No. 699,639. Patented May 13, 1902.

D. APPEL.

PAPER BAG MACHINE.

(Application filed Dec. 26, 1901.)

(No Model.) 8 Sheets—Sheet 1.

FIG. 1.

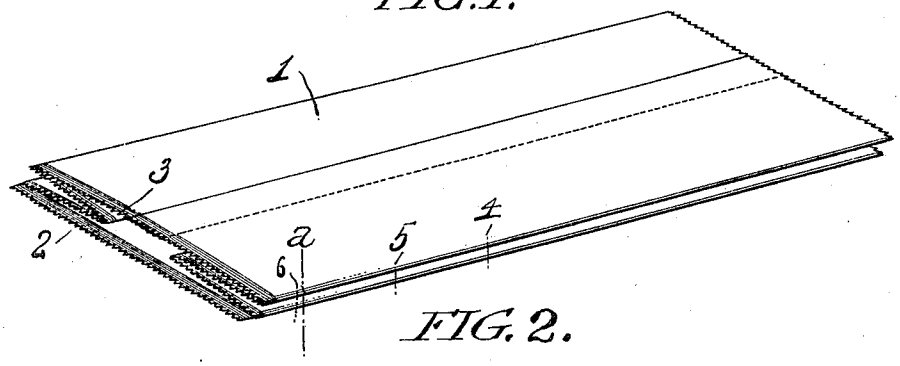


FIG. 2.

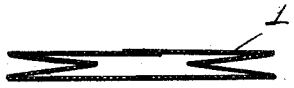


FIG. 3.

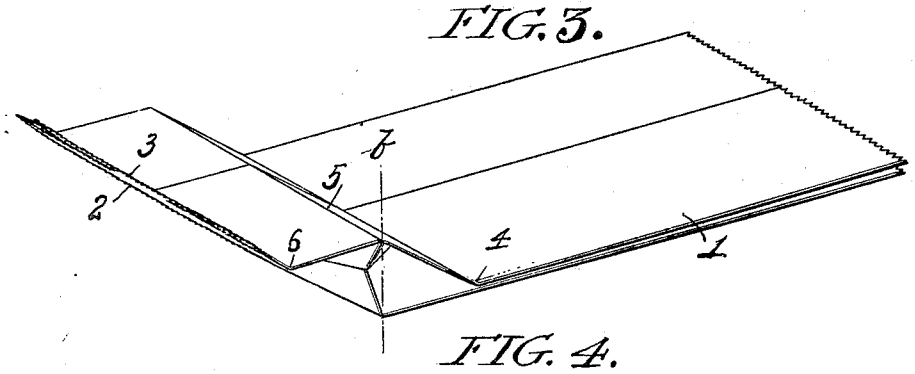


FIG. 4.

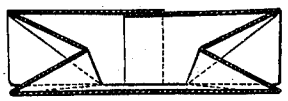


FIG. 5.

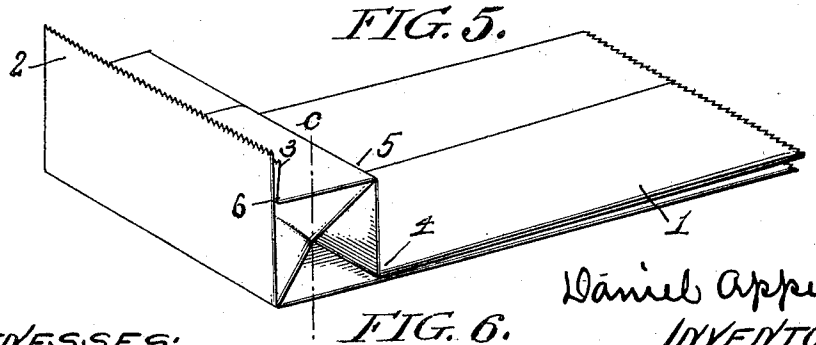
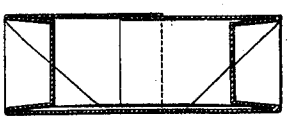


FIG. 6.



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(No Model.) (Application filed Dec. 26, 1901.) 8 Sheets—Sheet 2.

FIG. 7.

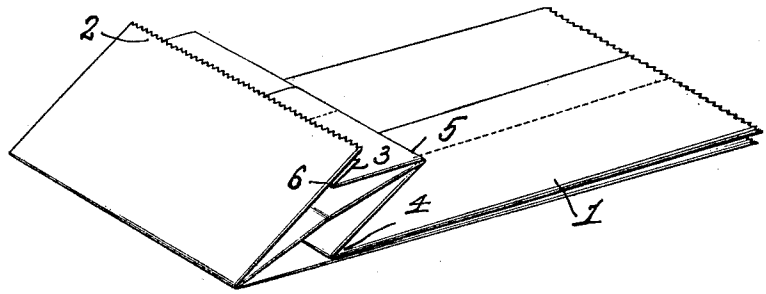


FIG. 8.

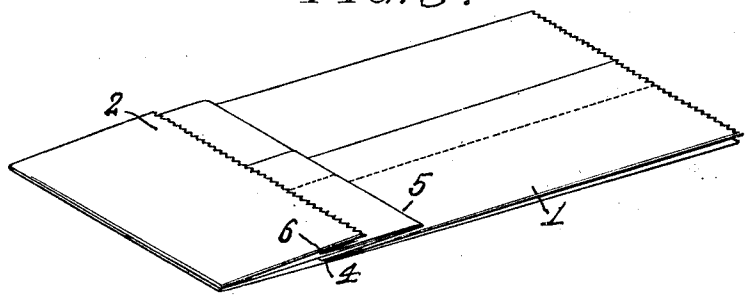
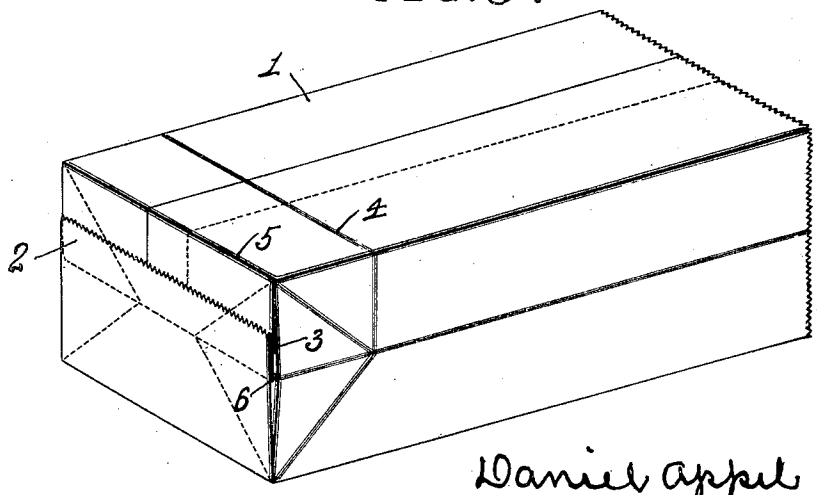


FIG. 9.



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FIG. 10.

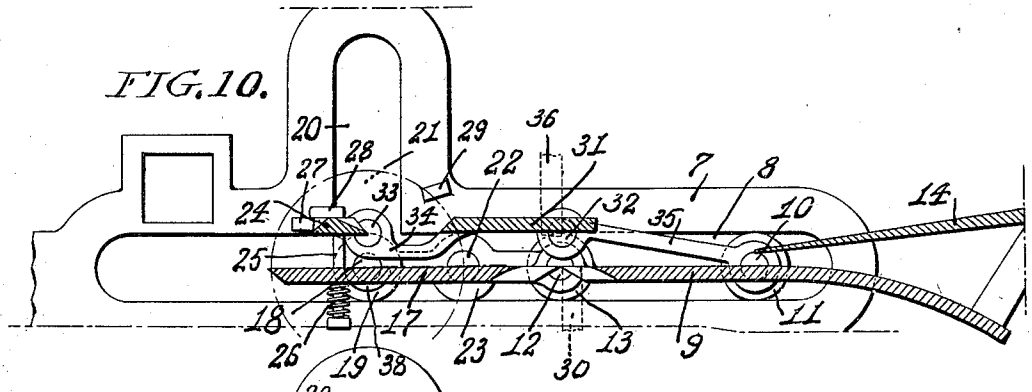


FIG. 11.

