4 Sheets--Sheet 1.

W. LIDDELL.

Paper-Bag Machine.

No. 160,446. Patented March 2, 1875.

Fig. 1.

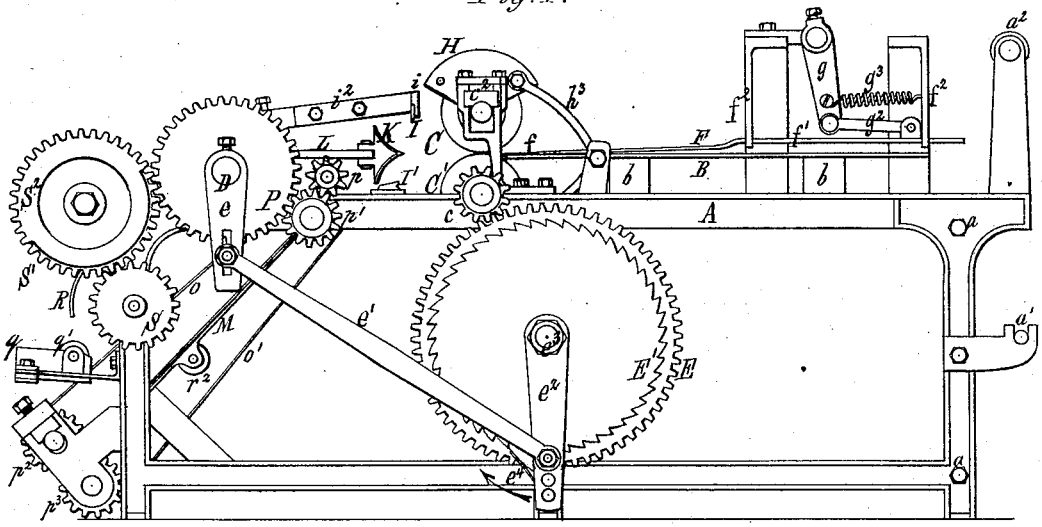
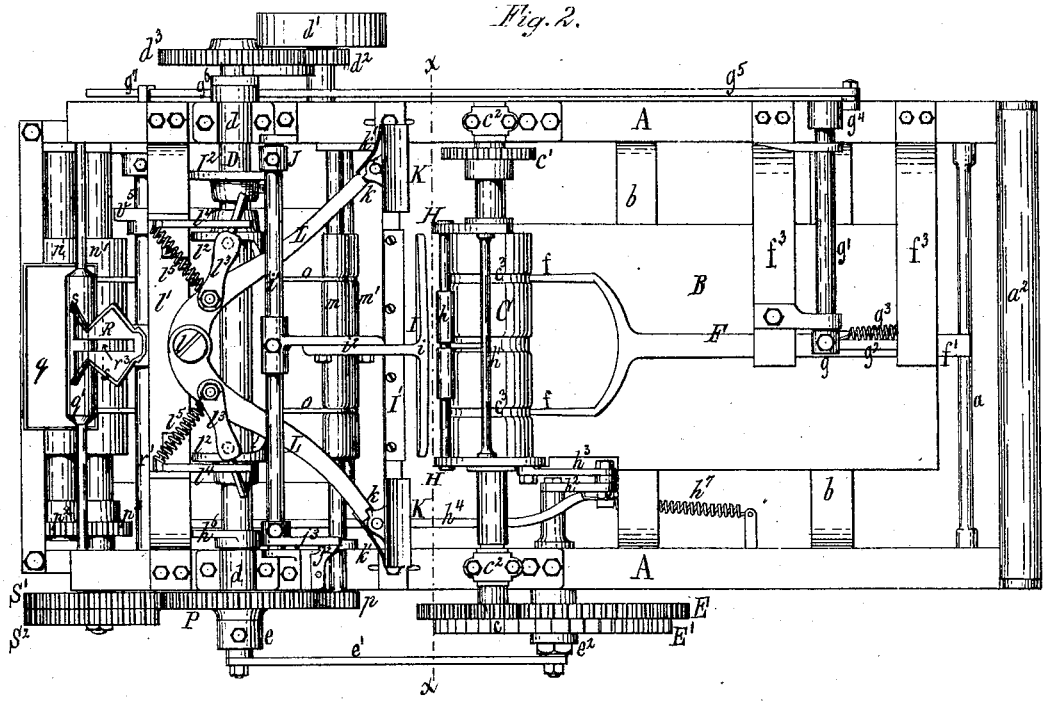


Fig. 2.



