5 Sheets—Sheet 1.

W. LIDDELL.

PAPER-BAG MACHINE.

No. 186,092. Patented Jan. 9, 1877.

Fig. 1.

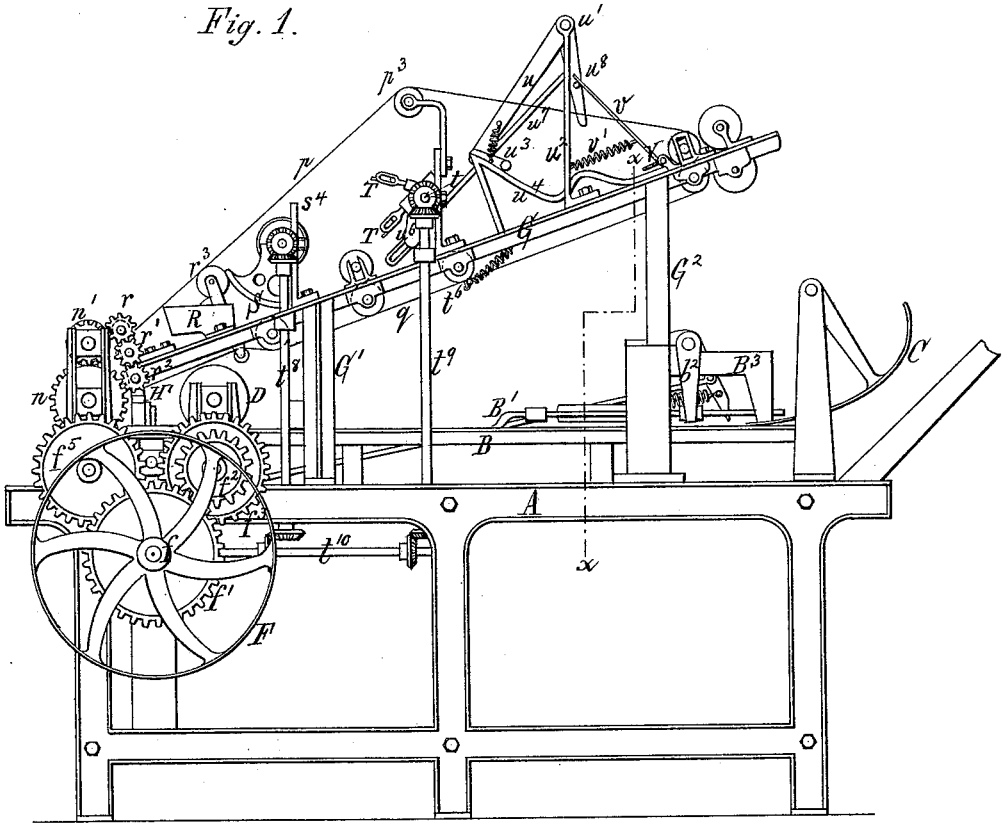


Fig. 2.

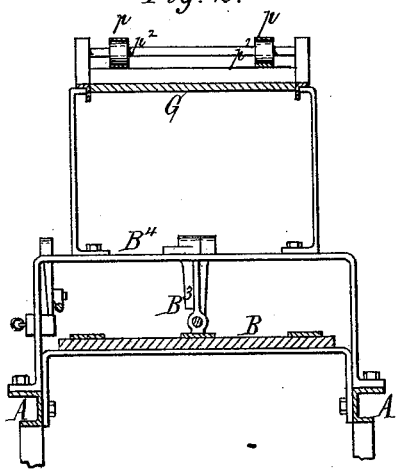
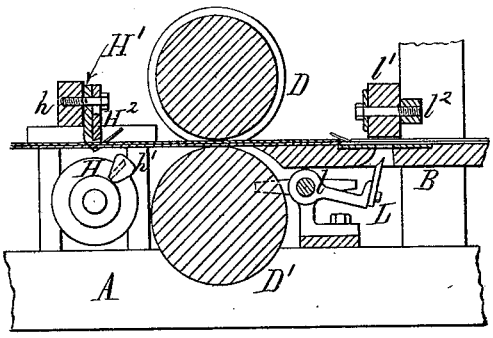


Fig. 3.



Witnesses
Charles J. Buchheit
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5 Sheets—Sheet 2.

W. LIDDELL.

PAPER-BAG MACHINE.

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Fig. 4.

