3 Sheets—Sheet 1.

# W. LIDDELL.

## Paper-Bag Machine.

No. 197,870. Patented Dec. 4, 1877.

Figure 1.

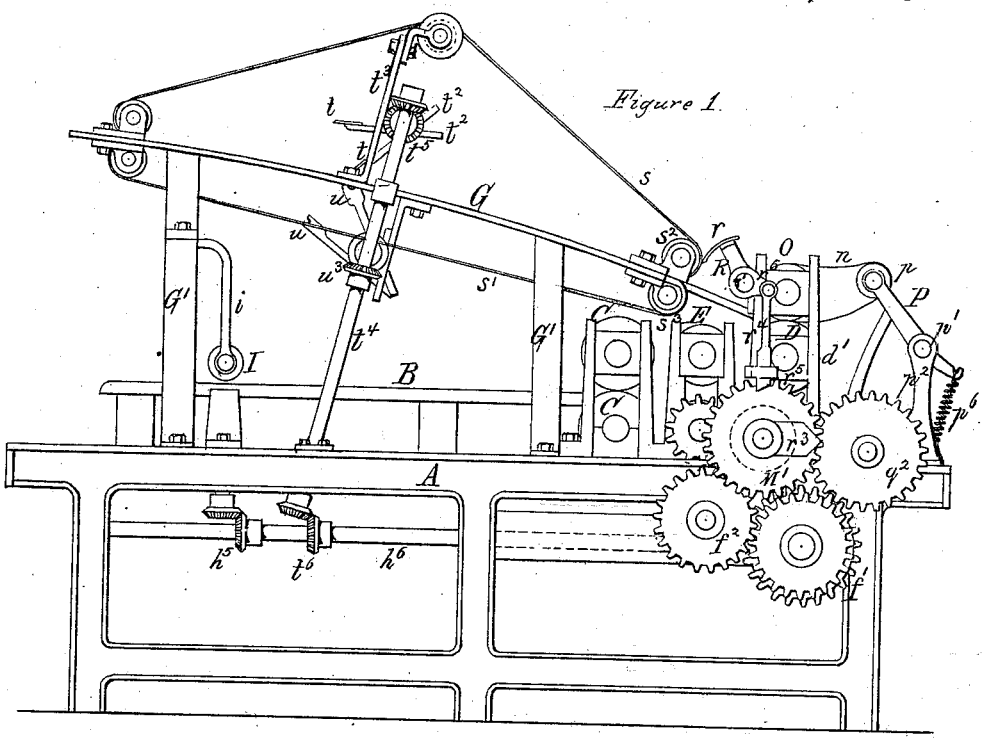
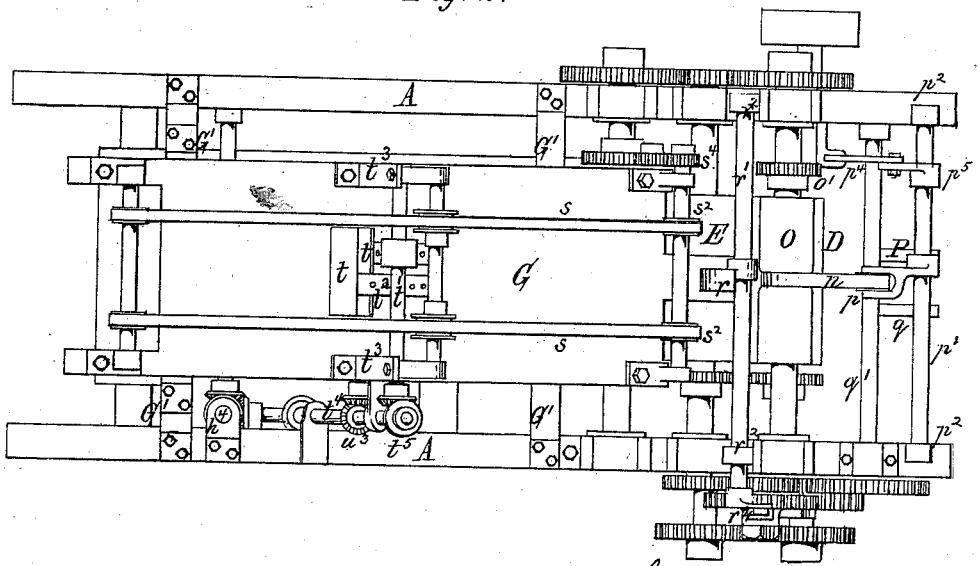



Fig. 2.