Witnesses

Jno. J. Bonner

Edward Wilhelm

Wm. Liddell Inventor

by Jay Dyatt Atty.

4 Sheets--Sheet 2.

W. LIDDELL.

Paper-Bag Machine.

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Fig. 3.

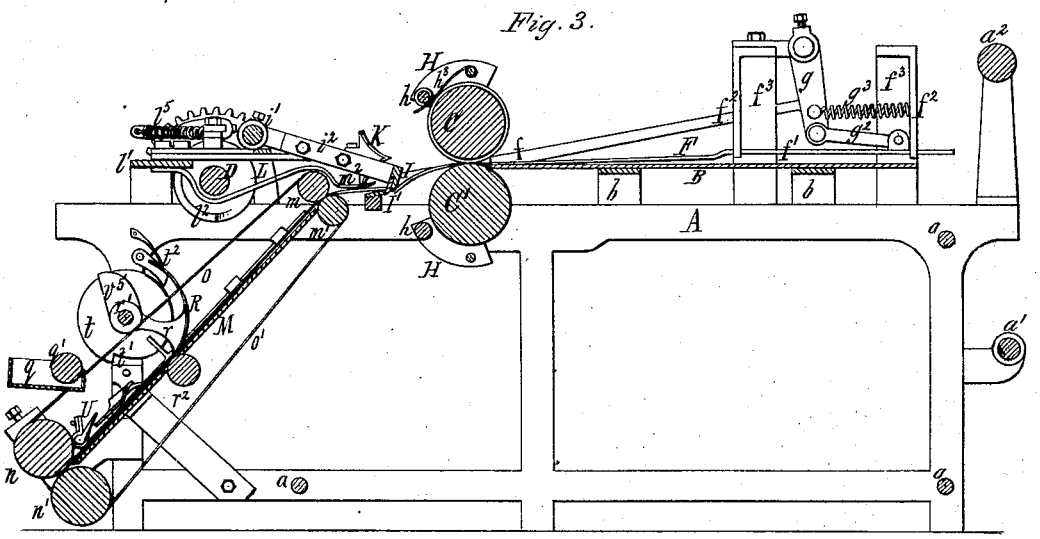


Fig. 16.

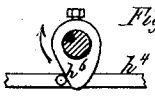


Fig. 15.

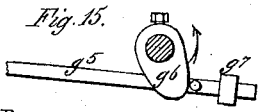


Fig. 4.

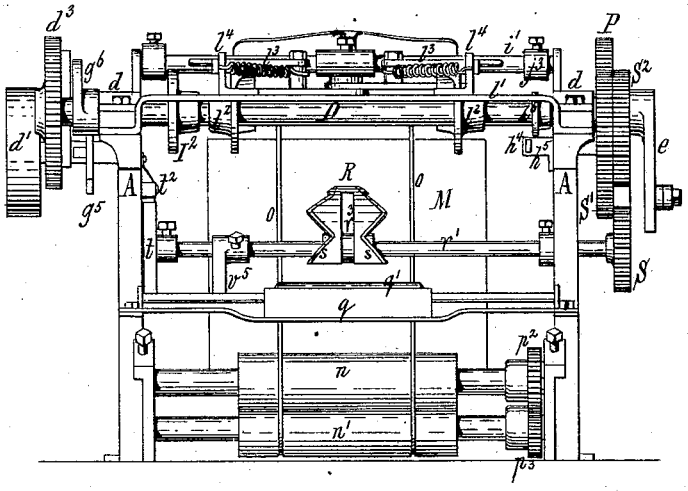


Fig. 7.

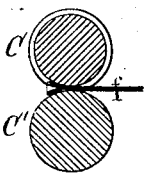


Fig. 8.

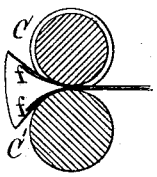
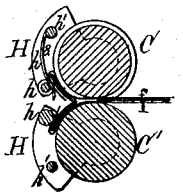


Fig. 9.



Witnesses.
Jno. J. Bonner
Edward Wilhelm

Inventor
Wm. Liddell
by Jay Hydell Atty.

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4 Sheets--Sheet 3.

W. LIDDELL.

Paper-Bag Machine.

No. 160,446. Patented March 2, 1875.

Fig. 5.