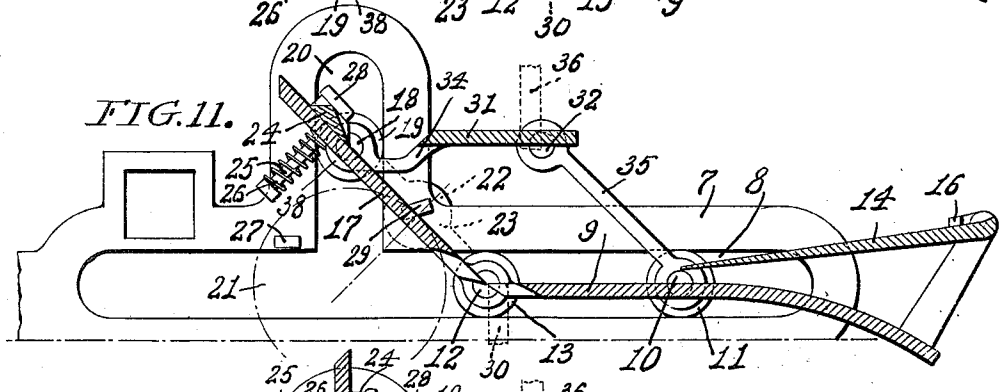


FIG. 12.

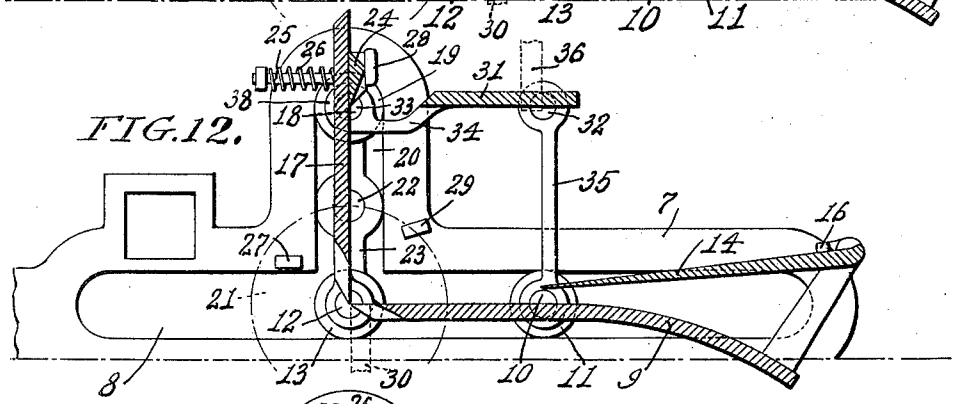
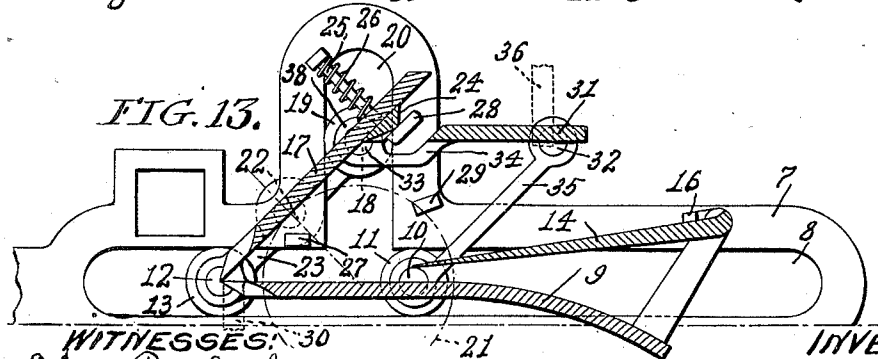


FIG. 13.



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FIG. 14.

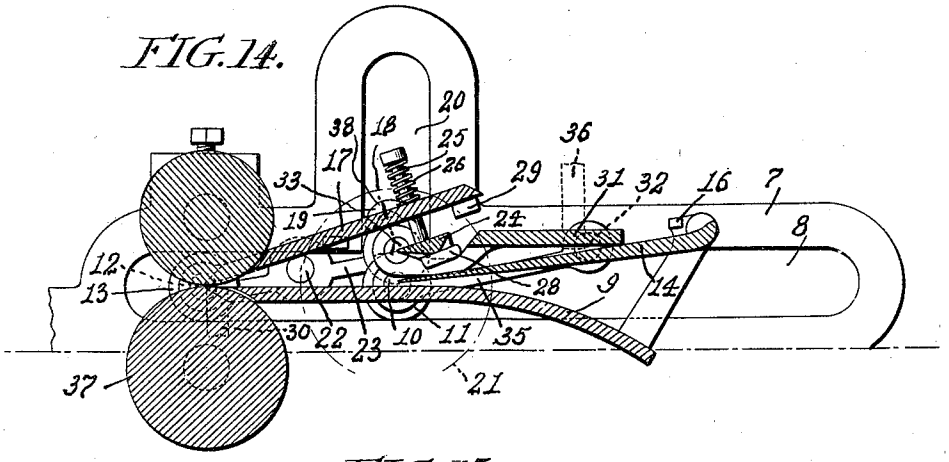
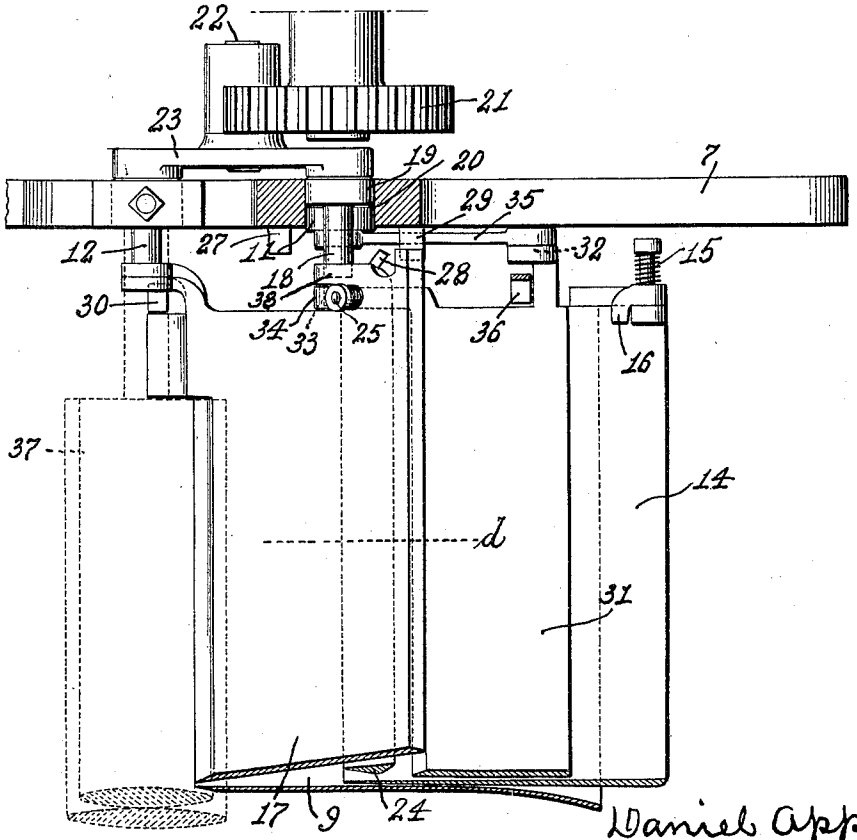


FIG. 15.



