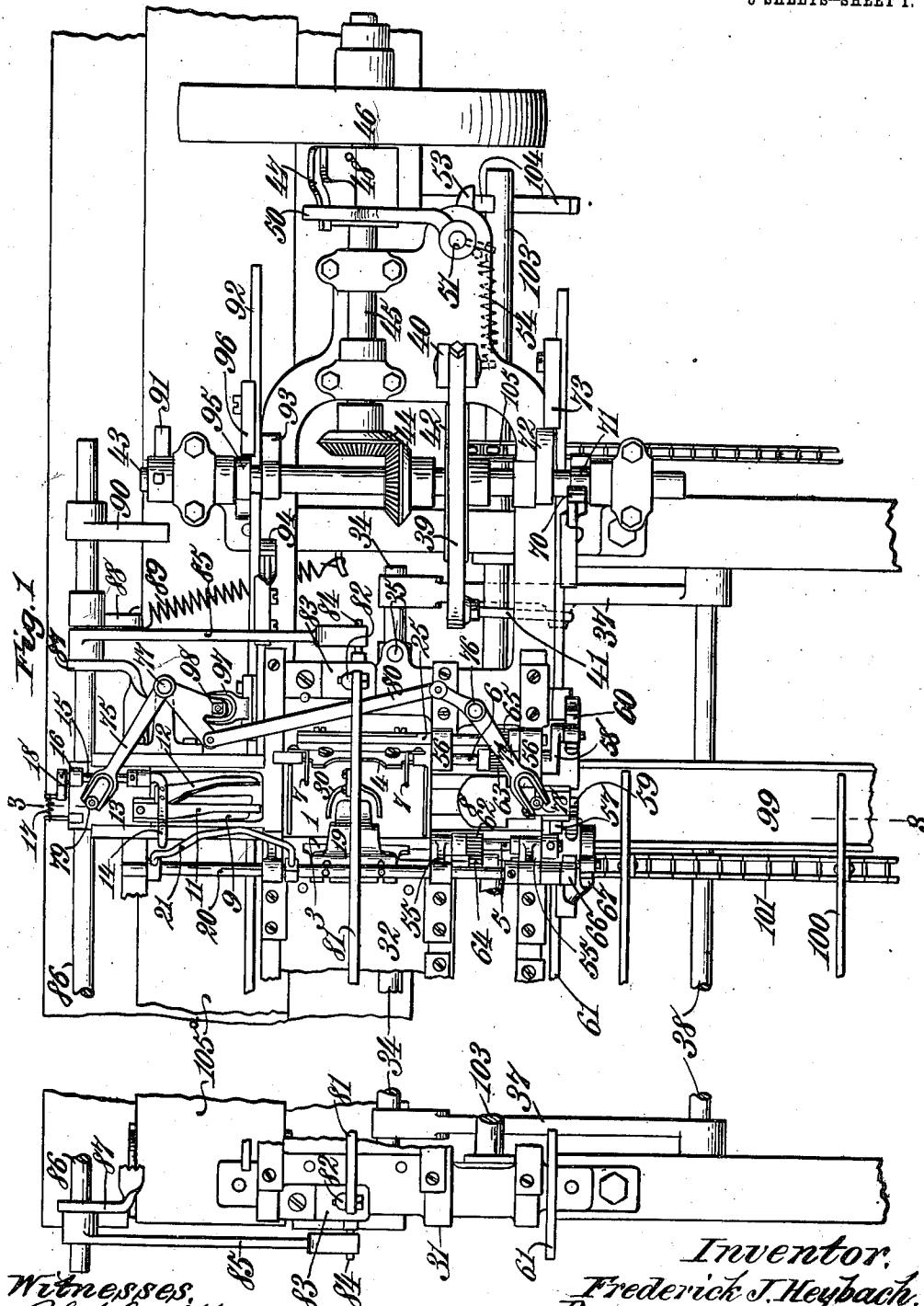


F. J. HEYBACH.
 CARTON CLOSING MACHINE.
 APPLICATION FILED JAN. 28, 1909.

995,965.

Patented June 20, 1911.

6 SHEETS—SHEET 1.



Witnesses,
 Robert Smith,
 Charles Hessler

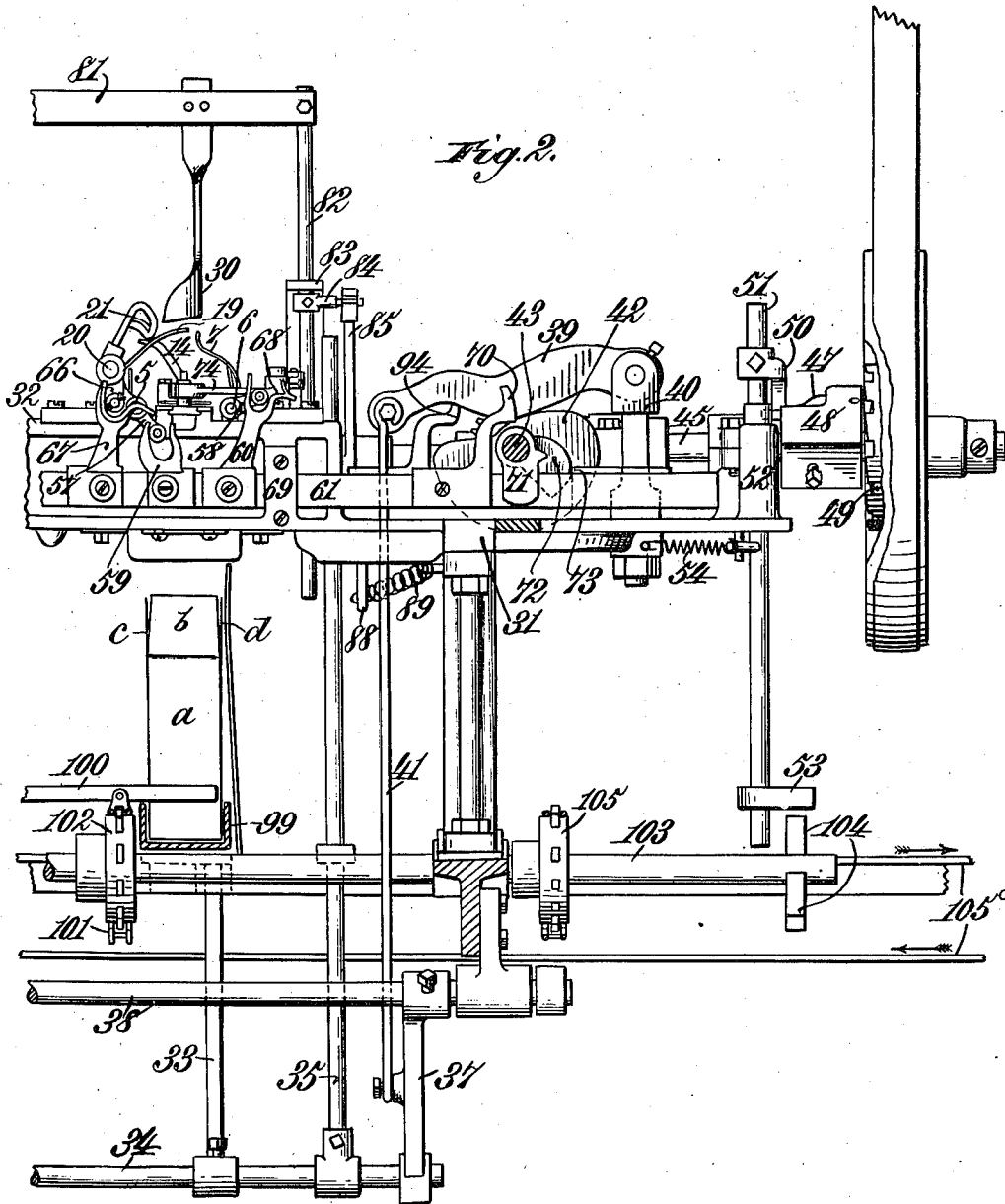
Inventor,
 Frederick J. Heybach.
 By James L. Norris,
 Atty.

