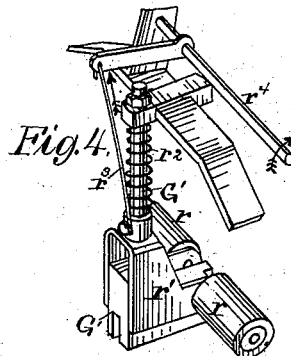
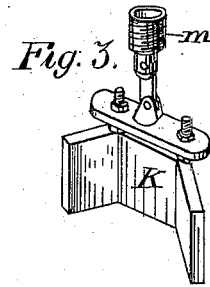
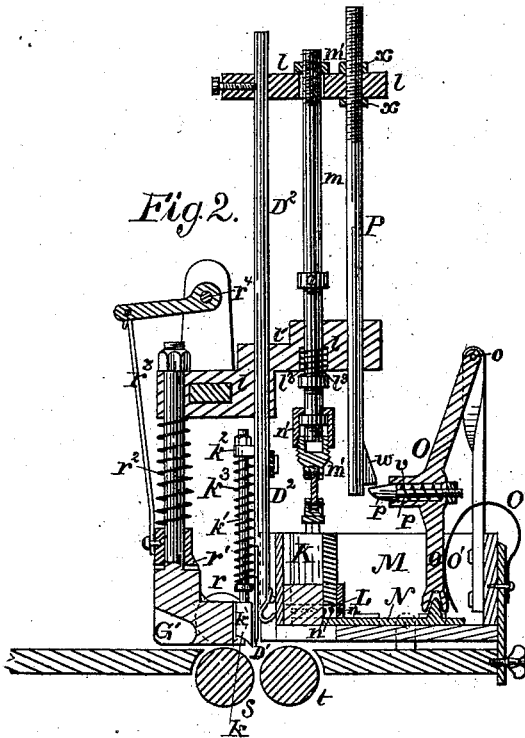
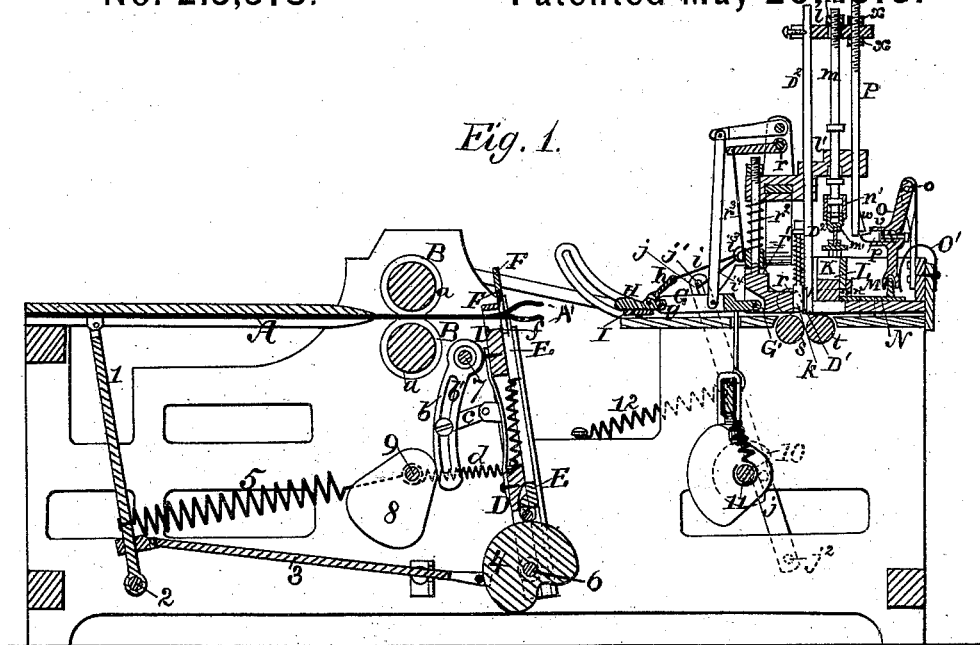


W. C. CROSS.
Paper-Bag Machine.

No. 215,578.

