

(No Model.)

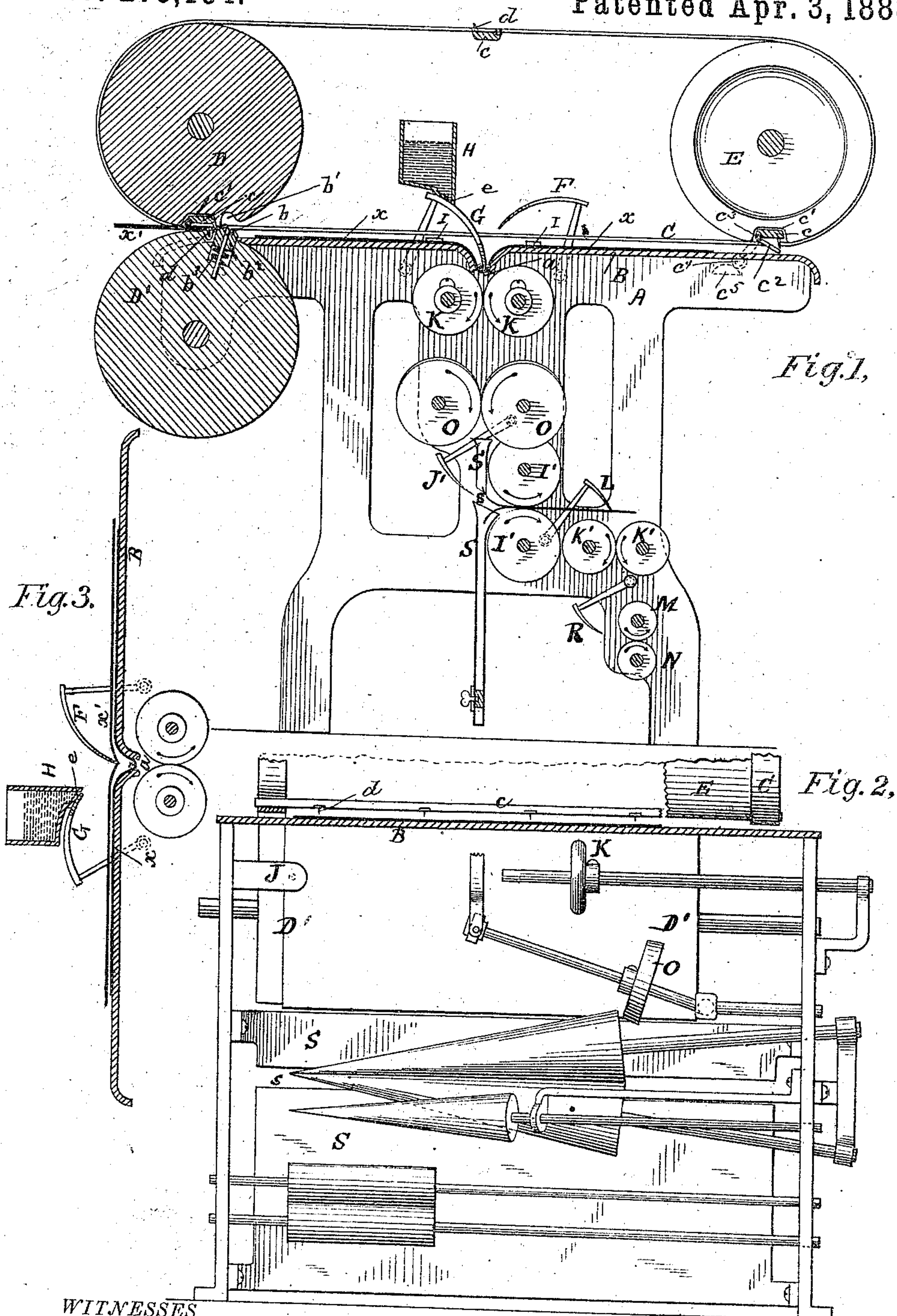
W. C. CROSS.

3 Sheets—Sheet 1.

MACHINERY FOR FOLDING PAPER, &c.

No. 275,154.

Patented Apr. 3, 1883.



WITNESSES

Wm A. Shirkle
Ernest Abshagen

By his Attorney

INVENTOR

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(No Model.)

3 Sheets—Sheet 2.

W. C. CROSS.

MACHINERY FOR FOLDING PAPER, &c.