Witnesses.
Chas J. Buchheit
Ernest Haddick

William Liddell, Inventor
By Edward Wilhelm
Attorney.

3 Sheets—Sheet 2.

# W. LIDDELL.

## Paper-Bag Machine.

**No. 197,870.** **Patented Dec. 4, 1877.**

*Fig. 3.*

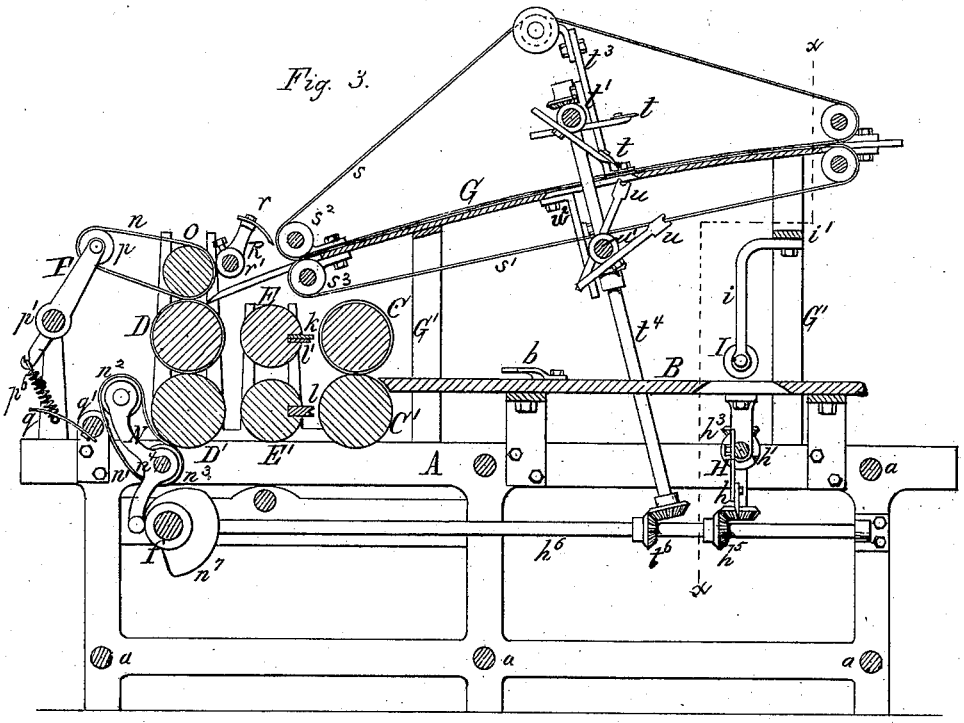


*Fig. 4.*

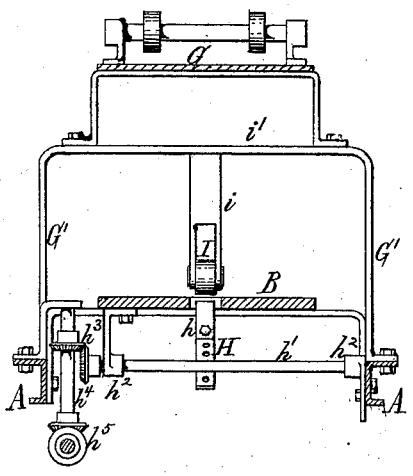


*Fig. 5.*

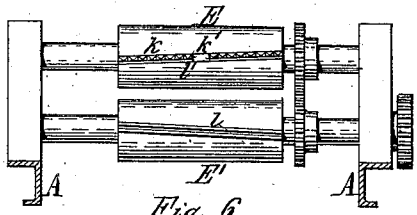
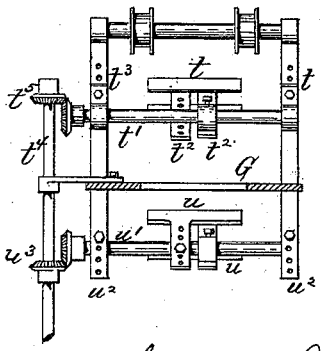


*Fig. 6.*



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3 Sheets—Sheet 3.

