May 1, 1923. 1,454,008

P. J. WOOLDRIDGE

ENVELOPE FILLING MACHINE

Filed Aug. 17, 1918 3 Sheets-Sheet 1

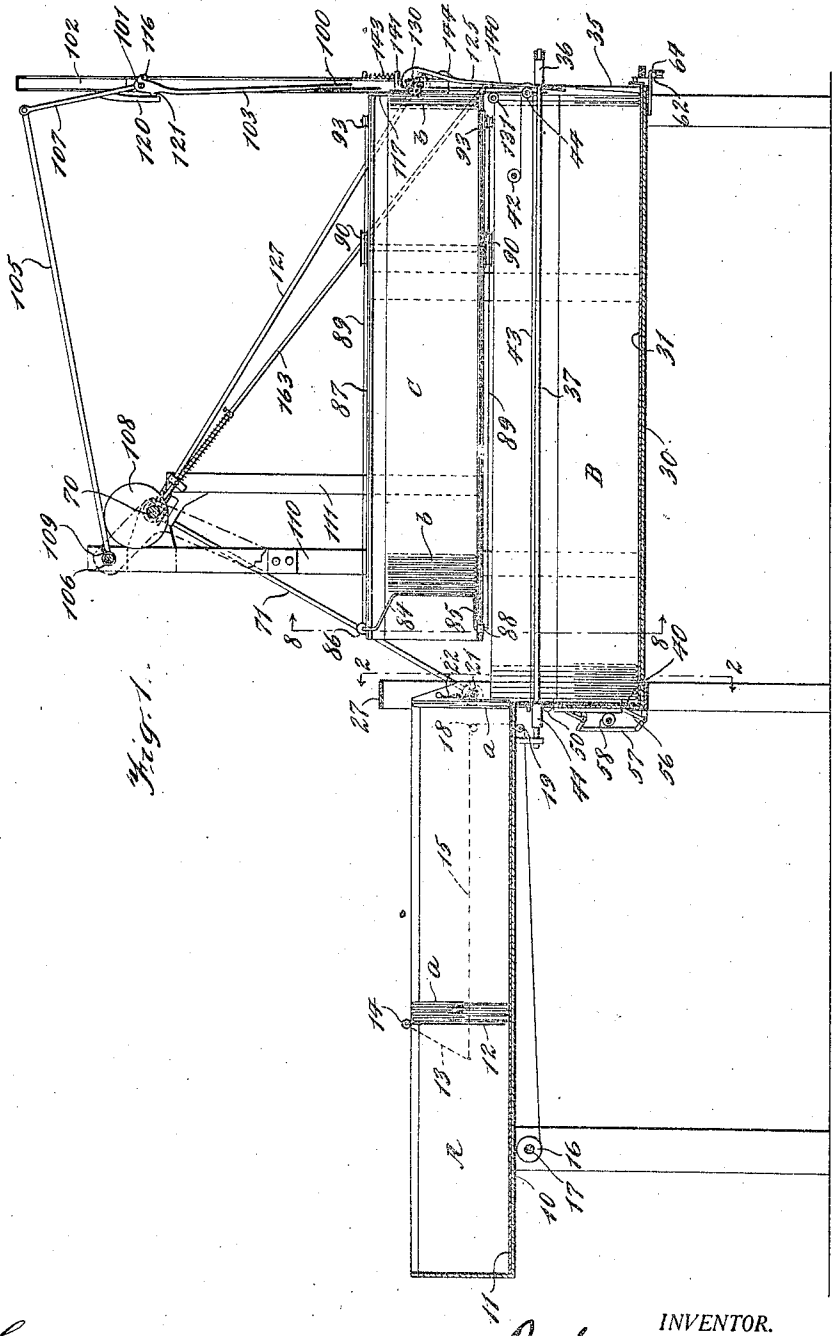


Fig. 1.

WITNESS:
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Marie Maurus

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Fig. 2.

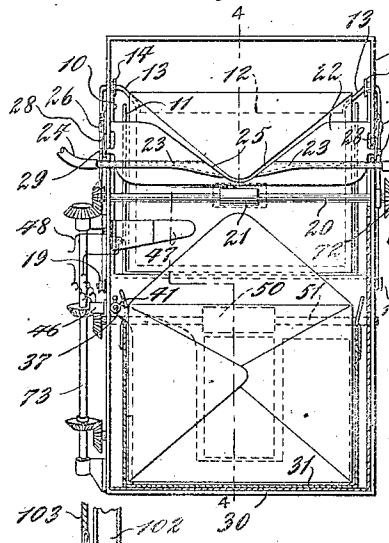


Fig. 3.

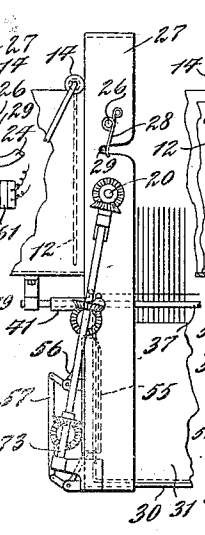


Fig. 4.

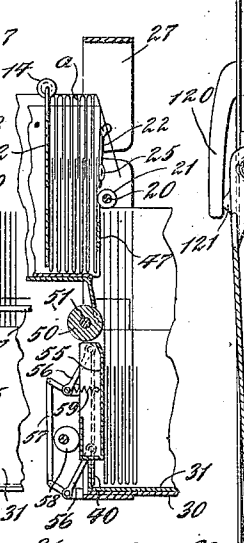
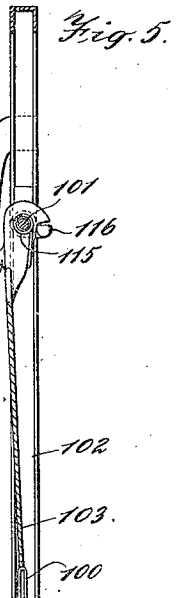


Fig. 5.



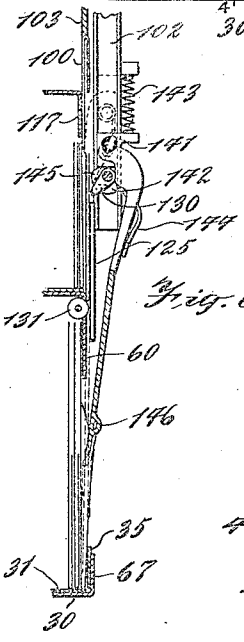
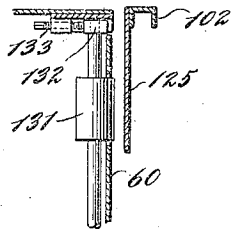


Fig. 11.



