2 Sheets—Sheet 1.

W. C. CROSS.

Paper-Bag Machine.

No. 221,035. Patented Oct. 28, 1879.

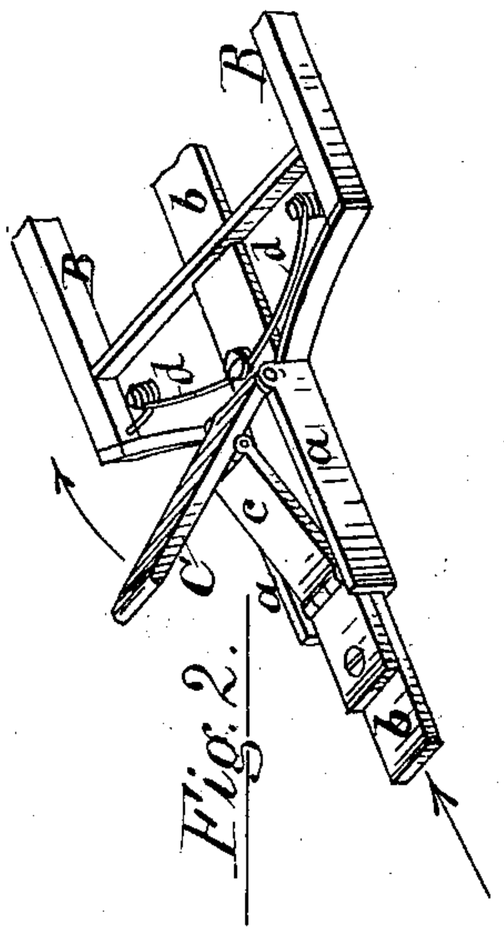

Fig. 2.