# W. LIDDELL.

## Paper-Bag Machine.

**No. 197,870.** **Patented Dec. 4, 1877.**

*Fig. 7.*

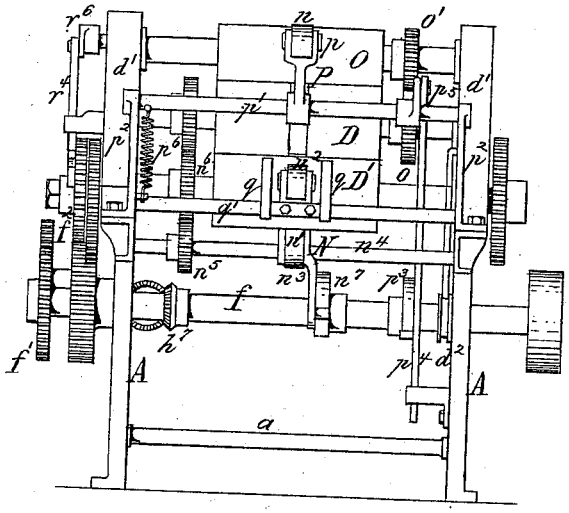



*Fig. 8.*

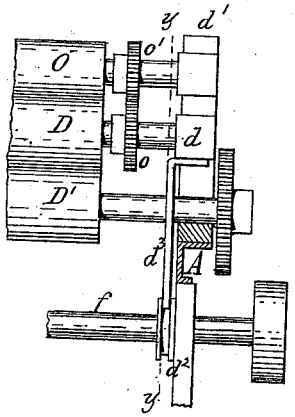



*Fig. 9.*

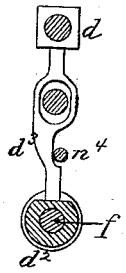



*Fig. 10.*

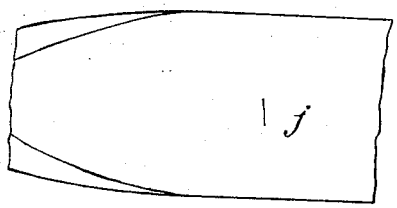



*Fig. 11.*

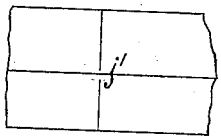



*Fig. 12.*

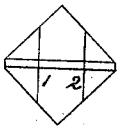
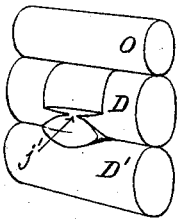



*Fig. 13.*




Witnesses

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By *Edward Wilhelm*

Attorney

# UNITED STATES PATENT OFFICE.

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

## IMPROVEMENT IN PAPER-BAG MACHINES.

Specification forming part of Letters Patent No. **197,870**, dated December 4, 1877; application filed August 3, 1877.

*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 Method and Machines for Making Paper Bags, 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-bottom paper bags from an endless web of paper, such as are described and shown in Letters Patent of the United States No. 186,092, granted to me January 9, 1877.

My invention relates to a peculiar method of opening the mouth of the paper tube preparatory to forming the bottom of the bag; also, to the mechanical means for preparing the paper tube for that purpose; and to various mechanical devices for accomplishing the several operations by which the bottom of the bag is formed and the bags are severed from the paper tube, as will be hereinafter fully set forth.

In the accompanying drawings, consisting of three sheets, Figure 1 is a side elevation of a paper-bag machine provided with my improvements. Fig. 2 is a top-plan view thereof. Fig. 3 is a longitudinal section thereof. Fig. 4 is a vertical section in line *x x*, Fig. 3. Fig. 5 is a rear elevation of the main cutter mechanism. Fig. 6 is a front elevation of the mechanism for creasing the bottom of the bag. Fig. 7 is a front elevation of the machine. Fig. 8 is a fragmentary front elevation, showing the means for raising the upper feed-roller. Fig. 9 is a vertical section in line *y y*, Fig. 8. Fig. 10 is a fragmentary view of the web of paper previous to folding it into a tube. Fig. 11 is a fragmentary view of the paper tube. Fig. 12 is a view of the bottom of the bag. Fig. 13 is a perspective view, showing the manner in which the mouth of the paper tube is opened.