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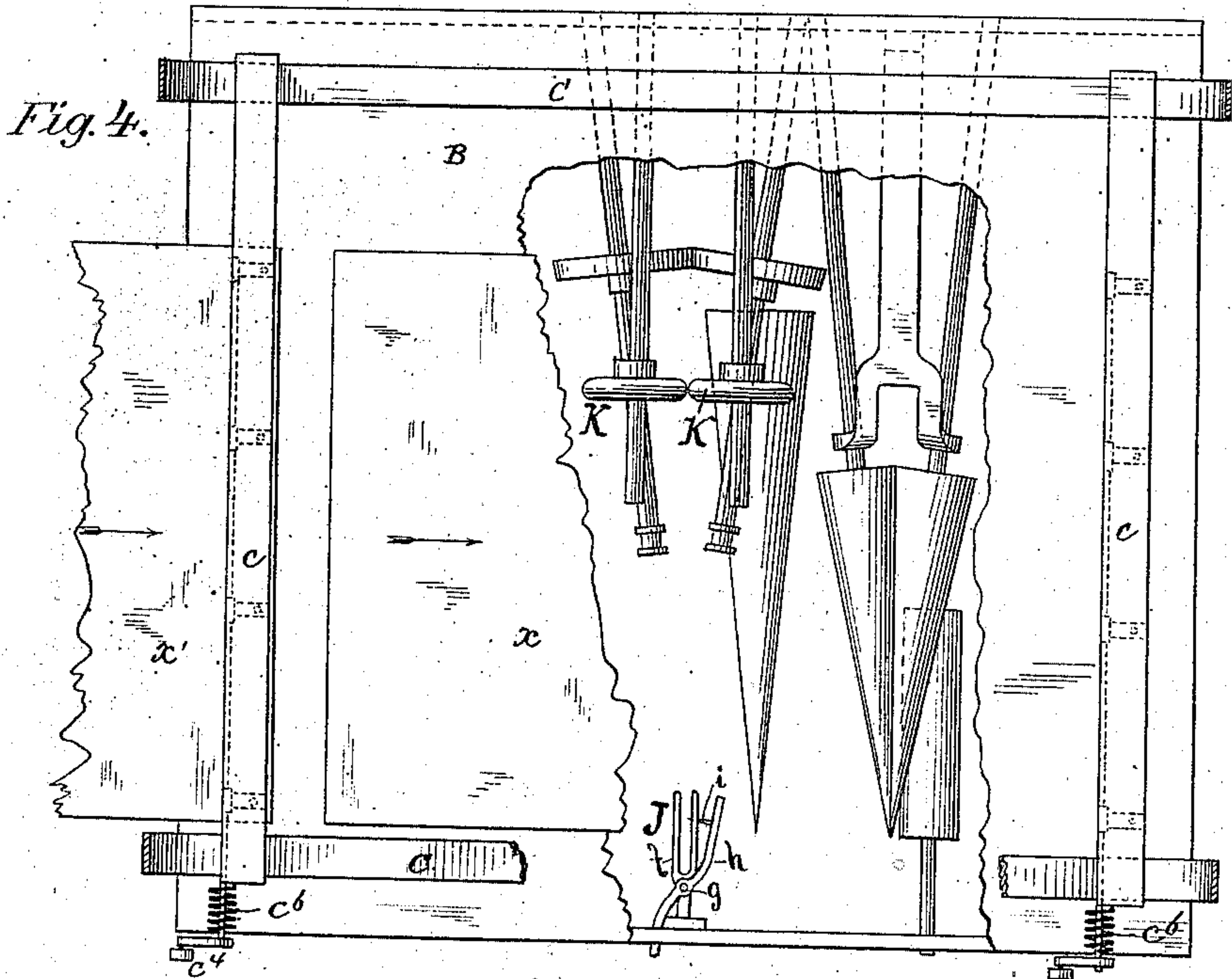


Fig. 7.