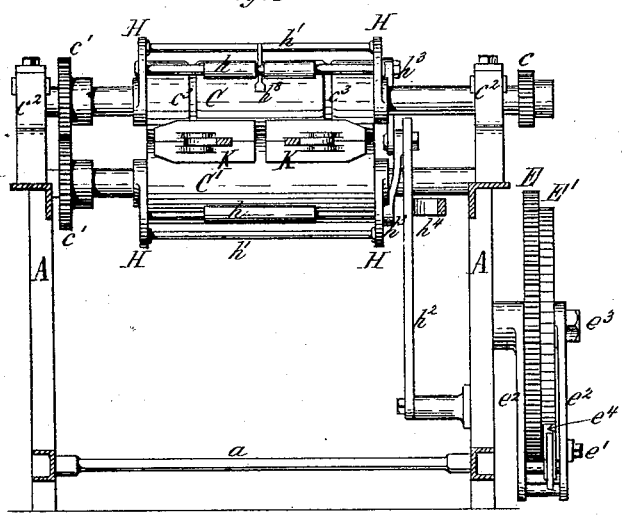


Fig. 13.

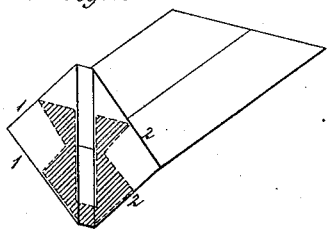


Fig. 14.

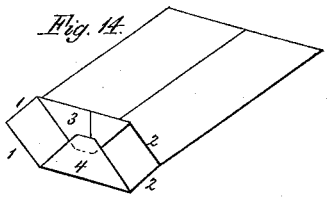


Fig. 6.

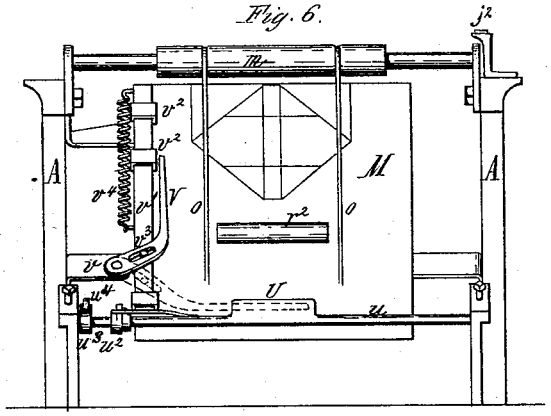


Fig. 12.

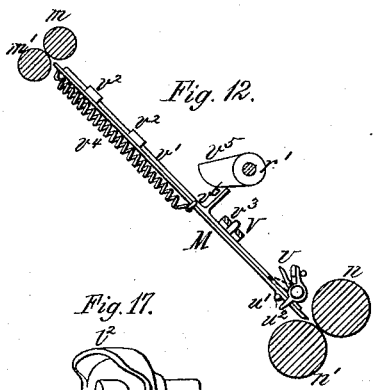


Fig. 17.

Fig. 10.

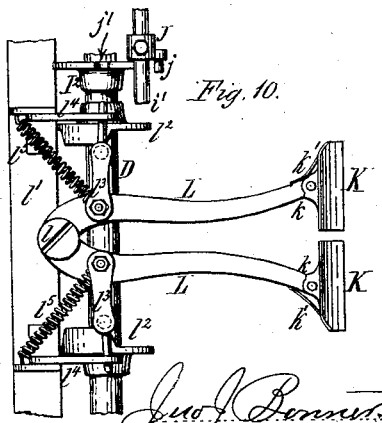
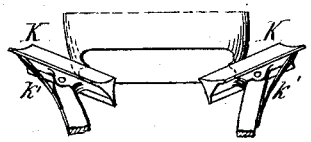


Fig. 11.



Witnesses

Jno. J. Bonner.

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4 Sheets--Sheet 4.

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Fig. 18.

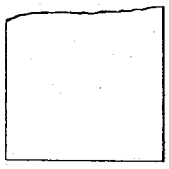


Fig. 19.

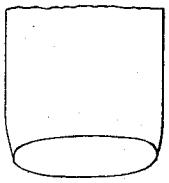


Fig. 20.

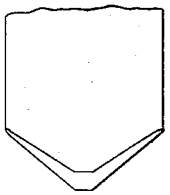


Fig. 21.