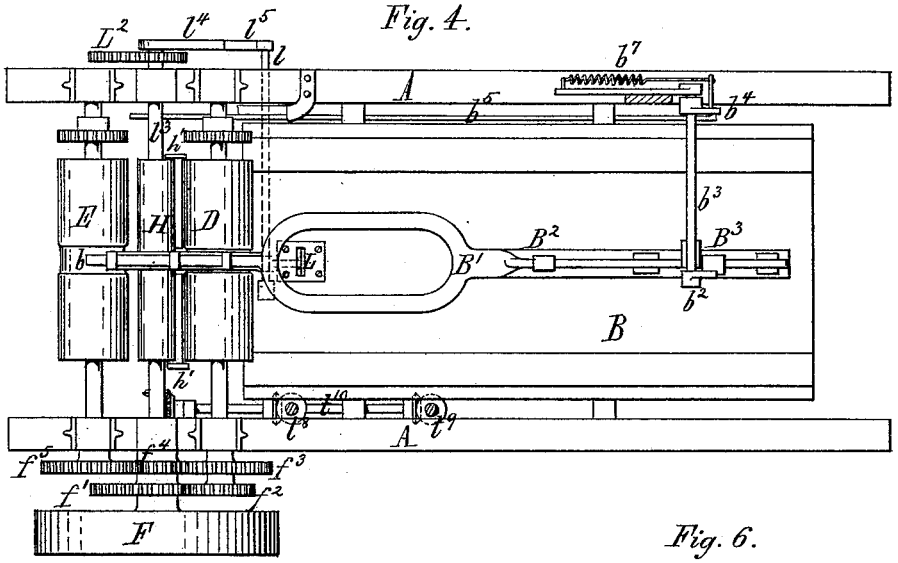


Fig. 5.

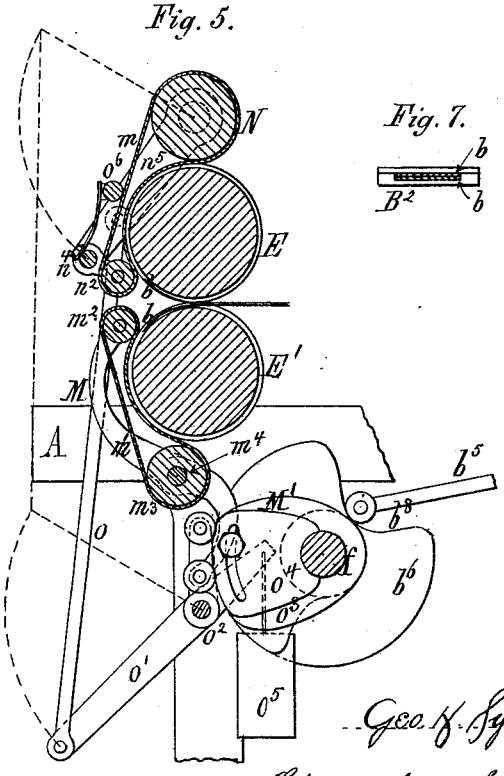
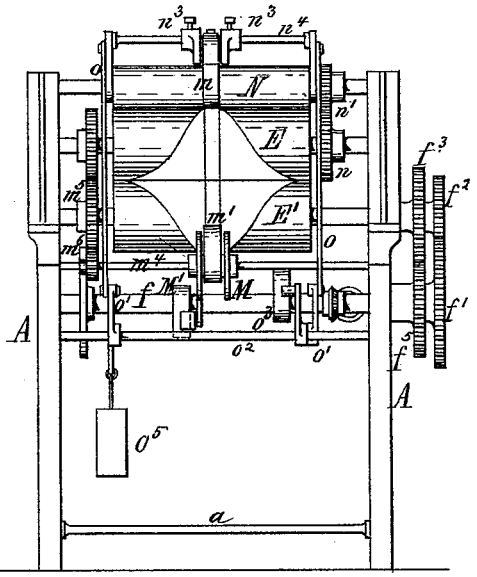


Fig. 7.

Fig. 6.



Witnesses

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5 Sheets—Sheet 3.

W. LIDDELL.

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No. 186,092. Patented Jan. 9, 1877.

Fig. 8.

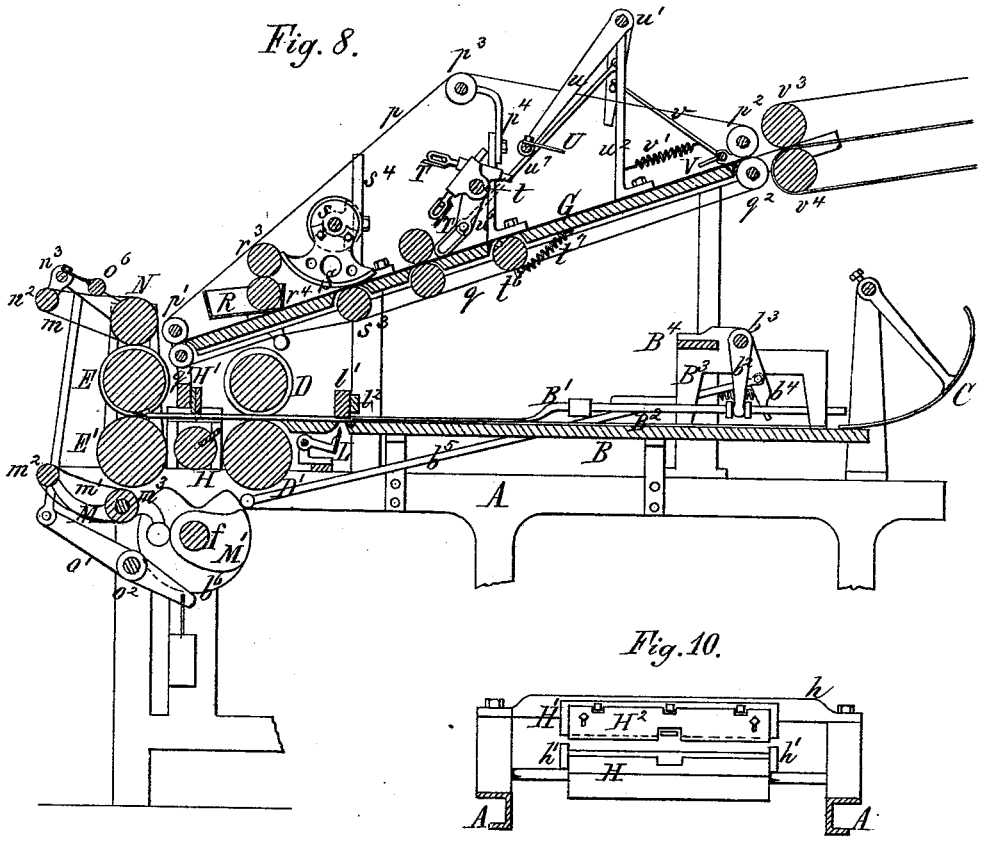
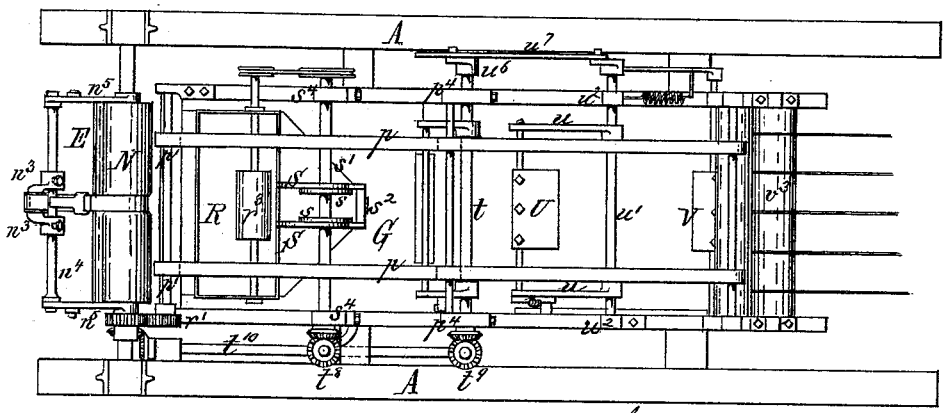