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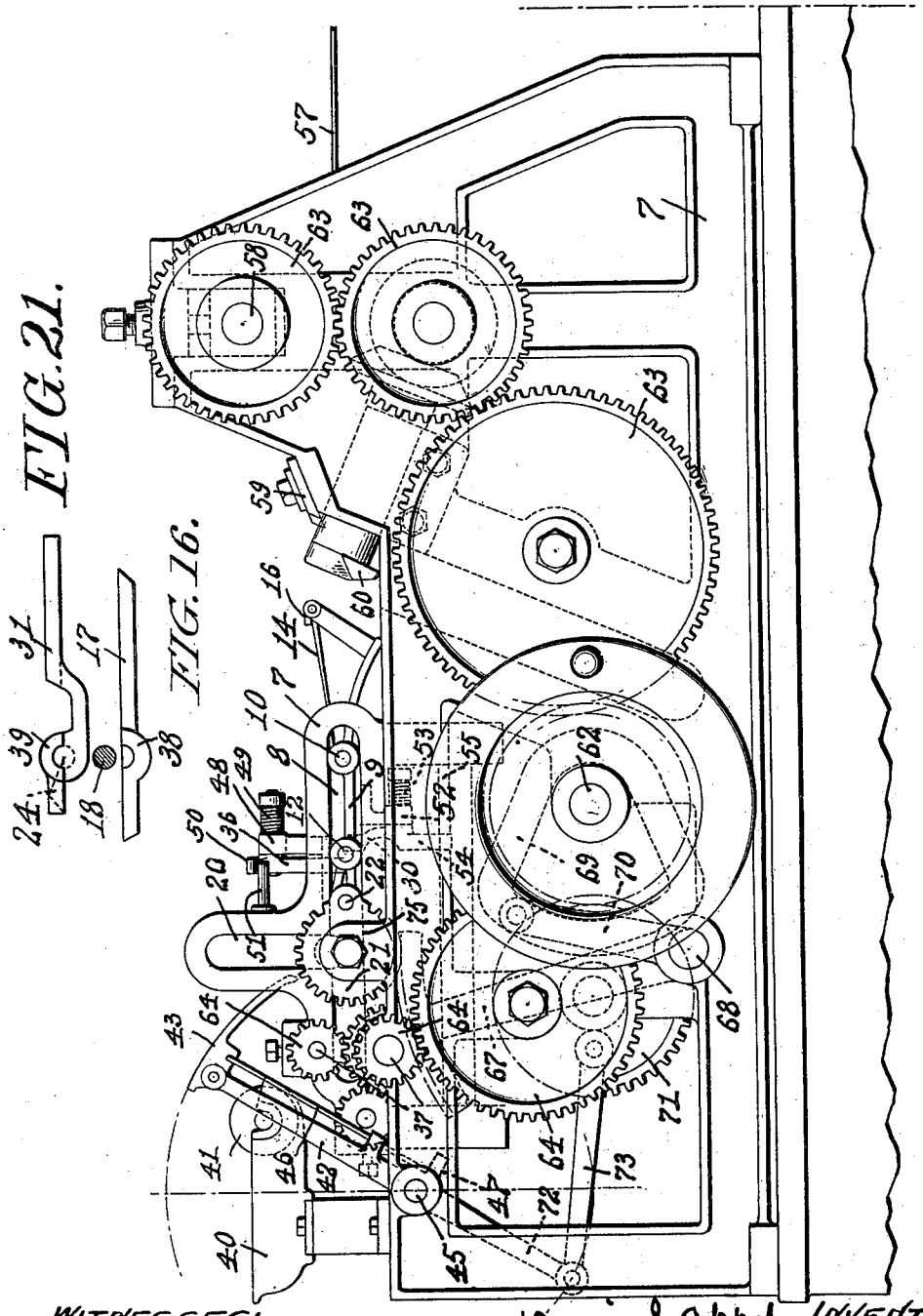
PAPER BAG MACHINE.

(Application filed Dec. 26, 1901.)

(No Model.) 8 Sheets—Sheet 5.

FIG. 21.

FIG. 16.



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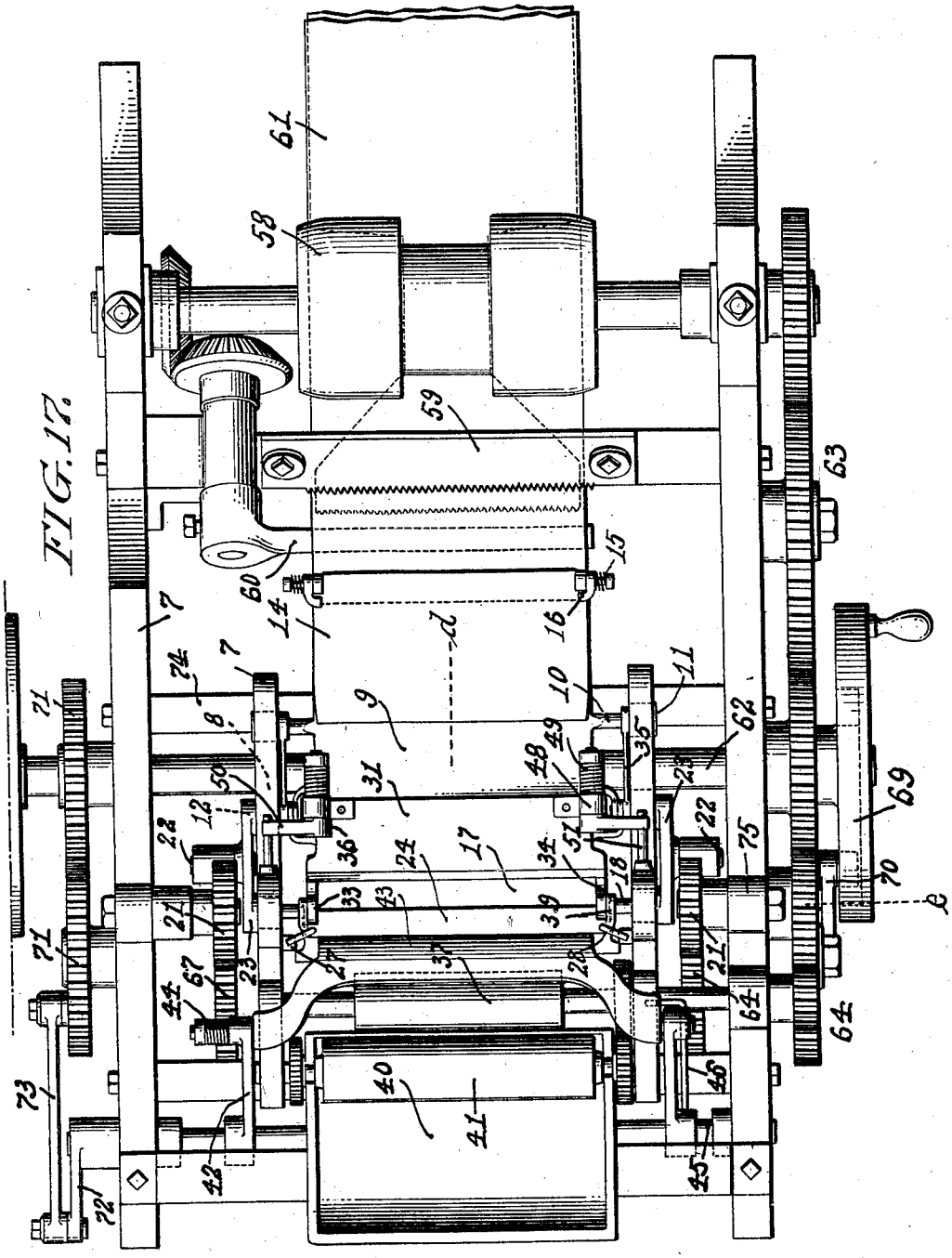
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(Application filed Dec. 26, 1901.)

(No Model.) 8 Sheets—Sheet 6.

FIG. 17.



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No. 699,639. Patented May 13, 1902.

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PAPER BAG MACHINE.

(No Model.) (Application filed Dec. 26, 1901.) 8 Sheets—Sheet 7.

FIG. 18.