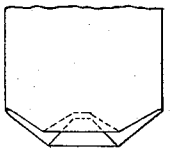


Fig. 22.

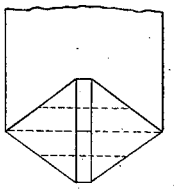
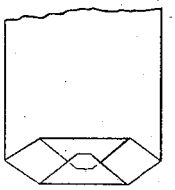


Fig. 23.



Witnesses

Edward Wilhelm

Jno. J. Bonner

William Liddell Inventor

by Jay Hyatt

Atty.

THE GRAPHIC CO. PHOTO-LITH. 39 & 41 PARK PLACE, N.Y.

UNITED STATES PATENT OFFICE.

WILLIAM LIDDELL, OF BUFFALO, ASSIGNOR TO HIMSELF AND HOWLAND & CO., OF SANDY HILL, NEW YORK.

IMPROVEMENT IN PAPER-BAG MACHINES.

Specification forming part of Letters Patent No. **160,446**, dated March 2, 1875; application filed November 3, 1874.

To all whom it may concern:

Be it known that I, WILLIAM LIDDELL, of the city of Buffalo, in the county of Erie and State of New York, have invented certain Improvements in Machines for Making Paper Bags, of which the following is a specification:

The invention relates to that class of machines which are employed in the manufacture of what is known as square or satchel bottom bags, the features of which will be best understood from the following description.

In the accompanying drawings, consisting of three sheets, Figure 1 is a side elevation of a machine provided with my improvements. Fig. 2 is a top-plan view. Fig. 3 is a vertical longitudinal section, and Fig. 4 a front elevation, thereof. Fig. 5 is a cross-section in line *x x*, Fig. 2. Fig. 6 is an end elevation, with the lower conveyer-rollers and bottom paste mechanism removed. Fig. 7 is a sectional view of the feed-rollers, with the expanding-springs compressed between the same. Fig. 8 is a similar view, with said springs thrust forward and expanded. Fig. 9 is a similar view of the feed-rollers, with the side folders pressed against the same, and the upper and lower folding-rollers in the act of forming the upper and lower bottom lap. Fig. 10 is a fragmentary view of the side-folding arms in a close position, and actuating parts. Fig. 11 is a perspective view, illustrating the manner in which the side-folding arms fold in the distended mouth of the paper tube. Fig. 12 is a detached view of the inclined table and connecting parts. Fig. 13 is a perspective view of the bag with the two side laps formed. Fig. 14 is a perspective view of the bag with the bottom completed. Fig. 15 is a detached view of the cam by which the expanding-springs are actuated. Fig. 16 is a detached view of the cam by which the upper and lower folding-rollers are operated. Fig. 17 is a perspective view of one of the cams by which the side-folding hands are closed. Fig. 18 represents the plain end of the tube; Fig. 19, the same, opened by the spring-arms; Fig. 20, the corners of the tube turned in by the side-folders; Fig. 21, the upper and lower bottom-flap, formed by the upper and lower folding-rollers. Fig 22 represents the bottom of the bag flattened out as it passes onto the inclined table. Fig. 23 represents the bottom pasted and folded as it is discharged by the last set of pressure-rollers.

Like letters of reference designate like parts in each of the figures.

A A represent the side frames of the machine connected by cross-stays *a*, in the usual manner; a^1, a horizontal shaft, arranged at the rear end of the frames A, for the reception of the paper roll, and a^2, an elevated guide-roller, over which the web of paper passes preparatory to being formed into a tube. B is the horizontal bed-plate or table, supported by cross-bars *b b*, and *c* c^1 the two main feed-rollers, arranged above each other at the forward end of the table B. The upper roller *c* is supported in suitable standard-bearings c^2, secured to the side frames A A, and connected to the lower roller c^1 by two gear-wheels, c^1 c^1, in an ordinary manner. D is the main driving-shaft of the machine, supported in bearings *d d*, arranged near the forward ends of the side frames A. As represented in the drawings, motion is transmitted to the shaft D from a pulley, d^1, and pinion d^2, turning on a stud or arbor secured to one of the side frames, and engaging with a gear-wheel, d^3, secured to one end of the shaft D. *e* is a crank, mounted on the opposite end of the shaft D, and e^1 a rod or link connecting the same with a radial arm, e^2, turning loosely on an arbor, e^3. E is a gear-wheel, and E^1 a ratchet-wheel, secured together side by side, and turning loosely on the arbor. The radial arm e^2 is provided with a spring-pawl, e^4, engaging with the teeth of the ratchet-wheel E′, so that when the arm e^2 is turned by the crank *e* in the direction of the arrow, Fig. 1, the ratchet-wheel E′ and gear-wheel E are turned on the arbor e^3, while, when the movement of the arm e^2 is reversed, the pawl e^4 slides over the ratchets, when the wheels E E′ remain stationary. The gear-wheel E engages with a pinion, *c*, secured to the shaft of the lower feed-roller c^1.