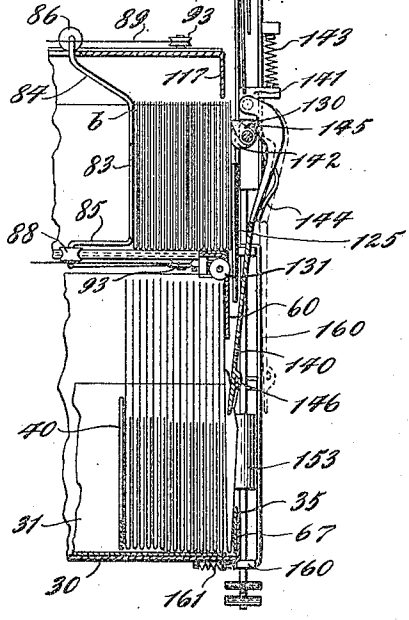
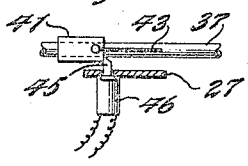


Fig. 12.



WITNESS:

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May 1, 1923. **1,454,008**

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ENVELOPE FILLING MACHINE

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Fig. 7.

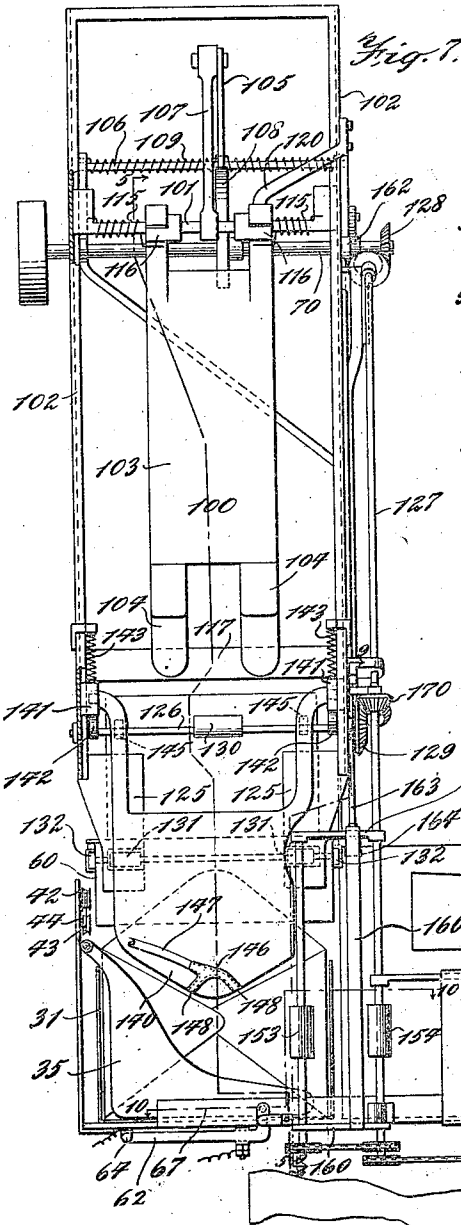


Fig. 8.

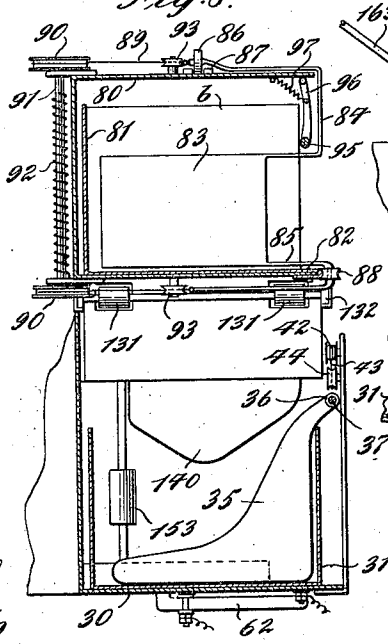


Fig. 9.

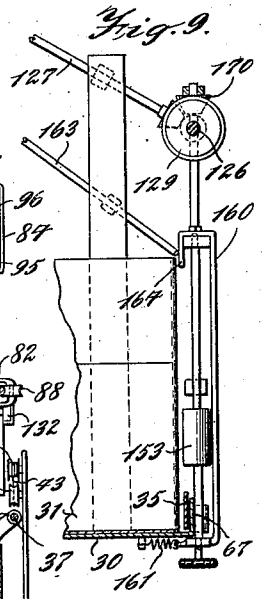
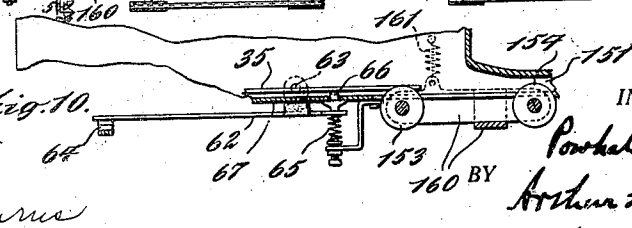


Fig. 10.



WITNESS:

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BY

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Patented May 1, 1923. 1,454,008

UNITED STATES PATENT OFFICE.

POWHATAN J. WOOLDRIDGE, OF OLDHAM COUNTY, KENTUCKY.

ENVELOPE-FILLING MACHINE.

Application filed August 17, 1918. Serial No. 250,295.

To all whom it may concern:

Be it known that I, POWHATAN J. WOOLDRIDGE, a citizen of the United States, residing in Oldham County, Kentucky, have invented certain new and useful Improvements in Envelope-Filling Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to a machine for filling envelopes, more particularly with flat folded sheets of paper or similar material, such as folded circulars or pamphlets. The invention aims to provide a machine of this kind whereby made envelopes having folded over closing flaps supplied to the machine in quantity will be successively opened and presented in position to receive the folded circular or other filler, and whereby the fillers will be fed, one by one, from a stack or column and inserted in the successively positioned open envelopes, the filled envelopes being then successively closed and delivered from the machine. The invention consists in various features of construction, arrangement and combinations of parts, all as hereinafter described and specifically pointed out in the claims.

A full understanding of the invention can best be given by a detail description of an organized machine embodying the various features of the invention in the form which I now consider best in connection with drawings illustrating such a machine, and such a description will now be given in connection with the accompanying drawings, in which:—

Fig. 1 is a side view of the machine shown partly in section;

Fig. 2 is a transverse sectional view taken on line 2—2 of Fig. 1, but on a larger scale than Fig. 1;

Fig. 3 is a broken side view of parts of the apparatus taken looking from the left of Fig. 2;

Fig. 4 is a broken sectional view taken on line 4—4 of Fig. 2 looking from the left;

Fig. 5 is a vertical longitudinal sectional view taken on line 5—5 of Fig. 7;

Fig. 6 is a diagrammatic view illustrating the position of the filler delivering and envelope opening devices after the pusher by which the fillers are delivered from the holder C has made part of its delivery movement, and showing also by dotted lines the position of such devices at the end of the downward movement of the pusher;

Fig. 7 is an end view of the machine looking from the right of Fig. 1;

Fig. 8 is a transverse sectional view taken on line 8—8 of Fig. 1, but on the scale of Figs. 2 to 6 and without any envelopes in the holder;

Fig. 9 is a view taken on line 9—9 of Fig. 7, but with parts omitted in order to show illustrated parts more clearly;

Fig. 10 is a broken detail sectional view taken on line 10—10 of Fig. 7, but on a further enlarged scale;

Fig. 11 is a detail view illustrating means for adjusting the position of a drag roller past which the fillers are advanced from the filler holder; and

Fig. 12 is a detail view of the release catch which is operated to permit movement of a follower for feeding the opened envelopes.