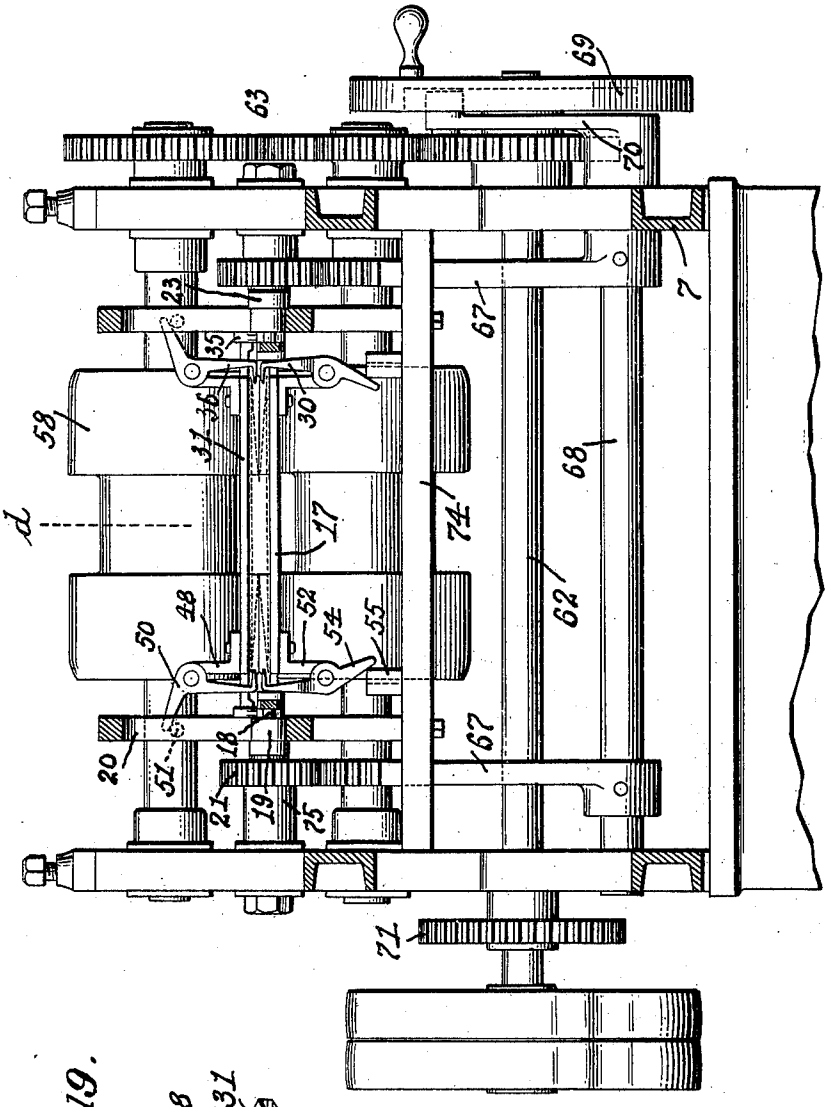
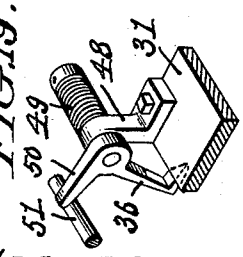


FIG. 19.



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PAPER BAG MACHINE.

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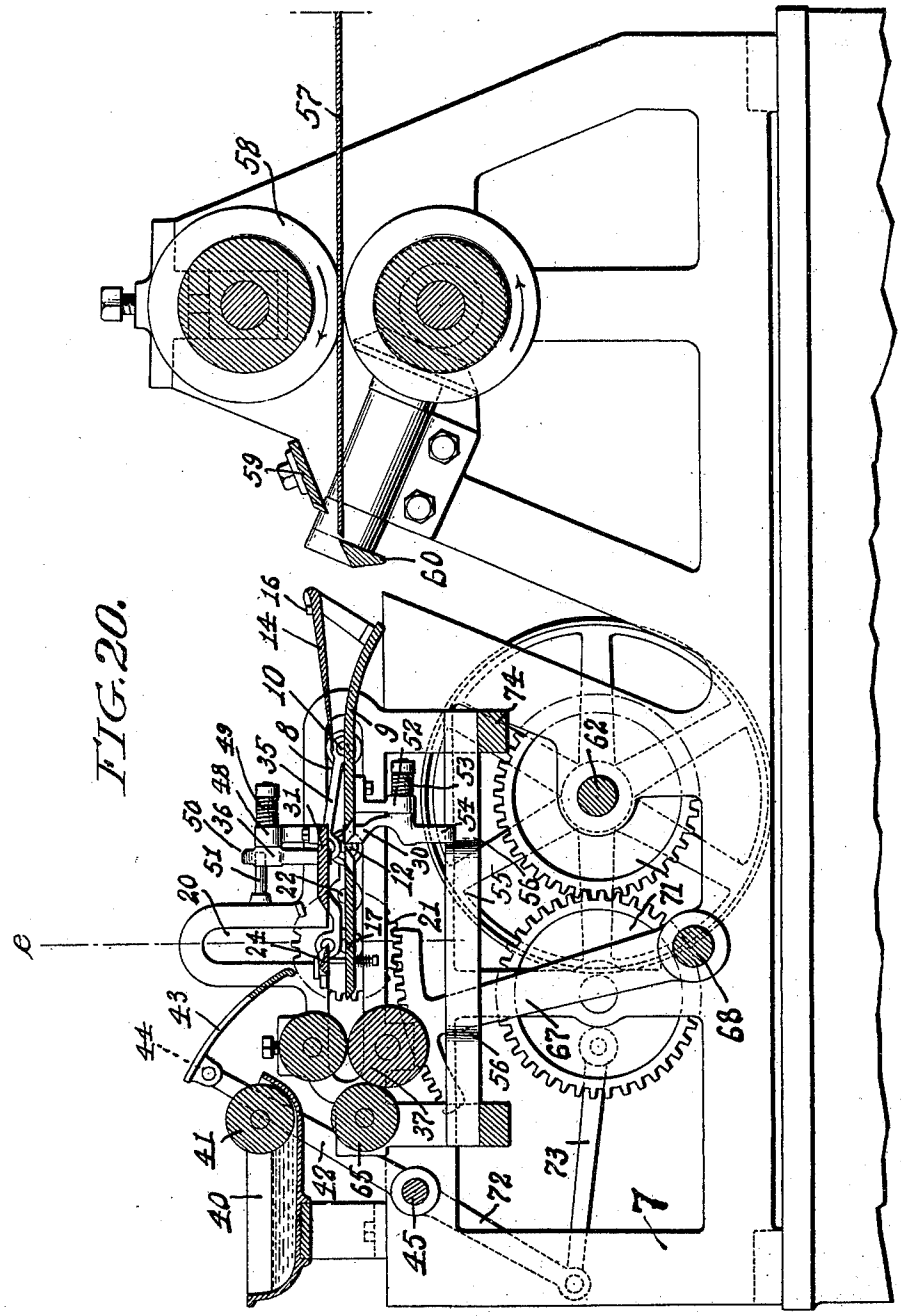


FIG. 20.

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UNITED STATES PATENT OFFICE.

DANIEL APPEL, OF CLEVELAND, OHIO, ASSIGNOR TO THE UNION PAPER BAG MACHINE COMPANY, OF PHILADELPHIA, PENNSYLVANIA.

PAPER-BAG MACHINE.

SPECIFICATION forming part of Letters Patent No. 699,639, dated May 13, 1902.

Application filed December 26, 1901. Serial No. 87,173. (No model.)

To all whom it may concern:

Be it known that I, DANIEL APPEL, a citizen of the United States, residing at Cleveland, Cuyahoga county, Ohio, (post-office address No. 62 Holyoke Place, Cleveland, Ohio,) have invented certain new and useful Improvements in Paper-Bag Machines, (Case F,) of which the following is a specification.

This invention, pertaining to improvements in paper-bag machines, will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a perspective view of a section of plicated tube from which the bag is to be made; Fig. 2, a transverse section of the same, line *a* of Fig. 1; Fig. 3, a perspective view of the same in early stages of bottom-folding; Fig. 4, a transverse section of the same in the plane of line *b* of Fig. 3; Fig. 5, a perspective view of the section in a further stage of bottom-folding; Fig. 6, a transverse section of the same, plane of line *c* of Fig. 5; Fig. 7, a perspective view showing a still further stage of bottom-folding; Fig. 8, a perspective view of the bag complete, but in flat folded condition; Fig. 9, a perspective view of the bag opened out for use; Figs. 10, 11, 12, 13, and 14, vertical longitudinal sections, plane of line *d* of Figs. 15, 17, and 18 of the folding mechanism, showing the same, respectively, in progressive stages of action; Fig. 15, a partial plan of the bottom-folding devices; Fig. 16, a side elevation of the machine; Fig. 17, a plan of the machine; Fig. 18, a vertical transverse section of the machine, plane of line *e* of Figs. 17 and 20; Fig. 19, a perspective view of one of the grippers; Fig. 20, a vertical longitudinal section of the machine, plane of line *d* of Figs. 15, 17, and 18; and Fig. 21, a side elevation of the trunnion-bearings of the folding-plate and clamp-bar.