Fig. 10.

Fig. 9.



Witnesses

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5 Sheets—Sheet 4.

W. LIDDELL.

PAPER-BAG MACHINE.

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Fig. 11.

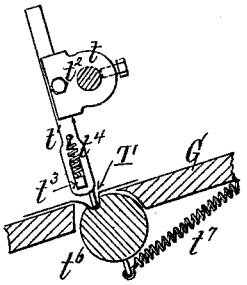


Fig. 13.

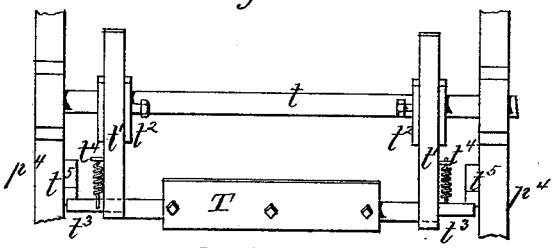


Fig. 12.

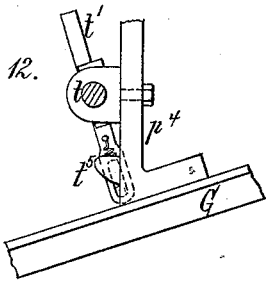


Fig. 14.

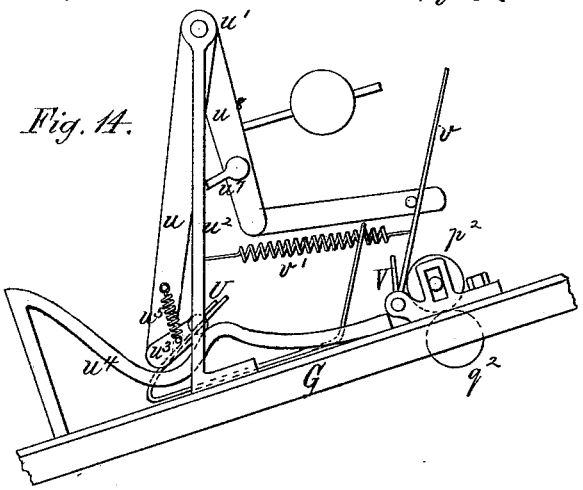


Fig. 15.

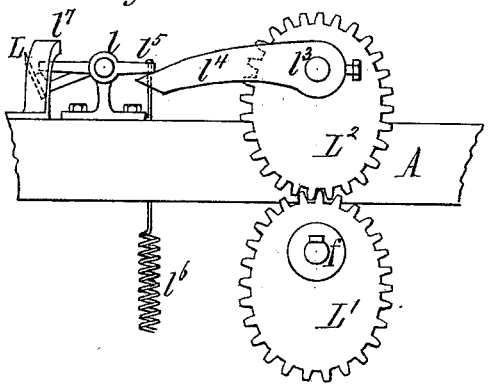


Fig. 16.

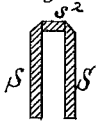


Fig. 17.

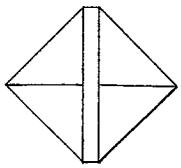


Fig. 18.

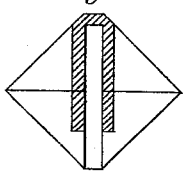


Fig. 19.