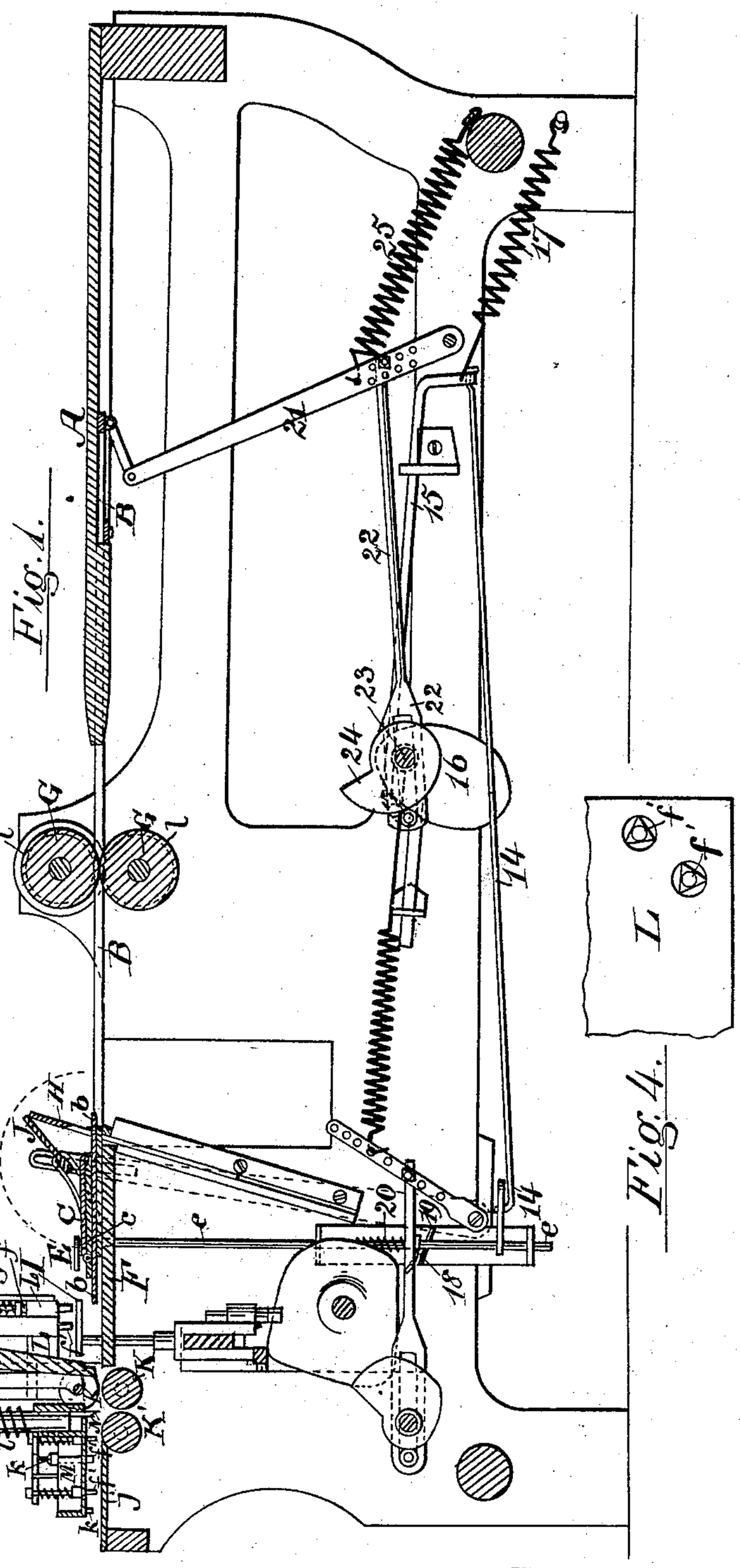

Fig. 1.

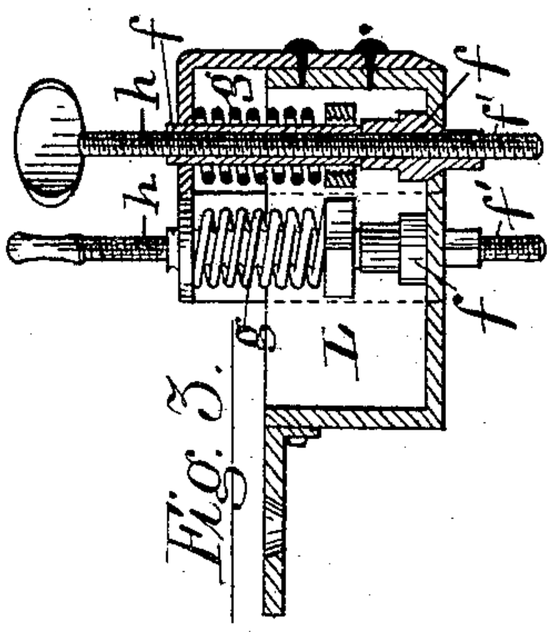

Fig. 3.

Fig. 4.

Witnesses:

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Inventor:

William C. Cross,

by M. Bailey

his Attorney.

2 Sheets—Sheet 2.

W. C. CROSS.

Paper-Bag Machine.