Patented May 20, 1879.



Witnesses:
George W. D. P. Fowl

Inventor:
 Wm C. Cross
 by *W. Daily*
 his Attorney.

W. C. CROSS.
Paper-Bag Machine.

No. 215,578.

Patented May 20, 1879.

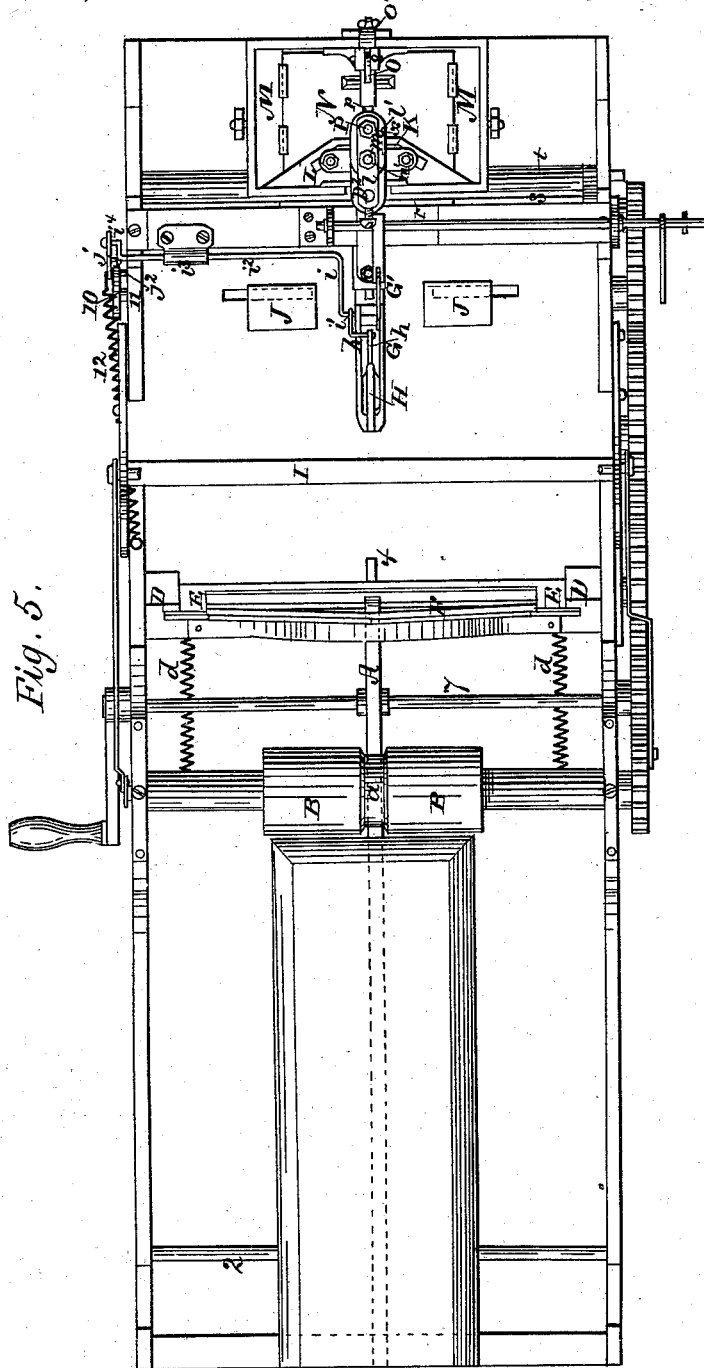


Fig. 5.

Witnesses:
M. Giorgio
D. P. Cowl

Inventor:
Wm. C. Cross
by *M. Bailey*
his Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM C. CROSS, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN PAPER-BAG MACHINES.

