

No. 661,330.

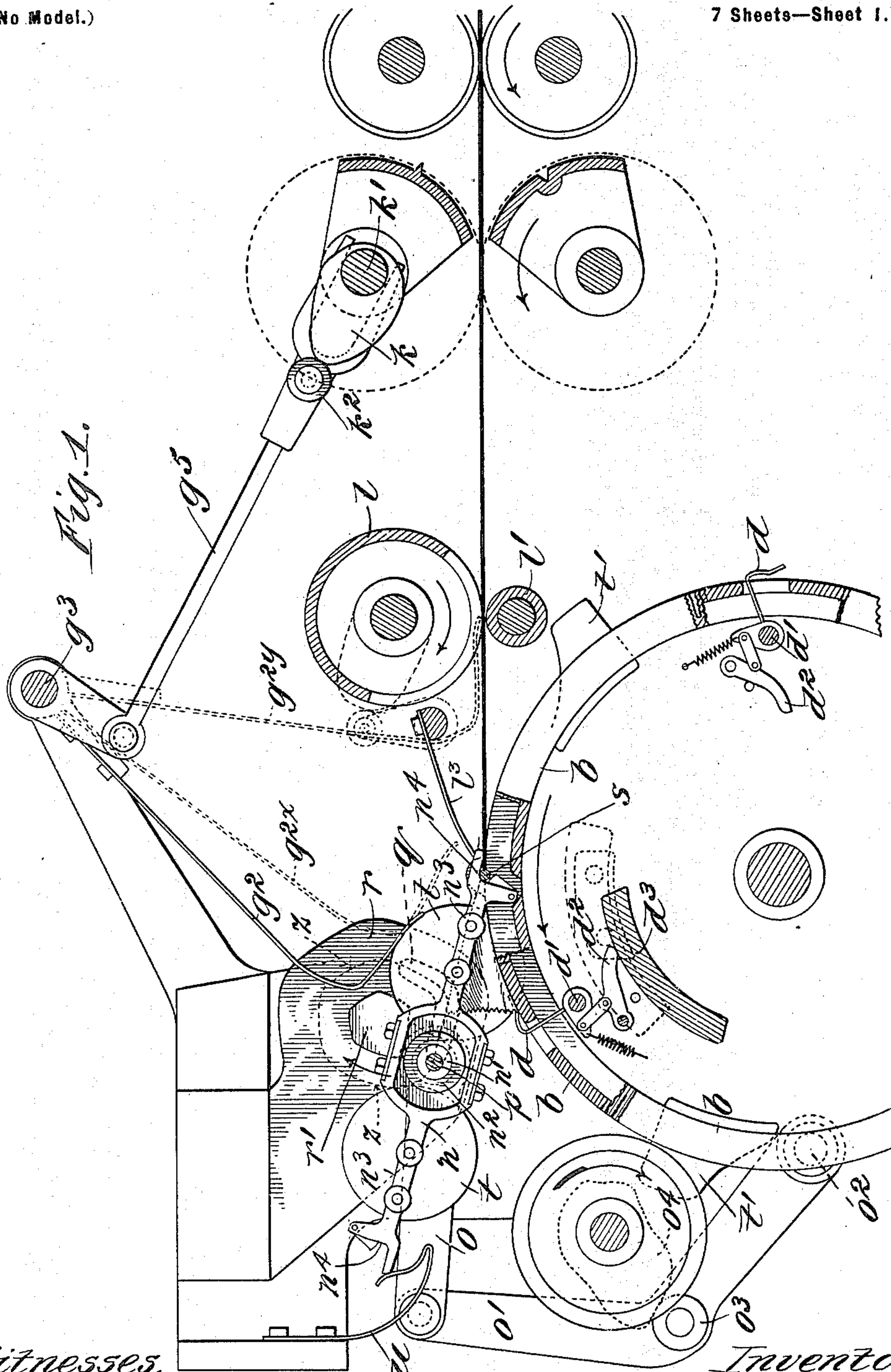
Patented Nov. 6, 1900.

H. E. WESTERVELT.  
PAPER BAG MACHINE.

(Application filed Aug. 19, 1899.)

(No Model.)