In the machine shown, the envelopes, *a*, to be filled are fed successively from a holder A to a second holder D, the envelopes being opened, or having their closing or sealing flaps turned upward, as they are advanced from the holder A to the holder B. The open envelopes are then advanced through the holder B to be successively presented in position to receive a filler. The fillers, *b*, are successively fed from a holder C and entered, one into each envelope, and the envelopes after receiving their fillers are successively moved from their receiving position and have their flaps turned over into closed position and are then delivered from the machine. In the machine shown, and most desirably, the holders A, B and C are arranged horizontally, the holder A being adapted for holding a horizontal stack or column of unopened envelopes, the holder B being adapted for holding a horizontally arranged stack or column of opened envelopes, and the holder C being adapted for holding a horizontally arranged stack or column of the folded circulars or other fillers.

The holder A comprises an outer supporting member 10 having bottom and side walls and an inner container or holder proper 11 also having bottom and side walls. The inner member or holder proper 11 is of a width between its side walls just sufficient to receive and properly guide the

envelopes of the particular size for which said holder is intended, and is removable so that holders of different sizes may be used according to the size of the envelope to be filled. The outer member 10 is made of such transverse dimensions as to receive the inner holder 11 for the largest size envelopes the machine is intended to handle. Both holder members 10 and 11 are open at their front or delivery ends and the inner member is, most desirably, open also at its rear end. The outer member might also be open at its rear end, but is best provided with a rear wall, as shown in Fig. 1. The inner holder member may be of the full length of the outer member, and any suitable means may be provided for holding it in position both longitudinally and transversely of the outer member.

For feeding the column of envelopes gradually forward in the holder as the end envelopes are successively delivered from the holder, a follower 12 is provided which, as shown, is formed by a plate carried by arms 13 provided with rolls 14 to run on the upper edges of the sides of the outer holder member 10 and which extend downward outside the holder and are connected by cables or cords 15, one on each side of the holder, with spring driven winding drums or pulleys 16 fast on a shaft 17, the cables passing forward from the follower arms over guide pulleys 18 and 19 and thence back to the winding pulleys. A shaft 20 extends across the open delivery end of the holder and carries a feed roll 21 in position to engage the end envelope of the column of envelopes in the holder. This feed roll, which is constantly driven in the normal operations of the machine, has a soft rubber or other suitable friction surface and acts to move the successive end envelopes edgewise and, in the arrangement shown, downward from the delivery end of the holder A.

Arranged immediately above the shaft 20 and feed roll 21, is a flap opening plate 22 which, as each envelope is fed edgewise downward by the delivery roll 21, enters beneath the closing flap of the envelope and acts to turn the flap outward and upward as the envelope is fed downward. In connection with this flap opening plate 22, there is provided means for causing a jet of air to strike against the envelope for the purpose of lifting the flap away from the body of the envelope and insuring its passing outside the plate 22 as the envelope moves downward. In the construction shown, the plate 22 is formed with a V-shaped upper edge corresponding approximately in form with the shape of the edge of the envelope flaps, and is provided with air conduits 23 which are connected by flexible tubing 24 with any suitable source of compressed air and which have discharge outlet openings or nozzles 25 located at or adjacent the edge of the plate and near the bottom of the notch therein for directing jets of air against the edge of the envelope flap. The plate 22 is best pivotally supported at points 26 in a supporting frame 27 which extends upward on each side of the delivery end of the holder A, the plate depending from its points of pivotal support and being pressed lightly inward by springs 28 which bear against pins or studs 29 extending outward from the side edges of the plate.

The holder B also comprises an outer or supporting member and an inner container or holder proper. The outer member 30 of the holder B is formed with a bottom and one side, being open at the other side, that is, the side at the left in Fig. 2. The inner member or holder proper 31 is similar to the inner member 11 of the holder A, having a bottom and sides and being open at its ends. This inner holder member is made to properly fit and support the envelopes which it is to hold and which are to be fed forward therethrough, and is removable from the outer member 30 so that inner members of the proper size may be used according to the size of the envelopes to be filled, and may be positioned in the supporting member 30 by any suitable means. The holder B is supported in a line with the holder A, but at a lower level, so that envelopes fed down from the discharge end of the holder A will enter the receiving end of the holder B.

For supporting the front of the column of open envelopes as the holder B is being filled with envelopes delivered from the holder A, a sliding abutment plate 35 is provided carried by a sleeve 36 mounted to slide on a rod 37 which extends longitudinally of and at one side of the holder member 30. The neck of the abutment plate 35 extends over the side wall of the holder member 31 and the plate extends downward into the holder in position to bear against the front envelope of the column of open envelopes which is being formed and fed gradually forward in the holder B, and the plate is cut away, as shown in Figs. 7 and 8, so that when the holder is filled and the plate in its forward movement reaches the forward end of the holder, it may pass by and not interfere with other parts of the apparatus hereinafter described. After the holder B has been filled with a column of envelopes and the movement of the successively filled envelopes from the delivery end of the holder begins, the column of envelopes in the holder will be moved gradually forward to maintain the forward end of the column in position at the delivery end of the holder

and under the desired pressure, by the feeding into the rear or receiving end of the holder of additional envelopes delivered from the holder A so long as the supply of envelopes in the holder A is maintained. When, however, the feeding of the envelopes from the holder A ceases, it becomes necessary to apply pressure to the rear end of the column of envelopes in the holder B to feed the column forward and maintain its front end at the delivery end of the holder and under the necessary pressure. For this purpose, a follower 40 is provided which is carried by a sleeve 41 mounted to slide on the rod 37, and which is constantly urged forward by a spring drum or pulley 43 acting through a cable or cord 48 which passes from the spring pulley forward about a guide roll 44 and thence backward to the sleeve 41. The follower 40 is formed by a thin plate which, during the time that envelopes are being fed from the holder A into the holder B, rests in position against the rear end wall of the outer member 30 of the holder B and slightly to the rear of the plane of downward feed of the envelopes from the holder A into the holder B, being held in its inactive position by means of a stop 45 engaging the sleeve 41 (see Figs. 9 and 12). In order that the follower 40 may come into operation automatically when needed, means are provided for withdrawing the catch 45 when the supply of envelopes in the holder A is exhausted. For this purpose, in the construction shown, the stop is arranged to be withdrawn by the action of a solenoid 46 connected in circuit with an insulated contact piece 47 which extends in position at the delivery end of the holder A to be engaged by the follower 12 when the follower reaches the end of its forward movement after the last envelope has been delivered downward from the holder A, the follower 12 being of metal and connected in the solenoid circuit as by a connecting wire 48 leading to the metal side wall of the holder member 10. The solenoid circuit is closed by contact of the follower 12 with the contact piece 47 and the solenoid 46 will then act to retract the catch 45, thereby releasing the follower 40 and permitting it to move forward to feed the column of envelopes in the holder B forward under the desired pressure.