Specification forming part of Letters Patent No. **215,578**, dated May 20, 1879; application filed March 28, 1879.

To all whom it may concern:

Be it known that I, WILLIAM C. CROSS, of Boston, Massachusetts, have invented certain new and useful Improvements in Machinery for Making Paper Bags, of which the following is a specification.

My invention is directed to machinery for making what are known as "satchel-bottom bags," and relates more particularly to machinery which is organized and operates upon the general plan set forth in Margaret E. Knight's patent, No. 116,842, dated July 11, 1871.

The improvements I have devised relate to the feed, the knife or cutter, the follower, the "guide-finger," (so-called in said Letters Patent,) the delivery-rolls, and the pasting devices. These improvements will be described in the order in which they have been named. I shall confine my description as far as possible to those features which I consider to be of my invention, and will not deem it necessary to describe such features as are described in the Knight patent or are embodied in the Knight machine now in practical use.

In the accompanying drawings I have represented so much of a paper-bag machine as needed in order to illustrate my improvements.

Figure 1 is a longitudinal vertical central section of the machine. Fig. 2 is a like section, on an enlarged scale, of the pasting and delivery end of the machine. Fig. 3 is a perspective view of the paster, detached. Fig. 4 is a perspective view of the breaking rolls or rollers and supporting-frame, detached. Fig. 5 is a plan of the machine.

I. *The feed.*—In the Knight machine, the tube from which the bags are cut is made from a roll of paper supplied to the machine as fast as required, and folded around a former or trunk, with the lap on the upper side, the pasting by which the lapped parts are united being effected by suitable devices for that purpose. The tube is fed along by a power-driven roll below the trunk or former, which runs in contact with a loose roller in the trunk, the two nipping or grasping between them the under side of the paper tube. One face only of the tube is grasped, and the other is left free, in order that the follower may move freely back and forth inside the tube. It is my ob-

ject to permit the follower to move with entire freedom, but at the same time to grasp or pinch the whole tube—that is, both thicknesses above and below the trunk—between the feed-rolls, in order to carry forward the tube with less strain and with more certainty.

To effect this result, I place in advance of the trunk A feed-rolls B B, between which the tube from the trunk passes. The rolls B are provided with annular grooves or recesses *a*, forming a space through which the reciprocating follower A within the tube can play back and forth with entire freedom. This organization permits me to bring the lap in the tube on the under side of the trunk or former A. The arrangement shown is that which I prefer. It permits me to make the rolls of a length to take any width of bag, from the smallest to the largest, and avoids the necessity which exists in the old Knight machine of providing a different trunk, containing a different length of feed-roll, for each width of bag.

The arrangement may, however, be modified to a considerable extent—as, for instance, the follower, instead of being a central stem or rod, may be a frame, such as shown in the Knight patent, in which case spaces or recesses for passage of the frame-rods should be provided between the feed-rolls or their shafts. All that is necessary is that the feed-rolls should be arranged to grasp between them both thicknesses of the tube, while offering no obstruction to the free reciprocatory movement within the tube of the follower. The follower may obtain its movement in any suitable way—by means, for instance, of such a mechanism as provided in the Knight patent for that purpose. In the present case it is driven by a vibratory rod, 1, mounted on a shaft, 2, and united with the follower by a link-joint. The rod is vibrated by a jointed connecting-rod, 3, which at one end rests against the periphery of a rotary cam, 4, mounted on shaft 6, driven by suitable power. A spring, 5, holds the rod against the cam.


The feed-rolls themselves are driven by suitable mechanism, such as described in the Knight patent, which gives them the intermittent action requisite in the feed of bag-machines of this kind. It is not deemed necessary to describe any such mechanism or to show it in the drawings, it being well known

to those skilled in the art to which this invention pertains.