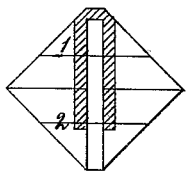
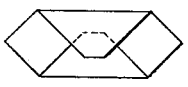


Fig. 20.



Witnesses
Charles J. Buchheit.
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By Edward Wilkes
Attorney.

5 Sheets—Sheet 5.

W. LIDDELL.

PAPER-BAG MACHINE.

No. 186,092. Patented Jan. 9, 1877.

Fig. 21.

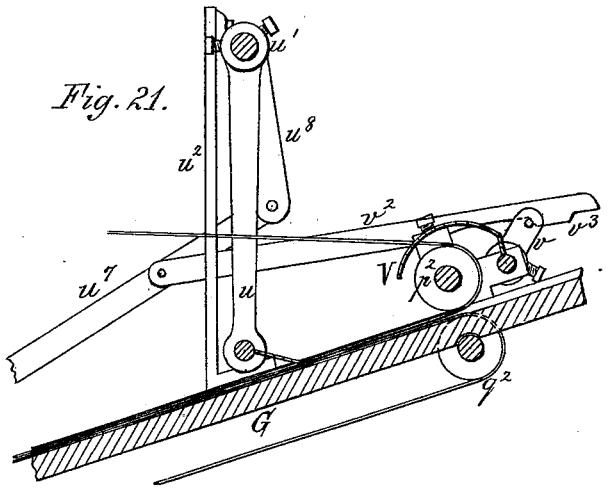
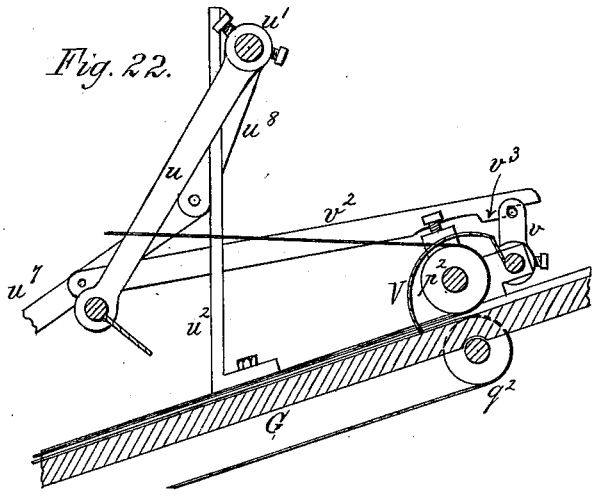


Fig. 22.



Witnesses
Charles J. Buchheit
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William Liddell. Inventor
By Edward Wilhelm
Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM LIDDELL, OF SANDY HILL, NEW YORK, ASSIGNOR OF ONE-HALF OF HIS RIGHT TO HOWLAND & CO., OF SAME PLACE.

IMPROVEMENT IN PAPER-BAG MACHINES.

Specification forming part of Letters Patent No. **186,092**, dated January 9, 1877; application filed September 7, 1876.

To all whom it may concern:

Be it known that I, WILLIAM LIDDELL, of Sandy Hill, in the county of Washington and State of New York, have invented certain new and useful Improvements in Paper-Bag Machines, which improvements are fully set forth in the following specification, reference being had to the accompanying drawings.

My improvements relate to that class of machines which are employed for manufacturing square or satchel bottomed paper bags.

The nature of my invention will be fully understood from the following description.

In the accompanying drawings, consisting of five sheets, Figure 1 is a side elevation of a machine provided with my improvements. Fig. 2 is a cross-section in line *x x*, Fig. 1. Fig. 3 is a detached sectional view of the cutting mechanism on an enlarged scale. Fig. 4 is a top-plan view of the lower feed-table and lower feed-rollers and connecting parts. Fig. 5 is a detached sectional view of the bottom-folding mechanism on an enlarged scale. Fig. 6 is a front elevation of the machine. Fig. 7 is a cross-section of the tube-distending springs and inclosing guide-tube. Fig. 8 is a longitudinal section of the machine. Fig. 9 is a plan view of the upper feed-table. Fig. 10 is a rear elevation of the main cutting mechanism. Fig. 11 is a sectional elevation of one of the creasing-blades and connecting parts. Fig. 12 is a side elevation thereof. Fig. 13 is a front elevation of the same. Fig. 14 is a detached view of the folding-blade and means for operating the same. Fig. 15 is a side elevation of the cutter-gear. Fig. 16 is a plan view of the pasting-segments. Fig. 17 represents the mouth of the paper tube when drawn out by the endless belts. Fig. 18 is a view of the same with the paste applied thereto. Fig. 19 is a view of the same with the creases for forming the bottom flaps formed therein. Fig. 20 shows the bottom of the bag completed. Fig. 21 is a detached view, showing the blade for folding down the forward bottom flap in an elevated position. Fig. 22 is a similar view, showing the folding-blade in a depressed position.

Like letters of reference refer to 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. B represents the lower feed-table, secured in a horizontal position between the side frames A A. C represents a portion of the tube-forming mechanism, arranged above the rear end of the table B, and constructed in any suitable and well-known manner. D D′ represent the first pair of feed-rollers, arranged above each other at the forward end of the table B; and E E′, the second pair of feed-rollers, arranged near the forward ends of the side frames A A, in line with the feed-rollers D D′. *f* is the main driving-shaft of the machine, located centrally between the two pairs of feed-rollers, and below the same.