The machine is designed to make paper bags from plicated tubes; and its construction and operation can perhaps best be explained by setting forth, first, step by step the results that are to be produced upon the tube in forming the bag, and, second, the direct instrumentalities and their motions by means of which these steps are performed, and, third, the general organization of the machine, including these instrumentalities and mechanism for giving them their functional motions.

The steps of procedure, (see Figs. 1 to 9, inclusive.)—Referring to Fig. 1, 1 indicates a section of ordinary plicated tube of cross-section, as seen in Fig. 2; 2, the bottom end of its lower face-ply; 3, the bottom end of its upper face-ply, the end of the lower face-ply projecting somewhat beyond the upper face-ply and the inner implications, and 4, 5, and 6, the planes of several transverse folding-lines.

Let it be assumed that we clamp the bottom ends of all the plies together at all points forward of plane 6, that all the plies are similarly clamped just at the rear of plane 4, and that the lower face-ply and lower inner plications are gripped together just at the rear of plane 5, and that the upper face-ply and upper inner plications are gripped just forward of plane 5. (See Figs. 3, 4, and 5.) If the clamped bottom ends of the plies be turned somewhat upward with a hinging motion and at the same time the gripped upper portions of the tube be correspondingly elevated, the tube will assume the form seen in Fig. 3, transverse foldings having taken place in the planes of lines 4, 5, and 6, the inner plications between points 4 and 6 flexing outwardly, somewhat as indicated in Fig. 3. If now this lifting and hinging motion of these parts be continued, the structure will take the form indicated in Figs. 5 and 6, in which it will be observed the transverse folds on lines 4, 5, and 6 have reached a right-angle stage, producing at the bottom of the bag a transversely-disposed rectangular box whose ends are formed by the inner plications, which have flexed still further outwardly upon diagonal folding-lines. (See Figs. 7 and 8.) If now with the structure in the condition seen in Fig. 5 the bottom end of the end plies and the gripped upper plies be carried rearwardly and downwardly, the tube will take on the form indicated in Fig. 7, the parallelogram of the transverse box beginning to flatten and the diagonal fold of its ends flexing outwardly to nearly the full width of the plicated tube. Assume that before the folding operation was begun paste was applied to the upper sur-

faces of the bottom ends of the two face-plies, as indicated by the shading in Fig. 1. Then if the parallelogram of the transverse boxing be completely flattened down, as seen in Fig. 8, the ends of the two face-plies will become pasted against that portion of the upper face-ply just rearward of fold-line 6 and the diagonal folding-lines of the ends of the transverse boxing will have been flexed completely out to the full width of the plicated tube. This completes the bag and puts it in marketable condition. The bag when opened out has the form indicated in Fig. 9, with a particularly strong and well-sealed bottom.

The instrumentalities, (see Figs. 10 to 15, inclusive, and Fig. 21.)—The instrumentalities are to perform the above-mentioned clamping, gripping, hinging, folding, pasting, and flattening; but the pasting devices will be separately treated. The construction of the instrumentalities will first be described and then their mode of action.

Referring to Figs. 10 to 15, inclusive, 7, wherever found in the drawings, indicates fixed frame parts, the general frame taking on the aspect of two side housings properly supported at a considerable distance apart for the passage of the tube and the presence of the instrumentalities; 8, a horizontal guide-slot in each side of the frame; 9, a reciprocating table having about the length of the bag-section of the tube, its rear end (the end at the right) curving downwardly and its forward end being brought to an edge in the plane of the top of the table; 10, trunnions projecting from opposite edges of the table into the frame-slots 8, the distance from the front sharp edge of the table to the axis of these trunnions being equal to the distance between the fold-lines 4 and 5 of the bag-bottom, as heretofore referred to; 11, rollers on these trunnions fitting the frame-slots 8; 12, a second pair of trunnions at opposite edges of the table, their axial line corresponding with the front edge of the table; 13, rollers on these trunnions engaging the frame-slots 8, so that the table 9 as thus supported by the four rollers may slide back and forth, Fig. 10 showing the table in its rearmost position; 14, a follower, consisting of a plate overlying the table 9, its rear end being pivoted to brackets projecting upwardly from the table and its front edge, which is thin, being in the vertical plane of the axis of trunnions 10; 15, springs at the pivot-mountings of follower 14, these springs tending to flex the follower upwardly upon its pivots; 16, stops at the pivots of the follower to limit the upward movement of the follower away from table 9 to such extent as will readily permit the passage of the uncompressed or somewhat-open plicated tube between the table and the toe of the follower; 17, a folding-plate lying when in the position seen in Fig. 10 as a forward prolongation of table 9, the rear edge of this folding-plate being pivotally mounted on the trunnions 12 and being brought to an edge contiguous to the thin forward edge of table 9, these two contiguous edges lying in the axial line of trunnions 12, the extreme fore-and-aft length of folding-plate 17 being equal to the distance from folding-line 5 to the bottom end of the tube as such distance is indicated in Fig. 1; 18, horizontal trunnions, one at each side of the machine, these trunnions projecting inwardly toward the side edges of folding-plate 17 and adapted to move in a vertical plane, Fig. 10 showing these trunnions in their lowest position and Fig. 12 showing them in their highest position, the distance between the axes of trunnions 18 and 12 when the former are in the lowermost position, as seen in Fig. 10, being equal to the distance between folding-lines 5 and 6 as that distance is indicated in Fig. 1; 19, rollers on trunnions 18 in the plane of the frame part containing guide-slots 8; 20, vertical guide-slots leading up out of guide-slots 8 and adapted to be engaged by rollers 19 as trunnion 18 rises; 21, gears, one at each side of the machine, their common axes being in the vertical plane of the center of slots 20, these gears being adapted to have substantially a half-revolution first in one direction and then in the other; 22, crank-pins carried by these gears, their radial distance from the common axis of the gears being equal to about half the distance between the folding-lines 5 and 6 of Fig. 1; 23, link-levers having their centers carried by the crank-pins 22, their rear ends being mounted upon trunnions 12 and their forward ends carrying the trunnions 18; 24, a clamp-bar disposed across the face of folding-plate 17 and having a thin rear edge which when the clamp-bar is against the folding-plate will be at a distance from the axis of trunnion 12 equal to that between the folding-lines 5 and 6 of Fig. 1, the forward edge of this clamp-bar being preferably thinned; 25, studs projecting from clamp-bar 24 through the folding-plate 17; 26, springs on these studs at the back of the folding-plate tending to urge the clamp-bar against the face of the folding-plate; 27, fixed stops carried by the frame; 28, lugs projecting from the ends of the clamp-bar and adapted when the folding-plate is in the horizontal position (indicated in Fig. 10) to engage stops 27 and support the clamp-bar at some distance above the face of the folding-plate; 29, a second pair of fixed stops on the frame, adapted, as the folding-plate 17 is turned upward and then folded back downward, to engage under that plate, as in Fig. 14, and limit the further descent of the plate; 30, grippers, one carried by each side of table 9, at the toe thereof, (see also Fig. 18,) the toes of these grippers when idle standing outwardly beyond the side edges of the plicated paper tube, but being adapted to swing into the side folds of the tube and clamp the lower plies thereof to table 9 at the forward extremity of the table and just to the rear of folding-line 5 of Fig. 1; 31, a boxing-plate disposed over and parallel with the face of table 9, its forward edge pre-

senting toward the edge of clamp-bar 24; 32, trunnions projecting from the side edges of this boxing-plate, their common axes being in the plane of the lower face of the plate and at a distance from the rear edge of clamp-bar 24 equal to the distance between the axes of trunnions 10 and 12; 33, horizontal pivots at the ends of clamp-bar 24 in a common axial line coinciding with the thin rear edge of the clamp-bar; 34, arms projecting forwardly from boxing-plate 31 and coupled to the clamp-bar by means of the pivots 33; 35, links connecting trunnions 10 and 32, their lengths between centers being equal to the distance between trunnions 12 and 18; 36, a gripper carried at each side of boxing-plate 31, their rear portions being in the vertical plane of the center of trunnions 32, (see also Fig. 18,) the toes of these grippers when idle standing out sidewise and free from the side edges of the plicated tube, but being adapted to swing inwardly into the side folds of the tube and clamp the upper plies thereof to the under surface of boxing-plate 31 at points just forward of folding-line 5 of Fig. 1; 37, a pair of discharge-rolls, one above the other, their common tangent being in the horizontal plane of the upper surface of table 9 and the plane of their vertical axes being in such position in front of table 9 that the front edge of the table will about reach that plane when the table is at its forward extremity of stroke, as seen in Figs. 14 and 15, these discharge-rolls having a length less than that of the active width of table 9 and folding-plate 17 and the contiguous edges of the table and folding-plate being gapped, so that these parts can reach the forward position just referred to without interference from the discharge-rolls; 38, half-bearings at the side edges of folding-plate 17, adapted to be engaged by trunnions 18 when those trunnions are in their lowest position, as indicated in Fig. 10, (see also Fig. 21,) and 39 similar half-bearings at the pivotal joints uniting clamp-bar 24 and arms 34 of boxing-plate 31, these half-bearings being also adapted to engage trunnions 18.