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*. B is the lower feed-table, secured in a horizontal position between the side frames A A; and *b* a portion of the tube-folding mechanism, arranged on the table B.

C C′ represent the first pair of feed-rollers, arranged at the forward end of the table B; and D D′, the second pair of feed-rollers, arranged near the forward end of the side frames A, in line with the rollers C C′. E E′ are the cutting-rollers, arranged between the feed-rollers C C′ and D D′. *f* is the main driving-shaft, arranged underneath the feed-rollers D D′, and connected therewith by gear-wheels $f^1$ $f^2$. G is the upper feed-table, arranged above the lower feed-table B in an inclined position, so as to rise from the front end of the machine toward the rear end thereof.

*h* represents a preliminary cutter or knife, arranged below the table B in the rear of the tube-forming mechanism *b*, so as to form a narrow transverse slit or cut, *j*, centrally in the web of paper, previous to folding the sides of the web over for forming the tube. As shown in the drawings, the cutter *h* is secured to an arm, H, mounted on a revolving shaft, $h^1$, arranged below the table B, and supported in bearings $h^2$. The shaft $h^1$ is driven by bevel-wheels $h^3$ from a vertical counter-shaft, $h^4$, which latter is connected by bevel-wheels $h^5$ with a line-shaft, $h^6$, driven from the main driving-shaft *f* by bevel-wheels $h^7$. I is a roller, arranged above the slot in the table B, through which the knife *h* works, so as to cause the latter to impinge against the roller I during the cutting operation.

The roller I is supported in a hanger, *i*, attached to a cross-piece, *i′*. *k* is a finely-serrated blade or knife, secured to the upper cutter-roller E. The knife *k* is provided at the middle with a notch or space, *k′*, equal in width to that of the preliminary cutter *h*, so that the blade *k* will cut entirely across the paper tube with the exception of a narrow strip in the center. The lower roller E′ is provided with a grooved wooden strip, *l*, meshing with the blade *k*, so as to cause the latter to impinge against the strip *l* in cutting. *l′* is a strip of rubber or other elastic material arranged on the upper roller E, in front of the blade *k*, for disengaging the paper from the teeth of the

blade, and preventing the latter from carrying the paper around with it.

$n$ $n^1$ represent the endless belts, arranged with the second pair of feed-rollers D D′, for drawing out the mouth of the paper tube into a diamond-shaped form preparatory to forming the bottom of the bag. The lower belt $n^1$ passes loosely over two rollers, $n^2$ and $n^3$, the roller $n^2$ of which is supported in the outer end of a swinging frame, N, mounted loosely on a shaft, $n^4$. The roller $n^3$ is secured to the shaft $n^4$, which latter is rotated from the shaft of the lower feed-roller D′ by gear-wheels $n^5$ $n^6$. The frame N is actuated by a cam, $n^7$, mounted on the shaft $f$ and engaging with a depending arm of the frame N.

O is a pressure-roller, arranged above the upper feed-roller D, and running in contact therewith. It is driven from the feed-roller D by gear-wheels $o$ $o'$, preferably in such manner as to rotate slightly faster than the feed-rollers D D′. The belt $n$ passes around the roller O, and around a smaller roller, $p$, mounted on an arm, P, which is secured to a rock-shaft, $p^1$, arranged in front of the rollers D D′ O, and supported in bearings $p^2$ secured to the side frames. The shaft $p^1$ is oscillated, so as to swing the belt $n$ against the roller D, by a cam, $p^3$, mounted on the driving-shaft $f$, and a rod, $p^4$, and arm $p^5$. The shaft $p^2$ is moved in the opposite direction when released by the cam $p^3$ by a spring, $p^6$. $q$ $q$ represent two elastic arms, arranged on opposite sides of the lower belt $n^1$, and mounted on a rotating shaft, $q^1$, arranged in front of the roller D′, so that the arms $q$, in rotating with the shaft $q^1$, are swung against the lower roller D′, for pressing the lower portion of the mouth of the paper tube against the roller D′ until the belt $n^1$ has seized the tube. The shaft $q^1$ is rotated from the driving-shaft $f$ by gear-wheels $q^2$. $d$ represents one of the bearings of the upper feed-roller D. It is made movable between the vertical guides $d^1$, secured to the side frames A in such manner as to permit of the roller D, being raised away from the lower roller D′, and to be lowered upon the same, as may be required. $d^2$, Fig. 8, is a cam, mounted upon the driving-shaft $f$, and $d^3$ a rod connecting the cam $d^2$ with the bearing $d$, so as to alternately raise and lower the same. The cam $d^2$ is so formed as to keep the feed-roller D slightly raised from the lower roller D′, except when the main cutter $k$ is severing the tube, when the upper roller D is lowered upon the roller D′, so as to firmly seize the paper. If desired, both bearings of the roller D may be made movable in the same manner; but one movable bearing is sufficient to accomplish the purpose.