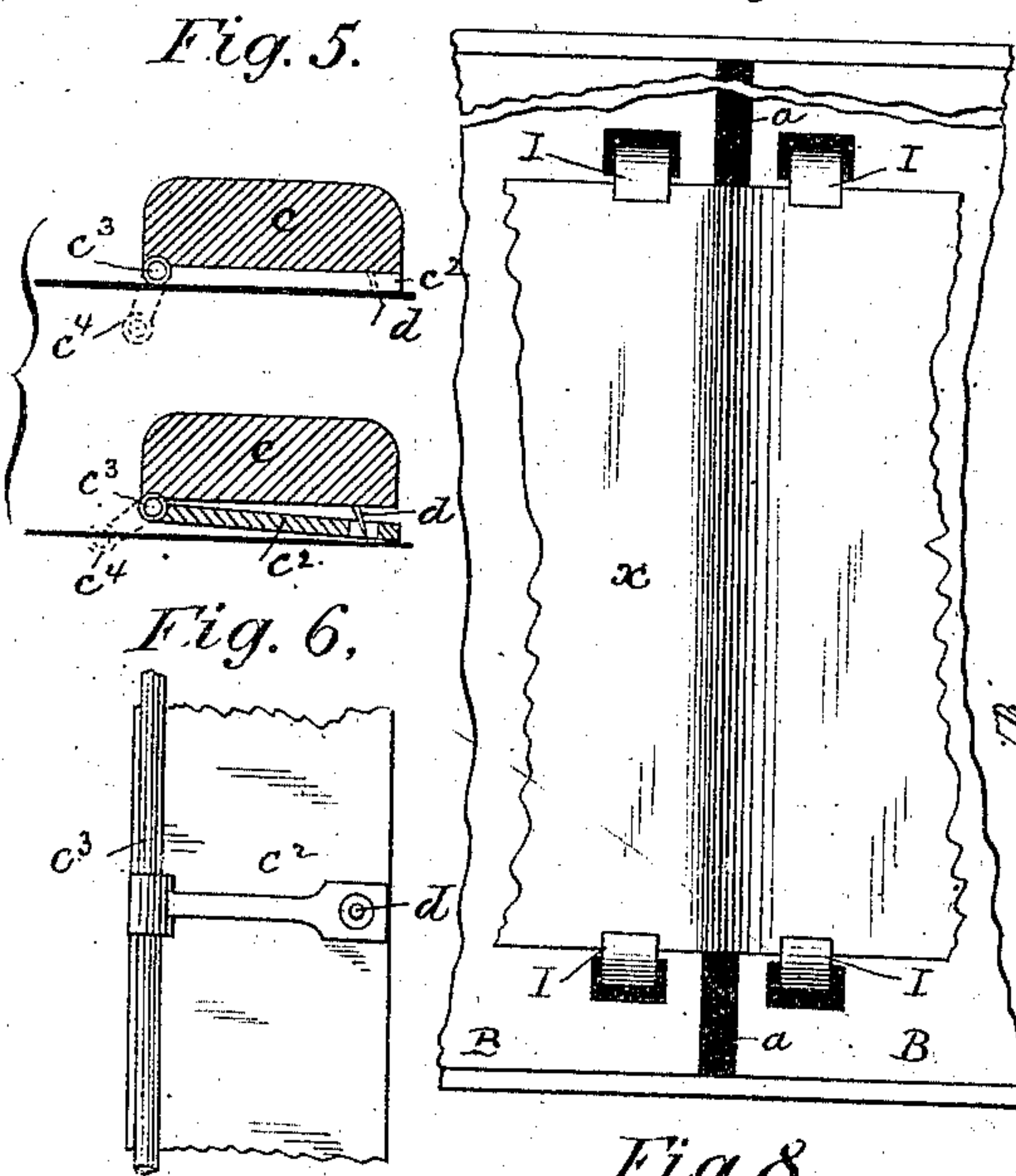


Fig. 6.

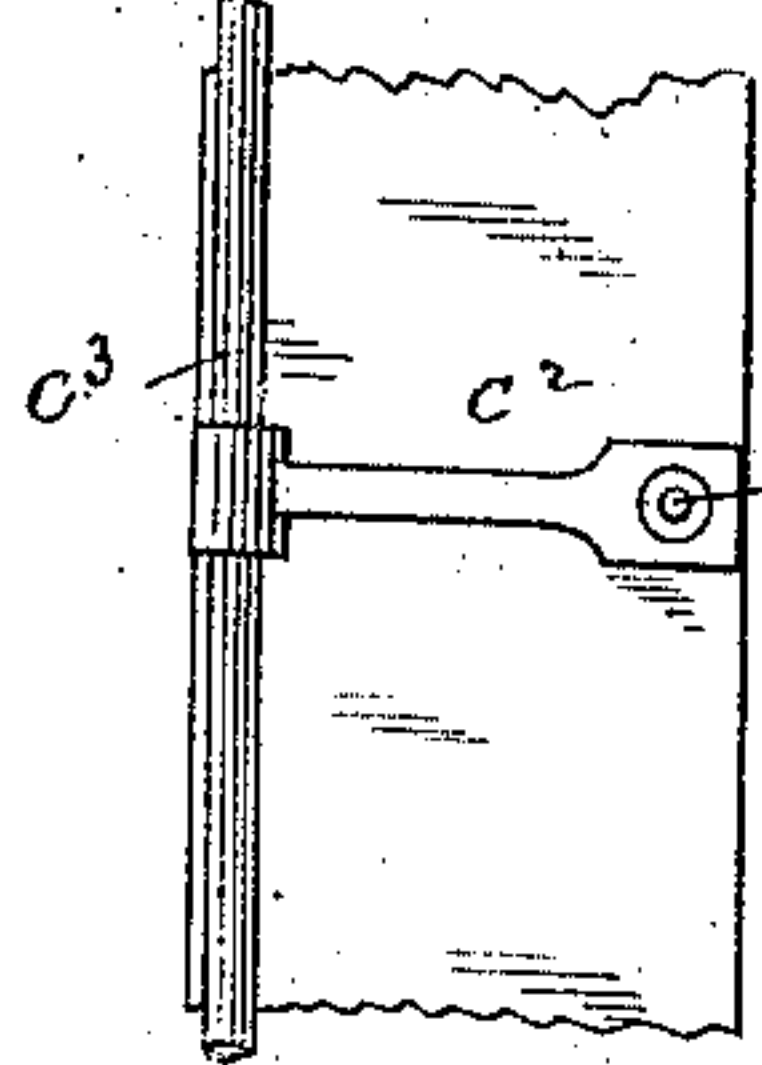
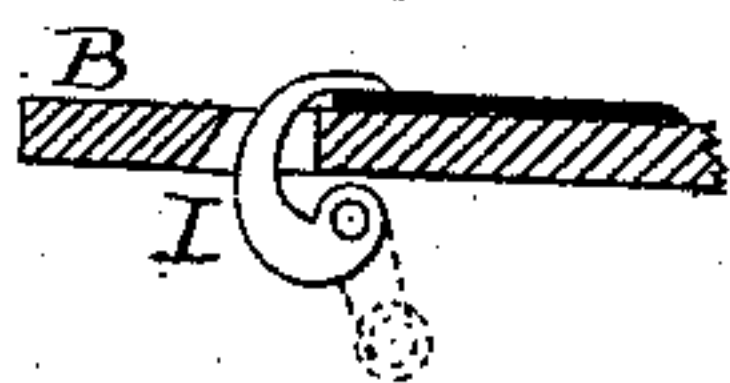


Fig. 8.