Operation of the instrumentalities, (see Figs. 10 to 15, inclusive.)—Assume a plicated tube-section, such as shown in Fig. 1, but without paste at the bottom, to be in hand and assume the mechanism to be in the position seen in Fig. 10. The tube is to be passed under follower 14 and along on table 9 and folding-plate 17 till the forward end of the tube is even with the front end of the folding-plate. The tube being uncompressed has its side folds sprung somewhat open. It will be observed that the position of follower 14, boxing-plate 31, and clamp-bar 24 is such as to readily permit this entrance of the tube. Now assume gear 21 to be turned a trifle in non-clockwise direction. Crank-pin 22 in rising elevates trunnion 18, lever-link 23 rocking upwardly on trunnion 12 as a pivot. Spring 26 causes folding-plate 17 to rise with and stay in bearing engagement with trunnion 18. During this rising motion of the folding-plate toward clamp-bar 24 grippers 30 and 36 move into the side folds of the paper tube and go into action, grippers 30 clamping the lower plies to the forward edge of table 9, while grippers 36 grip the upper plies to boxing-plate 31, the former grippers acting just to the rear of the axis of trunnion 12 and the latter grippers acting just forward of that axis, this axis coinciding with folding-line 5. (Indicated in Fig. 1.) Further turning of gear 21 causes the further rise of trunnion 18, whose roller enters guide-slot 20, until finally the upper surface of folding-plate 17 reaches clamp-bar 24, which by the action of springs 26 clamps all the plies of the paper tube to folding-plate 17 just forward of folding line 6. (Indicated in Fig. 1.) Trunnion 18 has now gotten into the axial line of pivot 33, also half-bearing 38, and during this upwardly-tipping motion of folding-plate 17 a slight upward flexation is given to that portion of the paper tube lying upon it. Further turning of gear 21 puts the folding-plate to the position seen in Fig. 11, table 9 having been drawn forward somewhat by lever-link 23 drawing upon trunnion 12. Boxing-plate 31, it will be observed, has risen considerably, still remaining parallel with table 9. It will be observed that while the clamp-bar is against the folding-plate the folding-plate 17, the boxing-plate 31, the table 9, and the links 35 at all times form a parallelogram. As the parts move into the position indicated in Fig. 11 the tube is brought to the condition shown in Fig. 3, the fold at line 4 taking place in the axial line of trunnions 10, near which stands the toe of follower 14. With the tube properly creased at the folding lines, as is customary in the manufacture of paper bags, the toe of follower 14 need not be close to the table to sharply define the fold at line 4, it being sufficient that it be present at the rear of the rising portion of the paper to prevent its improper retreat, and thus compel the lower fold in the plane of line 5 of Fig. 1 to take place in the axial line of trunnion 12. The still further turning of gear 21 brings the parts to position shown in Fig. 12 and puts the tube in the condition seen in Fig. 5, the parallelogram of folders and fold having reached the rectangular stage and crank-pin 22 and trunnion 18 having reached their highest positions. The continued turning of gear 21 puts the parts in the position shown in Fig. 13, crank-pin 22 and trunnion 18 having descended somewhat and the parallelogram of the folders and fold having flattened somewhat rearwardly. The still further turning of the gear effects a further flattening of the parallelogram of the folders and the folds until finally the descent of folder-plate 17 causes its rear edge to be arrested by stops 29, as seen in Fig. 14, the still further descent of trunnion 18 causing that trunnion to leave the half-bearing 38 of the folding-plate and to depress clamp-bar 24 away from

the folding-plate against the resistance of springs 26. At about this time all of the grippers have gone to position of release, leaving the bag ungripped and unclamped upon the table. In the meantime the folding parts are all advancing, and any retreat of the folded bag is prevented by follower 14, which may advantageously at this time have its toe somewhat lowered, as by the follower being pressed down by the rear edge of boxing-plate 31. The folded bag is now loose in the folding mechanism, but moving forward with it, and the now extreme forward portion of the folded bag becomes presented to the bite of discharge-rolls 37. These rolls pull the folded bag out of the folding devices and flatten down its bottom and complete it, assuming the paste to have been properly applied. Gear 21 now reverses its direction of motion and restores the parts to the position shown in Fig. 10 ready for the beginning of another cycle of operations.

The paster.—See Figs. 16, 17, and 20, in which 40 indicates a paste-fountain supported by the frame in advance of the discharge-rolls; 41, a fountain-roll mounted therein; 42, a pair of arms having their lower ends mounted on a shaft journaled across the frame, their upper ends projecting above the fountain-roll; 43, a paste-blade having its forward edge pivoted to the upper extremities of arms 42, this blade projecting rearwardly and downwardly, so that in the rearward position of arms 42, as in Fig. 20, the rear edge of the blade is disposed over the front portion of clamping-bar 24 when the folding mechanism is at rearward position; 44, a spring at one of the pivot-mountings of paste-blade 43, tending to flex the rear edge of the blade inwardly; 45, the rock-shaft on which paster-arms 42 are mounted; 46, a stop-rod articulated to the scraper-blade and extending down to a point near but to the rear of shaft 45, and 47 a fixed stop adapted to be engaged by the end of the stop-rod.

Fig. 20 illustrates the folding devices in the initial position heretofore referred to in connection with Fig. 10. The tube having passed into the folding devices and folding-plate 17 having arisen against the clamp-bar 24, at which stage the tube has become clamped and gripped to the folding devices, the extreme forward end of the tube, following the motions heretofore described in full, rises and begins to present its upper surface rearwardly as it approaches the vertical position. The inner surface of the toe of paste-blade 43 is covered with paste and stands over the ascending end of the tube. As the end of the tube rises it engages the inner face of the toe of the paste-blade 43, the toe of the blade yielding upwardly as the end of the tube rises, whereby the upper surfaces of the end of the tube wipe off upon themselves from the paste-blade the paste which becomes disposed as a cross-stripe, as indicated by the shading in Fig. 1. Then, as will be understood from the previous description of the folding and flattening operation, these pasted surfaces will be pressed home and secured as the bag goes through the discharge-rolls. As the toe of the paste-blade is moved upwardly by the wiping end of the tube the spring 44 yields, thus giving the paste-blade an elastic pressure upon the wiping-tube. Stop-rod 46 limits the paste-blade to proper downward position at the time the tube starts to take the paste. Later and before another pasting is to be performed the arms 42 swing forward and drag the toe of the paste-blade over the fountain-roll 41, whereby the blade becomes replenished with paste. At this time and after the toe has passed the neighborhood of the upper one of the discharge-rolls 37 the spring 44 urges the toe of the blade downwardly, so as to make elastic contact with the fountain-roll, the departure of stop-rod 46 from its stop 47 permitting this further downward movement of the blade to take place.

The machine.—While many alternative devices in the way of gearing, &c., could be employed in giving the functional motion to the folding devices and while many of the details may well lend themselves to a variety of modifications without departure in principle of action, I will now proceed to describe more fully certain details which may have been referred to and also the general organization of the machine, the drawings setting forth the preferred construction of these matters.