By this means an intermittent rotary motion is transmitted to the feed-rollers C C′ from the continually-rotating driving-shaft D.

The bolt or pin by which the rod e^1 is connected by the crank e is arranged in a slot of the latter, so that the throw of the crank e can be increased or reduced by shifting said bolt in its slot, whereby the arc through which the arm e^2 moves and the motion of the feed-rollers are correspondingly increased or lessened. $f\,f$ are two pair of flat springs arranged between the feed-rollers C C′, the upper roller being provided with two shallow annular grooves, c^3, for the reception thereof. The two springs f, forming one pair, are arranged one upon the other, and secured with their rear ends to the arms of a bifurcated bar, F, while their front ends are free, the springs being so constructed that their front ends will expand when they are released. The rear end f^1 of the bar F slides in dependent bearings f^2, secured to brackets f^3.

The web of paper is formed into a tube around this bar by any suitable and well-known means, which mechanism is not shown in the drawings, the position of the guide-roller a^2 being removed farther back or changed, as may be required by the particular tube-forming mechanism employed.

The bar F is operated by a lever, g, mounted on a cross-shaft, g^1, and connected with the bar by a link, g^2. The bar F is retained in such a position that the free ends of the springs f are compressed together, or held in contact between the feed-rollers C C′, as shown in Fig. 3, by a spiral spring, g^3, connecting the lever g with the rear guide f^2. The shaft g^1 and lever g are actuated by means of an arm, g^4, and rod g^5 from a cam, g^6, mounted on the shaft D, and engaging with a pin on the rod g^5, the latter sliding in guides g^7 attached to the side frame. H H are two radial frames or bearings, arranged at the ends of each of the feed-rollers C C′, so as to turn loosely on the shafts thereof. h is a folding-roller, supported in the bearings H of each feed-roller, so as to travel in contact with the surface thereof. The two swinging bearings H of each roller are connected by a cross-stay, h^1. h^2 is a rock-lever, pivoted at its lower end to one of the side frames, and jointed at the top to two links, h^3, connecting with the swinging bearings H of both feed-rollers, so as to actuate the same simultaneously. The lever h^2 is swung forward at regular intervals, so as to bring the upper and lower folding-rollers h together in front of the feed-rollers, by means of a rod, h^4, sliding in a bearing, h^5, and actuated by a cam, h^6, mounted on the shaft D, and engaging with a pin on the rod h^4. The lever h^2 is returned to its rearward position when released from the cam h^6 by a spiral spring, h^7, Fig. 2, connecting it with one of the side frames C. h^8 is a flat spring or plate attached to the cross-stay of the upper bearings H, and arranged in a groove of the upper roller h, on the inner side thereof, so as to project slightly from under said roller, for a purpose hereinafter to be explained. I represents the movable knife, and I^1 the stationary knife, by which the paper bags are severed from the tube. The movable knife I is secured to a head, i, attached to a rock-shaft, i^1, by an arm, i^2, which is preferably composed of two parts bolted together, so as to be lengthwise adjustable. This knife is retained in an elevated position by a cam, I^2, mounted on the shaft D, and engaging with the pin j of an arm, J, secured to the rock-shaft i^1. The cam I^2 is provided with a recess, j^1, which, as the pin j of the arm J enters, leaves the knife I free to descend and close upon the stationary blade I^1. j^2 is an elastic cushion secured to the side frame A, and j^3 an arm secured to the rock-shaft i^1, so as to strike this cushion at the moment the tube is severed, thereby arresting the closing movement of the knife, and causing the same to rebound when the pin j is withdrawn from the recess of the cam I^2 and the knife returned to its elevated position by the latter.

The same result may, however, be attained by arranging the cushion j^2 in the bottom of the recess j^1 of the cam.