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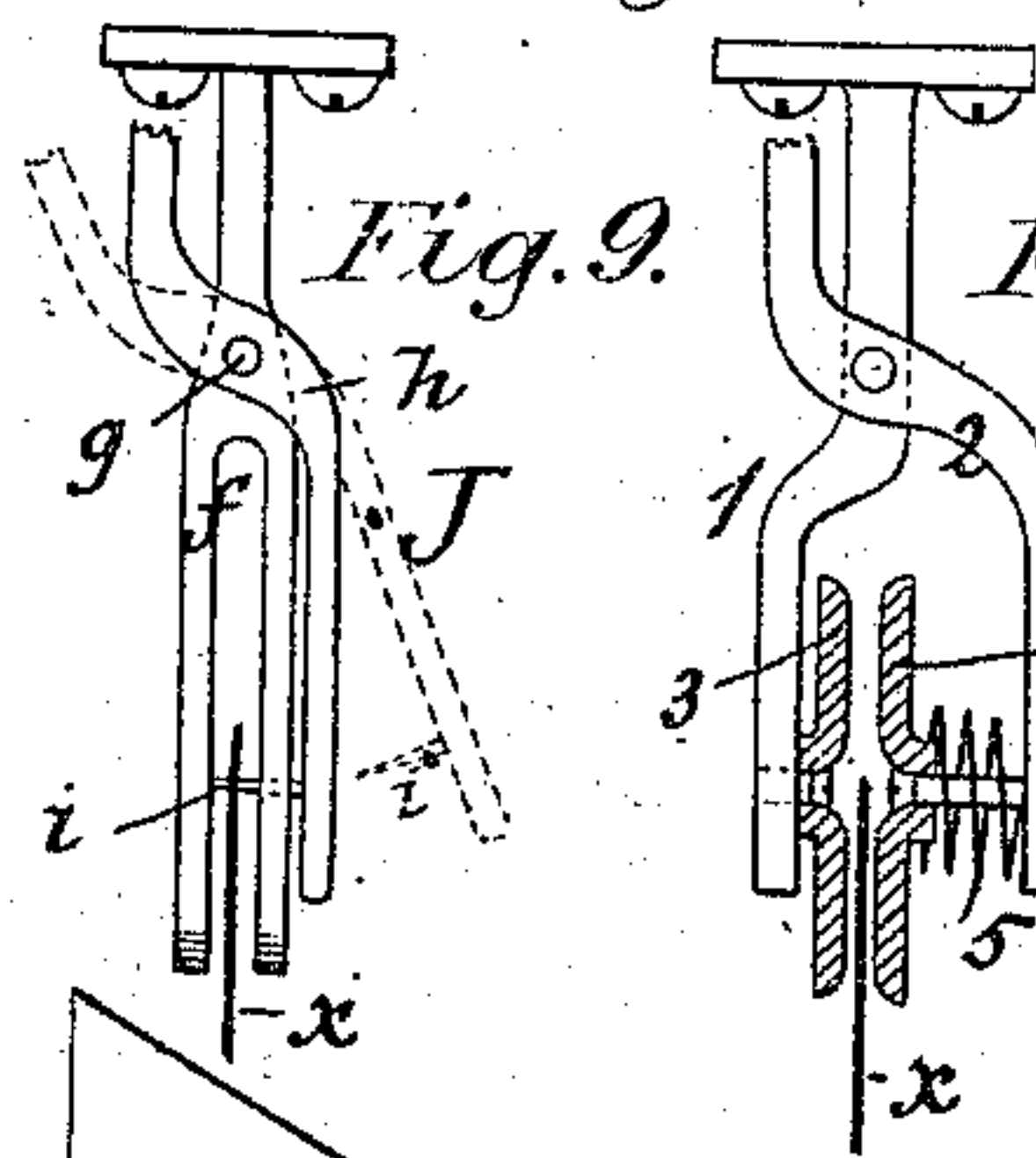


Fig. 10.