Referring now to the means for delivering the envelopes from the holder A and into the holder B: as each envelope is fed downward from the end of the holder A by the action of the delivery roll 21, its flap being turned outward and upward by the action of the plate 22 and air jets from the nozzle openings 25, the envelope comes into engagement with a feed roll 50 which has a surface of soft rubber or other suitable friction material and is carried by a shaft 51 mounted to extend across the rear end of the holder B to support the feed roll 50 in position to engage the rear side of the envelopes as they are fed downward from the holder A and while they are still being acted upon by the delivery roll 21. In order that the feeding of the envelopes downward into the receiving end of the holder B shall not be obstructed by the backward pressure of the column of envelopes in the holder, a reciprocating pusher, or tapping device, is provided which acts to alternately push forward against the end of the column of envelopes in the holder and then move backward away from the end of the column, thus permitting envelopes from the holder A to be fed more freely downward at the rear of the column of envelopes in the holder B in the intervals between the forward movements of the pusher. In the construction illustrated, the reciprocating pusher 55 is mounted below the feed roll 50 and is carried by pivoted arms 56 connected by a link 57 to move together so that the pusher shall have a parallel movement. The pusher is operated by a cam 58 mounted on a shaft extending transversely across the rear end of the holder behind the pusher, a spring 59 tending to draw the pusher backward and the cam working against the spring giving the pusher a forward and back reciprocating movement to alternately force the rear end of the column of envelopes in the holder B slightly forward and then move backward away from the end of the column, so that an envelope being fed down into the holder shall not meet with any continuing resistance such as might prevent its downward movement.

The feed roll 50 mounted just above the pusher 55 is positioned to engage the rear side of the envelopes as they are successively delivered from the holder A in a plane slightly in advance of the plane in which the end envelope stands in the holder A, this being for the purpose of giving the feed roll 50 a stronger bearing against and better feeding grip on the envelopes. This feed roll 50 has a higher surface speed than the roll 21 so that its feeding speed shall be sufficiently high to make up for any interruption of the downward movement of the envelopes due to forward movement of the pusher 55. The upper end of the engaging face of the pusher 55 should be suitably bevelled backward as shown to prevent any possible blocking of the downward movement of the envelopes through their coming into engagement with the upper edge of the pusher when it is in its forward position.

When the holder B is filled with envelopes or when partly filled and the column is being pushed forward by the follower 40, the front end of the column abuts against the

abutment plate 35 and against a fixed abutment plate 60 (see Figs. 5 and 7) which extends downward in position to engage only the upper portion of the upstanding closing flap of the end envelope. The column of envelopes in the holder should be pressed forward with sufficient force to maintain the end envelope at the front or discharge end of the holder in the desired position against the abutments 35 and 60, but it is desirable to avoid too strong a pressure on the column such as might result from continuous feeding of envelopes from the holder A down into the holder B at a faster rate than the envelopes are filled and delivered from the front end of the holder B. Means are provided, therefore, for interrupting the feeding of envelopes from the holder A whenever the pressure on the column of envelopes in the holder B becomes greater than desired. For this purpose, in the construction shown, the shaft 20 which carries the delivery feed roll 21 is driven through a magnetic clutch 61, the circuit of which is controlled by a contact piece at the discharge end of the holder B which comprises a lever 62 connected in the clutch circuit and pivoted at 63 to the bottom of the outer holder member 30. The lever normally makes contact with an insulated contact piece 64 which is also connected in the clutch circuit. The contact lever 62 is normally held in its circuit closing position, as shown in Fig. 10. by means of a spring 65, and carries or bears against a stud 66 which normally bears against the abutment plate 35 and holds the plate slightly back from an upstanding flange 67 at the end of the holder. When the pressure of the column of envelopes against the abutment plate 35 becomes great enough to overcome the pressure of the spring 65, the abutment plate forces the stud 66 forward slightly and thereby swings the contact lever 62 to move its end away from the contact 64, thereby opening the clutch circuit and stopping the operation of the delivery feed roll 21. Delivery of envelopes from the holder A will thus be interrupted until the pressure of the column of envelopes in the holder B against the abutment plate 35 is reduced sufficiently to permit the spring 65 to return the contact lever 62 to its circuit closing position, whereupon the feeding of envelopes from the holder A to the holder B will again proceed.

The feed rolls 21 and 50 and cam 58 may be driven in any suitable manner. As shown, the driving member of the magnetic clutch 61 through which the shaft 20 of the feed roll 21 receives its motion, is driven from a main shaft 70 through a connecting shaft 71 which carries at its ends bevelled gears, the gear on one end meshing with a bevelled gear on the shaft 70, and the gear on the other end meshing with a bevelled gear 72 on the driving member of the clutch 61. The shaft 51 which carries the feed roll 50 and the shaft of the cam 58 are driven from the shaft 20 by means of a shaft 73 which carries bevelled gears meshing respectively with similar gears on the shafts 20 and 51 and on the shaft of the cam 58, as shown in Figs. 2 and 3, these gears being arranged so that the feed roll 50 will be driven in the opposite direction from that in which the feed roll 21 is driven and being timed to give the feed roll 50 a higher surface speed than the feed roll 21, as already explained. As the feed roll 50 and the cam 58 are driven from the shaft of the feed roll 21, they will operate only when the feed roll 21 is in operation.

The holder C is arranged parallel with and above the holder B with its front or delivery end in vertical alinement with the front end of the holder B, and like the holders A and B it comprises, in the most desirable form and as illustrated, an outer or supporting member and an inner member or holder proper. The outer member 80 has a bottom wall, one side wall and a top wall, and is open along one side. The front or delivery end of the holder member 80 is open except for abutment plates hereinafter referred to, and its rear end may also be open. The inner member 81, or holder proper, is most desirably made with merely a bottom plate and one side plate. The supporting member 80 is of sufficient size for the largest fillers which the machine is intended to handle, and the member 81 is made removable so that such members of proper size according to the particular fillers to be handled may be inserted. Any suitable means may be provided for securing the member 81 in position within the member 80. I prefer, however, to extend the bottom of the member at its open side and bend it downward and backward to provide a channel to receive the edge of the bottom plate of the outer holder or supporting member 80 as shown in Fig. 8. Screw or other pins 82 extending through the bent-over flange and into the bottom plate of the member 80 serve to hold the inner member securely in position.

The folded circulars or other fillers, which are placed in the holder from the side, are fed forward by a follower 83 formed by a plate carried by arms 84 and 85. The upper arm 84 extends over the top of the supporting member 80 and carries a roller 86 which runs in a track 87 on the top of the member 80 as shown in Fig. 8. The lower arm 85 extends outward and then inward about the bottom plates of the members 80 and 81 and is provided with a grooved roller 88 which bears against the turned over edge of the bottom plate of the holder 81. The ends of the arms 84 and 85 are connected by cables

or cords 89 with winding pulleys 90 carried by a shaft 91 and operated by a coiled spring 92, the cords extending forward from the follower arms and about guide pulleys 93. As will be seen, the follower 83 may be readily lifted out from the side of the holder so as to be moved back and placed behind additional fillers in the holder.