F. J. HEYBACH.
 CARTON CLOSING MACHINE.
 APPLICATION FILED JAN. 28, 1909.

995,965.

Patented June 20, 1911.

5 SHEETS—SHEET 2.



Witnesses.
 Robert Emmett,
 C. J. Hesler

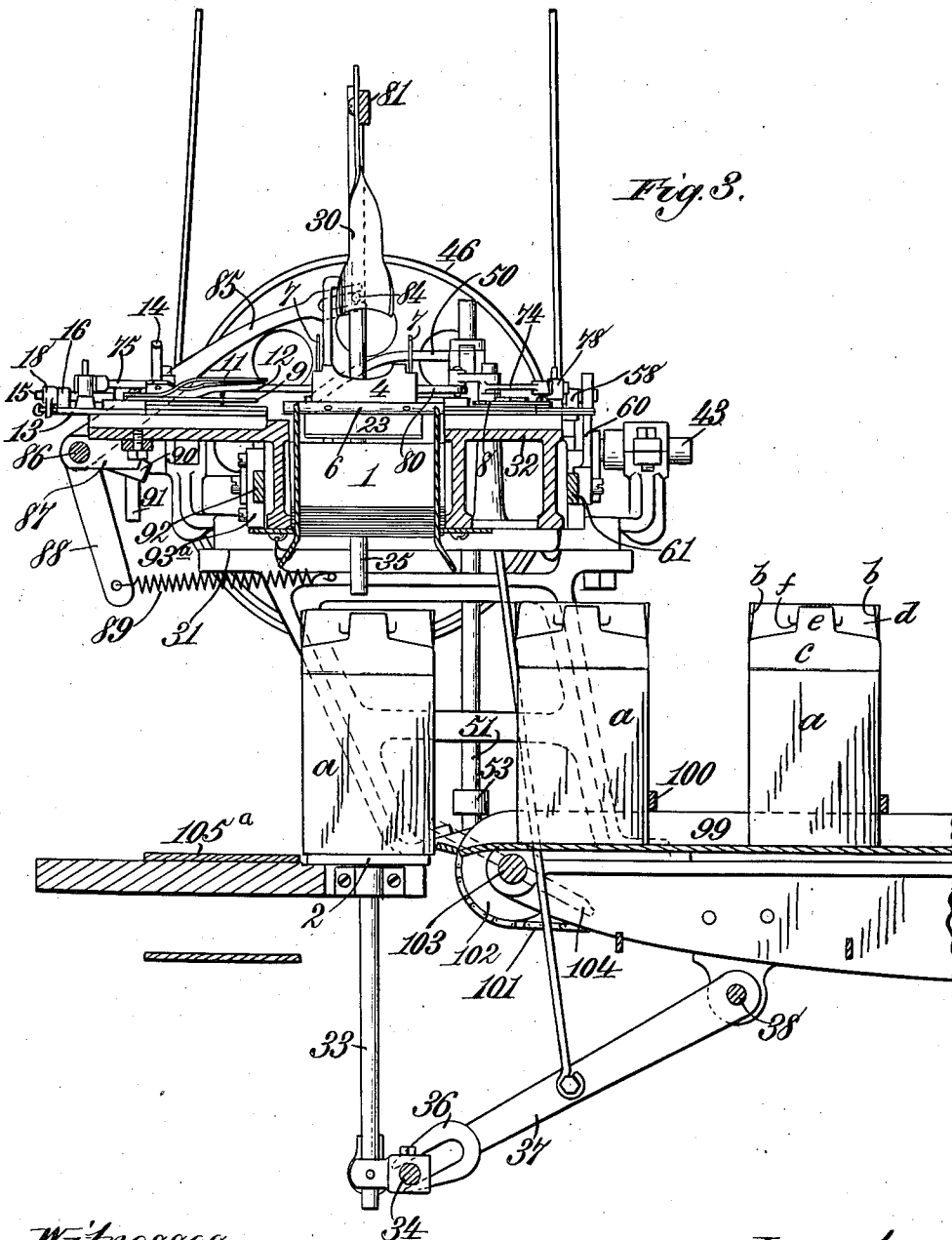
Inventor,
 Frederick J. Heybach.
 By
 James L. Norris
 Att'y.

F. J. HEYBACH.
 CARTON CLOSING MACHINE.
 APPLICATION FILED JAN. 28, 1909.

995,965.

Patented June 20, 1911.

5 SHEETS—SHEET 3.



Witnesses:
 Robert Emmett,
 C. H. Mesler

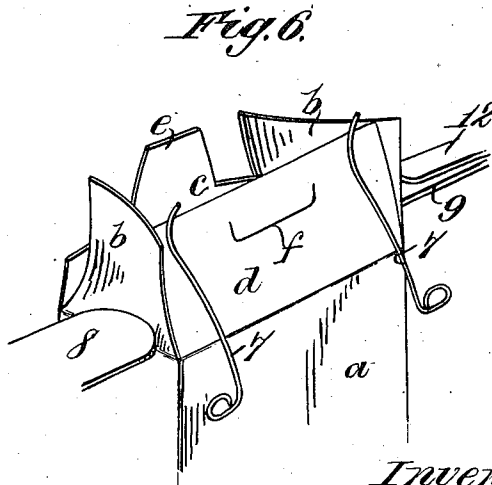
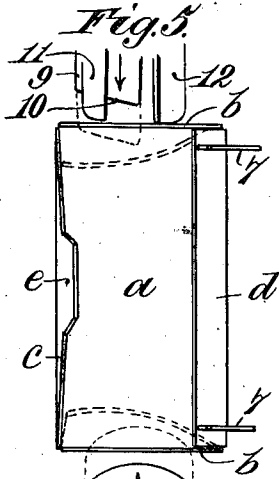
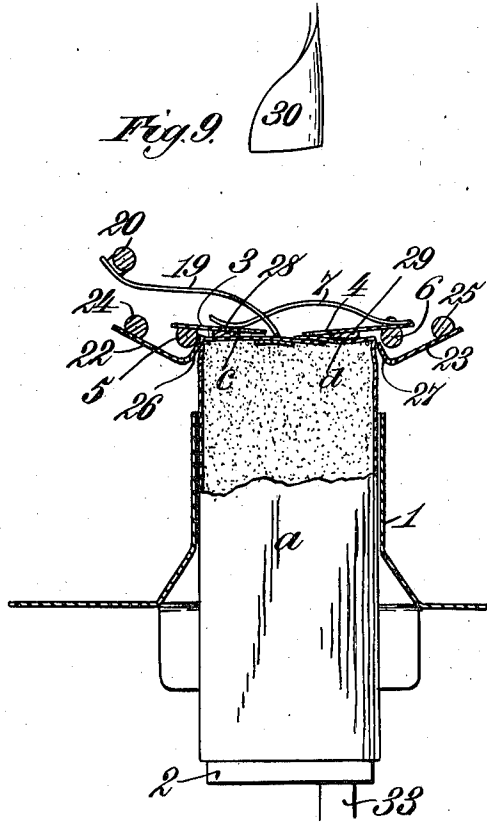
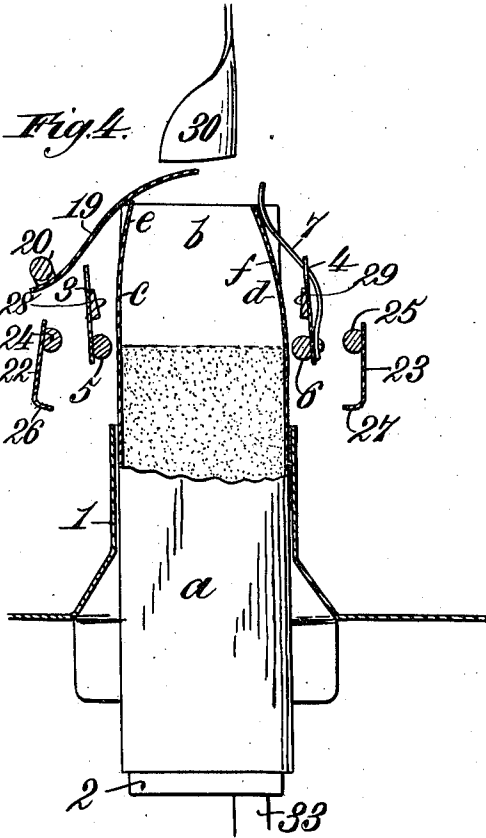
Inventor
 Frederick J. Heybach.
 By
 James L. Norris
 Atty.