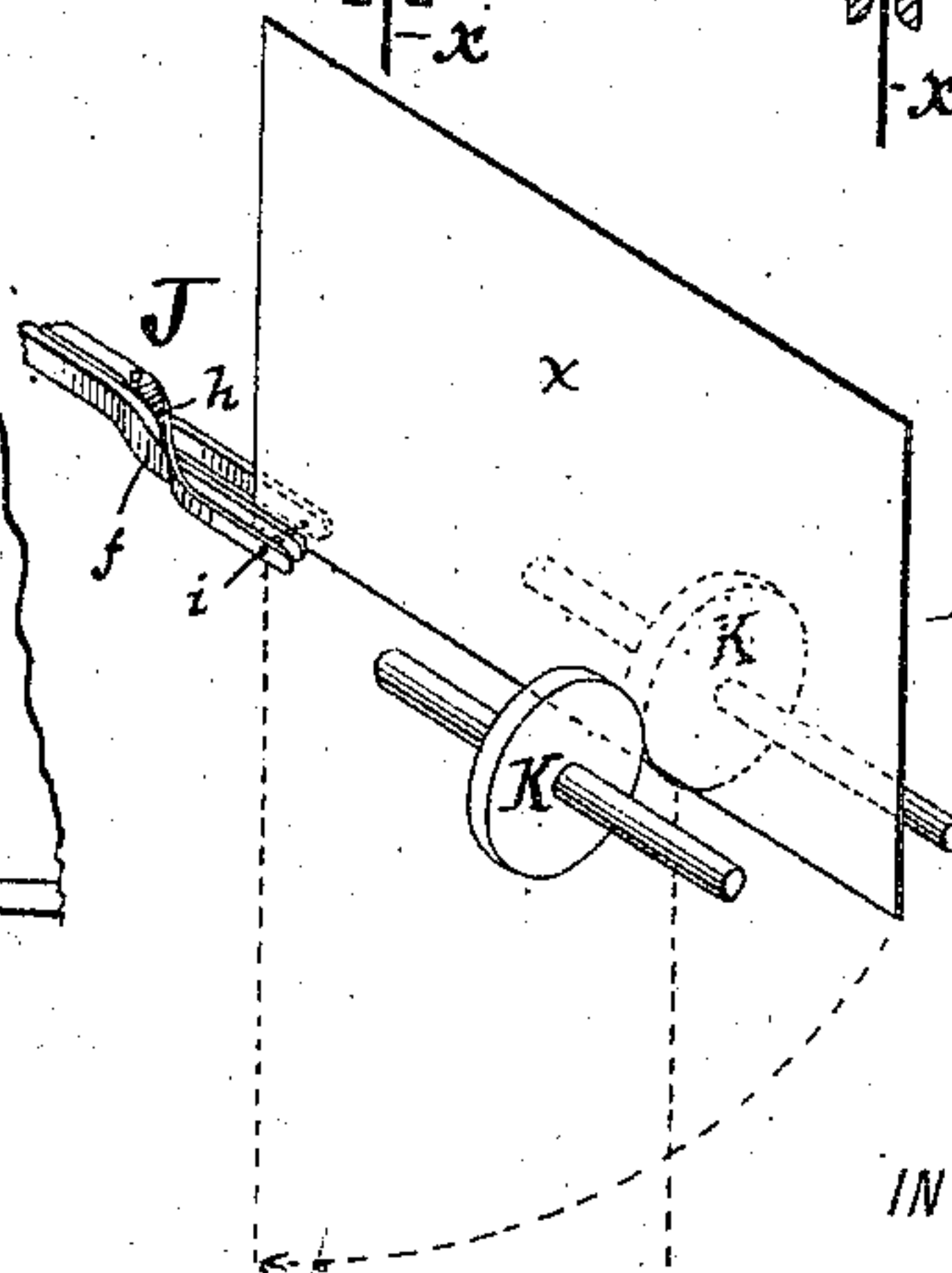
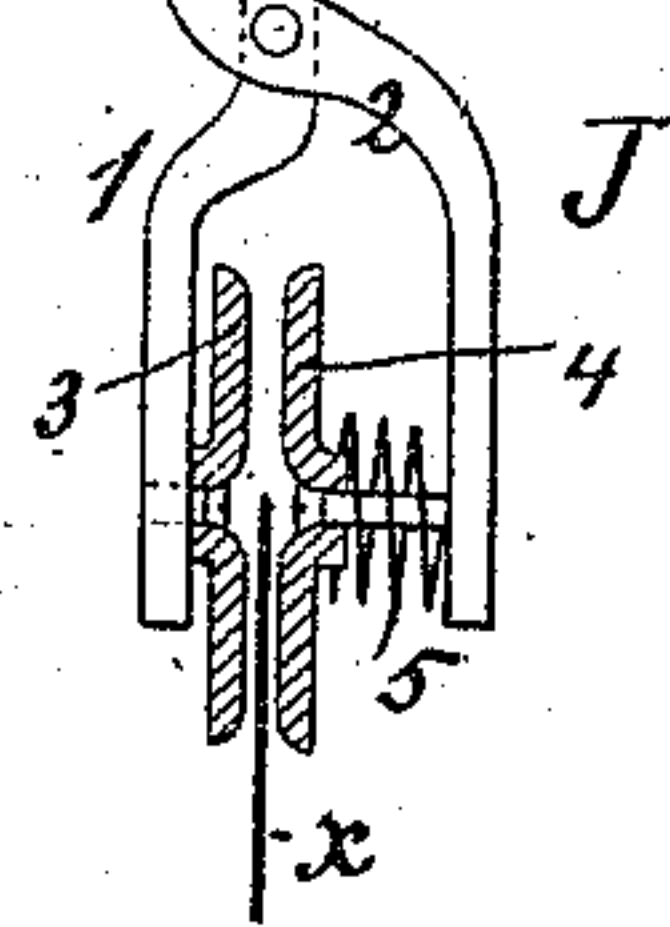


Fig. 12.

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(No Model.)

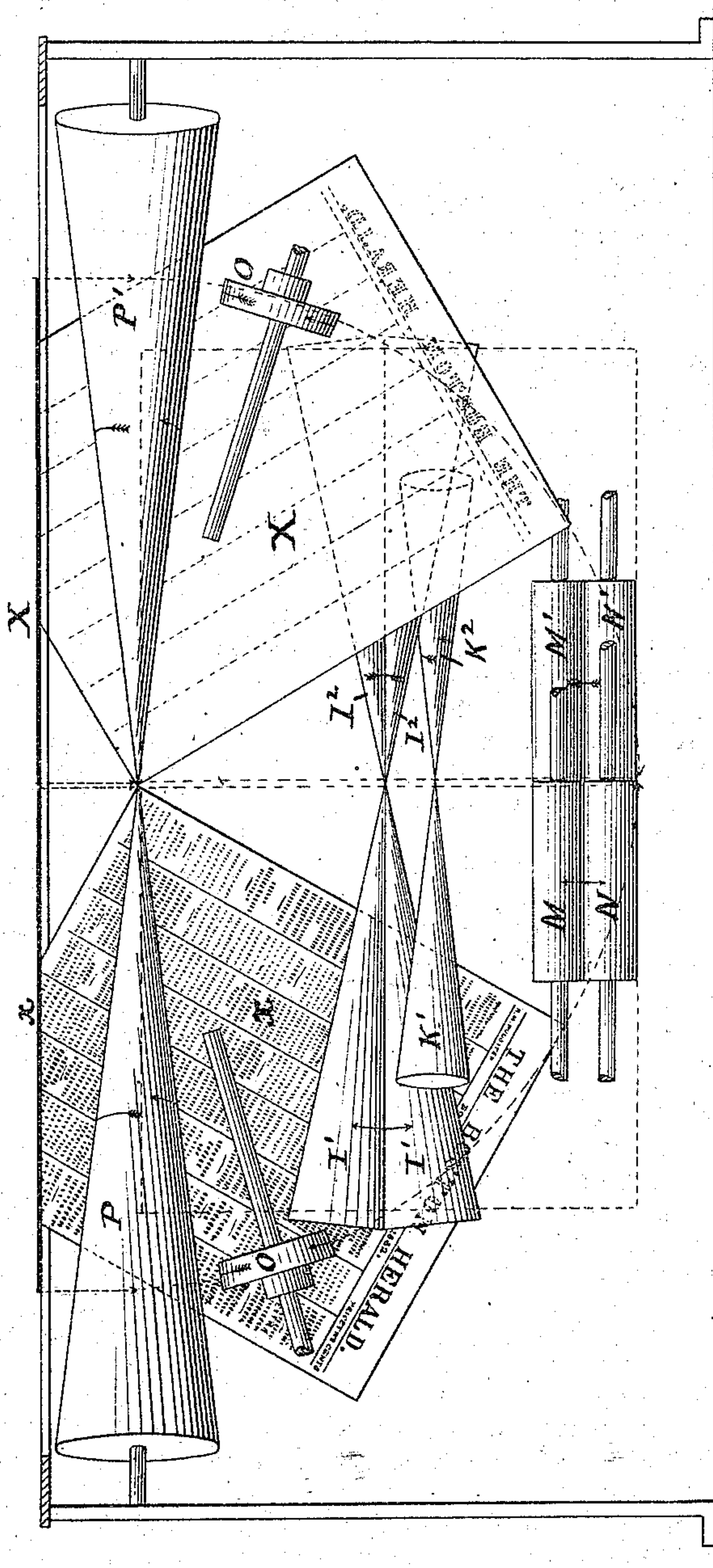
3 Sheets—Sheet 3.