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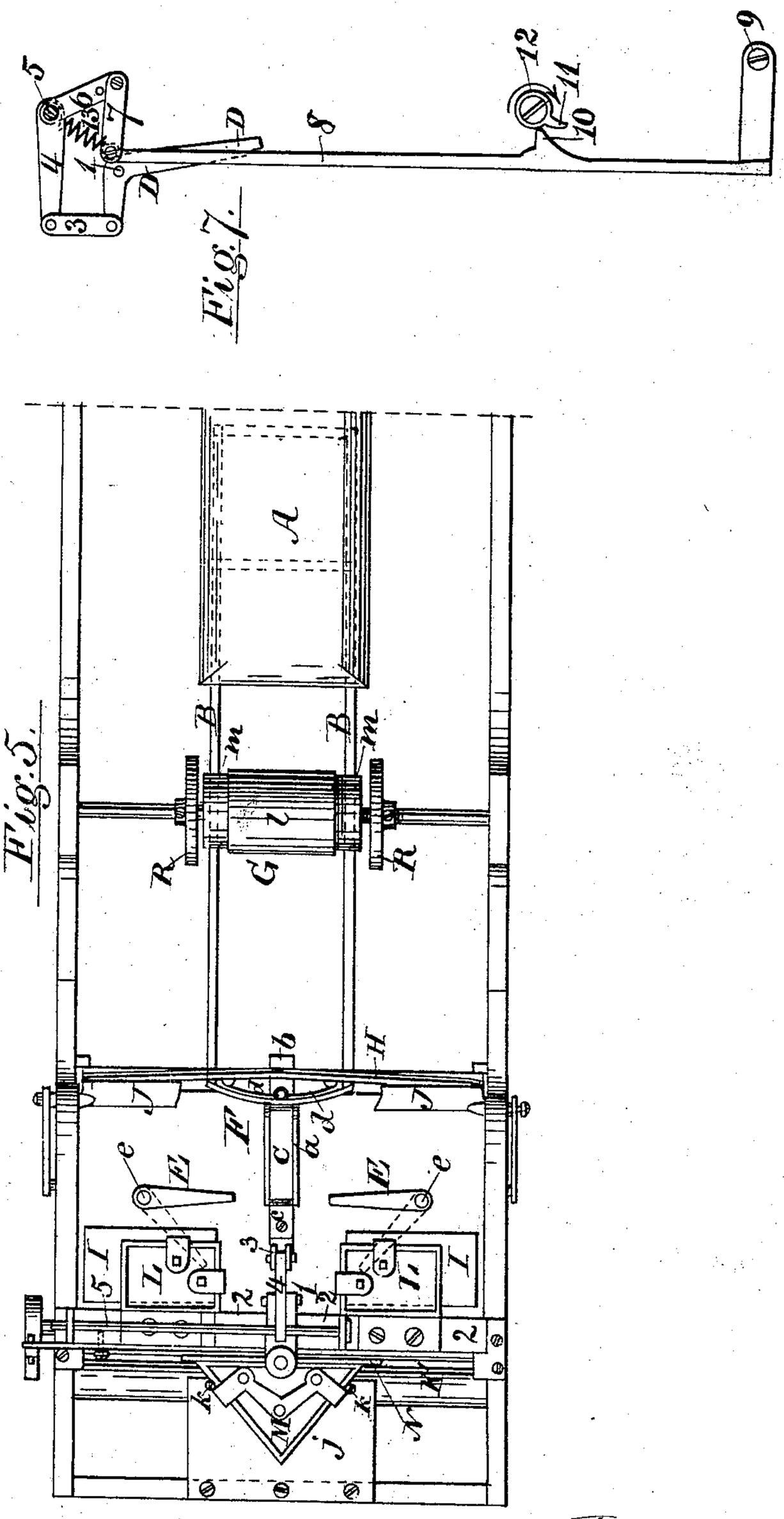

Fig. 7.

Fig. 6.

Fig. 5.

Witnesses:

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D. P. Lowe

Inventor:

William C. Cross,
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UNITED STATES PATENT OFFICE.

WILLIAM C. CROSS, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN PAPER-BAG MACHINES.

Specification forming part of Letters Patent No. **221,035**, dated October 28, 1879; application filed July 3, 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 Machines for Making Paper Bags, of which the following is a specification.

My invention has reference to machines for making what are known as "satchel-bottom bags," and is related in a number of particulars to machines of the kind shown and described in my Letters Patent dated May 20, 1879, No. 215,578, as well as in Margaret E. Knight's patent, No. 116,842, of July 11, 1871.

My improvements enable me to dispense with the "guide-finger," so called in said Letters Patent, or with any equivalent device to enter the mouth of the tube, and to act in conjunction with the plate-knife folder to push back the upper ply of the tube and make the first or diamond fold.