F. J. HEYBACH.
 CARTON CLOSING MACHINE.
 APPLICATION FILED JAN. 28, 1909.

995,965.

Patented June 20, 1911.

5 SHEETS—SHEET 4.



Witnesses
 R. H. Smith,
 C. H. Kessler

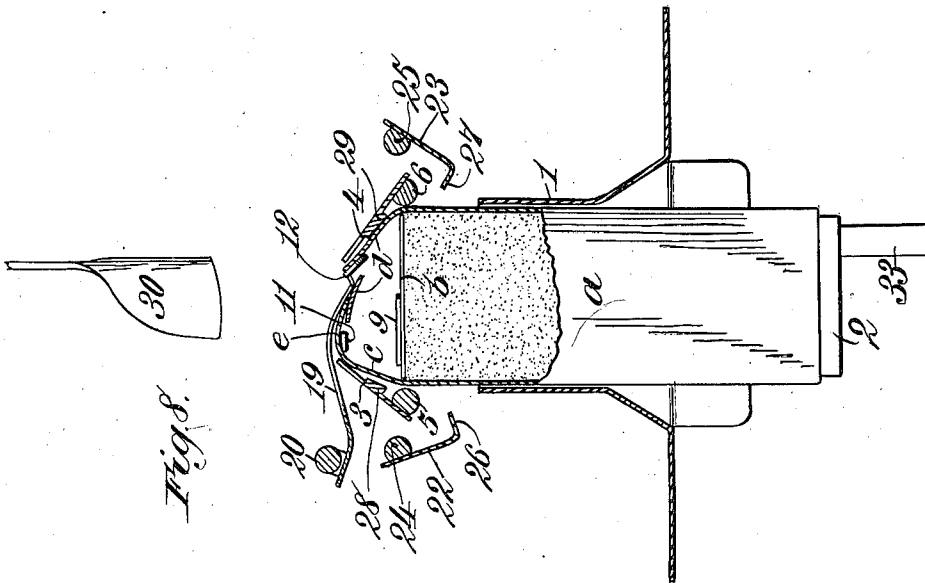
Inventor,
 Frederick J. Heybach
 By James L. Norris
 Atty.

F. J. HEYBACH.
 CARTON CLOSING MACHINE.
 APPLICATION FILED JAN. 28, 1909.

995,965.

Patented June 20, 1911.

5 SHEETS—SHEET 5.



Figs.

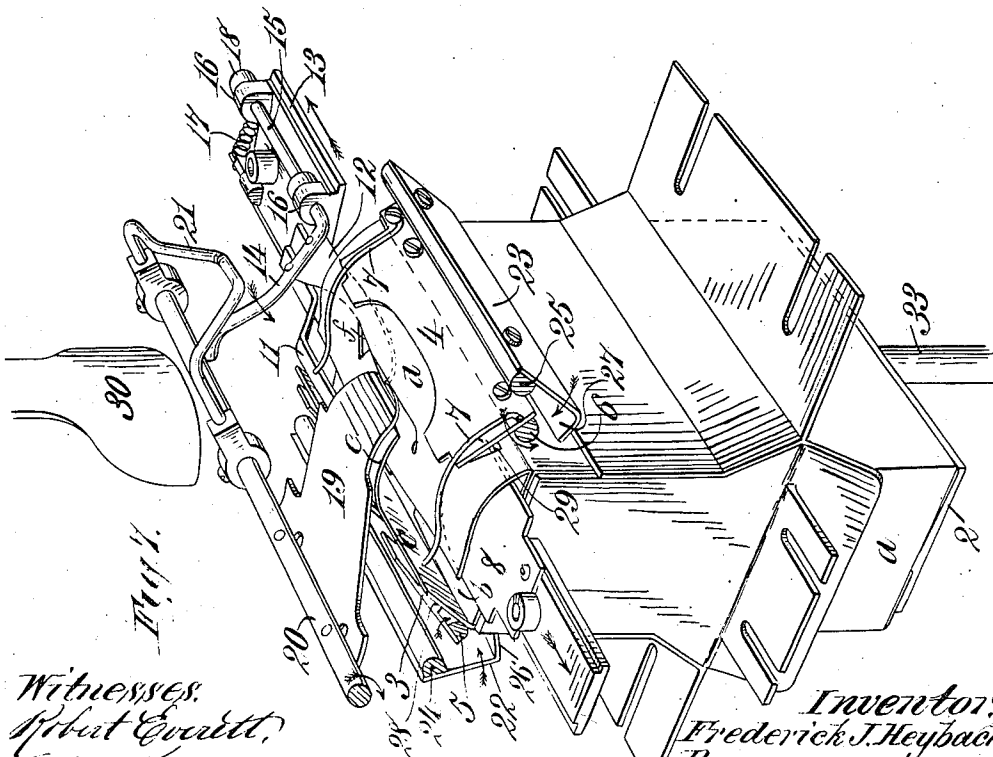


Fig. 9.

Witnesses:
 Robert Emmett,
 Chas. Kessler.

Inventor:
 Frederick J. Heybach.
 By
 James L. Norris
 Atty.

UNITED STATES PATENT OFFICE.

FREDERICK J. HEYBACH, OF SAVANNAH, GEORGIA, ASSIGNOR TO THE AMERICAN AUTOMATIC MACHINERY COMPANY, OF SAVANNAH, GEORGIA, A CORPORATION OF GEORGIA.

CARTON-CLOSING MACHINE.

995,965.

Specification of Letters Patent. Patented June 20, 1911.

Application filed January 28, 1909. Serial No. 474,728.