W. C. CROSS.
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Fig. 12.



WITNESSES

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UNITED STATES PATENT OFFICE.

WILLIAM C. CROSS, OF BOSTON, MASSACHUSETTS.

MACHINERY FOR FOLDING PAPER, &c.

SPECIFICATION forming part of Letters Patent No. 275,154, dated April 3, 1883.

Application filed May 31, 1882. (No model.)

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 folding Paper and other Material, of which the following is a specification.

My invention is an improvement on that kind of folding-machine shown and described in Letters Patent No. 240,390, dated April 19, 1881.

It has reference to the devices for carrying the successive sheets to proper place upon the folding-table; to a combination of instrumentalities intended to adapt the machine to the needs of that method of folding, now used to some extent in newspaper establishments, in which the paper is composed of two separate sheets, which are first pasted together along their vertical central line of fold, and are then folded as one sheet; and to a device which may be used as a substitute for the continuous conical roll, and which, although in a broad sense the equivalent of that roll, nevertheless possesses novel characteristics.

The nature of my invention and the manner in which the same is or may be carried into effect can best be explained and understood by reference to the accompanying drawings, in which—

Figure 1 is a sectional side elevation of so much of a folding-machine as needed to illustrate my several improvements. Fig. 2 is a sectional elevation of the delivery end of the same. Fig. 3 is a sectional side elevation representing the paste and tucker blades in the position which they assume when the second sheet is brought above the first. Fig. 4 is a plan with the tape-carrying rollers removed and the folding-table partly broken away in order to disclose the folding mechanism beneath. Fig. 5 represents in cross-section the brad or pin carrying bar with its hinged stripper in closed and in open position. Fig. 6 is a plan of the under face of a portion of the device represented in Fig. 5. Fig. 7 is a plan of a portion of the folding-table, with the paper sheet in place thereon and grasped by the retaining-nippers, which hold the one sheet in place until the following sheet is delivered and rests upon the former. Fig. 8 is a side sectional elevation of one of the nippers. Figs. 9

and 10 represent different instrumentalities which may be used to hold the paper at one end or corner while it is being folded and turned by the action of rotating wheels at or near the other end. Fig. 11 is a diagrammatic view, in perspective, of the said holder and wheels, which coact to produce substantially the same result as is produced by conical rolls. Fig. 12 is a diagrammatic end elevation of a modified form of machine designed for use with presses from which two complete newspapers are simultaneously delivered.

A is the frame which supports the working parts of the machine.

B is the folding-table, provided with a central transverse opening, *a*, through which the paper to be folded is tucked into the bite of the first set of folding-rolls.

In order to carry successive sheets to proper place on the folding-table, I now employ the following instrumentalities: They consist of cross-bars *c*, armed with brads or teeth *d*, and attached to and carried by endless tapes or bands *U*, which pass around and are driven by rolls *D E*. Roll *D* in this instance is one of a pair of rolls, *D D'*, supposed to be the delivery-rolls of a printing-press. The cross-bars are placed at suitable intervals apart, so that as they come around each in turn will meet the sheet just in rear of the point where it is to be severed from the sheet in front by the cutter *b*, carried by the lower roll, *D'*, as indicated in Fig. 1, where *x* represents the sheet. The upper roll, *D*, is recessed, as at *c'*, at the point where the cross-bar passes between it and its fellow roll, *D'*, and the knife *b* (which operates in conjunction with a notch, *b'*, in roll *D*) passes up through a yielding protruding block or plate, *b²*, which is outwardly pressed by a spring or springs, *b³*, and serves to prevent the paper from sticking to the knife—a thing which not unfrequently happens when operating on the damp sheets issuing from a printing-press. The brads or teeth *d* pass through the paper, as indicated in Fig. 1, and support and carry forward the front end of the sheet as it feeds along between rolls *D D'*.