II. *The knife or cutter.*—This device is intended to sever from the tube the portion required to make one bag. It is my object to arrange it so that it will cut off longer or shorter portions, according to the length of bag desired, and so that in cutting short lengths it will not interfere with the reciprocatory device distinguished as the "plate-knife folder" in the Knight patent. To effect this result, I give the knife a compound movement—to wit, in addition to the rising and falling movement, by which it is caused to cut, I impart to it a back-and-forth movement also, so that it will move forward and make the cut, then recede, and rise again into its first position. Inasmuch as the knife makes its cut at a time when the plate knife folder has moved forward to do its work, it will be seen that it can move forward to or beyond the point occupied by the plate knife folder when retracted, make its cut, and recede in time to get out of the way of the plate-knife folder before the latter reaches its rearward position. I can thus cut off a very short portion of the tube, and yet prevent any interference between the knife and the plate knife folder.

I also combine with the knife means whereby its back-and-forth throw may be varied, in order to cut varying lengths of bags, as desired.

One convenient way of obtaining these results is indicated in the drawings. As there shown, the knife is carried by an upright vibratory frame, D, mounted loosely on the horizontal shaft 6. The frame is vibrated back and forth on shaft 6, as an axis, by means of a vibratory hanging arm, b, mounted loosely on shaft 7, and connected with the frame by a jointed link or connecting-rod, c. The arm b is operated by means of the cam 8, on power-driven shaft 9, against which cam the arm is held by the springs d, attached at one end to the frame and at the other end to the shaft 9. By means of the cam and the springs the frame D, when the cam revolves, is caused to vibrate back and forth.

Arranged to slide up and down in ways in the knife-carrying frame is the knife-stock E, which is operated by the same cam, 4, which actuates the follower, as hereinbefore described. Springs e, attached at one end to the frame D and at the other end to the knife-stock, hold the latter down upon and in contact with the cam 4. The knife or cutter proper, F, is of  shape, so as to make a shear-cut. It operates in conjunction with the edge f of the frame, which acts as the stationary blade. The follower A in moving forward passes between the knife above and the frame below; but it occupies a position back of the knife when the latter descends to make the cut.

In order to vary the throw of the knife-frame, I attach the link c adjustably to the arm b, providing it with a set-screw or pin,

which may be moved up and down in a slot, b', formed longitudinally of the arm. The nearer the joint is set to the axis of the vibratory arm b the less distance will the frame move forward, and consequently the longer will be the bag.

In lieu of this arrangement, other means may be employed for imparting to the knife the compound movement specified. For example, instead of being mounted in a vibratory frame, the knife may be set to run in inclined grooves, lowest at the front—that is to say, at the point where the knife makes the cut—and thence rising to the rear. In this way, in advancing toward the plate knife folder, it will at the same time descend to make the cut; and, on the other hand, in rising after making the cut, it will also recede.

The inclined guide-grooves may be formed in a head movable back and forth, thus securing also the adjustability required in order to cut bags of varying lengths.

I do not claim, broadly, the employment in a paper-bag machine of severing mechanism having back-and-forth and up-and-down motion; but I believe the combination of such a mechanism with the plate-knife folder, the two parts having their movement timed with relation to one another, as hereinbefore specified, to be new with me, and it is this which I design to here claim.

III. *The follower.*—In the use of the Knight machine it has been found, especially when the machine is working rapidly, that the front edges of the paper tube, as it is fed forward, are apt to butt up against the end of the guide-finger, thus preventing the latter from entering the tube as it should; and this happens notwithstanding the employment of a follower such as described in the Knight patent. To remedy this defect I form the front end of the follower with jaws, or in an equivalent manner, so that it shall compel the tube to open wide enough to pass around the finger without permitting the latter to meet the edges of the tube. One way of so forming the follower is shown in the drawings. It is represented as provided at its front end with jaws A', which are preferably of such length that when the follower is in its most advanced position they include or embrace between them the point or tip of the guide-finger G, directing the tube to pass, with great certainty, forward around the finger, and leaving, when they recede, the tip of the finger fairly within the tube. These jaws, which normally stand apart, I prefer to make yielding, so that they will readily close together whenever necessary. For this purpose they may be made of spring sheet metal, or may be jointed and held apart by a light spring; or only one of the jaws may be made yielding, to close against or open away from the other. The principal object of having them yielding in this way is the following: At the time the bag is cut off by the knife the follower-jaws occupy a position only a little in rear of the knife. Were they rigid they would