To all whom it may concern:

Be it known that I, FREDERICK J. HEYBACH, a citizen of the United States, residing at Savannah, in the county of Chatham and State of Georgia, have invented new and useful Improvements in Carton-Closing Machines, of which the following is a specification.

My present invention relates to improvements in machines for closing cartons of the class having flaps which are foldable to close an end of the carton and embodying a tongue upon one flap which enters an appropriate slot in another flap to retain the carton end in closed condition, and it has for its object primarily to provide an improved machine of this class which is capable of turning or folding the flaps and inserting the tongue into the slot automatically and with certainty whereby the end of the carton will be effectually closed without the necessity of using paste in order to seal or secure the flaps, the use of paste being objectionable in many instances.

Another object of the invention is to provide a machine of this character wherein the cartons after being filled by a suitable filling mechanism are automatically conveyed to the closing machine and are then positioned preparatory to the closing operation which is to be performed thereon, the closing devices being set into operation automatically and at the appropriate time, the operation of the folding machine being thereby automatically controlled by the filling machine or by the means which transfers the filled cartons from the filling machine to the carton-closing machine, whereby both of the said machines may operate in predetermined relation.

Another object of the invention is to provide a carton-closing machine of this type wherein the operations of positioning the filled cartons thereon, closing the flaps and inserting the securing or retaining tongue into its slot, and also the removal of the closed cartons from the machine are so timed as to require a minimum period of time whereby the machine may operate at a relatively high speed, and the ends of all the cartons will be uniformly closed.

Further objects of the invention are to provide the carton-closing machine with devices which serve to operate upon the folded

corners of certain of the flaps to insure a relatively sharp corner or bend whereby the said flaps shall have a tendency to remain in the proper closed position and thereby prevent bulging of the closed carton end, also to provide a closing machine of this class which may embody a plurality of closing mechanisms whereby any desired number of cartons may be closed at each operation of the machine.

To these and other ends, the invention consists in certain improvements, and combinations and arrangements of parts, all as will be hereinafter more fully described, the novel features being pointed out particularly in the claims at the end of the specification.

In the accompanying drawings: Figure 1 is a plan view of a carton-closing machine constructed in accordance with my present invention, the machine being shown in cooperative relation with the means which conveys the cartons thereto; Fig. 2 represents an elevation of the upper end of the machine as shown in Fig. 1, the closing mechanism being shown ready to receive a carton preparatory to the closing thereof; Fig. 3 represents a vertical section of the closing machine taken on the line 3—3 of Fig. 1, the closing mechanism in this figure being also ready to receive the carton preparatory to the closing of its end flaps; Figs. 4 and 5 are diagrammatic views of the flap-closing devices, these devices being shown in these figures in the positions they occupy at the moment the carton is introduced thereto; Fig. 6 is a perspective view of an end of a carton showing the manner in which the end flaps are closed; Fig. 7 is a perspective view of the flap-closing mechanism, the parts being shown in the positions they occupy during the operation of inserting the retaining tongue into its slot while the side flaps are being closed; Fig. 8 represents a vertical section of the closing mechanism indicating the manner in which the slot for the tongue is opened and the tongue is entered into the slot; and Fig. 9 is a view similar to Fig. 8 showing the position of the flap-closing devices at the moment the flaps are fully closed, this figure also showing the devices for operating upon the bent or creased corners of the outermost flaps.

Similar parts are designated by the same reference characters in the several views.

Carton closing machines constructed in accordance with my present invention are capable of use generally in performing the operation of closing the ends of cartons of the class having foldable flaps and more especially to the type wherein the flaps are retained in closed position by means of a tongue and slot, and it will be understood that I have shown in the accompanying drawing one specific embodiment only of the invention.

While the form shown in the accompanying drawing has been found practical and satisfactory in its operation, it will be understood that the invention is not limited to this particular form, as certain changes in the construction or the relative arrangements of the parts may be made which changes or modifications will be included within the scope of the claims.

In the present instance, the machine is adapted to operate upon cartons of the general character illustrated in Figs. 4-9, inclusive, these cartons being usually formed of card-board blanks which are set up and have one end closed previously to the filling of the material therein, the cartons comprising a body portion *a* one end of which is provided with a pair of end flaps *b* and a pair of relatively longer lateral flaps *c* and *d*, the end flaps *b* being usually folded first and the lateral flaps are subsequently folded, the flap *c* being provided with a tongue *e* which is adapted to enter an appropriate slot *f* which is formed in the flap *d*, the tongue serving to retain the flaps in proper closed condition. The filled cartons are conducted to the closing machine in an appropriate manner, the flaps upon the upper open end thereof standing in an unfolded condition as shown in Fig. 4. These cartons are introduced into a suitable receiver 1 by means of a plunger or other appropriate positioning device 2, the closed end of the carton resting upon this plunger so that as the latter operates, it will carry the carton into a position whereby the flaps upon its upper end may be appropriately closed. At the upper end of the receiver are mounted a pair of folding members 3 and 4 which are turnable with the supporting shafts 5 and 6 and are adapted to fold the lateral flaps *c* and *d* of the carton at the proper moment. The folding member 4 is provided with a pair of spring fingers 7 which are arranged at the rear side of the said members and their upper ends project forwardly or in advance of the member 4 so as to preliminarily engage the upper edge of the flap *d* and deflect it inwardly or between the end flaps *b* in the manner shown in Fig. 4. A pair of reciprocatory folding members 8 and 9 are mounted so as to engage the flaps *b*, the member 8 having preferably a rounded flap-engaging end while the member 9 has a beveled edge 10 whereby the member 9 may first

engage the corresponding flap *b* toward that side at which the flap *d* is located. The positioning device 2 so operates as to carry the carton into such a position that the lines on which the flaps are to be folded will occupy a plane slightly below the plane in which the flap-folding members 8 and 9 operate, and the first operation is performed upon the carton by the members 8 and 9 which approach one another in the directions indicated by the arrows in Fig. 5. When the flaps *b* are engaged respectively by the members 8 and 9, they will first be moved inwardly and also twisted slightly in the manner indicated in Fig. 6 by reason of the flap *d* having been deflected inwardly, and as these members 8 and 9 continue to move inwardly, those edges of the flaps *b* which engage the adjacent edges of the flap *d* will slip past the latter and will be folded down upon the material contained in the carton.

The folding member 9 also carries with it a pair of arms 11 and 12 which are arranged at each side and above the portion which engages the corresponding flap *b*. The arm 11 is mounted in stationary relation upon the slide 13 which carries the folding member 9, while the arm 12 is attached to a crank arm 14 which has a pintle portion 15 which is journaled in bearings 16 carried by the said slide. The arm 12 when so mounted has a pivotal movement about an axis which is parallel to the line of movement of the folding member 9. The arm 12 serves to open the slot in the flap *d* and it normally has a tendency to rise under the action of the spring 17 which acts on the crank 18 mounted upon the outer end of the shaft 15.

