and 69, over which the blank is led from one pair of rolls to the next. Between the first and second pairs of rolls and partly in these rolls themselves, the side flaps *g*, *g*, are creased. As the blank *w*, passes over the bridge 64, it is led under two bars 70, the outer edges of which lie directly over the fold lines *a*—*c*, and *b*—*d*. The side flaps *g*, thus project beyond these bars and beyond the bridge 64, as can be seen by the dotted lines in Fig. 2. Outside the bridge there are arranged two pushers 71, which are moved vertically upwardly in a known manner each time a blank passes through and thereby the flaps *g*, are bent upwardly over the outer faces of the bars 70 (see Fig. 14).

When the side flaps are turned up as described, the blank is then led through the second pair of rolls 72 and 73 to the second bridge 65. The rolls now bear on the center part of the blank and between the raised flaps *g*. The upper roll carried by arms 74, conveniently consists of three disks 72, mounted on an axis supported from arms 74.

As the blank passes over the second bridge 65 the side flaps *g*, *g*, are folded down by the action of the inclined guiding wings 75, so that these flaps enter the bite of the third pair of rolls 76, 77, to be pressed down close to the center part of the blank. The inclined guide wings 75 are of known curved construction and are consequently shown only somewhat diagrammatically. The third bridge 66 now conducts the blank with its folded side flaps to the fourth pair of rolls 78, 79. These, in conjunction with the fourth bridge 67, and the fifth pair of rolls 80, 81, carry the blank on to the gumming device. The purpose of the gumming device is to smear portions of the blank indicated by shading lines at *h*, *h*, in Fig. 13. The smeared portions are on the opposite side of the blank to that seen in Fig. 13, hence the dotted shade lines. This smearing takes place on the fifth bridge 68.

The adhesive is taken up from the container 83 by a roller 82, in the known manner, and transferred to the roller 84. This roller in turn transfers the adhesive to the helical blades 85 (see Figs. 1, 2, 8 and 9) which are really mutilated rolls mounted on a transverse axis above the flat table. These helical blades are oppositely arranged and apply the adhesive in the proper places on the side flaps. A feature of the arrangement just described is that the smearing members contact along the parts to be smeared, with the moving blank just like a roll. The table or bridge 68 is supported at such a height as to be substantially tangential to the lowest point of the helical blades or it may be incut with a transverse groove or slot 86 (as seen in Fig. 8) so that the lowest point of the wings 85 just passes below the upper plain surface of the table 68. The paper of the blank is thus slightly pressed into the slot and the smearing is effected with great reliability. The position of the smearing advances transversely with the screw shape of the wing; the paper, however, is always depressed or stretched substantially transversely to the axis of rotation of the wings 85, between the opposite edges of the slot so that there is no tendency to displace the blank. It has been found that when helical blades co-act with a roller instead of with a blank moving over a flat table at the peripheral speed of the helical blades there is a side thrust tending to displace the blank. The construction described has been found to eliminate the side thrust. The entire surface to be smeared, therefore, comes effectively in contact with the smearing wings without requiring any filleting or rounding of the edges of the smearing device. Such filleting or rounding of the edges renders the transference of the adhesive from the holder more difficult.

The sixth pair of rolls 87, 88, merely serve the purpose of transporting the blank. The upper roll 87 must in this case be arranged to avoid contacting with the freshly applied adhesive. This result is effected by providing suitable apertures or recesses 87^a (see Fig. 2) in this roll, which apertures register with the gummed portions. The blank may now pass over the sixth bridge 69 to the seventh or last pair of rolls 89, 90, which in conjunction with the parts now to be described fold over the bottom flap *e*, of the blank and the closing flap *f*.

V. The folding over of the bottom flap and closing flap and the reversal of the blank.—The steps described leave the blank as it passes from the second last pair of rolls with the two side flaps turned down and gummed along their edges, while the edges *a*—*b*, and *c*—*d*, are creased, but neither the flap *e*, nor the flap *f*, has been folded over. The flap *e*, forms the bottom flap and precedes the flap *f*, which forms the closing flap.

Referring to Figs. 1, 2, 5, and 6, as the flap *e*, passes out from the second last pair of rolls 87, 88, on to the bridge piece 69, a finger 91 mounted beneath the table is oscillated to project above the level of the bridge 69. This finger is pivotally mounted,

and is operated by a forked rod 92, having a roller which co-acts with a cam 93 on the axis of the roller 88. The finger 91 deflects the flap *e*, which precedes the flap *f*, upwardly, as shown in Fig. 5. The blank is still being advanced by the transporting rolls 87 and 88. At the proper time a finger 94 swings downward and catches the blank at the creased line *c*—*d*, in Fig. 13, whereupon the finger 91 swings back and the finger 94 introduces the blank with the creased line *c*—*d*, foremost, in the bite of the last pair of rolls 89, 90. The finger 94 is mounted on a transverse pivot 95, which is provided with an arm 96 operated by a rod 97, having a forked end and roller engaging a cam 98. The cam 98 is mounted on the axis of the roll 89. The rolls 89 and 90 now continue the transportation of the blank and press the bottom flap *e*, on to the previously gummed portions of the side flaps *g*, *g*.