hold the tube apart, and so not only would prevent the knife from making a clean cut, but would cause the paper to break or tear when the knife descended. By making them yielding they, by the pressure of the paper, will close to allow the tube to be cut off clean and smooth. The moment the pressure is released they at once expand and spread apart the fresh end of the tube formed by the cut that has just been made.

IV. *The guide-finger.*—The principal feature of my invention, as regards this portion of the machine, consists in combining with the guide-finger a vibratory folder, which acts to turn back and down the upper thickness of the tube along a line or crease determined by the plate-knife folder, in order to make the first fold. In the Knight machine, when working rapidly, there is liability that the guide-finger, in pushing back or holding back the upper thickness of the tube, will punch a hole through the paper or tear it. To avoid this difficulty I use a vibratory folder whose joint or axis of vibration when the finger has properly entered the tube is within the tube, and which turns upward and backward the upper thickness of the tube, so as to fold it back down upon the body of the tube across a line determined by the plate-knife folder. The vibratory folder acts before any appreciable pushing action of the guide-finger has been exerted on the paper.

In the arrangement of devices for this purpose which I have shown in the drawings, the guide-finger is marked G. It is recessed or made hollow to receive the vibrating folder H, which is jointed to the finger at *g*, and when folded up, as shown in Fig. 5, is held to a considerable extent in the recess in said holder. The folder H is jointed to a bent connecting-rod, *h*, which, in turn, is jointed at *i*¹ to a crank-arm, *i*, extending from a rock-shaft, *i*², having a proper bearing, *i*³, in the machine-frame, and provided at its outer end with a crank-arm, *i*⁴, from which a wrist-pin extends into a slot, *j*¹, in a vibratory arm, *j*, having its pivot at *j*² on the frame of the machine, and provided with a laterally-projecting pin, which rests against the periphery of a cam, 10, on rotary power-driven shaft 11. The pin on arm *j* is held against the cam by a spring, 12. The arm for the major portion of the revolution of the cam is held in the position shown in Fig. 5, where its pin rests on the circular portion of the cam, and in this position the vibratory folder H is folded up in the recess in the guide-finger. When, however, the notched or depressed part of the cam comes opposite the pin on the arm, the spring 12 suddenly draws back the arm, and this movement rocks the shaft *i*² in a direction to cause the vibratory folder, through the intermediary of the connecting-rod *h*, to turn up and back and down until it occupies the extended position shown in Fig. 1.

If we suppose (as in practice is the case) the finger before this movement of the folder to

have entered the mouth of the tube the proper distance, and the plate knife folder I to have moved forward to the proper position to determine the cross crease or line for the first or diamond fold, it will be seen that the throwing back of the vibratory folder under these conditions will have the effect of turning over and back the upper thickness of the tube down upon the body of the tube, thus practically completing the fold or breaking or turning back the one flap of the diamond fold along the line determined by the plate knife folder. The further forward movement of the plate knife holder carries forward the severed tube or partly-finished bag under the finger, bringing the diamond fold in proper position to be taken by the side-folders J J, which resemble in structure, arrangement, and operation the like folders described in the Knight patent, and, therefore, require no particular description here.

In this way I avoid necessity of using the guide-finger to break or push back the top thickness in making the diamond fold, and so avoid danger arising from that source of punching or tearing the paper. The moment the vibratory folder has done its work it returns to its folded-up position, and remains quiet until the time comes for beginning the diamond fold on the next bag.