As the arms 11 and 12 move with the slide 13 carrying the flap-closing member 9, they will both move inwardly into the space between the lateral flaps *c* and *d* while the end flaps *b* are being folded. After the end flaps *b* have been folded, the closing members 3 and 4 will turn inwardly, the flaps *c* and *d* being thereby carried into engagement with the arms 11 and 12 during which operation the arms 11 and 12 serve as supports over which the flaps *c* and *d* are bent. As the flap *d* is folded inwardly, the inner end of the arm 12 will engage the said flap at the outer margin of the slot *f*, the arm 12 at this time being turned toward a vertical position. After the flaps *c* and *d* have been carried into engagement with the arms 11 and 12, a tongue-inserting member 19 is turned downwardly through the rotation of its supporting shaft 20, this member engaging the tongue *e* on the flap *c* of the carton so as to deflect this tongue downwardly and the tongue-inserting member moves far enough to engage a portion of the flap *d* at the inner margin of the slot therein, the said portion of the flap *d* being thereby de-

pressed so as to open the slot for the entrance of the tongue. The shaft 20 carrying the tongue-inserting member is also provided with a cam 21 which is arranged to engage the crank-arm 14 to which the member 12 is attached whereby the member 12 will be rotated about the shaft 15 as an axis during the final movement of the member 19 which serves to open the tongue-receiving slot. After the tongue-receiving slot has been opened in the manner described, the flap-closing members 8 and 9 are retracted by movements in the directions indicated by the arrows in Fig. 7, and during the retracting movement of the slide 13 carrying the flap-folding member 9, the arms 11 and 12 will also be withdrawn from beneath the partially closed flaps *c* and *d*, and during the withdrawing movement of the arm 12, this arm will also receive a rotary movement owing to the action of the cam 21 upon the crank arm 14 supporting it, and this rotary movement will turn the arm 12 so that it lies more nearly in a horizontal plane. This rotary movement is given the arm 12 in order to avoid cutting of the flap *d* by the upper edge of the arm. As the slide 13 is retracted, the folding members 3 and 4 continue to move inwardly and downwardly, and during the said movements of the members 3 and 4, the tongue-inserting member 19 also continues to move downwardly and by these operations the tongue *e* is inserted into the slot of the cooperating flap while these two lateral flaps are being finally closed.

In order to avoid bulging of the two flaps last closed and in order to assist the tongue in maintaining the flaps in closed condition, a pair of creasing members 22 and 23 are provided, these members being mounted to rotate with corresponding shafts 24 and 25 and the said members are provided with in-turned edges or flaps 26 and 27, the creasing members being simultaneously movable into engagement with the sides of the carton adjacent to or immediately below the points where the lateral flaps *c* and *d* are bent. The folding members 3 and 4 are also provided with ribs 28 and 29 which are arranged at their under sides and so positioned as to press upon the respective flaps adjacent to the lines on which these flaps are folded, the combined action of the said ribs and the creasing devices serving to pinch or compress the folded corners formed between the body of the carton and the flaps *c* and *d* so as to produce a relatively sharp angle, the tendency of the material thus treated acting to maintain the flaps in closed position and thereby avoiding bulging of the closed end of the carton. The construction of the creasing devices is clearly shown in Fig. 9.

After the final operation just described has been performed upon the carton, the

creasing devices are retracted and the positioning device 2 descends, and ordinarily, the filled and closed carton will remove itself by reason of its weight. However, in order to insure a positive removal of the closed carton from the closing mechanism, an ejector 30 may be provided, this ejector being so timed as to descend through openings provided in the folding members 3 and 4 and to engage the top of the carton and thereby press it downwardly. In order to prevent interference of the tongue-inserting member 19 with the ejector, the latter is preferably rounded so as to clear the end of this member.

Any suitable mechanism may be provided for imparting the necessary movements in properly timed relation to the various parts of the closing mechanism and, in the accompanying drawing, I have shown a machine having means for conveying the filled cartons thereto from a filling machine, devices for automatically positioning the carton and for effecting the various operations of the folding mechanism as well as means for conveying the filled and closed cartons from the closing machine, and the operation of the closing machine is controlled automatically from the filling machine or the conveyor for transferring the filled cartons from the filling machine to the closing machine.

The complete machine is shown in Figs. 1, 2 and 3, it comprising a frame 31 having a table 32 upon which the desired number of closing mechanisms are mounted. These closing mechanisms may all be of the same construction and a description of one of them will be sufficient. The carton receivers 1 are mounted in vertical position upon the table 32 and each carton-positioning device 2 is mounted a suitable distance below and in alinement with its respective receiver. Each positioning device is provided with an operating and guiding rod 33 which is connected to a common transversely extending bar 34. This bar is guided for rectilinear movement by means of a pair of guide rods 35 which extend vertically of the machine frame and are provided with appropriate bearings. Each end of the transverse bar 34 coöperates with the forked end 36 of a crank-arm 37, the latter being fixed to a transverse shaft 38 and serves as an operative connection between the two arms 37 which are mounted at opposite sides of the machine, a pair of these crank arms being provided to maintain the cross-bar 34 in a horizontal position during its rising and falling movements. The carton-positioning devices being operatively connected to the shaft 38 are operated at appropriate intervals by means of an arm 39 which is pivoted at one end to a bracket 40 fixed to the machine frame while the opposite end of the arm 39 is con-

nected to the crank 37 by means of a connecting rod 41. An intermediate portion of the arm 39 coöperates with a cam 42, the latter being mounted on a shaft 43 journaled in suitable bearings on the machine frame and is driven by gearing 44 from a main shaft 45. The latter shaft is provided with a driving wheel 46 which is loosely mounted thereon and is adapted to be connected thereto at appropriate intervals by means of a clutch. A clutch of any appropriate construction may be used, that shown in the present instance consisting of a pawl 47 which is pivoted on a part 48 fixed to the shaft 45 and is adapted to engage one of a series of recesses 49 formed in the hub of the driving wheel. This clutch pawl normally has a tendency to establish a driving connection between the shaft 45 and the wheel 46, but it is detained at certain intervals by a clutch-controlling arm 50, the latter being fixed to a vertical shaft 51 which is journaled in a bearing 52 formed upon the machine frame and is operated through the medium of a projection 53 which is fixed to its lower end. The clutch-controlling arm 50 is normally retained in such a position as to hold the clutch pawl 47 in an inactive position by a spring 54.

The shafts 5 and 6 supporting the lateral folding members 3 and 4 are journaled in appropriate bearing brackets 55 and 56 which may be secured to the upper side of the table 32 of the machine, and the outer ends of these shafts are provided with cranks 57 and 58 having pins or rollers to coöperate with a corresponding pair of operating arms 59 and 60, the latter being both secured in appropriate positions upon an actuating bar or member 61. The shafts 5 and 6 also have operative connections with the shafts 24 and 25 of the crimping members, a pair of gears 62 and 63 being shown in the present instance which coöperate with corresponding gears 64 and 65 arranged on the shafts 24 and 25 whereby rotation of the shafts 5 and 6 in a direction to carry the closing members 3 and 4 inwardly and downwardly will impart rotation in reverse directions to the shafts 24 and 25 which will bring the crimping members into operation in the manner shown in Figs. 8 and 9. The shaft 20 carrying the tongue-inserting member 19 is also approximately journaled upon the upper side of the table 32 of the machine and is provided at one end with a crank 66 having a pin or roller which coöperates with an operating arm 67, the latter being also secured at an appropriate point on the actuating bar or member 61. The arm 67 which coöperates with the crank 66 of the shaft 20 has one side of its bifurcated end so formed as to permit a lag or interruption in the movement of the tongue-inserting member after the tongue has been

fully inserted, and the arm 60 which coöperates with the crank 58 upon the shaft 6 is similarly provided with an offset 68 which produces a pause in the folding movements of the members 3 and 4 during which pause the arms 11 and 12 are retracted from beneath them.