Under my present invention the tube does not move, but is at rest during the time the first or diamond fold is forming, and said fold is formed by means of a vibratory folder on the front end of the follower or trunk, as the case may be, which is within the tube and acts to raise, turn backward, and break down the upper ply over auxiliary devices external to the tube, which I term "first-fold guides," and which act to hold down the body of the tube and to determine the line of fold, and which, preferably, have also the further office of carrying forward the bag after the first fold is made to a position where it will be properly acted on by the second-fold-forming devices.

I still use the "side-folders" and the "plate-knife folder," so called in said Letters Patent; but these devices act only to form the second fold, neither of them taking any part in the formation of the first or diamond fold. In said patented machines the mode of operation of these devices in making the second fold is such that the plate-knife folder, after making the second fold, begins to recede before the side-folders quit the bag. Inasmuch as the plate-knife in making the fold passes over the side-folders and presses hard on the paper, it has been found in practice that when it withdraws it is apt to draw back and ruck up the second fold. I have removed this difficulty by withdrawing laterally the side folders from the bag before the plate-knife folder recedes. This relieves the pressure and permits the plate-knife folder to move back without drawing appreciably on the fold.

I have also devised what I deem to be an improved arrangement of the feed mechanism, and have also modified and improved the pasting devices.

My invention, however, can best be explained and understood by reference to the accompanying drawings, in which I have represented so much of a paper-bag machine as is needed in order to illustrate my improvements.

In the drawings, Figure 1 is a vertical longitudinal central section of my improved paper-bag machine. Fig. 2 is a perspective view of the vibratory folder with a portion of the follower to which it is attached. Fig. 3 is a vertical section of one of the paste-troughs, the plane of section passing through the center of one of the valves. Fig. 4 is an under-side view of a part of one of the paste-troughs. Fig. 5 is a plan of the paper-bag machine. Fig. 6 is a front elevation of the feed-rolls; and Fig. 7 is a side elevation of the arm which actuates the vibratory folder with its accessories, hereinafter to be explained.

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 embodied in the hereinbefore-referred-to patented machines.

The paper from which the bags are formed is supplied from a roll of paper to the machine, and folded around the trunk or former A with the pasted lap on the under side. I have not deemed it necessary to show the paper-supply or the pasting devices for pasting the lap, these being of any ordinary or suitable construction.

In suitable longitudinal guides in the trunk is the metallic reciprocatory follower B, having the form of an oblong frame, as shown. The vibratory folder hereinbefore referred to is in this instance secured to the front of the follower. The arrangement of this device, as shown in the drawings, which is one of the many arrangements that may be used for the

purpose, is as follows: The front end of the follower terminates in or is provided with a central longitudinally-channeled extension, *a*, on which is hinged the vibratory folder C. Extending beneath the folder and in the channeled extension *a* is a slide, *b*, capable of moving longitudinally in the part *a*, and connected with the vibratory folder by a link, *c*, jointed at one end to the slide and at the other end to the folder. If the slide be moved back it will cause the vibratory folder to turn upward and backward on its hinge. If the slide be moved in the opposite direction it will cause a correspondingly reverse movement of the vibratory folder, the latter having a range of movement of about half a circle, as indicated.

To actuate the slide I cause its beak or nose to project in advance of the extension *a*, and I act upon this beak by means of a vibrating arm, D, which intermittently, and at proper intervals, pushes back the slide, and consequently turns back the vibratory folder, which thus is moved positively in the direction in which it must move in order to turn back and break down the upper ply of the paper tube.

The reverse movement of the vibratory folder is caused by one or more springs, *d*, connected with the slide and the follower, and acting by their recoil to return the slide and consequently the vibratory folder to their first position so soon as the pressure of the arm D is removed.

In conjunction with the vibratory folder I employ first-fold guides E, one on each side of the tube or bag, the same being mounted in the frame of the machine and arranged upon the table F, on which the bag rests while the first and second folds are made. These guides have an up-and-down movement, so that they may alternately and at proper times clamp and release the tube. They are so placed that when the follower has moved forward the proper distance to permit the front fold to be made they and the hinge or axis of the vibratory folder will lie in about the same line transverse to the length of the tube.