I here remark that while I prefer the arrangement just described, it is, however, not absolutely essential that the vibratory folder should be attached to the guide-finger. It may, for instance, be carried by an arm or stock attached to and projecting from a suitable point on the machine-frame, so as to be independent of the guide-finger. It should, however, under all conditions occupy a position substantially the same within the tube, whether attached to the guide-finger or arranged to one side or the other of said finger.

I also remark that the guide-finger is jointed to the part G', which supports it so that its free end may be lifted when the plate-knife folder makes the second fold, and is provided with suitable appliances for the purpose. These appliances are partly shown in the drawings; but as they form no part of my invention they do not require description here.

The plate-knife folder I is arranged and actuated in substantially the same way as described in the Knight patent. I have not deemed it necessary therefore to show or describe it with any particularity here. It will suffice to say that in moving forward it first acts, in conjunction with the guide-finger and the vibratory folder, to form the diamond fold, and then moves forward with the bag until the latter has gone far enough to have the front end of the diamond fold between the delivery-rolls, to be hereinafter described. By the feed and the delivery rolls the bag is further advanced far enough to bring the side angles of the diamond fold in proper position under the side-folders, J, which descend and clamp the bag at predetermined points. The

plate knife folder, which has staid behind far enough to clear the side-folders, now advances and makes the second fold, the guide-finger rising to permit the fold to be readily turned over, and then descending to hold the fold in place. The plate knife folder then recedes, and the bag is finished as will presently be described.

V. *The delivery-rolls.*—These rolls are similar in many respects to the like rolls shown in the Knight patent. They differ, however, from the latter in this, that one of the pair of rolls, preferably the upper roll, between which the front end of the diamond fold passes, is made bodily movable to and from the other, so that it shall rise to permit the said end to be inserted between it and its fellow roll, and then descend to clamp the end. In the Knight machine difficulty was experienced in entering this end of the tube or bag between the rolls. By my arrangement the difficulty is entirely removed.

The two rolls referred to are marked *r s*, the latter, which is the lower roll, is power-driven, and the upper roll, *r*, is held in contact with it by yielding pressure. This roll *r* is mounted in a frame, *r*¹, which encircles the support *G'*, sliding up and down on it as a guide-rod, and being capable of vertical movement only. A spring, *r*², interposed between the roller-frame and the head of the support *G'*, holds the roller-frame down and causes the roller *r* to bear with yielding pressure on the lower roller, *s*.

The roller-frame is attached by a connecting-rod, *r*³, to a crank-arm on a horizontal rocking shaft, *r*⁴, supported in suitable bearings in the machine-frame, and caused to rock back and forth by means of a vibrating arm acted on by a cam and connected to a crank on the outer end of the rock-shaft, the movement of the cam and arm being so timed as to lift the roller-frame when the front end of the diamond fold arrives at and is to be inserted between the delivery-rollers, and to maintain it so lifted for the time needed to secure the proper insertion between said rolls of the said end of the diamond fold. Inasmuch, however, as these instrumentalities—viz., the vibrating arm and the cam—are well known I have not deemed it necessary to show them in the drawings.

Adjoining the roll *s* is another roll, *t*. The two rolls *s t* are in the same horizontal plane, and constitute the pair of rolls in conjunction with which the vertically-reciprocating knife *D*¹ acts to form the last fold, in the manner substantially as described in the Knight patent. I combine with these parts a vertically-movable guide, *k*, with an under face, which is curved or formed, substantially as shown, to direct the folded bottom down into and between final rolls *s t*.

In the Knight machine, as heretofore made, the second fold, when the nearly-completed bag is being fed forward preparatory to having the final fold tucked down between the

rolls *s t*, is apt not to lie smoothly and closely in place while the bag is entering between the final rolls, thus preventing the final fold from being pasted over it smoothly and securely. It is to this end that I provide the guide *k*, which answers fully to direct and hold down the second fold. Inasmuch, however, as the front end of the diamond, which makes the last fold, must pass beyond the guide to the pasting devices, I make the guide vertically movable, so that it shall rise to permit this part of the bag to pass horizontally beyond it without obstruction, and shall then descend in time to guide the second fold properly.