As represented in the drawings, power is applied to the driving-shaft *f* by means of a pulley, F, and a continuous rotary motion is transmitted from the driving-shaft *f* to the lower feed-roller of each pair by a train of gear-wheels, $f^1 f^2 f^3 f^4 f^5$.

G is the upper feed-table, arranged above the lower table B in an inclined position, so as to rise from the front end of the machine toward the rear thereof. *b b* represent two flat springs, arranged centrally between the feed-rollers E E′, and attached to a reciprocating bar, B^1, extending between the feed-rollers D D′, toward the rear portion of the table B, the upper rollers being provided with a shallow annular groove for the reception thereof. The two springs *b b* are arranged one above the other, and secured with their rear ends to the bar B^1, while their front ends are disconnected, and so constructed that they will separate or expand when released.

The construction and mode of operation of the springs *b b* are the same as described and shown in Letters Patent of the United States No. 160,446, granted to myself and Howland & Co., March 2, 1875, for a similar invention.

B^2 is a stationary bar, arranged under the bar B^1 and springs *b b*, so as to form a guide and support for the same, the front portion of the bar B^2 being made in the form of a channel or tube, in which the springs *b b* and bar B^1 are confined. The supporting-bar B^2 extends forward to the rear of the second pair of feed-rollers E E′, and rearward to a de-

pending bearing, B^3, to the lower ends of which it is firmly secured. The bearing B^3 is attached to a cross-bar, B^4, and provided with two arms, in the lower ends of which the cylindrical rear end of the movable bar B^1 is guided. The latter is operated by means of an arm, b^2, mounted on a rock-shaft, b^3, which latter is connected, by an arm, b^4, and rod b^5, with a cam, b^6, secured to the driving-shaft *f*. b^7 is a spring, connecting the arm b^4 with a stationary part of the machine, so as to move the bar B^1 and springs *b b* forward when released by the cam b^6. The latter consists of a circular disk provided with a recess, b^8, so that the bar B^1 and springs *b b* will be held in a rearward position by the circular portion of the cam, when the free ends of the springs *b b* are compressed between the second pair of feed-rollers E E′, until the roller or pin of the connecting-rod b^5 enters the recess b^8 of the cam b^6, when the springs *b b* are moved forward by the spring b^7 and permitted to expand. The tubular portion of the bar B^2 serves to prevent the springs *b b* from bulging out and interfering with the movement of the paper.

H represents the revolving knife or cutter, arranged centrally between the lower feed-rollers D′ and E′. H^1 is the stationary blade, arranged above the rotary knife H, and secured to a cross-bar, *h*. H^2 is a movable guard-plate, arranged on the face of the stationary knife H^1, and extending through the entire width thereof. The plate H^2, when in its lowest position, projects slightly below the cutting-edge of the stationary blade H^1, and is attached to the latter by bolts passing through slotted holes, so as to be vertically adjustable thereon. *h′* are small inclines or cams attached to both ends of the rotary cutter H, in such manner that these cams will raise the movable plate H^2 before the cutter H reaches the same, and release the plate H^2 immediately after the cutter H has passed the same. By this means the upper portion of the paper tube, after being severed by the knives H H^1, is prevented from springing up and catching against the stationary knife H^1, as the plate H^2 descends directly after the cut is accomplished, and depresses the paper below the cutting-edge of the stationary knife H^1. The plate H^2 is lowered by its own weight; but, if desired, suitable springs may be employed for returning it to its lowest position after being released by the cams *h′*.

The knives H and H^1 and plate H^2 are provided with a central recess or space, through which pass the stationary bar B^2 and movable bar B^1, and in consequence of which a central portion of the paper tube equal in width to the width of this space would remain uncut. To avoid this an auxiliary cutter, L, is employed, which cuts the paper tube, in advance of the main cutters, at the point where the main cutters fail to cut, thus forming, with the cut of the main knives H H^1, a complete cut across the paper tube. The auxiliary cutter L is arranged in advance of the first pair of feed-rollers D D′, and below the table B, the latter being provided with a central opening, through which the cutter L works. As shown in the drawings, the cutter L consists of an oscillating knife attached to an arm mounted on a transverse shaft, *l*, and it impinges against a block, l^1, secured centrally to a cross-bar, l^2, above the opening in the table B. The cutter L is actuated from the shaft l^3 of the rotary knife H by means of an arm or cam, l^4, mounted on the end of the shaft l^3, and engaging with an arm, l^5, secured to the shaft *l* of the auxiliary cutter. The cutter L is closed against the block l^1 by the reaction of a spring, l^6, and returned to its former position by an elastic cushion, l^7. The rotary cutter H is actuated from the main driving-shaft by a pair of elliptic gear-wheels L^1 L^2, whereby the speed of the rotary cutter at the time of severing the paper tube is rendered greater than the feed-motion of the paper, as described and shown in Letters Patent of the United States No. 143,358, granted to myself and Robert D. Hamlin, September 30, 1873, for improvements in paper-bag machines. One of the wheels L^1 L^2 is made adjustable on its shaft, so that the motion of the rotary cutter can be regulated.