The lower knife I^1 is attached to the side frames A A in such manner that it can be readily adjusted toward and from the feed-rollers to correspond with the adjustment of the upper knife. K K represent the two side-folding hands, each having two concave faces joining to a horizontal edge, so as to fit in the angle between the feed-rollers C C^1. The hands K K are hinged to horizontal arms L L, pivoted at l to a cross-piece, l^1, secured to the side frames. The hinges of the hands K K are provided with a stop or shoulder, k, to limit their inward movement on the pivot, while their outward movement is opposed by a flat spring, k^1, the normal position of the hands being shown in Fig. 2, in which the springs k^1 hold the hands against the stops k. The arms L when opened, as shown in Fig. 1, hold the folders K at such a distance apart that the paper tube can pass between them to the cutting mechanism. The arms L are swung inwardly, so as to close against the feed-roller, by two cams, l^2, mounted on the driving-shaft D, and engaging with pins projecting downwardly from links l^3, attached with their inner ends to the arms L, while their outer ends are guided in brackets l^4, secured to the cross-piece l^1. The arms L are opened, when released from the cams l^2, by spiral springs l^5, in an obvious manner. M is an inclined table, arranged between the side frames A A, with its upper end in the rear of the stationary knife I^1, while its lower end terminates near the bottom of the machine, at the forward end thereof. m m^1 are two feed-rollers, arranged near the upper end of the plate M, on opposite sides thereof, and n n' two rollers of larger diameter, arranged similarly near the lower end thereof. The rollers m n and m^1 n' are connected, respectively, by endless tapes or cords o o^1, forming two conveyers, the carrying parts of the tapes running in close contact with the upper surface

of the inclined table. m^2 is a guide-bar, attached to the under side of the cross-piece l^1, and arranged with its inner end over the stationary knife I^1, so as to guide the bottom lap of the bag between feed-rollers m m^1. p is a pinion, mounted on the end of the shaft of the upper feed-roller m^1, and p^1 a counter-pinion, turning on an arbor secured to the side frame, and transmitting motion to the pinion p from a gear-wheel, P, mounted on the driving-shaft D. The upper roller m transmits motion to the lower roller n by means of the tapes o, whence the motion is transmitted to the roller n^1 by two gear-wheels, p^2 p^3, and thence to the upper roller m^1 by the tapes o^1. q is the paste-receptacle of the bottom-pasting mechanism, arranged at the forward end of the machine, near the lower portion of the inclined table M, and q' the paste-roller arranged therein. R is the revolving pasting-plate, curved in the form of a cylinder-segment, and attached by an arm, r, to a shaft, r^1, arranged equidistant from the surfaces of the inclined table and the paste-roller q'. The radius of the segmental plate R is slightly less, or almost equal to the distance from the axis of the shaft r^1 to the surface of the paste-roller and to the inclined table M, so that as the plate R revolves its surface will come in contact with the paste on the roller q', and take it therefrom, and then apply it to the paper. The face of the pasting-plate is preferably roughened to better receive, retain, and transfer the paste to the paper. r^2 is a friction-roller, arranged in an opening of the inclined table, at the point where the paste-plate R is designed to come in contact therewith, so as to facilitate the carrying along of the paper by the plate R in applying the paste thereto. The outlines of the pasting-plate R are of such shape as to apply the paste in the bottom of the bag in the form represented by the shaded portion in Fig. 13. r^3 is a slot formed in the rear portion of the pasting-plate, and extending nearly the whole length thereof, to prevent any paste being applied between the inner edges of the side laps 1 2, which would cause the bottom to adhere to the inside of the sack. s are projecting gage-strips of rubber or other suitable material arranged around the outer edge of the pasting-plate for the purpose of regulating the thickness of the layer of paste taken from the roller q'. The paste-roller q' is revolved by its contact with the carrier R, but if desired it may be rotated from the shaft r^1 by an endless band and pulleys, or by any other suitable means. The paster-shaft r^1 is provided with a pinion, S, to which motion is transmitted from the wheel P of the main driving-shaft D by means of a duplex gear-wheel, S^1 S^2. The latter is composed of two halves, arranged side by side and secured together, the half S^1 engaging with the wheel P being provided with teeth on its entire circumference, while the half S^2 engaging with the pinion S of the paster-shaft is provided with teeth only on a certain portion of its circumference. The size of the pinion S and of the toothed portion S^2 of the intermediate gear-wheel are so proportioned that the paster-shaft will make one revolution for each revolution of the main driving-shaft D, while the pasting-plate R will have the same circumferential velocity as the upper conveyer-rolls m m^1, and consequently travel at the same speed at which the sacks move past the pasting mechanism. t is a circular disk mounted on the shaft r^1, and provided with a notch, t^1, in which engages a spring-pawl, t^2, pivoted to the inner side of the side frame. The disk t is so arranged on the shaft r^1 that when the pasting-plate R has completed one revolution and the partly-toothed wheel S^2 is disengaged from the pinion S, the pawl t^2 will engage into the notch t^1 and retain the paster-shaft and pinion S in this position ready for re-engagement with the wheel S^2, as shown in Figs. 2, 3, and 4. The weight and overhanging position of the pasting-plate R, when the shaft r^1 is released, are sufficient to counteract any momentum which it may have acquired during its revolution, and insure the stopping of the parts at the proper point. U is a folder-plate attached to a shaft, u, arranged above the lower end of the inclined table near the rollers n n'. V is an oscillating striker or folding arm pivoted at v to a bracket attached to one of the side frames A, and arranged parallel with the inclined table and in close proximity therewith. It is actuated by a sliding bar, v^1, running in guides v^2 attached to the table M and connecting with the striker V by a pin, v^3, engaging in a slot thereof, as clearly shown in Fig. 6. v^4 is a spiral spring attached to the bar v^1, so as to hold it in a raised position. The bar v^1 is operated by a cam or arm, v^5, mounted on the paster-shaft and engaging with a projection, v^6, on the bar v^1. The latter actuates the folder-plate U by means of a pin or projection, u^1, engaging with a spring-dog, u^2, on the shaft u. The shaft u is provided with an arm, u^3, against which bears a spring, u^4, whereby the folder-plate U is held in an open position, as represented in Fig. 12.