I have found it convenient for this purpose to mount the guide on the vertically-reciprocating knife-stock *D*². Its stem *k*¹ is supported in a bearing, *k*², fixed to said head, in which it is vertically adjustable by means of a nut, so as to regulate its working length. A spiral spring, *k*³, encircling the stem, and held between the bearing *k*² above and a collar on the stem below, serves to make the guide vertically yielding, so that the knife may descend independently of it as low as required.

VI. *The pasting devices.*—These devices are arranged in proximity to the folding-knife *D*¹, in such position that the paster proper will come directly over the front or forward end of the diamond fold when the bag has been brought far enough to be at the proper point to allow the descending folding-knife *D*¹ to make the last fold; and they all mediate or immediately derive their movement from the vertically-reciprocating knife *D*¹, as will presently be explained.

The knife *D*¹ itself is actuated in substantially the same manner and by substantially the same means as in the Knight patent, and it is therefore not necessary to here show its actuating mechanism.

The paster *K* is supported and is movable vertically in an upper bearing, *l*, attached to and projecting laterally from the knife-stock *D*², and in a lower bearing, *l*¹, forming part of the supporting-head, through which the knife-stock passes.

A nut, *m*¹, is screwed on the end of the paster-stem *m*, projecting above the upper bearing, *l*, and it forms a head by which the paster is lifted when the knife-stock rises.

The paster is of the shape shown in perspective in Fig. 3, and works in a box, *L*, provided with a correspondingly-shaped opening, which box is within the paste-trough *M*. The box *L* communicates at its lower part with the trough by means of openings *n* in its sides, and it is provided with a sliding bottom, *N*, which can be drawn back to permit the paster to descend upon the flap or fold to which paste is to be applied.

The sliding bottom *N* is actuated through the instrumentality of a vibratory hanging rod, *O*, pivoted or hinged at *o*, and provided with a forked lower end, which straddles a projection on the slide *N*. About midway in the hanging rod *O* is formed a horizontal, or

nearly horizontal, socket, containing a pin, *p*, which is pressed outwardly by a spring, *v*, its projecting end normally lying in the path of a projection or wiper, *w*, on a vertically-reciprocating rod, *P*, fast to the upper bearing-piece, *l*, and passing through the lower bearing, *l'*, the rod being vertically adjustable in the piece *l* by means of the upper and lower nuts *x*. The projecting end of the pin *p*, and also the under face of the wiper *w*, are beveled but slightly, in order that when the rod descends the wiper *w* will not press back the pin in its socket, but will force back the entire rod *O*, thus retracting the sliding bottom. A stiff spring, *O'*, tends to press the rod *O*, and consequently the bottom *N*, in a direction opposite to that in which they are moved by the descending rod *P*. When the wiper-rod *P* rises the sliding bottom, by the action of the spring *O'*, is returned to its first position.

In order to permit the opening of the bottom to take place without interference on the part of the paster, I make the paster-stem *m* in two parts, united by a coupling-sleeve, *n'*, screwing on the one part—in this instance the lower part, *m'*—and provided at the other end with an internally-projecting annular lip or flange, to engage or catch over a collar, *m''*, on the upper part of the stem. The two parts of the stem are not put closely together, but their contiguous ends are some distance apart, as shown.

Under this arrangement it will be noted that when the knife *D*¹ and its appurtenances descend, the upper part of the paster-stem will descend some distance, sliding down in the sleeve *n'*, which encircles it, before it meets the lower part, *m'*. During this time the wiper-rod *P* has forced back the sliding bottom and opened the way for the paster, which now feels the action of the upper part of the stem, and descends through the box upon the bag. The lower stem-section, *m'*, is preferably united with the paster by a link-joint, as shown. The descent of the paster is simply, by reason of its own weight, aided by the action of a spring, *B*, interposed between the lower bearing, *l'*, and a collar on stem *m*, as shown. It is, however, lifted positively by the head *l*.