The actuating member or bar 61 is guided to reciprocate in bearings 69 arranged at one side of the table portion of the machine, and this bar may serve as a common operating device for any number of folding mechanisms as may be mounted upon the machine. This bar may be appropriately reciprocated in any suitable manner, it being provided in the present instance with a heel 70 which is arranged to be actuated by a cam 71 which serves to move the bar in a direction to perform the closing operation upon the carton. The heel 70 is arranged above the shaft 43 and, in order to effect the return movement of the bar 61, the shaft 43 is provided with a returning cam 72 which coöperates with a shoulder or lug 73 which is secured to the bar 61 and is arranged beneath the center of the shaft 43.

The members 8 and 9 which serve to close the end flaps of the carton are simultaneously reciprocated in directions either toward or from one another by means of a pair of crank arms 74 and 75. These cranks are pivoted upon the machine frame at 76 and 77 respectively, and the members 8 and 9 are provided with pins or rollers 78 and 79 which coöperate respectively with the forked ends of said crank arms. In order to impart the requisite rotary movements to the crank arms in reverse directions, a crossed connecting link 80 forms an operative connection between them.

The ejector 30 is mounted upon a horizontal member 81 having its ends supported by a pair of vertically movable rods 82 which are suitably guided by brackets 83, and each vertically movable rod is provided with a lateral projection 84 which coöperates with the forked end of an operating arm 85, the two operating arms 85 being fixed to a common actuating shaft 86 which is journaled in a bracket 87 secured at one side of the machine and this shaft has a crank arm 88 with which a spring 89 coöperates, the function of this spring being to normally retain the ejectors in an elevated or inoperative position. The shaft 86 is also provided with an actuating arm 90 which is fixed thereto and is normally arranged in the path of an arm 91 which rotates with the shaft 43 so that the ejectors will be actuated once for each revolution of the shaft 43.

The crank arms 74 and 75 are operated at proper intervals by means of an actuating member or bar 92, the latter being mounted in bearings 93 and is preferably arranged

at that side of the machine opposite to the actuating bar 61. The actuating member or bar 92 is operated at appropriate intervals to proximate the closing members 8 and 9 by means of a cam 93 which coöperates with a heel 94 fixed to the said bar, and the return movements of the latter are effected by means of a cam 95 which coöperates with a stop or lug 96 which is also secured to the bar 92, the two cams 93 and 95 being fixed to the shaft 43. The bar 92 carries a forked operating arm 97 the bifurcated end of which coöperates with a roller or projection 98 carried by a portion of the crank arm 75.

Any appropriate means may be employed for conveying the filled cartons from a suitable filling machine to the closing machine. In the present instance, a conveyer of the endless type is shown, it consisting of a set of channel-shaped tracks 99 which extend from the filling machine to the closing machine and form channels along which the filled cartons are conducted. The number of tracks employed corresponds to the number of cartons which are to be filled and closed at each operation. The cartons are advanced along the respective tracks by means of cross members 100 which are connected to chains 101 which pass over sprocket wheels 102 mounted upon a common shaft 103, the cartons being conducted to the closing machine in rows suitably spaced one in advance of the other. The shaft 103 is arranged in immediate proximity to the plungers or carton-positioning devices 2, sufficient space being provided, however, to permit the passage of the cross members 100 as they reach the end of the conveyer and begin their return movement. The tracks 99 along which the cartons are conducted extend to points in immediate proximity to the carton-lifting devices 2 in order that the cartons may be transferred from the conveyer to the corresponding lifting devices.

The closing machine is preferably set into operation at appropriate intervals so as to close one or more cartons immediately after the filling machine performs each filling operation, and in the present instance, a controlling connection is provided between the closing machine and the filling machine through the medium of the conveyer which serves to transfer the filled cartons from the filling machine to the closing machine. For this purpose, the conveyer shaft 103 is provided with a pair of arms 104 which are arranged to alternately engage the heel 53 and thereby release the clutch member 47 to set the closing machine into operation each time the conveyer advances a set of filled cartons thereto.

In order to facilitate the removal of the filled and closed cartons from the closing machine, a belt conveyer 105* is preferably

provided, this conveyer in the present instance having a movement transverse to the direction of movement of the conveyer which supplies the cartons to the machine, and the closed cartons are transferred to this conveyer from the positioning devices 2 after the cartons have been closed and lowered by the engagement of the next cartons to be filled engaging therewith.

The operation of the machine is as follows: Assuming that the cartons are supplied to an appropriate filling machine in such a form that their bottom ends will be closed and that the cartons will stand vertically with the flaps at their upper ends in open condition, predetermined charges of material are deposited into the cartons by the filling machine, the latter performing the filling operation at predetermined intervals. After the cartons have been filled, the conveyer which transfers the filled cartons from the filling machine to the closing machine is set into operation and it removes the filled carton from the filling machine and advances it one step toward the closing machine, each carton being acted on by the respective cross member 100 of the conveyer. After the conveyer has operated a predetermined number of times, each carton will successively reach the closing machine, the foremost filled carton upon the conveyer being transferred to the positioning devices 2 as shown in Fig. 3. At the moment a carton is positioned beneath the receiver of the closing machine, one of the arms 104 on the shaft 103 of the conveyer will strike the heel 53 upon the shaft 51, thereby causing the latter to rotate sufficiently to carry the clutch-controlling arm 50 thereon out of engagement with the clutch member 47. As the latter is spring-operated so as to have a normal tendency to engage the notched clutch face 49 upon the driving wheel 46 and as the latter rotates continuously, the clutch member 47 will establish an operative connection between the driving wheel 46 and the shaft 45, and the latter operating through the gearing 44 will impart a rotary movement to the shaft 43. The first operation to take place is the elevating or positioning of the carton preparatory to the closing of the flaps thereon, and this elevating or positioning operation is performed by the cam 42 which acts on the arm 39, the latter being operatively connected to the shaft 38 of the elevating mechanism through the medium of the connecting rod 41 and the cranks 37. Each carton rests upon an elevating device 2 which has a vertical guide rod 33, and as these vertical guide rods are connected to the cross member 34, lifting movements of the crank arms 37 will cause the positioning devices 2 to move upwardly thereby carrying the upper open end of each carton into its respective receiver in such a manner as to position the flaps there-

on in such a position to be correctly operated upon by the closing members.

A continued rotation of the shaft 43 will bring the cam 95 thereon into engagement with the lug or projection 96 upon the actuating bar 92, causing the latter to be moved toward the left in Fig. 1, and the forked arm 97 acting on the roller or projection 98 carried by the crank arm 75 will cause the latter to rotate in a direction that will carry the slide 13 inwardly. As the crank arm 75 is also connected to the crank arm 74 by the crossed link 80, the closing member 8 will be simultaneously moved inwardly. The carton during the simultaneous inward movements of the folding members 8 and 9 will be so positioned in the receiver that the flaps *b* thereon will be engaged by these members. The simultaneous inward movement of the folding members 8 and 9 will continue until these flaps have been fully closed or folded downwardly upon the material contained in the carton, and after the completion of the inward movement of said members, the cam 71 will begin to act on the heel 70 carried by the actuating bar 61, the latter then moving toward the left as shown in Fig. 2. The forked arms 59 and 60 carried by the bar 61 will then act upon the cranks 57 and 58 which are fixed upon the shafts 5 and 6. The bar 61 will thereby serve to simultaneously turn the lateral folding members 3 and 4 downwardly and inwardly, carrying the lateral flaps *c* and *d* of the carton into corresponding positions. The forked arm 67 on the bar 61 also acts upon the crank 66 which is attached to the shaft 20 and during the closing movements of the members 3 and 4, the tongue-inserting member 19 will also be turned downwardly in the direction indicated in Fig. 7. The flap *d* of the carton is thereby carried into engagement with the upper side of the slot opening arm 12, the latter engaging the flap *d* adjacent to one edge of the slot and the tongue-inserting member 19 will move downwardly until it engages the flap *d* at the opposite side of the slot and pressing downwardly upon the flap will open the slot in the manner shown in Fig. 8. This tongue-inserting member also presses downwardly upon the tongue *e*, causing it to be deflected or curved downwardly in alinement with the opened slot, the flap *c* carrying the tongue being bent over the arm 11.