When the parts are thus positioned, and the vibratory folder is caused to turn up and back, it will be seen that the upper ply of the tube will be broken down and folded back upon a line determined by the front edges of the first-fold guides.

The movement of the parts just described is as follows, supposing the follower to be retracted and the feed for a fresh bag about to take place: By the feed mechanism the tube is fed forward the proper distance, the follower and its vibratory folder moving forward also to the proper extent to bring the beak of the slide in position to be acted upon by the vibratory arm D. The folder and follower are within the tube, but the nose or beak of the slide projects beyond the mouth of the tube sufficient distance to permit the vibratory arm D to act without coming in contact with or entering the tube.

The moment the feed is finished the first-fold guides, which before were raised, now descend and clamp the tube, and simultaneously the actuating-arm D advances, pushing back the slide and throwing back quickly the vibratory folder, which turns up, breaks down, and folds back upon the body of the tube the front end of the upper ply along a line determined by the first-fold guides, thus forming the first or diamond fold. The moment this is done the vibrating arm D returns to its normal position, and the recoil-springs, acting through the slide on the vibratory folder, force the latter back to its original position. The follower then advances just a little to prevent the hinge of the folder from catching the folded edge of the upper ply, and then instantly is retracted through the tube to its first position. The tube is now fed forward to a position to be acted on by second-fold-forming devices. The feed for this purpose may be accomplished in various ways.

In the arrangement shown in the drawings I make use of the first-fold guides for the purpose. To this end these guides, which lie between the body of the tube and that flap of the diamond fold which is folded back on the body of the tube, have a movement of reciprocation longitudinally of the machine. One convenient way of giving them this movement is to mount each at its outer end upon an upright stem or spindle, *e*, to which at proper intervals a movement of partial rotation is imparted. This will cause the guides to vibrate, and, in so doing, to move forward the tube. Each spindle also has a rising-and-falling motion to raise the guide from and lower it upon the table at the proper times.

The action of the guides after the first or diamond fold is formed is as follows: As soon as the follower recedes the spindles *e* have a movement of partial rotation to cause the guides to vibrate in the proper direction and to the proper extent to move the tube forward to a position to be acted on by the second-fold devices. They may be assisted in this movement by the feed-rolls G in case the cutter H does not act to sever the blank from the tube before the same is moved up to the second-fold-forming devices.

The cutter H may, however, be so placed and timed in its movement as to sever the blank from the tube after the follower recedes and before the first-fold guides advance, and in that case the latter devices will alone act to carry forward the blank to proper position. As soon as the blank is advanced to proper place under the side-folders I, the latter, which have been raised to allow the blank to pass, now descend and clamp it.

Before passing to the second-fold-forming device I will indicate briefly the devices by which the arm D, the first-fold guides, and the follower are, respectively, operated. The arm D, in this instance, is the longer vertical arm of an elbow-lever pivoted at 1 to the overhanging part 2 of the machine-frame, and having its shorter arm connected by a jointed link,

3, to a radial arm, 4, on rock-shaft 5. The rock-shaft is connected by a radial arm, 6, and jointed link 7 to a vibratory driving-arm, 8, pivoted at 9 to the machine-frame and provided with a projection, 10, which is acted on by a tappet, 11, on rotary shaft 12. A spring, 13, acts to move the arm 8 in a direction contrary to that in which it is forced by the tappet.

Each first-fold guide-spindle *e* is mounted to have vertical play in its bearings, and has on its lower end a radial horizontal arm connected by a rod, 14, to a slide-bar, 15, provided with a friction-roller or stud that is drawn or pressed against the face of a rotary cam, 16, by a spring, 17. The cam acts to give horizontal vibratory movement to the guides. The rising-and-falling motion is obtained by a cam, 18, on the spindle, which, when the spindle turns in a direction to move the guide rearwardly, lifts the spindle by passing above and in contact with an inclined bridge-piece, 19, projecting from the frame. The cam moves far enough to clear the bridge, and then drops below it by reason of the recoil-spring 20, which acts in a contrary direction to the cam. Thus when the spindle moves in a direction to carry the fingers forward the cam will pass below the bridge-piece and be out of action, and the guides will consequently bear with yielding pressure on the tube.