The upper grippers 36, (see Figs. 15 to 20, inclusive.)—48 indicates a bearing mounted at each side of boxing-plate 31, the upper grippers 36 being journaled in these bearings; 49, springs at the pivot of these grippers, the tendency of the springs being to urge the toes of the grippers inwardly to active position; 50, arms projecting outwardly from the grippers and giving the grippers the form of bell-cranks, and 51 fixed studs projecting horizontally from the framing in position to be engaged downwardly by the gripper-arms 50 as the boxing-plate and its grippers go to downward position.

When the folding parts are in initial position, as in Figs. 10 and 20, the boxing-plate 31 is so low down that the arms 50 of its grippers are held upward by studs 51, thus holding the gripper-toes outwardly. The tendency of the springs being to close the grippers it follows that as soon as the boxing-plate rises the grippers will move inwardly and go to clamping position and stay in that condition so long as the gripper-arms 50 are free from the studs 51. As the folding devices complete their operation, reaching the position indicated in Fig. 14, the boxing-plate and its grippers have again so far descended that the gripper-arms again engage the studs 51, thus opening the upper grippers. This opening action occurs when the bag is to be released from the grippers, and, it will be observed, the action is brought about without the need of any extra moving parts.

The lower grippers 30, (see Figs. 10 to 20, inclusive.)—52 indicates gripper-bearings mounted below table 9 at each side thereof, the grippers 30 being journaled in these bearings; 53, springs at the journal-mountings of these grippers tending to swing their toes inwardly to clamping position; 54, arms projecting downwardly from these grippers; 55, a pair of parallel cam-bars mounted fore and aft on the framing below the folding apparatus, the inner surfaces of these cam-bars being engaged by gripper-arms 54, the vertical planes of the general surfaces of these cam-bars being such as to leave the grippers free to go to clamping position, and 56 inwardly-projecting cam portions upon the cam-bars adapted, as the gripper-arms 54 reach them at each end of the stroke of the folding devices, to move the gripper-arms 54 inwardly, and thus move the gripper-toes outwardly to position of release.

When the folding parts are in initial position, as in Figs. 10 and 20, the gripper-arms 54 are being pressed inwardly by the right-hand cam members on cam-bars 55, thus holding the lower grippers open. When the folding devices start forward, then the grippers leave these cam members and their springs promptly put the grippers to clamping position. As the folding devices about complete their forward stroke just before reaching the position indicated in Fig. 14, these lower grippers are opened by reason of their arms coming in contact with the forward cam members. As the folding devices retreat the lower grippers close, but open again in proper time when they reach the rear cam members on the cam-bars.

Feeding devices, (see Figs. 16 to 20, inclusive.)—The machine is designed to have the plicated tube fed continuously to it, and the machine may well be disposed in prolongation of an ordinary tuber, so that the product of the tuber becomes fed directly into the present machine.

57 indicates a guide-plate disposed rearwardly of the table 9 and in its horizontal plane, this guide-plate being by preference the forward end portion of the usual former of an ordinary tuber; 58, a pair of feed-rolls arranged one above and the other below the guide-plate and adapted to feed continuously forward a plicated tube surrounding the guide-plate; 59, the upper severing-blade, the same being fixed above and somewhat to the rear of the forward end of guide-plate 57, the forward end of the latter forming the lower severing-blade; 60, the severing-arm sweeping diagonally upward across the forward end of the guide-plate, and 61 the plicated tube being fed forward by the feed-rolls.

The feed-rolls feed the plicated tube continuously forward, the advancing end of the tube going into the folding devices when the latter are retreating to the position shown in Figs. 10 and 20. When the advancing end tube has been properly taken and gripped and operated upon by the folding devices, which advance at the same speed as the advancing tube end, and when the folding devices have released their hold and have delivered the bag-bottom to the bight of the discharge-rolls, and while the discharge-rolls are applying strain to the tube, then arm 60 severs the forward section forming the now completed bag and the discharge-rolls carry it forward out of the folding devices at higher rate of speed than the advancing tube end, the disposition of the severing-blades and arm being obviously such as to produce the protruding lower face-ply, as indicated in Fig. 1. The folding devices retreat and meet and receive the advancing tube end, as before.

Gearing.—See Figs. 16 to 20, inclusive, in which 62 indicates the main driving-shaft, to which rotary motion may be imparted by any suitable means; 63, a train of gearing connecting this shaft with the feed-rolls, whereby the feed-rolls and the severing-arm are actuated, the pivot-shaft of the latter being geared to the shaft of one of the feed-rolls; 64, gearing connecting the driving-shaft with the discharge-rolls 37 for the continuous driving of those rolls and also for the continuous driving of breast-roll 65, disposed outwardly beyond the discharge-rolls and adapted to serve, if desired, for the support and actuation of an off-bearing carrier, as usual in paper-bag machines; 67, a pair of gear-segments engaging the gears 21, which operate the folding mechanism; 68, the rock-shaft on which the segments 67 are mounted; 69, a cam fast on the driving-shaft; 70, an arm fast on rock-shaft 68 and having a roller engaging the cam 69, whereby each turn of the driving-shaft causes a double oscillation of segments 67 and a half-turn in one direction and then in the other for gears 21, and a consequent full cycle of movements for the folding devices; 71, a pair of gears, one fast on the driving-shaft and the other being a crank-gear loose on a stud; 72, an arm on rock-shaft 45 of the pasting device, and 73 a link connecting this arm with the crank-gear just mentioned.

The driving-shaft turns continuously, thereby turning the feed-rolls and the discharge-rolls continuously, the latter being turned at a higher peripheral rate of speed than the former. The folding devices are put through their full cycle of movements at each turn of the driving-shaft, the pasting-blade goes to the fountain-roll and gets paste and presents itself in proper position to apply the paste once at each turn of the main shaft, and the severing-arm makes its circular sweep and severs a section from the plicated tube at each turn of the main shaft.

Framing, (see Figs. 16 to 20, inclusive.)—Cross-bars 74 extend across between the main sides of the framing below the folding mechanism, and on these bars are mounted the frame parts having the guide-slots 8 and 20 and carrying the general folding mechanism,

the feed-rolls and the general gearing being mounted on the main frame, the rotatory gears 21 actuating the crank-pins 22, which give motion to the folding devices, being supported by bearings 75 on the outer frame parts, the toothed segment 67, carried by rock-shaft 78, being in the vertical planes of these gears. By this plan of construction the general gearing and the feed devices may be considered as a part of the main mechanism, while the folding mechanism and its immediate adjuncts, which will vary in dimension according to the size of the bag to be produced, may be considered as a submechanism separably mounted as a whole within the main framing.

I claim as my invention—

1. In a paper-bag machine, the combination, substantially as set forth, of a table, side grippers thereon adapted to hold the lower plies of a blank to the table, a folding-plate disposed in prolongation of the table and hinged thereto, a clamp-bar mounted upon the folding-plate and adapted to clamp all of the plies of the blank thereto, a boxing-plate disposed parallel with the table and having pivotal connection with the folding-plate and link connection with the table, grippers mounted on the boxing-plate and adapted to grip the upper plies of the blank thereto, a follower disposed over the table and presenting an edge above the table at a transverse folding-line of the blank, and mechanism for opening and closing the grippers and clamp and moving the boxing-plate to and from the table and turning the folding-plate upwardly and then downwardly to near the table.

2. In a paper-bag machine, the combination, substantially as set forth, of a table, side grippers thereon adapted to hold the lower plies of a blank to the table, a folding-plate disposed in prolongation of the table and hinged thereto, a clamp-bar mounted upon the folding-plate and adapted to clamp all of the plies of the blank thereto, a boxing-plate disposed parallel with the table and having pivotal connection with the folding-plate and link connection with the table, grippers mounted on the boxing-plate and adapted to grip the upper plies of the blank thereto, a follower disposed over the table and presenting an edge above the table at a transverse folding-line of the blank, mechanism for opening and closing the grippers and clamp and moving the boxing-plate to and from the table and turning the folding-plate upwardly and then downwardly to near the table, and discharge-rolls adapted to take the folded blank from between the table and the folding-plate.