$r$ is the final cutter or knife, arranged in rear of the pressure-roller O, for completing the cut by which the bag is severed from the tube. The knife $r$ is attached to an arm, R, secured to a rock-shaft, $r^1$, which is supported in bearings $r^2$. The shaft $r$ is actuated by means of a cam, $r^3$, secured to the gear-wheel M′ and engaging with a rod, $r^4$, the lower end of which slides in a guide, $r^5$, while its upper end connects with an arm, $r^6$, secured to the end of the shaft $r^1$. The knife $r$ is returned to an elevated position by a suitable spring. The knife $r$ is made of sufficient width to cut through the strip of paper which is left uncut by the blade $k$. The knife $r$ impinges against the forward end of the upper feed-table, as shown in Figs. 2 and 3.

The upper feed-table G is supported on the side frames A A by standards G′, in such manner that its forward end is located directly back of the line of contact of the upper feed-roller D with the pressure-roller O.

$s$ $s$ and $s^1$ $s^1$ represent two pairs of conveying-belts, for carrying the bags from the front end of the table G to the rear thereof. The belts of each pair are arranged at such a distance apart that the operations of pasting, creasing, and folding the bottom can be carried on between the belts.

In order to enable the belts to hold the bags operated upon firmly to the table G, the upper surface of the latter is made convex longitudinally, as clearly shown in Figs. 1 and 3.

The belts $s$ $s^1$ are driven at the forward end of the table G by two pairs of pulleys, $s^2$ $s^3$, arranged, respectively, above and below the upper surface of the table, and connected with the upper feed-roller C by gear-wheels $s^4$.

$t$ $t$ represent two revolving blades, for forming the creases 1 and 2, Fig. 12, in the bottom of the bag. The blades $t$ are adjustably attached to a transverse shaft, $t^1$, by means of arms $t^2$, so that the distance of the blade from the shaft may be increased or lessened in accordance with the size of the bag operated upon. The shaft $t^1$ is arranged above the table G in adjustable bearings secured to standards $t^3$. The shaft $t^1$ is driven from the line-shaft $h^6$ by means of a counter-shaft, $t^4$, and bevel-wheels $t^5$ $t^6$.

$u$ $u$ represent two revolving plates, arranged below the table G, so as to mesh with the blades $t$ $t$ as they rotate. The plates $u$ $u$ are secured to a shaft, $u^1$, so as to be radially adjustable thereon, and the shaft $u^1$ is supported in adjustable bearings $u^2$, and driven from the shaft $t^4$ by bevel-wheels $u^3$. The plates $u$ are provided with longitudinal grooves in their faces, in which engage the blades $t$ as they revolve, thereby depressing the paper into these grooves, and forming the creases by which the bottom flaps are determined.

The table G is provided with a suitable opening or slot, through which the blades $t$ and plates $u$ work. The mechanism for pasting the bottom of the bags is arranged on the table G in front of the blades $t$, and the mechanism for folding over the bottom flaps is arranged on the table G in the rear of the blades $t$, and both mechanisms are substantially constructed as shown and described in my Letters Patent above referred to.

The web of paper receives a narrow central slit, $j$, by the knife $h$ before the sides of the

web are folded over to form a tube. The latter is then formed in any suitable and well-known manner, and fed forward between the rollers C C′ and D D′.

The main cutting mechanism E E′ produces a cut across the tube, with the exception of a narrow strip at the center of the tube, which remains uncut by reason of the central space $k'$ formed in the blade $k$. The lower portion of the tube being cut at this point by the preliminary cutter $h$, only the upper portion of the paper tube remains uncut at the center, leaving a narrow strip, $j'$, whereby the bag-blanks remain attached to each other, as represented in Fig. 13.