The follower is actuated through the instrumentality of the rocking lever 21, connected to the follower by a link and jointed to the rod 22, which is slotted to encompass the cam-shaft 23, and is provided with a friction-roller or stud, which is kept tight against the periphery of the rotating actuating-cam 24 by a spring, 25.

I also remark that the rising-and-falling and longitudinal to-and-fro movement of the first-fold guides can be effected in various ways and by the employment of various mechanical devices. In illustration of my invention I have represented them as arranged to vibrate horizontally; but it is manifest that they may move in a right line as well.

I wish further to remark that as regards the vibratory holder, it is not essential that it should be carried by a reciprocating follower. The follower may, for instance, be stationary, in which event said follower would virtually form part of or be a prolongation of the trunk or tube-forming device. So, too, in lieu of a vibratory actuating-arm, D, other actuating instrumentalities can be employed, and these instrumentalities, if desired, may be carried by the trunk, and be actuated from the rear of said trunk to pull back the slide.

Second-fold-forming devices.—These devices consist of the side-folders I and the plate-knife folder J, and they, so far as their general structure is concerned, are similar to like-named devices found in the hereinbefore-recited Letters Patent. The main difference between the patented devices and those herein shown is in the timing of their respective movements. In the patented machine, after the side-folders descend on the diamond fold, the plate-knife folder moves forward and turns the flap of the diamond fold over upon the side-folders, thus making the second fold. It then retires, and only then, after the retiring of the plate-knife folder, do the side-folders separate or move apart laterally, so as to quit the blank. The disadvantage of this mode of operation has been before stated, and need not be repeated.

In my present machine the movement of the parts in making the second fold, and until that fold is completed, is the same as in the patented machines; but here the similarity ceases. The plate-knife folder, instead of receding, remains at rest, and it is the side-folders which move. The latter retire laterally far enough to quit the blank, the plate-knife folder remaining at rest over the second fold which it has made, and the front end of the diamond-fold being between the delivery-rolls K, which are in constant revolution. As soon as the side-folders clear the blank, the latter by the delivery-rolls is drawn forward, and then the plate-knife folder returns to its original position, pressing in its passage but slightly and not to any injurious extent upon the second fold. In this way I am enabled to avoid danger of drawing back or displacing the second fold. The plate-knife folder here performs the same work in holding down the second fold as does the guide-finger in the Knight machine.

I do not deem it necessary to here describe the mechanisms for imparting motion to the side-folders and plate-knife folder. These mechanisms may resemble those shown in the aforesaid patented machines, save that in the case of the plate-knife-folder-actuating mechanism the same should be organized and arranged to give said folder for each bag only one movement of reciprocation, inasmuch as it here takes no part in the formation of the first or diamond fold.

Pasting devices.—I avail myself of the up-and-down movement of the side-folders I in order to obtain and apply the paste required to paste down the second fold. In suitable position over each side-folder is a paste-box, L, secured adjustably to the overhanging part 2 of the frame, so that it may be adjusted vertically to different heights above its side-folder. In the paste-box I place one or more conical valves, *f*, whose stems are mounted in bearings, in which they may move vertically, and are pressed downward by springs *g*. The valves close openings in the bottom of the paste-box, and they have on their lower ends studs or pins *f'*, which project through the openings and below the bottom of the box. When the side-folder rises it comes in contact with the studs *f'*, and so presses upwardly and opens the valves, permitting paste to pass through from the box upon the top of the side-folder. This paste is taken up by the second fold, which is subsequently folded over upon the side-folder, and thus I readily deliver to the bag the paste required for the second fold.