m m^1 represent two endless belts, arranged with the second pair of feed-rollers E E′, for drawing out the mouth of the tube into a diamond-shaped form preparatory to forming the bottom of the bag. The lower belt m^1 passes loosely over two rollers, m^2 m^3, the roller m^2 being supported in the outer end of a swinging frame, M, while the roller m^3 is arranged concentric with the fulcrum of the frame M, and mounted on a rotating shaft, m^4, driven from the lower feed-roller E′ by means of two gear-wheels, m^5 m^6, as clearly shown in Fig. 6. The frame M swings loosely on the shaft m^4, and is actuated by a cam, M′, mounted on the driving-shaft *f*, and engaging with a roller on the rear arm of the frame M, so as to swing the latter upward, bringing the belt m^1 in contact with the face of the lower feed-roller E′, whereby the belt is tightened on the rollers m^2 m^3, and to retain it in this elevated position (shown in Fig. 5) for a certain length of time, and then allowing the frame to drop back to its former position away from the roller E′, as shown in Fig. 8. N is a pressure-roller, arranged vertically above the upper feed-roller E, and in contact therewith. It is driven from the latter by means of a pair of gear-wheels, *n* n^1, preferably in such manner as to travel about one-tenth faster than the feed-rollers E E′. The belt *m* passes around the roller N, and around a smaller roller, n^2, supported between two bearings, n^3, attached to a cross-bar, n^4, which connects two arms, n^5, arranged at opposite ends of the roller N, and swinging loosely on the shaft thereof. The arms n^5 are connected by rods *o* with two arms, o^1, mounted on a rock-shaft, o^2, which is actuated from a cam, o^3, secured to the main

driving-shaft f. The cam o^3 is so constructed and arranged that the belt m will be swung down against the face of the upper feed-roller E, and held against the same in the same manner that the lower belt m^1 is held against the lower feed-roller E′, the upper belt m being driven by the pressure-roller N. The cam o^3 is preferably provided with an adjustable portion, o^4, for regulating the length of time during which the upper belt m is held against the face of the roller E, in accordance with the size of the bag intended to be produced. The belt m is held in an elevated position, away from the upper roller E, by means of a weight, o^5, connected with an arm attached to the rock-shaft o^2.

The speed of the belts m m^1 is preferably made about one-tenth faster than the feed-motion of the paper, so as to stretch the paper in opening the mouth of the tube and drawing it into the diamond shape.

The upper belt m is preferably provided with a tension-roller, o^6, attached to a spring-arm, as shown. The upper feed-table G is supported on the side frames A A by standards G^1 G^2, in such manner that its forward end is located directly back of and in line with the line of contact of the upper feed-roller E and the pressure-roller N. p p and q q represent two pairs of conveyer-belts, for carrying the bags from the front end of the feed-table G to the rear thereof. They are arranged at such a distance apart that the operations of pasting and folding the bottom can be carried on between the belts, the latter holding the bags operated upon firmly to the table G. The belts p and q are driven at the forward end of the table G by two pairs of pulleys, p^1 q^1, arranged, respectively, above and below the upper surface of the table G, and mounted on shafts driven from the roller N by a train of gear-wheels, r r^1 r^2. The belts p and q run over pulleys p^2 q^2 at the rear end of the table G, and the upper belts p are supported, near the middle of the table, by adjustable elevated guide-pulleys p^3, mounted on a shaft supported in standards p^4, while the lower belts q are carried below the table G nearly parallel therewith. R represents the paste-receptacle, arranged above the table G, near the front end thereof, and provided with two paste-rollers, r^3 r^4, as clearly shown in Fig. 8.

S S are two revolving pasting-plates, curved in the form of cylindrical segments, and attached to two disks, s, secured to a transverse shaft, s^1. The two segmental plates S S are connected at their front ends by a cross piece or strip, s^2, as clearly shown in Fig. 16. The paster-shaft s^1 is arranged equidistant from the upper paste-roller and the table G, so that as the segments S revolve, their surfaces and that of the strip s^2 will come in contact with the paste on the upper roller r^3, and take it therefrom, and then apply it to the paper. The faces of the segments S and strip s^2 are preferably roughened to better receive, retain, and transfer the paste to the paper. s^3 is a roller arranged in an opening of the table G at the point where the segments S would come in contact therewith, so as to facilitate the carrying along of the paper. The disks s, to which the segments S are attached, are made laterally adjustable on the shaft s^1, to enable the space between the segments to be regulated according to the size of the bag, strips s^2 of different lengths being provided for connecting the segments when properly adjusted.

The segments S are made removable from the disks s, and the bearings of the shaft s^1 are made vertically adjustable in a standard, s^4, so that by raising or lowering the shaft s^1, and attaching to the disks s segments of the proper radius, the pasting mechanism is adjusted to the size of the bag intended to be produced. The segments S S and connecting-strip s^2 apply the paste to the bottom of the bag in the form represented by section-lines in Fig. 18.