A rod 95 carried by swinging arms 96 depending from the upper wall of the outer holder member 80 extends longitudinally of the holder in position to bear against the outer edge of the column of fillers in the holder, the rod having a slight tendency to move inward, as under tension of a spring 97, to bear against the outer edges of the fillers and hold the same in position as they are advanced through the holder without bearing thereon so strongly as to interfere with their being fed forward by the follower 83.

The fillers are delivered downward successively from the front or delivery end of the holder C and into the envelopes successively positioned at the delivery end of the holder B by means of a vertically reciprocating pusher 100. The pusher 100 is carried by a crosshead 101 mounted to slide in ways formed by channelled side bars 102 extending vertically upward from the end of the holder C, the lower ends of the side bars being mounted just in advance of the position taken by the forward end of a column of fillers in the holder. The crosshead 101 is formed in the construction shown by a shaft provided with slide blocks extending into the channels of the side bars 102. The pusher 100 is mounted to have a slight forward and back swinging movement on the crosshead shaft, and comprises in the construction shown a downwardly extending part or plate 103 and a forked lower end formed by laterally spaced engaging members 104 extending downward from the end of the plate. Each member 104 is formed of a strip of sheet metal or other suitable material bent to U-form to provide a downwardly extending rear plate and a shorter downwardly extending front plate spaced apart sufficiently to receive the upper portion of a filler between them. The crosshead shaft 101 is reciprocated vertically to give the pusher its filler delivering and return movements by means of a cam-operated rod 105 which is pivotally mounted at one end on a rod or shaft 106 and has its other end connected by a link 107 with the crosshead shaft 101, and which is operated by a cam 108 on the shaft 70. The weight of the pusher, crosshead and operating rod 105 tend to hold the rod in contact with the cam and cause the pusher to move downward when permitted by the cam, but a spring 109 tending to throw the rod downward is also desirably provided. The driving shaft 70 and the shaft 109 are shown as carried by an upwardly extending frame formed by uprights 110 and 111 and parts carried by such uprights.

Springs 115 tend to swing the pusher backward from the position shown in Fig. 5, such backward movement being limited by stops 116 and by a flange or plate 117 extending downward from the front edge of the upper wall of the holder member 80. When the pusher and crosshead are in their uppermost position as shown in Figs. 5 and 7, the pusher is held in the forward position shown in Fig. 5 by means of an arm 120 which extends downward in position to engage a lug 121 on the pusher when the pusher is at and near its uppermost position. When the pusher has been moved downward a short distance from the position shown in Figs. 5 and 7, the lug 121 passes below the end of the arm 120 and the pusher is then permitted to swing under the influence of its springs 115 rearwardly against the flange 117. On the upper or return movement of the pusher, the lug 121 again comes into engagement with the arm 120 and the pusher is given a slight forward swing just before it reaches the end of its upward movement.

The forward movement of the column of fillers in the holder C is limited by a pair of side abutment plates 125 which are spaced apart sufficiently to leave room for the pusher 100 to pass between them in its downward movement. Extending across the end of the holder is a shaft 126 which is driven to make one revolution for each complete reciprocation of the crosshead and pusher. As shown, this shaft is driven from the shaft 70 through a shaft 127 which carries at one end a bevelled gear meshing with a gear 128 on the shaft 70, and at the other end a bevelled gear meshing with a similar gear 129 on the shaft 126. The shaft 126 carries a friction piece 130 which at each revolution of the shaft engages the end filler in the holder C and moves it a short distance edgewise downward, the friction piece then moving out of engagement with the filler, leaving the same to be given its further downward movement by the pusher 100. The abutment plates 125 are positioned with relation to the end of the holder so as to leave a delivery slot between the plates and the bottom plate of the holder, as shown in Fig. 5, of sufficient width to permit one filler to pass downward therethrough. When this slot is of proper width only a single filler will be started downward from the holder C by the action of the friction piece 130, except possibly in the case of very thin fillers. In order to prevent further downward movement of a second filler which might be started with the end filler, friction means may be provided to

cated to engage, closely adjacent to the bottom of the holder, a second filler which may have been started downward. For this purpose there is provided in the construction shown a shaft located beneath the front end of the bottom of the holder C and provided with drag rollers 131 having a friction surface of soft rubber or other suitable material and which extend through openings in the abutment plate 60. The shaft carrying these drag rolls is mounted in friction bearings 132, see detail Fig. 11. which are adjustable by means of adjusting screws 133 to advance the rollers 131 more or less beyond the forward face of the abutment plate 60. The abutment plates 125 extend downward to provide a support to cooperate with the rolls 131.

As the end envelope of the column of envelopes in the holder B stands in receiving position at the forward end of the holder. its upstanding flap extends upward behind the downwardly extending abutment plate 60 so that when a filler is moved downward between the plate 60 and the plates 125 it will pass in front of the flap of the envelope into which it is to be fed. In order to open out the body of the envelope and insure the filler entering therein, opening means are provided comprising a plate 140 which is hung from slide blocks 141 mounted to have vertical movement in the lower ends of the side bars 102. The blocks 141 rest on cams 142 on the shaft 126 by which they are given a slight downward and return movement at each rotation of the shaft. For insuring the downward movement of the plate, springs 143 are provided bearing downwardly on the blocks 141 to hold them always in contact with the cams. The lower end of the opening plate 140 is made thin and suitably shaped to readily enter the body of the envelope, and most desirably its lower or entering end is made of bluntly tapered or V-form with rounded corners as shown, its oppositely inclined lower edges most desirably extending at an angle which is slightly less than the angle between the upper edges of the sealing side of the envelope when the envelope to be filled is of the ordinary form such as illustrated in the drawings.

When the pusher is in its uppermost position, as shown in Figs. 5 and 7, the opening plate is supported by the cams 142 so that its lower or entering edge shall stand just above the upper edge of the closing side of the body of the envelope, as shown in Figs. 5 and 7, and the plate is lightly pressed inward against the end envelope of the column standing in the holder B. as by means of a spring 144. At each downward movement of the pusher 100, before a filler has been moved downward by the pusher sufficiently to bring its lower edge down to the body of the envelope, the opening plate is by movement of the cam 142 permitted to move downward sufficiently to cause its lower edge to enter the body of the envelope. After a filler has been delivered into the envelope, the opening plate is withdrawn and is given a slight forward swinging movement to the position indicated by dotted lines in Fig. 5 to avoid interference with the edgewise delivery of the filled envelope from the holder as hereinafter described. This outward movement of the opening plate is in the construction shown given to it by cams 145, see Figs. 5, 6 and 7.

To insure the entrance of the lower edge of the opening plate into the envelope, means for directing a jet or jets of air against the edge of the closing side of the envelope is desirably provided, the opening plate being in the construction shown provided for this purpose with an air conduit 146 connected by a flexible tube 147 with any suitable source of compressed air, such air conduit having discharge orifices or nozzles 148 located near the center of the entering edge of the plate and arranged to discharge air jets downward and slightly outward against the edge of the closing side of the envelope.