The quantity of paste delivered may be regulated by turning the coupling-sleeve in one direction or the other, or by means which will readily suggest themselves.

The operation of the devices is as follows: While the second fold is being formed the front end of the diamond fold is held tightly between the delivery-rolls *r s*, the latter of which is power-driven and in continuous revolution. The tendency of these rolls to carry forward the bag is, however, counteracted by the side-folders, which hold the bag in place while the plate knife folder is making the second fold. When, however, this fold is completed and the side-folders withdrawn, the delivery-rolls carry forward the bag until it reaches the proper point under the folding-knife and paster, at which time the latter de-

scend, the paster delivering paste on that part of the diamond fold intended for the last fold, and the knife simultaneously tucking the said part down between the final rolls *s t*. With the knife descends the guide, which holds down the second fold in a position where it will be overlapped by the last fold. The bag thus passes through the final rolls with the satchel-bottom completed.

To prevent paste wiping off from the last fold onto the knife *D*¹, I provide one or more guards, *D*³, as shown, which effectually act to prevent paste from reaching the knife.

Having described my improvements, what I claim, and desire to secure by Letters Patent, is as follows:

1. The combination of the severing knife or cutter and the independent mechanisms for imparting to it rising-and-falling and back-and-forth motion with the reciprocatory plate-knife folder, substantially as set forth.

2. The combination, with the guide-finger, of a reciprocatory follower provided at its front end with jaws arranged and operating to direct the paper tube to pass around the guide-finger, substantially as set forth.

3. The combination, with the rising-and-falling severing knife or cutter, of the reciprocatory follower provided with yielding jaws, and arranged to move back and forth in the interval between the knife and its head or stationary blade, in conjunction with which it acts, substantially as set forth.

4. The combination, with the guide-finger, of a vibratory folder arranged and operating to break down the upper ply of the tube as it is fed forward under the guide-finger, substantially as and for the purposes set forth.

5. The combination, with the guide-finger and the plate knife folder, operating together to make the first or diamond fold, as described, of the vibratory folder, substantially as set forth.

6. The vibratory folder carried by the guide-finger, and arranged and operated to enter the tube with the guide-finger and to turn back, and thus break down, the upper ply of said tube, substantially as and for the purposes set forth.

7. The delivery-rolls arranged and operating to open or separate to permit the end of the diamond fold to pass between them, substantially in the manner and for the purposes set forth.

8. The combination, with the mechanism for forming the final fold, of the guide arranged and operating to keep down the second fold and to present it in proper position to pass into the final rolls, substantially as set forth.

9. The combination, substantially as set forth, of the vertically-reciprocating folding-knife and the second-fold guide, carried by and moving with said knife and united therewith, substantially in the manner described.

10. The combination, with the paste trough or reservoir and the vertically-reciprocating paster, of the box in which said paster moves,

arranged to communicate with the reservoir, and the sliding-box bottom or gate, intermittently withdrawn to permit the paster to descend, substantially as set forth.

11. The paster-stem formed in two parts, connected substantially in the manner described, to permit the upper part to partly descend without actuating the paster, substantially as set forth.

12. The paster and its two-part stem, in combination with the coupling-sleeve, adjustable substantially as and for the purposes set forth.

13. The combination, substantially as set forth, of the paster, the wiper-rod, the sliding

bottom, its hinged actuating-rod operated by the wiper-rod, and the spring for returning the sliding bottom to its first position.

14. In combination with the folding-knife, the guard for keeping the paste-covered part of the fold from contact with the knife, substantially as set forth.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

W. C. CROSS.

Witnesses:

J. W. HAMILTON JOHNSON,
M. GEORGH.