In order to disengage the teeth from the sheet at the proper time, I combine with them a stripper, in this instance consisting of a plate, *c²*, which is hinged to the bar and lies

flat against the toothed face of the latter, the brads or teeth extending through perforations in the stripper. The shaft or rod c^3 , on which the stripper is mounted, is provided with a crank-arm and roller-stud, c^4 , which, when it meets a cam, c^5 , Fig. 1, on the frame, acts to swing the plate c^2 away from the bar c , and to thus strip the paper from the brads d . A spring, c^6 , on shaft c^3 returns the stripper to its normal or closed position and maintains it there except when under the control of its cam.

In order to tuck the paper down into the bite of the fold-forming instrumentalities, I use a vibratory tucker-blade, F, of ordinary construction, which can be timed and arranged to operate in the same way as described in the Letters Patent hereinbefore referred to.

Some newspapers, as is well known, consist of two or more superposed separate sheets, which are pasted together along the line on which the leaves of the paper open, and are then folded.

In order to adapt my machine for such papers, I adopt the following arrangement: I employ, in conjunction with the tucking-blade, a vibratory power-driven paster-blade, G, which is driven by mechanism of known construction, similar to that used for the tucker-blade, but has not so great range or extent of movement as the latter blade. This paster-blade draws its supply of paste from any suitable source—as, for instance, from a paste-box, H, with the concave bottom of which the convex face of the blade is in contact. The blade moves for an instant just far enough back to uncover in front of its edge a slit, e , in the bottom of the box, through which paste oozes, and is taken up and carried along on the edge of the blade as the latter moves forward.

In order to hold in position the under sheet while the sheet that follows it travels forward and comes into place above it, I make use of two pairs of nippers, I, one pair on each side of the table in a position to grasp the opposite sides of the sheet, and the two nippers of each pair on opposite sides of the opening a in the folding-table, as indicated in Fig. 7. The nippers are arranged to project up through the table, so as to rest upon and clamp the paper, as indicated in Fig. 8. The nippers of each pair are mounted on a rock-shaft, which by a spring (not shown) is rotated in a direction to cause the nippers to be swung down below the face of the table, and the shaft is provided with a crank-arm and stud, (indicated by dotted lines in Fig. 8,) which, by a suitable rotating wiper-cam driven from any convenient part of the machine, is operated to cause the nippers to rise and close upon the paper sheet at the proper time. Spring and cam controlled nippers or clamps of this description are well-known devices, particularly in the art to which my invention pertains, and require no further description here.

The parts thus far described are timed in their movements so as to co-operate in the fol-

lowing manner: The first sheet, x , is brought by the carrier along to its proper position on the folding-table, severed from the sheet x' in rear, and then dropped. At this instant the paste-blade descends and tucks the sheet down into the opening a a short distance, not far enough to cause it to enter the bite of the folding-rolls, and in so doing delivers paste along the line of contact between its edge and the paper sheet. Before the paster can rise the clamps or nippers, which before were retracted, will have been projected from the table and upon the opposite edges of the paper, which they clamp, as seen in Fig. 7, at points adjoining but on opposite sides of the edges of the slot a . They thus hold the sheet x , with its pasted middle portion tucked down and out of the way, while the sheet x' in rear moves along and comes directly over sheet x . When this takes place sheet x' is disengaged from the carrier, and simultaneously the nippers release their hold and the tucking-blade F descends and first tucks the central part of the upper sheet down into contact with the already depressed and pasted part of the under sheet, by which operation the two sheets are stuck together, and then, by continuing its downward movement, tucks the two together into the bite of the folding-rolls, by which they are operated on as one sheet in the usual way.

It is manifest that three or more sheets may be pasted together, as well as two. If, for instance, there should be three sheets, the paster-blade would move twice—once for each of the first two sheets—and the tucker-blade would operate only on the third sheet, and so on. The nippers in such case would be arranged to move so as to release the sheet below, and then at once return to clamp the two sheets, and so on until the final sheet should come, at which time they would finally quit the sheets.

In the event of folding only single sheets the paster-blade can readily be thrown out of engagement and the tucker-blade speeded so as to increase its rate of vibration to the needed extent.

The instrumentalities which take and fold the sheet or sheets tucked down by the blade F may be similar to those described in Letters Patent No. 240,390, hereinbefore referred to. In lieu, however, of using conical rolls, and as the equivalent therefor, I can make use of appliances which I now proceed to describe. These appliances are represented in the place of the first pair of conical rolls. They consist of a holder, J, and a pair of power-driven wheels, K, and are shown more clearly in Figs. 9, 10, 11. The holder shown in Fig. 9 consists of a horizontal forked bar, f , which is secured to and projects laterally from one side of the machine, occupying a position indicated by J in Fig. 2. To the forked bar is hinged, at g , an arm, h , provided with a pin, i , which passes through openings or holes in the two legs of the fork. The arm h is controlled by a cam which causes it to vibrate so as to move the cross-pin i to and away from the legs of the fork, as will