The operation of feeding a filler downward from the holder C and delivering it into an envelope standing in the holder B by the devices which have been described is briefly as follows:—As shown in Figs. 5 and 7, the pusher 100 is in its uppermost position and about to start on its downward or delivery movement, and the rotary friction device 130 is about to give a preliminary downward movement to the end filler in the holder C. Rotation of the shaft 126 and device 130 from the position shown in Fig. 5 to that shown by full lines in Fig. 6 then moves the end filler in the holder C downward a short distance, as to the position shown in Fig. 6. Meanwhile, the pusher 100 has started on its downward movement, and after its lower end has been moved below the upper edge of the column of fillers in the holder, the lug 121 having been carried below the end of the arm 120, the pusher swings backward to bring the lower end of the rear plates of its engaging members against the second filler in the holder as shown by full lines in Fig. 6, so that by continued downward movement of the pusher in this rearward position the rear plates of the engaging members of the pusher, then bearing against the second filler in the holder, will pass behind the upper edge of the first filler which has been started downward by the friction device 130, the front plates of the engaging members of the pusher passing in front of the filler. During the first part of the downward movement of

the pusher, the opening plate makes its short downward movement to enter its lower edge into the envelope, as shown by full lines in Fig. 6, such entrance being insured by the action of the air jets from the nozzles 148. Then by continued downward movement of the pusher the filler is pushed down into the open envelope, the light pressure of the spring 144 permitting the opening plate to give place to the filler. After the filler has been pushed down into the envelope and before the pusher starts on its return movement, the opening plate swings backward again under the influence of its spring 144 to bring its lower edge above the upper edge of the filler in the envelope and between the engaging members 104 of the filler, so that the filler will be prevented from being drawn upward again out of the envelope by the upward or return movement of the pusher. By continued rotation of the shafts 70 and 126, the parts are thereafter returned to the position shown in Figs. 5 and 7 ready to repeat the operation after the filled envelope has been delivered from the holder B.

In the machine shown, the filled envelopes are successively delivered from the holder B edgewise through a delivery way extending laterally from the end of the holder, such delivery movement of each filled envelope taking place after withdrawal of the pusher and the opening plate. The delivery way as shown is formed by a vertical plate 150 and the end flange 67 which is extended from the end of the holder B in front of the plate 150 and connected with the lower edge of the plate to provide a guideway 151 for the lower edge of the envelopes, as shown by Figs. 7, 9 and 10. A folding plate 152 is mounted on the plate 150 and is suitably curved to fold the upstanding closing flap of each envelope over and down against the body of the envelope as the envelope is fed out through the guideway 151. For feeding the envelopes from the end of the holder and past the folder 152, a series of feed rollers 153, 154, 155, 156 and 157 is provided, the roller 153 being mounted in position to engage the envelopes in their filling position in the end of the holder B and acting to start them in their movement edgewise from the holder, and the rollers 154, 155, 156 and 157 being positioned opposite the plate 150 and suitably spaced therefrom to bear against and feed the envelopes along as they are supported by the plate 150.

In order that the delivery feed-roll 153 shall act only after an envelope has received its filler and the pusher 100 and opening plate 140 has been withdrawn, it is mounted to have a movement toward and from the face of the envelope to be delivered. For this purpose, the shaft of this delivery roll is mounted in a swinging frame 160 which is operated to carry the delivery roll at the proper time into engagement with, an envelope to be delivered and is then swung to move the roll out of operative position after the envelope has been advanced to the next roll 154. As shown, the frame 160 is acted on by a spring 161 tending to move it in the direction to carry the roll into operative position, and is moved in the opposite direction and its movement into operative position controlled by a cam 162 on the shaft 70 acting through a rod 163 which extends diagonally downward and is suitably guided to bear against a bearing piece 164 carried by the frame 160 (see Figs. 7 and 9).

The shafts of the feeding rolls 154, 155, 156 and 157 are journaled in stationary bearings, as shown in Fig. 7, and are driven from the bevel gear 129 on the shaft 126 through a bevel gear 170 on the extended end of the shaft of the roll 154, the shafts of the rolls 155, 156 and 157 being connected with the shaft of the roll 154 by suitable driving connections, such as the sprocket wheels and chains shown in Fig. 7. The swinging frame 160 is mounted to swing on the shaft of the roll 154, and the shaft of the roll 153 is driven from the shaft of the roll 154, as by means of a sprocket chain as shown in Fig. 7.

The operation of the machine as a whole will be clear from the foregoing description. It should be noted that, by reason of the interposition, between the first or flap, opening means whereby the envelope flaps are turned upward and the filling and secondary, or body, opening means whereby the body of the envelope is opened, of the holder B in which a number of envelopes with their closing flaps turned up into open position are collected and advanced to the filling position, the necessity of any exact timing between the primary opening means and the filling means is avoided. The holder B acts as a supply equalizing means, and it is necessary only that the means for delivering the envelopes from the holder A and depositing them in the holder B with their flaps turned up into open position shall be capable of operating to supply the envelopes to the holder B at a rate not lower than the rate at which the envelopes are filled and delivered from the holder B, this condition being met in the machine shown by causing the means for feeding the opened envelopes into the holder B to have a capacity in excess of that required and providing means for interrupting the operation of such means whenever the pressure on the envelopes at the delivery end of the holder B exceeds a desired pressure, as has been described. This arrangement also makes it possible to use a friction feed means between the holders A and B, avoiding the necessity of the use of positive feeding means and exact timing with relation to the filling mechanism. It is

to be understood of course that the supply of fillers in the holder C and of envelopes in the holder A may be replenished as required for maintaining the machine in continuous operation by simply supplying additional fillers to the holder C and envelopes to the holder A and shifting the respective followers to the rear end of the replenished columns, the operation of the machine may continue until the supply of envelopes in the holder B or of fillers in the holder C is exhausted.

The term "envelope" as used in the claims is to be understood in its ordinary sense as meaning a flat container of sheet material closed at three edges and provided at its fourth edge with a turn-over closing flap which turns down against the closing or sealing side of the container, although not necessarily meaning an envelope of the exact form and construction shown in the drawings.

It is to be understood that the invention is not to be limited to the exact construction, arrangement and combinations of parts shown in the drawings and to which the foregoing description has been largely confined, but that it includes changes and modifications thereof within the claims, and that certain features of the invention as claimed may be employed independently of other features thereof.

What is claimed is:

1. An envelope filling machine, comprising in combination flap opening means for operating on a series of envelopes in succession, filling means, and a feedway in which the envelopes are deposited from the flap opening means and in which the opened envelopes are accumulated in a column arranged flatwise together and through which the column of opened envelopes is advanced to the filling means.

2. An envelope filling machine, comprising in combination a holder for receiving a column of envelopes arranged flatwise together, flap opening means for operating on a series of envelopes in succession to turn their closing flaps into open position and for depositing the opened envelopes successively in one end of said holder, envelope filling means for filling the envelopes as they successively reach the other end of said holder, and means for delivering the filled envelopes from the holder.