It is still necessary to fold over the top flap *f*, along its creased line *a*—*b*. This folding operation is effected by the co-action of the roll 90 with a further roll or sector 99. It is necessary, however, first of all to turn the blank, so that the creased edge *a*—*b*, precedes the edge *c*—*d*. For this purpose the blank is deflected upward as shown in Fig. 5, by means of a movable guide finger 100. The guide finger 100, is supported on an arm 101 pivoted at 102. It is actuated by a centrally pivoted lever 104 connected at 103 to a bracket on the rear face of the finger. The lever 104 is oscillated at the proper time by means of a rod 105, having a forked end, and a roller which engages a cam 106, which rotates with the roll 90. At the proper time a folding blade 107 is oscillated in a manner similar to the finger 94, to press the blank along the creased line *a*—*b*, downward past the movable deflecting finger 100 into the bite between the roll 90 and the sector 99. As the blade 107 moves from the position shown in Fig. 5 to that shown in Fig. 6, the guide finger 100 is moved backward. The position of the parts at this stage is illustrated in Fig. 6. This figure also illustrates the finger 94 introducing the next following blank between the rollers 89 and 90 for the purpose of folding over the bottom flap *e*.

No claim is made here broadly to the reversal of the blank after folding over the closing flap *e*, for the purpose of introducing the blank between a second pair of rolls to transport and press the folded closing flap *f*. It has already been proposed for this purpose to employ gripping fingers in the upper roll, that is, in the present case, the roll corresponding to 89, but this necessitates the use of openings in this roll, which do not give a sharply defined edge on pressing. It has also been proposed to employ a fixed guide plate to reverse the blank. This construction enables a sharp folding edge to be obtained along the creased line *c*—*d*, but the device is apt to become inoperative at times, so that some of the blanks stick, or pass straight through to the second pair of transporting rolls, without being turned. The use of a movable arm or guide 100 obviates all these difficulties, in conjunction with the sector 99, which allows the movable arm 100 sufficient room to become effectively operative. The sector 99 also only presses the blank for a sufficient time to insure the proper folding of the flap *f*, and thereby prevents the imprisoning of air or the spoiling of the fold which has already been completed along the creased line *c*—*d*.

The finished envelops are counted and bundled by suitable mechanism illustrated somewhat fragmentarily in Fig. 1, but described more fully in our co-pending application Serial No. 848,043 filed 29th June 1914. A suction nozzle 108 transports the finished envelops into the compartments of a rotatable drum 114. The number of envelops consigned to each compartment is counted by counting mechanism embodying a ratchet 124 having pawl operated mechanism 127 and trip gear 164 which prevents the pawl from operating when no envelop is seized by nozzle 108. When twenty five envelops have been discharged into a compartment the levers 132, 133, receive a kick by mechanism not illustrated, whereby the drum 114 is moved forward one step to bring a fresh compartment into receiving position. The bundles are carried around an arcuate guide 143 till they engage a stop 144, when they are swept off the arcuate guide and fall on to a table 147 being pushed forward by a pusher 146 operated by an arm 145 pivoted about the pin 148. Dotted circle 139 indicates the location of the operative mechanism for feeding the drum 114 forward through a single step.

The invention may be applied to envelops and paper bags of widely varying shapes and sizes.

We claim:

1. A machine for folding envelop blanks comprising means for feeding separate blanks to a gripping roll, means for adjusting the blanks on said roll, a creasing roll pressing against said gripping roll and between which rolls the blank is introduced immediately after adjustment, transverse blades in said creasing roll operable to crease transverse fold lines on said blank and side creasing and folding means operable on said blank immediately subsequent to said transverse creasing.

2. A rotary machine for folding envelop blanks comprising a table supporting a pile of blanks, means for separating and flexing the bottom blank downward, a gripping roll

receiving the forward edge of said bottom blank and withdrawing it from beneath the pile over the top of the roll, means for adjusting the blank during its forward movement on the gripping roll, and creasing mechanism receiving and operating on the blank immediately after adjustment.