presently be described. I have not deemed it necessary to show the cam arrangement in this figure nor in Fig. 10, which represents a somewhat similar appliance. Such an arrangement is well known in the art and requires no explanation. The wheels K are power-driven, as above stated, and are placed opposite one another in a horizontal plane, with the point at which they are in contact in the same horizontal plane with the point where the cross-pin *i* extends across the legs of the fork. The shafts on which the wheels are carried are mounted in and project laterally from the side of the frame opposite to that from which the holder J projects, and the distance between the two parts J K is about equal the length of the conical rolls whose place they take. The wheels K represent the bases of such rolls and the pin *i* the point where the axes of the two rolls would intersect if prolonged. Their relative arrangement is clearly shown in Figs. 2, 4, and also in Fig. 11, in which latter figure I have represented the manner in which they act to turn the folded sheet, which may be explained as follows: The tucker-blade acts to double the sheet or sheets along the line of fold and to tuck it down into the bite of the wheels K and between the legs of the forked bar *f*, from which the cross-pin *i* at this time is withdrawn. Immediately thereafter the cross-pin, by the action of its cam, is moved so as to pass through the bar *f* far enough to perforate and hold the lower corner of the sheet, as indicated in Fig. 11, in which the sheet lettered *x* is represented by full lines in the position it occupies when it first reaches the wheels and holder. The sheet thus held by one corner is turned by the rotating wheels K until it occupies the position shown by dotted lines in Fig. 11, at which time the pin *i* is withdrawn, so as to release the sheet from the holder. The sheet, while turning, enters the pocket S, (similar to the like-lettered contrivance in Letters Patent No. 240,390,) and, by a tucker-blade, J', working through an opening, *s*, in said pocket, is tucked between the conical rolls I', which make the second fold. It is then taken in turn by the third set, K', and fourth set, M N, of rolls, by which it is folded in substantially the manner set forth in the aforesaid Letters Patent. L and R are the tuckers, which operate in connection with the two sets of rolls last above mentioned. In lieu of the forked bar *f* and cross-pin *i*, I can employ a holder such as represented in Fig. 10. This consists of a stationary leg, 1, and a leg, 2, pivoted thereto and acted on by a cam at the time and in the manner substantially as hereinbefore described with relation to arm *h*. On a stud projecting from the stationary leg is loosely mounted a disk, 3, and on a stud projecting from the interior opposite face of the movable leg is similarly mounted a disk, 4, between which and the leg is interposed a spring, 5, which pushes the disk out toward the opposite disk, 3. The sheet *x* of paper is held between the disks in

the manner indicated in the figure, and the latter are caused to intermittently and at the proper times clamp and release the sheet.

In order to facilitate the turning of the sheet at the time the first fold is made, I make use of a pair of power-driven turning-wheels, O, speeded so as to move at the same rate at which the sheet travels, and placed at a point intermediate between the first and second set of folding-rolls, as indicated in Figs. 1 and 2. The axes or shafts of the wheels are set at an inclination, as shown, and so that their prolongation will pass through the point at which the sheet is held by the holder J. The peripheries of the wheels are tapered so as to constitute frusta of cones whose apexes are at the same point, J. By means of their appliances the sheet is carried surely into proper position. The wheels are placed at such a distance from the point J that the sheet quits them by the time it reaches the position in which it is ready to be acted on by the tucker J'. They can, of course, be used as well in connection with conical rolls as with the devices J K, as indicated in Fig. 12, in which I have represented diagrammatically a folding-machine adapted to receive and fold two newspapers at once, the newspapers traveling side by side from the press to proper place upon the folding-table, as indicated at *x X*. All that is needed is to place the folding-rolls on one side of the machine, which operate on one paper, in a position exactly the reverse of that occupied by those on the other side of the machine, which operate on the other paper, as indicated in the figure. The two sets of conical rolls P I' K' and P' I² K² being set with their smaller ends pointing inwardly, the smaller, P and P', revolve in the same direction, but I' K' revolve in direction opposite to I² K², respectively, as indicated by the arrow, as do also the two sets M N M' N' of cylindrical rolls, which make the final folds. The reason for this arrangement is that the one paper is discharged from one end of the machine and the other paper from the opposite end of the machine. Assuming the end of the machine represented in the drawings to be the rear end, the paper *x* passes down between rolls P in front of rolls I', and thence rearwardly through rolls I' K' and M N. Paper X, on the contrary, passes down from between rolls P' in rear of rolls I², and thence toward the front end of the machine through I² K² and M' N'. This arrangement of two sets of conical folding-rolls, permitting the mode of operation just described, is convenient and compact, and saves both room and expense.

Having described my improvements, what I claim as new and of my invention is—

1. The endless tapes, the rolls for supporting and driving the same, the pin or brad armed bars carried by said tapes, and the strippers for disengaging the sheets from said brads, in combination with the slotted folding-table and the tucker-blade for tucking the sheet down through the slot in said table, these parts being

arranged and operated and timed in their movements relatively to one another substantially as and for the purposes hereinbefore set forth.

5 2. The endless tapes, the rolls for supporting and driving the same, and the cutting mechanism carried by said rolls, combined with the pin or brad armed bars carried by said tapes, the strippers, the slotted folding-table, and the
10 tucker-blade, substantially as hereinbefore set forth.

3. The combination, with the folding-table and mechanism for conveying successive sheets to place thereon, of the tucker and paster mechanisms arranged to operate successively upon
15 the sheets delivered onto the folding-table, substantially as hereinbefore set forth.

4. The combination of the sheet-conveying mechanism, the slotted folding-table, the inter-
20 mittently-operating nippers, the pasting-blade, and the tucker, these parts being arranged and timed in their movements relatively to one another, and having the mode of operation substantially as hereinbefore set forth.

5. The holder J and wheels K, in combination with the mechanism for tucking the successive sheets into the bite of the same, these elements being arranged and having the mode of operation substantially as hereinbefore set forth.

6. The combination, with the conical folding-rolls or their equivalent, of auxiliary turning-rolls arranged and operating as hereinbefore set forth.

7. The double folding-machine having two
35 sets of conical folding-rolls, and co-operating tuckers arranged relatively to one another and operating to deliver the respective sheets folded by them at opposite ends of the machine, substantially as hereinbefore described, and represented in Fig. 12 of the accompanying drawings.

In testimony whereof I have hereunto set my hand this 4th day of April, 1882.

WM. C. CROSS.

Witnesses:

EWELL A. DICK,

P. B. DOING.