T T represent two revolving knives or blades for forming the creases 1 and 2, Fig. 19, in the bottom of the bag. These knives are attached to a shaft, t, by means of bars or arms t^1, secured adjustably in hubs t^2. The creaser-blades T are provided at their ends with tenons t^3, projecting through elongated holes or slots in the ends of the bars t^1, and held against the upper side of these slots by spiral springs t^4. t^5 is a stationary cam or incline, attached to the inner side of each of the standards p^4 in such manner that as the blades T revolve, the tenons of each blade will engage under the cams t^5, whereby the blade is forced down to its lowest position until the tenons have passed the cams t^5, when the blade is returned to its elevated position by the springs t^4. t^6 represents a roller arranged in an opening of the table G, at the point where the creasing-blades T would come in contact therewith. The roller t^6 is provided with a longitudinal recess or groove, into which the blades T are forced by the cams t^5 as the blades revolve, whereby the roller is swung back until the blade is disengaged from the groove of the roller. t^7 is a spring connected with the roller t^5, for returning it to its normal position after it is released by the creasing-blade.

The bearings of the shaft t are adjustably connected to the standard p^4, so that by raising or lowering the shaft t, and lengthening and shortening the arms t^1 in their hubs, the distance of the creasing-blades T from the center of the shaft t can be readily adjusted to the size of the bag. The distance between the two creasing-plates is increased or lessened by adjusting their hubs on the shaft t. The shaft s^1 of the pasting mechanism and the shaft t of the creaser-blades are driven by vertical shafts t^8 t^9 from a line-shaft, t^{10}, geared with the main driving-shaft f. The lower paste-roller r^4 is driven from the shaft s^1 by means of an endless band running over suitable pulleys secured to the respective shafts.

U is the folding-blade for turning over the first flap of the bottom of the bag. It is pivoted between two arms, *u u*, mounted on a rock-shaft, u^1, which latter is supported in standards u^2. The blade U is provided with an arm, u^3, riding on a cam or curved guide-bar, u^4, and held in contact therewith by a spring, u^5, or by the overhanging weight of the folding-blade. The rock-shaft u^1 is operated from the shaft *t* by means of a crank, u^6, mounted on the end thereof, and a slotted rod, u^7, connecting the crank u^6 with an arm, u^8, secured to the end of the rock-shaft.

In Fig. 8 the folding-blade U is shown in its highest position. In moving down toward the table G, the arm u^3, riding on the cam u^4, allows the blade U to almost touch the table, and so engage under the rear flap of the bottom of the bag, when the arm u^3, riding over the convex portion of the cam u^4, causes the blade U to turn first up and then lie down, whereby the rear bottom flap is turned over upon the pasted portion of the bottom and secured. The slot in the connecting-rod u^7 renders the movements of the folder-blade U intermittent, and, by allowing a period of rest, enables the forward movement of the blade to be made slightly faster than the feed-motion of the paper. V represents the blade for turning over the forward flap of the bottom of the bag. It is arranged with its edge in front of the belt-pulleys p^2, and attached to a transverse shaft supported in suitable bearings, and provided with an arm, *v*. The latter is actuated, as shown in Figs. 21 and 22, by a rod, v^2, connected at one end with the rod u^7, actuating the arm u^8, and resting with its other end upon a pin or stud formed on the arm *v*. This end of the rod v^2 is provided on its under side with an offset or projection, v^3, having two slightly-inclined shoulders, either of which may engage against the pin on the arm *v*, so as to move the latter sufficiently to raise it from the table or close it again, as the rod v^2 moves in either direction, when the further movement of the rod v^2 causes the projection v^3 to ride over the pin of the arm *v* without causing any further movement of the latter. If preferred, the arm *v* may be arranged to rest against a pin or other projection of the arm u^8, or an extension thereof, and be held in contact therewith, so as to be actuated thereby, by a spring, v^1, as shown in Figs. 8 and 14.

The paper tube having been formed in any usual and well-known manner, it is fed forward between the feed-rollers D D′ and E E′ until the mouth of the tube projects a short distance beyond the feed-rollers E E′, when the springs *b b* are thrust forward, so as to distend the mouth of the tube against the rollers E E′. The two endless belts *m* m^1 are now swung against the rollers E E′ by their respective cams, so as to grasp the distended mouth of the paper tube, when the combined motion of the rollers E E′ and belts *m* m^1 causes the mouth of the paper tube to be drawn out in opposite directions into a diamond-shaped form. As soon as the belts *m* m^1 have fairly seized the distended mouth of the paper tube, the springs *b b* are returned to their former compressed position between the rollers E E′. The motion of the belts *m* m^1, being faster than that of the feed-rollers E E′, the paper is stretched as the mouth of the tube is drawn out, thereby preventing the formation of wrinkles, and insuring the paper to enter between the upper feed-roller E and pressure-roller N in a perfectly smooth state. As soon as the mouth of the paper tube is properly drawn out, the lower belt m^1 is swung away from the roller E′, so as to release its hold upon the paper, while the upper belt *m* continues to remain in contact with the paper until the tip of the diamond-shaped end of the paper tube has entered between the upper feed-roller E and pressure-roller N, when this belt is also swung away from the paper, thereby permitting the latter to enter between the rollers E N without obstruction. The rollers E N compress the paper as it passes between the same, and complete the creases formed by drawing out the mouth of the paper tube. When a length of paper tube sufficient to form a bag of the required size has been fed past the auxiliary cutter L, the latter is swung up so as to penetrate the center of the paper tube, and when this slit reaches the main cutters H H^1 they close and complete the cut. The diamond-shaped end of the paper tube is fed from the rollers E N between the belts *p q*, which seize it and convey it under the pasting-segments S S, which apply the paste thereto in the form shown in Fig. 18. The end of the paper tube is next presented to the creasing-knives T, the first one of which depresses the paper into the groove of the roller t^6, thereby forming the crease 1 of the bottom. As soon as the roller t^6 is released by the first creasing-blade T, the roller is returned to its former position by the spring t^7, when the second creasing-knife depresses the paper into the groove of the roller t^6, forming the second bottom crease (marked 2, Fig. 19.) The bottom flaps formed by the creases 1 and 2 now project upward more or less, according to the stiffness of the paper, and are, in this condition, moved past the folding-blade U. The latter, in its forward movement, seizes the rear bottom flap, and folds it down upon the pasted bottom of the bag, and holds it in this position until the pivoted plate V folds down the second bottom flap, when the folder U is withdrawn, and the second flap closed down upon the first flap by the folder V, the bottom being completed by passing between the pressure-rollers v^3 and v^4. The lower roller v^4 is provided with an endless apron of felt or other suitable material, and the upper roller v^3 with a series of conveyer-cords, whereby the completed bags are delivered to the drying apparatus.