The vertical adjustability of the paste-box is with a view to regulate the supply of paste, and in order to regulate the separate delivery of each valve I make each pin or stud *f'* adjustable by connecting it to, or forming it on, a screw-stem, *h*, adapted to screw down through the valve-stem *f*, made hollow or tubular for the purpose. Either adjustment may, if desired, be used independently of the other, the effect in each case being that the position of the wiper-studs can be varied with respect to the side-folders.

I here remark that I make use of the same instrumentalities in the paste trough or box M for delivering the paste needed for the final fold. This box is carried by and attached to the vertically-reciprocating folding-knife N by a connection which will allow it to yield vertically, and is downwardly pressed by a spring, *i*. In its descent its wiper-studs *f'* come in contact with and are upwardly pressed by that flap of the diamond fold which forms the final fold, and which rests on the fixed plate or table *j*. Paste is thus delivered for the final fold, and simultaneously the folding-knife N, which, by reason of the yielding connection between it and the paste-box, can descend lower than the latter, tucks the blank down between the final rolls K K'.

The paste-box M is provided on each side with an adjusting-screw, *k*, which can be screwed up or down to regulate its contact with plate *j*, and consequently the amount of paste delivered.

The delivery-rolls and final rolls operate substantially as described in the Knight patent, and require no further description, save that of the two delivery-rolls the lower is driven positively, and the upper bears on the lower with yielding pressure, and is moved by frictional contact therewith. The final rolls mesh together and revolve together positively.

The folding-knife N is also actuated and operates in substantially the same way as described in the hereinbefore-mentioned Letters Patent, and requires no further description.

Feed mechanism.—The feed-rolls are shown at G G between the trunk and the cutter. They are geared together and move intermittently and at proper intervals, as described in the patents hereinbefore referred to. It is not necessary, therefore, to describe their actuating mechanism or to represent the same in the drawings.

My improvement in this direction relates to the construction of the rolls themselves and to their combination with the follower and trunk.

It is of importance to take hold of both plies of the tube in order to feed evenly and avoid dragging on one ply more than on the other. It is, however, equally important that the longitudinal edges of the tube shall not be broken down and excessively creased, as they would be were they squeezed forcibly between rolls, for this makes it difficult to properly form the folds for the satchel-bottom, and renders the paper at the junction of the bottom and the crease edges liable to crack and break when the folds are being formed.

In order to grasp both plies of the tube I place the feed-rolls in advance of the trunk, as in my patented machine hereinbefore referred to. To prevent, however, the undue creasing and breaking down of the edges of the tube, I form the rolls so that they will grasp the paper only at a point intermediate between its edges, making their acting surfaces *l* of a width less than the trunk or former, as shown, and cutting them away or reducing them at their ends, as indicated at *m*. Through the spaces between the reduced portions of the rolls pass the side bars of the oblong follower-frame. In this way I avoid exercising pressure on the tube at or near its edges, which edges are thus left comparatively rounded, so that the blank which is acted on by the folding devices has side edges which are not broken down, but in condition to permit the folds to be formed with ease and certainty, and without that liability to break at the junction of the bottom and sides which now exists.

I have found that under this arrangement there is at times a tendency in the plies of that part of the tube which has passed through and beyond the feed-rolls to bend or corrugate longitudinally, which has the effect of causing the first or diamond fold at the bend in the upper ply to crease and wrinkle and be uneven. This tendency, I find, can be effectually neutralized by providing pressers which bear slightly down upon the outer edges of the tube. The pressers in this instance are disks R, mounted on the shaft of the upper feed-roll, P, one at each end of said roll, these disks being of a diameter slightly greater than that of the acting part *l* of the feed-roll, in order that they may bear down slightly upon the upper ply at or near the sides of the paper tube. The disks are made adjustable longitudinally of the feed-roll shaft, so that they may be set nearer together or farther apart, according to the width of the tube to be acted on.