A continued rotation of the shaft 43 will bring the cam 93 into engagement with the heel or projection 94 on the bar 92, the movement of the latter being thereby reversed to cause a simultaneous withdrawal of the closing members 8 and 9. During the withdrawal of the slide 13, a turning movement is imparted to the arm 12 about the shaft 15 as an axis, this movement being effected by the engagement of the cam 21

with the crank arm 14 supporting the said arm which motion is effected during the return movement of the slide, and the shaft 20 at this time is also rotating. By so turning the arm 12, the upper edge thereof is carried into such a position as to avoid cutting of the flap which bears upon it. After the folding members 8 and 9 have been withdrawn, continued closing movements of the members 3 and 4 will carry the flaps *c* and *d* into fully folded position, and during the final folding of the flaps *c* and *d*, the tongue *e* upon the flap *c* will enter the slot *f* of the flap *d*. During the final closing of the flaps, the creasing members 22 and 23 which are operatively connected to the shafts of the folding members 3 and 4 will reach such a position as to bring the flaps 26 and 27 thereon into engagement with the opposite sides of the carton at points immediately adjacent to the lines upon which the flaps *c* and *d* are folded, and as the ribs 28 and 29 of the folding members 3 and 4 at this time bear upon the upper side of the flaps *c* and *d*, the corners of the carton will be pinched or otherwise acted upon to produce a tendency that will retain the flaps *c* and *d* which are last folded in closed position, bulging of the closed end of the carton being thereby avoided.

A continued movement of the shaft 43 will bring the cam 72 into engagement with the lug or shoulder 73 on the bar 61, the latter being thereby retracted to cause the folding mechanism to resume its initial condition, and at the moment the folding mechanism is restored, the cam 42 will permit a lowering movement of the arm 39, the carton-positioning devices 2 being thereby permitted to lower and remove the filled and closed carton from the closing mechanism. In order to insure a positive removal of the closed carton from the closing mechanism, the ejector previously described may be used, the arm or projection 91 on the shaft 43 striking the actuating arm 90 on the shaft 86 and thereby causing the ejector 30 to be depressed. This ejector, as previously stated, passes through appropriate apertures formed in the closing members 3 and 4 and is arranged to cooperate with the top or folded end of the carton and thereby push it downwardly through its receiver. The operation of the ejector is momentary only, and it is returned to its elevated or inoperative position by means of the spring 89.

The clutch employed between the driving wheel 46 and the shaft 45 is of the one revolution type, and when the member 47 thereof reaches a point where its end engages the controlling arm 50, it will be retracted automatically so as to disconnect the shaft 45 from the wheel 46 to interrupt the operation of the folding machine until the heel 53 is again engaged by one of the arms 104 on the

conveyer shaft 103, the contact between the arms 104 and the heel 53 being only momentary.

After each carton has been removed from the folding mechanism, it will rest in the position indicated in Fig. 3 or, in other words, its bottom is substantially on the same level with the surface of the transversely-moving belt 105^a. The next advancing movement of the conveyer which transfers the filled cartons from the filling machine to the closing machine will bring the foremost carton thereon into engagement with the carton resting beneath the closing machine and which has been closed, and as the rear carton assumes its proper position upon the positioning device 2, preparatory to the folding operation, it will displace the carton which has been already closed, this closed carton being thereby transferred to the belt 105 and the latter serves to convey the carton to any suitable point for packing or other purposes.

A carton closing machine constructed in accordance with my invention is capable of closing carton flaps with certainty and uniformity, and it embodies means whereby a tongue or equivalent device on one flap may be automatically inserted into a corresponding slot or opening in another flap and without liability of tearing or otherwise damaging or weakening any part of the carton, the use of paste which obviously would be objectionable in the handling of powdery substances, being thereby avoided. Moreover, the construction of the machine is such that the closing of the flaps may be performed rapidly, and the arrangement is such that any desired number of closing devices may be embodied in the same machine. As the closing machine is set into operation automatically by the shaft 103 which is driven by the sprocket 105 thereon, and the said sprocket is operated by the filling machine, it is obvious that the closing machine is controlled by the filling machine, a proper timing of the movements of the closing and filling machines being thereby insured.

I claim as my invention:

1. A carton closing device involving a slot opening finger to engage the under side of a slotted flap, and a tongue-inserting device coöperative with said finger to open the slot in the slotted flap and adapted to engage the tongue on another flap to introduce such tongue in the opened slot.
2. A carton closing device involving means to engage the under side of a slotted flap to support it, and a device to coöperate with said means to open the slot in said flap and also coöperative with a tongue on another flap to introduce said tongue into the slot.
3. A carton closing device involving a slot opening finger to engage the under side of a

slotted flap, and a tongue-inserting device arranged in coöperative relation with said finger and operative to insert the tongue on another flap in the said opening slot, said finger and tongue-inserting device being capable of moving simultaneously in the direction of the closing movement of the flaps.

4. The combination of means for supporting a carton with slotted and tongued flaps in open position, a slot opening finger to engage the under side of the slotted flap, a tongue-inserting device arranged in coöperative relation with said finger and forming a guide to insure the insertion of the tongue into said opened slot, and means for simultaneously moving said finger and tongue-inserting device toward the body of said carton during the closing of said flaps and while the tongue on one flap is entered in the opened slot of the other flap.

5. A carton closing mechanism involving opposed inwardly movable flap-closing means, a device to engage a tongue on one flap to aline with a slot in an opposed flap, and means to engage beneath and coöperative with said device to open the slot in the opposed flap, said device being movable in a direction to carry said tongue into the slot.

6. A carton closing mechanism comprising means for closing a pair of flaps, a device operative to insert a tongue on one flap into a slot in an opposed flap, means arranged to engage beneath and support the slotted flap and also coöperative with said device to open such slot, and mechanism for operating said device and means during the closing of the flaps by said flap-closing means.

7. A carton closing device embodying a pair of opposed and pivoted flap-closing members, devices pivotally mounted to swing in parallelism with said flap-closing members and operative to first open a slot in one flap and to subsequently introduce a tongue on an opposed flap into the opened slot, and operating means for moving said devices relatively to each other and to the flap-closing members.

8. A carton closing device comprising a pair of opposed pivoted flap-closing members, an arm pivoted to swing in parallelism with said flap-closing members and having means for positioning it as a support beneath a slotted flap, and a tongue-inserting device pivoted in opposed relation to said arm and coöperative with said arm to open a slot in the slotted flap and to introduce a tongue on another flap.