3. An envelope filling machine, comprising in combination a holder for receiving a column of envelopes arranged flatwise together, flap opening means for operating on a series of envelopes in succession to turn their closing flaps into open position and for depositing the opened envelopes successively in one end of said holder, envelope filling means for filling the envelopes as they successively reach the other end of said holder, and delivery and closing means for delivering the filled envelopes edgewise from said holder and for closing the flap of each envelope as it is delivered from the holder.

4. An envelope filling machine, comprising in combination a holder for receiving a column of envelopes arranged flatwise together, flap opening means for operating on a series of envelopes in succession to turn their closing flaps into open position and for depositing the opened envelopes successively in one end of said holder, envelope filling means for filling the envelopes as they successively reach the other end of said holder, a feedway extending laterally from said holder, means for delivering the filled envelopes edgewise from the holder through said feedway, and a flap turner for turning the flaps of the envelopes back into closing position as they are delivered through the feedway.

5. An envelope filling machine, comprising in combination a holder, means for feeding a column of envelopes arranged flatwise together through said holder, a second holder, means for delivering the envelopes successively from the first holder to the second holder, flap opening means for turning the flaps of the envelopes to open position as they are delivered from the first holder to the second holder, envelope filling means for filling the envelopes as they are successively presented in filling position at the delivery end of the second holder, and means for delivering the filled envelopes.

6. An envelope filling machine, comprising in combination a holder, means for advancing a column of envelopes arranged flatwise together in said holder, a second holder, means for delivering the envelopes successively from the first holder to the second holder, flap opening means for turning the flaps of the envelopes to open position as they are delivered from the first holder to the second holder, envelope filling means for filling the envelopes as they are successively presented in filling position at the delivery end of the second holder, means for delivering the filled envelopes, said delivery means whereby the envelopes are delivered from the first holder into the second holder operating to deliver the envelopes into the second holder at rate faster than the rate at which they are filled and delivered from the second holder, and means controlled according to the pressure of the envelopes at the delivery end of the second holder for interrupting the operation of said delivery means.

7. An envelope filling machine, comprising in combination a holder, means for advancing a column of envelopes arranged flatwise together in said holder, a second holder, means for delivering the envelopes successively from the first holder to the second holder, flap opening means for turning the

flaps of the envelopes to open position as they are delivered from the first holder to the second holder, envelope filling means located at the delivery end of the second holder, and means controlled according to the pressure of the envelopes at the delivery end of the second holder for controlling the feeding of the envelopes from the first holder into the second holder.

8. An envelope filling machine, comprising in combination with filling means, a holder through which a column of envelopes arranged flatwise together is advanced to the filling means, means for feeding envelopes successively into the receiving end of the holder with their flaps standing in open position, and means controlled according to the pressure of the envelopes at the delivery end of the holder for controlling the feeding of the envelopes into the receiving end of the holder.

9. An envelope filling machine, comprising in combination a holder, means for advancing a column of envelopes arranged flatwise together in said holder, a second holder, means for delivering the envelopes successively from the first holder to the second holder, flap opening means for turning the flaps of the envelopes to open position as they are delivered from the first holder to the second holder, a moving abutment in the second holder against which the end of the column of envelopes therein is advanced during the time the second holder is being filled, and envelope filling means located at the delivery end of the second holder.

10. An envelope filling machine, comprising in combination a holder, means for advancing a column of envelopes arranged flatwise together in said holder, a second holder, means for delivering the envelopes succesively from the first holder to the second holder, flap opening means for turning the flaps of the envelopes to open position as they are delivered from the first holder to the second holder, a moving abutment in the second holder against which the end of the column of envelopes therein is advanced during the time the second holder is being filled, envelope filling means located at the delivery end of the second holder, and a follower for advancing the column of envelopes in the second holder after the delivery of envelopes from the first holder has ceased.

11. An envelope filling machine, comprising in combination a holder, means for advancing a column of envelopes arranged flatwise together in said holder, a second holder, means for delivering the envelopes successively from the first holder to the second holder, flap opening means for turning the flaps of the envelopes to open position as they are delivered from the first holder to the second holder, a moving abutment in the second holder against which the end of the column of envelopes therein is advanced during the time the second holder is being filled, a follower for advancing the column of envelopes in the second holder, and means for bringing the follower automatically into operation when all the envelopes have been fed from the first holder.

12. An envelope filling machine, comprising in combination a holder, means for advancing a column of envelopes arranged flatwise together in said holder, a second holder, means for delivering the envelopes successively edgewise from the first holder to the second holder, flap opening means for turning the flaps of the envelopes to open position as they are delivered from the first holder to the second holder, filling means located at the delivery end of the second holder, a follower for advancing the column of envelopes in the second holder, means tending to give said follower its feeding movement, restraining means for holding the follower in position to the rear of the plane in which the envelopes are fed into the second holder, and means for operating said restraining means to release the follower when the last envelope has been fed from the first holder.

13. An envelope filling machine, comprising in combination a holder, means for advancing a column of envelopes arranged flatwise together in said holder, a second holder, means for delivering the envelopes successively edgewise from the first holder into the second holder, filling means located at the delivery end of the second holder, a reciprocating pusher mounted at the receiving end of the second holder in position to act against the rear end of the column of envelopes therein, a follower for advancing the column of envelopes in the second holder, and means for bringing the follower automatically into operation when the last envelope has been fed from the first holder.

14. An envelope filling machine, comprising in combination a holder, means for advancing a column of envelopes arranged flatwise together in said holder, a second holder, means for delivering the envelopes successively edgewise from the first holder to the second holder, and a reciprocating pusher mounted at the receiving end of the second holder in position to act against the rear end of the column of envelopes in the second holder.

15. An envelope filling machine, comprising in combination a holder, means for advancing a column of envelopes arranged flatwise together in said holder, a second holder, means comprising a friction feed roll for delivering the envelopes successively edgewise from the first holder to the second holder, and a reciprocating pusher mounted at the receiving end of the second

holder in position to act against the rear end of the column of envelopes in the second holder.

16. The combination with a holder and means for advancing a column of envelopes arranged flatwise together in said holder, of means for feeding the envelopes successively edgewise from the delivery end of the holder, and means for turning the flaps of the envelopes to open positon as they are delivered from the holder comprising means for directing an air jet against the flap side of the envelope.

17. The combination with a holder and means for advancing a column of envelopes arranged flatwise together in said holder, of means for feeding the envelopes successively edgewise from the delivery end of the holder, and means for turning the flaps of the envelopes to open position as they are delivered from the holder comprising a flap opener past which the enevolopes make their delivery movement and means for directing a flap lifting jet of air against the envelope.

18. The combinaion with a holder and means for advancing a column of envelopes arranged flatwise together in said holder, of means for feeding the envelopes successively edgewise from the delivery end of the holder, a flap opening member extending across the delivery end of the holder in position to enter beneath the flap of each envelope as the envelope is delivered from the holder, and means for directing a flap lifting jet of air against the envelope.

19. The combination with a holder and means for advancing a column of envelopes arranged flatwise together in said holder, of means for feeding the envelopes successively edgewise from the delivery end of the holder, and a flap opening plate 22 extending across the delivery end of the holder, said plate having a V-shaped edge and being provided with an air conduit and air outlet openings located to direct flap lifting jets of air against the envelopes.