In lieu of mounting the pressers on the feed-roll shaft, they may be attached to any other suitable part of the machine. For instance, they may be stationary arms adjustably connected to the machine-frame, and so positioned as to extend above and bear with slight pressure on the upper ply, near the sides of the tube. It is only necessary to thus act on the upper ply, for it is this ply that alone is folded back upon itself in making the first or diamond fold.

The under feed-roll is provided at about its center with a shallow annular groove or recess, *n*, for the passage of the pasted lap of the tube.

I remark, in conclusion, that I do not broadly claim applying paste to the bag or blank through the intermediary of the side-folders. This has, in the practical use of the Knight patented machine hereinbefore referred to,

been done prior to my invention, but by instrumentalities and in a way substantially different from mine.

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

1. The combination, substantially as hereinbefore set forth, of the follower around which the formed paper tube passes, the vibratory folder carried by said follower, and actuating mechanism, substantially as described, whereby said folder is caused to lift up, break down, and turn back one ply down upon the body of the tube to form the diamond fold, and then return to its original position.

2. The combination, substantially as hereinbefore set forth, of the follower, the vibratory folder carried by said follower, and the first-fold guides, these members operating together to form the first or diamond fold while the blank is at rest, substantially as specified.

3. The combination, substantially as hereinbefore set forth, of the reciprocating follower, the vibratory folder carried by the same, and actuating mechanism, substantially as described, whereby said folder is caused to lift, break down, and turn back one ply of the paper tube down upon the body of said tube to form the diamond fold, substantially as specified.

4. The combination, substantially as hereinbefore set forth, of the first-fold guides, the reciprocating follower, the vibratory folder carried by the same, and mechanism for actuating said folder, substantially as set forth.

5. The vibratory folder and reciprocating follower by which the same is carried, in combination with the vibrating arm and intermediate mechanism, substantially as described, whereby said arm is caused to actuate the folder.

6. The first-fold guides, constructed, arranged, and operated, substantially as described, to move up and down and longitudinally back and forth, substantially as set forth, whereby they act to clamp the blank while the first fold is forming, and subsequently to feed said blank forward in position to be operated on by the second-fold-forming devices.

7. The combination, substantially as hereinbefore set forth, with the side-folders, of the first-fold guides, which first clamp the blank while the diamond fold is forming, and subsequently feed said blank forward to the side-folders.

8. The combination, substantially as hereinbefore set forth, of the plate-knife folder, the side-folders, and the first-fold guides, which clamp the blank while the first fold is forming, and subsequently feed said blank forward to the side-folders.

9. The combination, substantially as hereinbefore set forth, of the vibratory folder and its supporting-follower, the first-fold guides, the side-folders, and the plate-knife folder.

10. The combination, substantially as hereinbefore set forth, of the side-folders and the plate-knife folder; but this I claim only when said members are actuated to move with relation to one another, as herein specified.

11. The combination, with the paste trough or receptacle, of one or more valves held to their seats by yielding pressure, and provided with wiper-studs which project below the bottom of the said receptacle, substantially as and for the purposes set forth.

12. The combination, with the side-folders, of paste-troughs, arranged over said folders, and valves in said troughs, held to their seats by yielding pressure, and provided with projecting wiper-studs adapted to be acted on by the side-folders to cause the lifting of the valves, substantially as set forth.

13. The paste-trough and valves and wiper-studs for the same, carried by and united by a yielding connection with the final-fold knife, these parts being combined for joint operation substantially as set forth.

14. The longitudinally-adjustable wiper-stud, in combination with the paste-delivery valve and its tubular stem, substantially as set forth.

15. The combination of the tube-forming device, the feed-rolls having acting surfaces of a width less than said device, and pressers to bear upon the unpinched edges of the tube as it is fed along by said rolls.

16. The combination, substantially as hereinbefore set forth, of the trunk or tube-forming device, the reciprocatory follower, the feed-rolls having acting surfaces of a width less than that of said trunk and the pressers.

In testimony whereof I have hereunto set my hand this 18th day of June, A. D. 1879.

WILLIAM C. CROSS.

Witnesses:
JAMES T. POWELL,
M. BAILEY.