3. In a paper-bag machine, the combination, substantially as set forth, of a table, side grippers thereon adapted to hold the lower plies of a blank to the table, a folding-plate disposed in prolongation of the table and hinged thereto, a clamp-bar mounted upon the folding-plate and adapted to clamp all of the plies of the blank thereto, a boxing-plate disposed parallel with the table and having pivotal connection with the folding-plate and link connection with the table, grippers mounted on the boxing-plate and adapted to grip the upper plies of the blank thereto, a follower disposed over the table and presenting an edge above the table at a transverse folding-line of the blank, mechanism for opening and closing the grippers and clamp and moving the boxing-plate to and from the table and turning the folding-plate upwardly and then downwardly to near the table, discharge-rolls adapted to take the folded blank from between the table and the folding-plate, and mechanism for reciprocating said table to and from the discharge-rolls.

4. In a paper-bag machine, the combination, substantially as set forth, of a table, a folding-plate disposed in prolongation thereof and hinged thereto, a boxing-plate disposed parallel with the table, grippers upon the table and the boxing-plate, a clamp-bar mounted across the folding-plate, springs urging the clamp-bar toward the folding-plate, fixed stops adapted to be engaged by and support the clamp-bar, fixed stops adapted to be engaged by and support the folding-plate, independent trunnion-bearings on the folding-plate and clamp-bar, and moving trunnions engaging said trunnion-bearings.

5. In a paper-bag machine, the combination, substantially as set forth, of a table, a folding-plate disposed in prolongation thereof and hinged thereto, a boxing-plate disposed parallel with the table, grippers upon the table and the boxing-plate, a clamp-bar mounted across the folding-plate, springs urging the clamp-bar toward the folding-plate, fixed stops adapted to be engaged by and support the clamp-bar, fixed stops adapted to be engaged by and support the folding-plate, a crank with its axis in the plane of the surface of the table, a crank-pin carried by the crank, a link-lever having its mid-portion carried by the crank-pin and having one of its ends pivoted at the juncture between the table and the folding-plate, independent trunnion-bearings on the folding-plate and clamp-bar, and a trunnion carried by the other end of the link-lever and engaging said trunnion-bearings.

6. In a paper-bag machine, the combination, substantially as set forth, of a table, a folding-plate disposed in prolongation thereof and hinged thereto, a boxing-plate disposed parallel with the table, grippers upon the table and the boxing-plate, a clamp-bar mounted across the folding-plate, springs urging the clamp-bar toward the folding-plate, fixed stops adapted to be engaged by and support the clamp-bar, fixed stops adapted to be engaged by and support the folding-plate, a crank with its axis in the plane of the surface of the table, a crank-pin carried by the crank, a link-lever having its mid-portion carried by the crank-pin and having one of

its ends pivoted at the juncture between the table and the folding-plate, a horizontal guideway for the table, and a vertical guideway for said trunnion.

7. In a paper-bag machine, the combination, substantially as set forth, of a table, a rear pair of trunnions therefor, a forward pair of trunnions therefor, horizontal guideways for said trunnions, a folding-plate disposed in prolongation of the table and coupled to the forward trunnions thereof, a vertical guideway, a crank with its axis in the vertical plane of the vertical guideway, a link-lever carried by the pin of the crank and having its rear end coupled to a forward trunnion of the table, a trunnion carried by the forward end of the link-lever and adapted to engage the folding-plate and travel in said vertical guideway, a boxing-plate disposed parallel with the table and linked thereto and coupled to said last-mentioned trunnion, and holding devices adapted to grip the upper plies of a blank to the boxing-plate and the lower plies to the table and all of the plies to the folding-plate.

8. In a paper-bag machine, the combination, substantially as set forth, of a table, a rear pair of trunnions therefor, a forward pair of trunnions therefor, horizontal guideways for said trunnions, a folding-plate disposed in prolongation of the table and coupled to the forward trunnions thereof, a vertical guideway, a crank with its axis in the vertical plane of the vertical guideway, a link-lever carried by the pin of the crank and having its rear end coupled to a forward trunnion of the table and adapted to travel in said vertical guideway, a clamp-bar disposed across the folding-plate, springs urging the clamp-bar to the folding-plate, half-bearings on the clamp-bar and the folding-plate and engaging the trunnion of the link-lever, a boxing-plate disposed parallel with the table and pivoted to the clamp-bar, side grippers upon the boxing-plate and table, and links connecting the rear portion of the boxing-plate with the rear trunnions of the table and having a length equal to that of the link-lever.

9. In a paper-bag machine, the combination, substantially as set forth, with the table, the folding-plate, the boxing-plate, the blank-holding devices, and mechanism for reciprocating the table and operating the folding-plate and holding devices, of a follower moving with the table and presenting an edge above the same at the rear folding-line of the blank and adapted to prevent the retreat of the bag when the holding devices shall have been released.

10. In a paper-bag machine, the combination, substantially as set forth, of a reciprocating table notched at its forward edge, a folding-plate notched at its rear edge and having its rear edge pivoted to the forward edge of the table, means for holding a blank to the table and folding-plate, means for turning the folding-plate upward and backward upon the table so that the joint edges of the table and folding-plate will present forwardly, and a pair of discharge-rolls disposed in advance of the table and adapted to be engaged by the notches at the joint edges of the table and folding-plate.

11. In a paper-bag machine, the combination, substantially as set forth, of a reciprocating table, a folding-plate with its rear edge hinged to the forward edge of the table, a clamp carried by the folding-plate, a boxing-plate disposed parallel with the table, grippers carried by the boxing-plate and table, means for actuating the clamp and grippers, means for reciprocating the table and turning the folding-plate up and back over the table, feed-rolls disposed at the rear of the table and adapted to feed a tube upon the table, a severing device disposed between the table and the feed-rolls, and discharge-rolls disposed in advance of the table and having a peripheral rate of speed higher than that of the feed-rolls.

12. In a paper-bag machine, the combination, substantially as set forth, of a reciprocating table, a folding-plate with its rear edge hinged to the forward edge of the table, a clamp carried by the folding-plate, a boxing-plate disposed parallel with the table, grippers carried by the boxing-plate and table, means for actuating the clamp and grippers, means for reciprocating the table, means for turning the folding-plate up and back over the table, a pasting-blade disposed over the forward portion of the folding-plate when the latter is in initial position, a spring connected with said pasting-blade and permitting it to yield upwardly, and mechanism for moving said pasting-blade forward away from and then back to the position mentioned.

13. In a paper-bag machine, the combination, substantially as set forth, of a reciprocating table, a folding-plate with its rear edge hinged to the forward edge of the table, a clamp carried by the folding-plate, a boxing-plate disposed parallel with the table, grippers carried by the boxing-plate and table, means for actuating the clamp and grippers, means for reciprocating the table, means for turning the folding-plate up and back over the table, and a follower carried by the table and presenting a thin edge across the table over a folding-line of the blank.

14. In a paper-bag machine, the combination, substantially as set forth, of a reciprocating table, a folding-plate with its rear edge hinged to the forward edge of the table, a clamp carried by the folding-plate, a boxing-plate disposed parallel with the table, grippers carried by the boxing-plate and table, means for actuating the clamp and grippers, means for reciprocating the table, means for turning the folding-plate up and back over the table, a follower having its rear portion pivotally supported by the table and having its front edge within and disposed across and above the table at a folding-line of the blank,

a stop to limit the upward movement of the follower away from the table, and a spring at the pivot-mounting of the follower to hold the follower against its stop and permit it to descend toward the table when engaged by the boxing-plate.

15. In a paper-bag machine, the combination, substantially as set forth, of a reciprocating table, a folding-plate with its rear edge hinged to the forward edge of the table, a clamp carried by the folding-plate, a boxing-plate disposed parallel with the table, grippers carried by the boxing-plate and table, a gear carrying a crank-pin connected with said table and folding-plate, a toothed rocking segment engaging said gear, a driving-shaft, and a cam on the driving-shaft and arranged to rock said toothed segment.

16. In a paper-bag machine, the combination, substantially as set forth, of a reciprocating folding device, a pair of feed-rolls disposed to the rear of said folding device and in the plane of movement thereof, a guide-plate disposed between said feed-rolls and projecting toward the folding device, a severing-blade disposed above said guide-plate between the forward end thereof and the feed-rolls, a severing-arm arranged to move diagonally upward past the end of the guide-plate and past said severing-blade, discharge-rolls in advance of said folding mechanism, means for reciprocating the folding device, and gearing connecting said feed-rolls and discharge-rolls and serving to rotate them continuously and turn the discharge-rolls at a peripheral rate of speed in excess of that of the feed-rolls.

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