3. In a rotary machine for folding envelop blanks, a gripping roll, means for feeding separate blanks to said roll, movable adjusting means engaging said blank on the gripping roll, a creasing roll rotatable in contact with said gripping roll and having openings in the periphery thereof, means for disengaging said adjusting means from the blank when one of said openings has just passed the gripping roll and a transverse creasing knife mounted to slide radially in said creasing roll and spaced from the edge of said opening.

4. In a rotary machine for folding envelop blanks, a rotatable creasing roll having apertures in the circumference thereof, a creasing blade movable radially through one of said apertures, a sleeve adjustable about the axis of said roll, means for clamping said sleeve to said axis, pivoted arms on said sleeve, a folding blade carried by said arms and a fixed cam plate engaging said folding blade parts to move the same radially as they pass a definite point in their rotation and a counter pressure roll contacting with said creasing roll at said definite point.

5. In a rotary machine for folding envelop blanks, a transverse creasing roll having apertures therein, transverse creasing blades movable radially to and carried by said roll, a soft roll in contact with said creasing roll at the point where said blades move radially out from the creasing roll, and means for moving said soft roll toward and away from the apertured creasing roll during its operative and inoperative periods respectively.

6. In a rotary machine for folding envelop blanks, a transverse creasing roll having apertures therein, transverse creasing blades movable radially to and carried by said roll, means for adjusting one of said creasing blades circumferentially in said apertures, comprising an adjustable carrying sleeve rotatable with the roll and supporting members pivotally mounted on said sleeve to carry said adjustable blade, a soft roll in contact with said creasing roll at the point where said blades move radially out from the creasing roll, and means for moving said soft roll toward and away from the apertured creasing roll during its operative and inoperative periods respectively.

7. In a rotary machine for folding envelop blanks, means for gumming the folded flaps comprising a flat stationary table, transporting rolls engaging the blank and moving it over the flat table, a helical gumming blade rotatable above the table and at the lowest point of its movement substantially tangential to said table to press the blank against the table and means for applying gum to said blade.

8. In a rotary machine for folding envelop blanks, means for gumming the folded flaps comprising, transporting rolls engaging the blank, a flat stationary table over which said blank is transported and provided with a groove transverse to the direction of movement of the blank, a helical gumming blade mounted directly over said groove and rotatable about an axis parallel to the longitudinal sides of said groove, said blade being at its lowest point in its movement directly over the groove and substantially in the plane of the table, and means for applying gum to said blade.

9. In a rotary machine for folding envelop blanks, means for gumming the folded flaps, comprising transporting rolls engaging the blank, a flat stationary table over which said blank is transported and provided with a groove transverse to the direction of movement of the blank, oppositely arranged helical gumming blades mounted directly over said groove and rotatable about an axis parallel to the longitudinal sides of said groove, said blades being at the lowest point in their movement directly over the groove and substantially in the plane of the table, and means for applying gum to said blades.

10. In a rotary machine for folding envelop blanks, means for creasing the blanks transversely, means for folding the side flaps, means for gumming said side flaps, means for folding over the bottom flap on said gummed portions comprising an apertured transporting roll having its apertures adapted to register with the gummed portions on the blank and advance it bottom flap foremost, a table over which said blank is transported by said rolls, a finger mounted beneath the table and movable upward from said table through an aperture in the same to deflect the bottom flap upward, an oscillating finger mounted above said table to swing into engagement with the crease of said bottom flap and a pair of pressing rolls receiving the blank from said fingers and pressing the bottom flap on the gummed portions.

11. In a rotary machine for folding envelop blanks, means for creasing the blank along the folding lines of the bottom and closing flaps, means for advancing the blank bottom flap foremost, means for folding the side and bottom flaps, and means for turning the blank to advance with said closing flap foremost comprising, transporting rolls, a movable guide finger engaging the forward end of the blank passing from said

rolls and bent to deflect said blank with its advancing edge upward, a folding blade engaging the blank along the crease line of the closing flap and a second transporting roll coöperating with one of said first mentioned transporting rolls and receiving the blank from said folding blade.

12. In combination a pair of blank transporting rolls running in contact, a third roll coöperating and running in contact with one of the members of said pair, a movable bent finger receiving the blank from the first mentioned pair and deflecting its foremost edge upward, a folding blade movable separately from and independently of said finger bending said blank and entering it between the third roll and the member of the first pair with which said third roll runs in contact.

13. In a rotary machine for folding envelop blanks, a transporting roll, a sector coöperating therewith to press the last fold of the envelop blank and a movable suction nozzle receiving the blank from said sector and completing the delivery of the same.

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

MAX DÜNNEBIER.
ALFRED WINKLER.

Witnesses:
A. W. MATHYS,
P. S. H. ALEXANDER.