In starting the machine the upper portion of the mouth of the tube, projecting beyond the rollers D D′, is guided by hand between the upper belt $n$ and the roller D; but in all succeeding bags the mouth of the tube is opened by the narrow strip of paper $j'$, by which the upper portion of the bag-blank adheres to the preceding blank passing between the rollers D and O, while the lower portion of the mouth of the tube continues in a straight line, as shown in Fig. 13.

As soon as the mouth of the paper tube is slightly opened, in the manner just described, the spring-arms $q$ are swung against the lower portion of the mouth of the paper tube, pressing it against the roller D′, until the lower belt $n'$ has firmly seized this portion of the tube. The upper belt $n$ is at the same time swung down against the roller D, and the mouth of the paper tube is drawn out into a diamond form by both belts. When this is accomplished the lower belt $n^1$ is swung away from the roller D′, thereby releasing the mouth of the paper tube, which now follows the motion of the belt $n$ until it has entered between the rollers D and O, when the belt $n$ is also raised. As the bag-blanks are drawn between the feed-rollers D D′ mainly by their connecting-strips $j'$, the paper is liable to be taut at the center and loose at the sides, which would cause wrinkles in the paper. This is, however, prevented by keeping the roller D slightly raised from the roller D′ by the cam $d$, as hereinbefore described, except when the main cutter mechanism is about to cut. After the bag-blank is fed upon the table G and seized by the belts $s$ $s^1$, the blank is separated from the following blanks by the finishing-cutter $r$, which severs the strip $j'$. Paste is then applied to the bottom of the bag by mechanism, and in the manner as fully described in my Letters Patent above referred to, or in any other suitable manner. The diamond-shaped bottom of the bag is then presented to the creasing-blades $t$ $t$, which form the creases 1 and 2 in the bottom, as above described, whereby the bottom flaps are determined. The bottom flaps project upward more or less, according to the stiffness of the paper, and are folded over by mechanism constructed as shown and described in my Letters Patent above referred to, or in any other suitable manner. The bag is then completed by passing it through suitable pressure-rollers, and thence to the drier.

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

1. In a paper-bag machine in which the web is folded into a tube and severed without the employment of an inside former, the combination, with the main cutter $k$, provided with a central space, $k'$, of the preliminary cutter $h$, arranged in rear of the tube-forming mechanism, so as to form a central slit in the web of paper before the sides thereof are folded over, substantially as and for the purpose hereinbefore set forth.

2. The combination, with the roller D′, of one or more elastic rotating arms, $q$, for pressing the lower portion of the mouth of the paper tube against the lower roller D′, substantially as hereinbefore set forth.

3. The combination, with the main cutter $k$, provided with space $k'$ and preliminary cutter $h$, of the rollers D D′ O, endless belts $n$ $n^1$, and rotating elastic arms $q$ $q$, substantially as and for the purpose hereinbefore set forth.

4. The combination, with the roller D′, of the endless belt $n^1$ and two elastic rotating arms, $q$ $q$, arranged on opposite sides of the belt, substantially as shown and described.

5. The combination, with the rollers D O, of the endless belt $n$ and roller $p$, arm P, and rock-shaft $p^1$, arranged in front of the roller E, substantially as shown and described.

6. The combination, with the stationary lower feed-roller D′, of the movable upper roller D, constructed so as to be raised away from the roller D, except when the main knife is about to cut by mechanism, substantially as described, for the purpose hereinbefore set forth.

7. The combination, with the cutter mechanism E E′ and lower stationary feed-roller D′, of the upper roller D, mounted in movable bearings $d$, cam $d^2$, and rod $d^3$, substantially as and for the purpose hereinbefore set forth.

8. In a machine for making paper bags, the upper feed-table G, constructed with a convex upper side, in combination with the conveyer-belts $s$ $s^1$ and bottom-creasing mechanism, substantially as and for the purpose hereinbefore set forth.

9. The combination, with the upper feed-table G and conveyer-belts $s$ $s^1$, of the rotating creasing-blades $t$ $t$, arranged above the table, and rotating grooved plates $u$ $u$, arranged below the table, for creasing the bottom of the bag, substantially as and for the purpose hereinbefore set forth.

WILLIAM LIDDELL.

Witnesses;
F. M. VAN WORMER,
P. H. WAIT.