20. In an envelope filling machine, the combination with a holder and means for advancing a column of envelopes in the holder arranged flatwise together and with their flaps standing in open position, of body opening means for opening the successive end envelopes in the holder, means for filling each envelope after it has been opened, and separate means for delivering the filled envelopes from the holder.

21. The combination with means for presenting envelopes successively in position to be filled with their flaps standing in open position, and means for filling the successively positioned envelopes, of means for opening the envelopes comprising a member operated to enter the envelope, and means for directing a jet of air against the envelope to insure the entrance of said member therein.

22. The combination with means for presenting envelopes successively in position to be filled with their flaps standing in open position, and means for filling the successively positioned envelopes, of means for opening the envelopes comprising a flat opening member operated to enter the envelope and provided with an air passage and discharge orifice for directing an opening jet of air against the envelope to insure the entrance of the member into the envelope.

23. The combination with means for presenting envelopes successively in position to be filled with their flaps standing in open position, and means for feeding fillers edgewise into the successively positioned envelopes, of means for opening the envelopes comprising a flat edgewise reciprocating opening member mounted to yield flatwise while within the envelope under the pressure of an entering filler.

24. The combination with means for presenting envelopes successively in position to be filled with their flaps standing in open position, and means for filling the successively positioned envelopes, of means for opening the bodies of the envelopes comprising a flat edgewise reciprocating opening member, means for delivering the filled envelopes edgewise, and means for moving the opening member flatwise away from the envelope after it has been withdrawn therefrom.

25. An envelope filling machine, comprising in combination an envelope holder, means for advancing a column of envelopes in said holder arranged flatwise together and with their flaps standing in open position, a filler holder adjacent to the envelope holder, means for advancing a column of fillers through the filler holder arranged flatwise together, means for delivering the successive end fillers from the filler holder edgewise into the successive end envelopes standing in the end of the envelope holder, and means for delivering the successively filled envelopes.

26. An envelope filling machine, comprising in combination an envelope holder and means for advancing a column of envelopes in said holder arranged flatwise together and with their flaps standing in open position, a filler holder, means for advancing a column of fillers arranged flatwise together in the filler holder, opening means for opening the body of the successive end envelopes in the envelope holder, a reciprocating pusher for delivering the successive end fillers from the filler holder and into the successive end envelopes in the envelope

holder, and means for delivering the filled envelopes and for turning their flaps into closed position.

27. An envelope filling machine, comprising in combination means for presenting envelopes successively in position to be filled, a filler holder, means for advancing a column of fillers arranged flatwise together in said holder, means for giving the successive end fillers in the holder a preliminary edgewise delivery movement, and a reciprocating plunger for engaging the successive end fillers after they have been given such preliminary edgewise movement and delivering them from the holder and into the successively positioned envelopes.

28. An envelope filling machine, comprising in combination an envelope holder, means for advancing a column of envelopes in the holder arranged flatwise together and with their flaps standing in open position, means for serving as an abutment for limiting the movement of the column of envelopes, an abutment plate for engaging the upstanding flap of the end envelope in the holder, means for feeding a succession of flat fillers edgewise past said abutment plate and into the successive end envelopes in the holder, and means for delivering the filled envelopes edgewise from the holder.

29. The combination with means for presenting envelopes successively in position to be filled, of a holder, means for advancing a column of fillers arranged flatwise together in said holder, a reciprocating pusher for delivering the end fillers successively edgewise from the holder and into the successively positioned envelopes, means for giving the successive end fillers in the holder a preliminary edgewise delivery movement before it is engaged by the pusher, and means for moving the pusher backward into engagement with the second filler in the holder after the first filler has been given its preliminary movement and before the pusher in its delivery movement comes into engagement with the first filler.

30. An envelope filling machine, comprising in combination an envelope holder, means for advancing a column of envelopes in said holder arranged flatwise together and with their flaps standing in open position, a filler holder adjacent the envelope holder, means for advancing a column of fillers arranged flatwise together in the filler holder, guideways extending transversely to the end of the holders, a crosshead mounted to slide in said guideways, a pusher carried by said crosshead, means for reciprocating the crosshead to cause the pusher to deliver the end fillers successively from the filler holder and into the successive end envelopes in the envelope holder, means for engaging the surface of the end filler in the holder to give it a preliminary edgewise movement in the direction of its delivery movement by the pusher, means for giving the pusher a slight rearward movement against the second filler in the holder before it comes into engagement with the end filler on its downward movement, and means for opening the successive end envelopes in the envelope holder prior to the delivery of a filler thereinto.

31. An envelope filling machine, comprising in combination a holder, means for advancing a column of envelopes arranged flatwise together in the holder, an abutment against which the successive end envelopes in the holder are positioned, filling means for filling the successively positioned end envelopes, and means for delivering the filled envelopes edgewise from the holder comprising a friction feed roll and means for moving said roll into engagement with the successive filled envelopes.

32. The combination with a supporting structure, of a removable holder for holding a column of articles arranged flatwise together mounted on said supporting structure, and a follower mounted on the supporting structure to extend into the holder to advance the column of articles therein, the holder being of a size to fit the articles and the supporting structure being formed to support holders of various sizes.

33. The combination with means for presenting an envelope in position to be filled with its flap standing in open position, of a body opener, means for moving said opener into the envelope between its front side and its back side, a pusher adapted to engage the rear edge of a filler and push the filler into the envelope between the body opener and the back side of the envelope, and means for withdrawing the body opener from the envelope after the envelope has been filled.

34. The combination with means for presenting an envelope in position to be filled with its flap standing in open position, of a body opener, means for moving said body opener into the envelope, a spring arranged to press said body opener against one of the inner sides of the envelope, a pusher adapted to engage the rear edge of a filler and push the filler into said envelope between said body opener and the side of the envelope against which said spring presses the body opener, and means for withdrawing the body opener after the envelope has been filled.

35. The combination with means for presenting an envelope in position to be filled with its flap standing in open position, of a body opener, means for moving said body opener into the envelope, a pusher adapted to engage the rear edge of a filler and push

the filler into the envelope while the body opener is within the envelope, and means for withdrawing the body opener after the envelope has been filled.

36. The combination with means for presenting an envelope in position to be filled with its flap standing in open position, of a body opener, means for moving said body opener into the envelope to open it, a pusher adapted to engage a filler and push the filler into the envelope while the body opener is within the envelope, means for withdrawing the body opener, after the envelope has been filled, to such a position that it engages the rear edge of the filler, and means for withdrawing the pusher from the envelope while the filler is retained in the envelope by engagement with the body opener.

37. The combination with a receptacle adapted to hold a plurality of articles arranged flatwise together, of means for successively feeding articles into said receptacle, means for successively withdrawing articles from said receptacle operating at a slower rate than said first-mentioned means, and means actuated by the pressure of the articles at the delivery end of the holder to interrupt the action of said means for feeding articles into the receptacle when this pressure exceeds a predetermined amount.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

POWHATAN J. WOOLDRIDGE.

Witnesses:

DAVID C. LEWIS,

A. L. KENT.