The paper tube having been formed it is fed forward between the feed-rollers C C′ with the springs $f f$ within the tube, until the mouth of the same projects about six inches from the feed-rollers, when the motion of the latter ceases. The bar F and springs f f, the ends of which have been pressed together so far, are now thrust forward by the action of the cam g^6, so that the free ends of the springs $f f$ expand, whereby the mouth of the tube is distended, as clearly shown in Fig. 8. The arms L, with the folding-hands K in the position shown in Fig. 2, are now closed by the cams l^2. As these arms begin to close, the relative position of the hands to the arms remaining unchanged, the edges of the hands begin to incline inwardly from their former position parallel to the feed-rollers. In continuing to close, the folding-edges of the hands strike the edge of the distended mouth of the tube in the inclined

position shown in Fig. 11, and begin to fold in the paper, when the outer end of the folding-hands engage in the angle between the feed-rollers, near their ends, which, as the arms continue their closing movement, cause the inner ends of the hands K to be gradually forced into the angle of the feed-rollers, and against the same, until they assume the position shown in Figs. 5 and 10. This action of the hands K K causes the mouth of the tube to be folded laterally and inwardly, so as to approximate the form of the folds marked 1 2 in Fig. 13. As the hands K K close against the feed-rollers the springs *f f* are released from the action of the cam g^6, and withdrawn to their former compressed position by the spiral spring g^3. The folders K being retained in their closed position against the feed-rollers, the upper and lower folding-rollers *h h* are brought simultaneously together over the side folders K by the action of the cam h^6 upon the rock-lever h^2, folding the top portion of the mouth of the tube downward over the upper straight edges of the hands K K, and the bottom portion thereof upward, over the lower straight edges thereof, whereby the folds or creases marked 3 4 in Fig. 13 are produced. The spring h^8, projecting below the upper folding-roller *h*, serves to press inward the upper lap 3 a little in advance of the lower one 4, thereby preventing the interference of one lap with the other. The folding-rollers *h h* are now released from the action of the cam h^6, and swiftly moved back to their former position by the spring h^7, when the side folders K K are also released from the action of the cams l^2, and returned to their extended position by the springs l^5. The mouth of the tube being creased, as above described, the top and bottom laps partially expand or straighten out again after the rollers *h* are withdrawn. As soon as the side folders K are opened the feed motion begins, and the paper tube is fed over the stationary knife I^1 toward the conveyer-rollers *m* m^1, the tip of the partially-unfolded lap 4 being guided between the latter by the guide-bar m^2. The circumferential velocity of the rollers *m* m^1 is slightly in excess of that of the feed-rollers C C^1, so as to take up any slack in the paper, and hold it taut over the knife I^1. The creased end of the paper tube, in being advanced between the endless tapes *o o′* over the table M, as shown in Fig. 6, now meets, with the point of its lower lap 4, the point of the pasting-plate R, and is clamped thereby against the roller r^2, as shown in Fig. 3, when the knife I descends, and severs the bag from the tube. The paste is now applied to the flattened bottom, in the form represented in Fig. 13, by the pasting-plate as it revolves. Before the bag has advanced far enough to reach the folding-plate U the latter is swung with its edge against the inclined table by the action of the sliding bar v^1, as shown by dotted lines in Fig. 12, so as to receive the tip of the lower bottom lap 4 as it is fed forward. The folder U is then released, and returned to its open position, whereby the lower bottom lap 4 is raised and turned up. The striker V is now swung downward from the position shown in Fig. 6, and travels in contact, or nearly so, with the surface of the paper bag until it reaches the upper lap 3, which it folds down under the lower lap 4, the latter being folded back as the bottom of the sack passes under the plate U in traveling to the rollers *n n′*. The latter finally compress the folds, the tip of the lower fold being supplied with paste, by which it is secured over the tip of the lap 3. As the partially formed bag is carried down the inclined table by the endless tapes, the upper tapes *o*, by pressing the paper against the table, retain it in place thereon during the refolding of the laps 3 and 4, as above described. When the bottom of the bag is firmly clamped by the rollers *n n′*, the striker V is released by the cam v^5 and returned to its former position by the spring v^4. The completed bags are conducted from the rollers *n n′* to a drying apparatus of any suitable construction.