9. A carton closing device comprising a pair of opposed pivoted flap-closing members, an arm pivoted to swing in parallelism with the flap-closing members and also reciprocable in the direction of its axis whereby it may be introduced beneath a slotted flap as a support and withdrawn from be-

neath such flap, and a pivoted tongue-inserting device coöperative with said arm to open the slot in the slotted flap and constituting a guide to introduce a tongue on an opposed flap into said slot.

10. A carton closing device comprising means for closing a pair of flaps, a pair of fingers positioned to form supports over which the said flaps are folded, one of said fingers serving to open a slot on one of the flaps, and a tongue-inserting member operable to bend the other flap over its respective finger and to introduce a tongue thereon into the opened slot of the coöperating flap.

11. A carton closing device comprising means for closing a pair of flaps, a pair of fingers adapted to engage beneath the respective flaps during the closing thereof, one of said fingers serving to open a slot in its respective flap, a tongue-inserting member coöperative with a tongue upon the other flap for directing such tongue into the opened slot in the coöperating flap, said fingers adapted to be withdrawn before the closing of said flaps is completed.

12. A carton closing mechanism comprising means for closing a pair of flaps, a reciprocable finger movable into a position to engage beneath one of said flaps to serve as a support adjacent to a slot therein, a tongue-inserting member arranged to bear upon the slotted flap to open the slot therein and introduce a tongue upon the coöperating flap, and means for imparting a turning movement to the said finger while the latter is being withdrawn and preparatory to the final closing of the flaps.

13. A carton closing mechanism comprising means for carrying a pair of flaps into closed position, a finger mounted to move into a position beneath a slotted flap to serve as a support therefor, and a pivoted member coöperative with said finger to open the slot in the slotted flap and also operative upon a tongue on one of said flaps and movable about its pivot in a direction to carry said tongue into the slot in the coöperating flap.

14. A carton closing mechanism comprising a pair of reciprocatory members operative to close a pair of end flaps on a carton, a pair of pivoted flap closing members arranged to coöperate with a pair of lateral flaps on the carton to completely close them after the closing members first mentioned have been withdrawn, and devices movable in advance of the closing members for the lateral flaps for inserting a tongue on one of the lateral flaps into a slot in the opposed lateral flap.

15. A carton closing mechanism comprising a pair of oppositely reciprocable closing members, one of the latter carrying a finger, a second pair of closing members one

of which serves to carry a flap into engagement with said finger, a tongue-inserting member also coöperative with said finger to open a slot in the flap engaging it and adapted to engage a tongue on the coöperating flap to introduce such tongue into the opened slot.

16. A carton closing mechanism comprising a carton receiver, a pair of flap folding members mounted in coöperative relation therewith, one of said members having a pair of spring arms arranged to preliminarily act upon one of the flaps on the carton to deflect such flap inwardly during the insertion of the carton into the receiver.

17. A carton closing mechanism comprising flap closing means, and a device movable inwardly with respect to the carton and in a direction toward the corner thereof formed between the body of the carton and a flap, said device being active upon a side of the carton immediately adjacent to the said corner thereof and coöperative with said flap closing means while the latter is in closed position, whereby the said corner of the carton will be pinched and the adjacent flap will have a tendency to remain in closed position.

18. A carton closing mechanism comprising opposed flap closing members, and a pair of oppositely arranged pivoted devices having edges which are active upon the body of the carton immediately adjacent to and at one side of each corner, said devices being movable toward the respective corners of the carton and coöperative with the flap closing members while the latter are in closed position, whereby such corner will be compressed and the flaps will have a tendency to remain in closed position.

19. A carton closing mechanism comprising a pair of oppositely pivoted flap closing members having portions to bear upon the closed flaps at points adjacent to the lines on which they are folded, and devices coöperative with the folding members while the latter are in closed position to pinch said corners after the closing of the flaps has been completed.

20. A carton closing machine comprising a chambered carton receiver having a carton-receiving opening at one end, flap-closing devices arranged at the opposite end of the receiver and including opposed fingers, and means for introducing a carton into the chamber of said receiver by a movement of the carton toward the flap-closing devices, said fingers of the flap-closing devices being operative during such movement of the carton to effect preliminary closing of the flaps.

21. A carton closing machine comprising a chambered carton receiver, a pair of opposed pivoted flap-closing members mounted in coöperative relation with one end of the receiver, means for moving said members

into a plane substantially transverse to the length of the receiver to close the flaps upon a carton, an ejector, and means for operating it to engage the closed end of the carton while the flap-closing members are in closed position whereby the carton is ejected from the receiver.

22. A carton closing machine comprising a carton receiver having an opening at one end to receive the cartons, means for introducing a carton into the receiver, and flap-closing mechanism mounted at the opposite end of the receiver, such mechanism embodying fingers operative upon lateral flaps of the carton during its introduction into the receiver to produce preliminary closing movement of such flaps, a pair of opposed reciprocatory members operative upon the end flaps of the carton to close them, a pair of opposed pivoted members operative to close the lateral flaps upon the carton, and an ejector having means for operating it to engage the closed end of the carton while the pivoted members are in closed position.

23. A carton closing mechanism comprising a carton receiver, means for introducing a carton into the same, a pair of pivoted flap closing members coöperative with the receiver, and an ejector arranged to operate upon the closed end of the carton while the said members are in closed position whereby the closed carton is removed from the receiver.

24. A carton closing mechanism comprising a chambered carton receiver, means operative to introduce a carton into the chamber of the same, a pair of reciprocatory members arranged to operate upon a pair of flaps on the carton to close the same, a pair of members arranged to subsequently operate upon a second pair of flaps on the carton to close them, and means operative upon the closed end of the carton while said flap closing members are in closed position, for removing the closed carton from the receiver.

25. The combination of a carton closing machine embodying a chambered carton receiver having an entrance for the cartons at one end, flap-closing devices arranged at the opposite end of the receiver, a conveyer for conducting cartons to the closing ma-

chine, an elevator reciprocable in a direction transverse to the direction of movement of the conveyer and operative to transfer the cartons successively from the conveyer to the receiver and its closing mechanism, and means controlled by the conveyer for automatically setting the elevator into operation.

26. The combination of a carton closing machine embodying a chambered carton receiver having an entrance for the carton at its lower end, flap-closing devices arranged at the upper end of the receiver, a vertically reciprocatory elevator movable in alinement with the opening in the receiver and operative to introduce cartons thereto, a conveyer for advancing cartons successively to the elevator, and means operative automatically by the conveyer for setting the elevator and flap-closing devices into operation.

27. The combination of a carton closing machine embodying a vertically arranged chambered carton receiver, flap closing devices coöperative with such receiver, a conveyer for conducting cartons to the closing machine, a vertically movable transferring member arranged to receive the cartons from the conveyer and operative to introduce such cartons into the receiver, and a controlling connection between the conveyer and closing machine for setting the flap closing devices into operation after a carton has been inserted into the receiver.

28. The combination of a carton closing machine embodying a vertically arranged chambered receiver, carton closing devices coöperative with the upper end thereof, a conveyer for conducting filled cartons to the closing machine, a vertically movable carton transferring member driven by the closing machine and operative to receive the filled cartons from the conveyer and introduce them into the lower end of the receiver, and a driving clutch for the closing machine controlled by the conveyer.

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

FREDERICK J. HEYBACH.

Witnesses:

BLANCHE PACETTI,
KATIE M. COOK.