During the operation of applying the paste, and creasing and folding the bottom, the bag is securely held between the endless belts *p q*.

In my improved machine the mouth of the paper tube is opened and the bottom of the bag formed during a continuous movement of the feed-rollers, thereby rendering the operation of the machine very steady and uniform.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with the movable bar B^1 and expanding-springs *b b*, attached thereto, of the stationary guide-bar and tube B^2, for supporting and confining the springs and movable bar, substantially as hereinbefore set forth.

2. The combination, with the stationary knife H^1, of the guard-plate H^2, arranged to slide vertically on the face of the stationary knife, so as to act upon the paper with its whole weight, and depress the same below the edge of the knife H^1 after the paper is severed, substantially as hereinbefore set forth.

3. The combination, with the rotating cutter H, provided with cam *h'*, of the stationary blade H^1, provided with the vertically-movable plate H^2, substantially as and for the purpose hereinbefore set forth.

4. The combination, with the main cutting mechanism H H^1, having a space for the passage of the expanding-springs and bar, of the auxiliary cutter L, for completing the cut, substantially as hereinbefore set forth.

5. The combination, with the feed-rollers E E′, of the endless belts *m* m^1, both supported in movable frames in such manner that they may be brought in contact with the faces of the feed-rollers and cover a greater or less arc thereof, substantially as hereinbefore set forth.

6. The combination, with the feed-rollers E E′, of the two endless belts *m* m^1, adapted to be brought in contact with the faces thereof by mechanism, substantially as described, and driven at a speed exceeding that of the feed-rollers, for drawing the mouth of the paper tube out into a diamond shape, and stretching the paper at the same time, substantially as hereinbefore set forth.

7. The combination, with the feed-rollers E E′, of the expanding-springs *b b*, for distending the mouth of the tube, and moving endless belts *m* m^1, for seizing the mouth of the tube after it is distended, and drawing it out into a diamond shape, substantially as hereinbefore set forth.

8. The combination, with the lower feed-roller E′, of the endless belt m^1, rollers m^2 m^3, swinging frame M, and actuating-cam M′, substantially as and for the purpose hereinbefore set forth.

9. The combination, with the lower feed-roller E′, endless belt m^1, and swinging frame M, carrying the roller m^2, of the shaft m^4, carrying the roller m^3, and driven from the roller E′, substantially as and for the purpose hereinbefore set forth.

10. The combination, with the upper feed-roller E, of the pressure-roller N, endless belt *m*, and guide-roller n^2, and supporting-arms, substantially as and for the purpose hereinbefore set forth.

11. The combination, with the rollers E N, of the endless belt *m*, roller n^2, cross-bar n^4, arms n^5, rods *o*, arms o^1, rock-shaft o^2, and actuating-cam o^3, substantially as and for the purpose hereinbefore set forth.

12. The combination, with the endless belt *m*, and means for supporting the same, of the actuating-cam o^3, provided with adjustable portion o^4, for regulating the time during which the belt is held against the feed-roller, substantially as hereinbefore set forth.

13. The combination, with the feed-rollers E E′, of the distending-springs *b b*, endless driven belts *m* m^1, and pressure-roller N, substantially as and for the purpose hereinbefore set forth.

14. The combination, with the rotating creasing-knives T T and table G, of the roller t^6, having a longitudinal groove, in which said knives engage, and provided with a spring, t^7, substantially as and for the purpose hereinbefore set forth.

15. The combination, with the creasing-knives T T and shaft *t*, supported in vertically-adjustable bearings, of the arms t^1, secured adjustably to hubs t^2, substantially as and for the purpose hereinbefore set forth.

16. The combination, with the movable creasing-knives T T, of the slotted arms t^1, springs t^4, and stationary cams or inclines t^5, substantially as and for the purpose hereinbefore set forth.

17. The combination, with the pivoted folder U, of the arm u^3 and cam or guide u^4, constructed as shown and described, substantially as and for the purpose hereinbefore set forth.

18. The combination, with the folder V, of the arm *v* and actuating-rod v^2, provided with projection v^3, substantially as and for the purpose hereinbefore set forth.

WILLIAM LIDDELL.

Witnesses:

GRENVILLE M. INGALSBE,

EDWARD WILHELM.