What I claim as my invention is—

1. The combination, with the feed-rollers C C′, of the reciprocating bar F and expanding-springs *f f* attached thereto, for distending the mouth of the tube against the peripheries or faces of the rollers, preparatory to folding the same, substantially as hereinbefore set forth.

2. The combination, with the feed-rollers C C′ and expanding-springs, of the side folding hands and arms K L, constructed and combined as described, for forming the side laps of the bottom of the bag, substantially as hereinbefore set forth.

3. The combination, with the arms L L and side folding-hands K K hinged thereto, of the shoulders *k* and springs *k′*, substantially as and for the purpose hereinbefore set forth.

4. The combination, with the rollers C C, of the side folding-hands K K, and the folding-rollers *h h*, adapted to the peripheries of the feed-rollers, for folding the upper and lower bottom laps, substantially as hereinbefore set forth.

5. The combination, with the feed-rollers C C′ and folding-rollers *h h*, of the swinging bearings H H, links h^3, and rock-lever h^2, for operating the folding-rollers simultaneously, substantially as hereinbefore set forth.

6. The combination, with the simultaneously-operating folding-rollers *h h*, of the projecting plate or spring h^8, for folding one of the laps a little in advance of the other, substantially as hereinbefore set forth.

7. The combination, with the intermittingly-revolving pasting-plate R and shaft r^1, of the notched disk *t* t^1 and spring-pawl t^2, for supporting the pasting-plate in its proper position while at rest, substantially as hereinbefore set forth.

8. The combination, with the driving-shaft D and paster-shaft r^1, of the connecting gear-

wheels P S, and the perfect and mutilated gears S^1 S^2, for imparting an intermittent rotary motion to the pasting-plate, substantially as hereinbefore set forth.

9. The combination, with the table M and tape conveyer *o o'*, of the folding-plate U, for refolding the lower bottom lap of the bag, substantially as hereinbefore set forth.

10. The combination, with the table M and conveyer *o o'*, of the folding-plate U and oscillating striker V, the bottom lap 3 being folded and held down by the striker until the folder-plate has folded back the bottom lap 4 and secured it in an overlapping position over the lap 3, substantially as hereinbefore set forth.

11. The combination, with the folder-plate U secured to the shaft *u*, of the sliding bar v^1, spring-dog u^2, and spring-arm u^3, for operating the folder-plate, substantially as hereinbefore set forth.

12. The combination, with the oscillating striker V and paster-shaft r^1, of the sliding bar v^1, cam v^5, and spring v^4, for operating said striker, substantially as hereinbefore set forth.

13. The combination and arrangement, with the table M and revolving pasting-plate R, of the friction-roller r^2, substantially as and for the purpose hereinbefore set forth.

WILLIAM LIDDELL.

Witnesses:

J. J. BONNER,

EDWARD WILHELM.