7 Sheets—Sheet 1.



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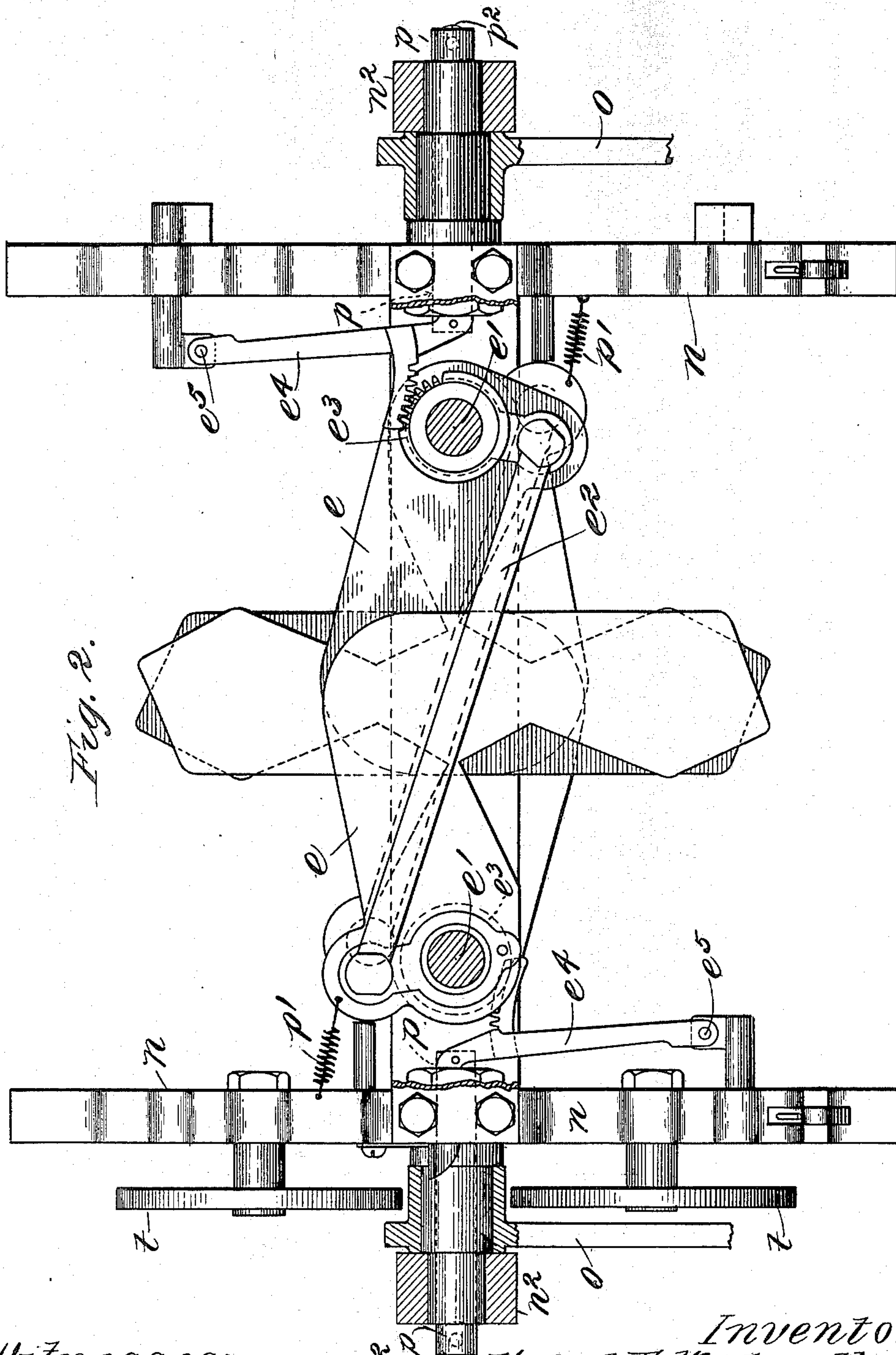
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(No Model.)

7 Sheets—Sheet 2.



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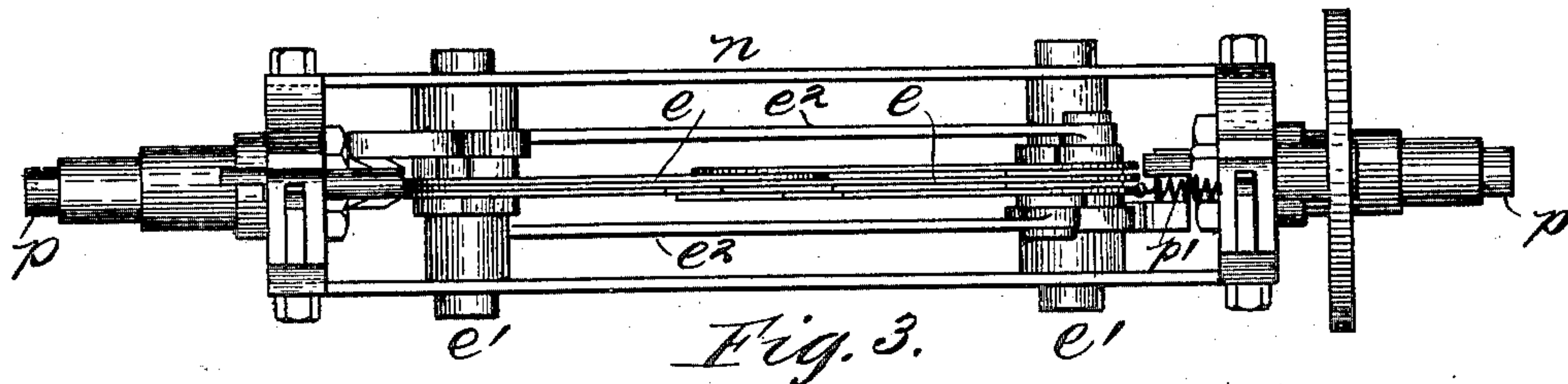


Fig. 3.

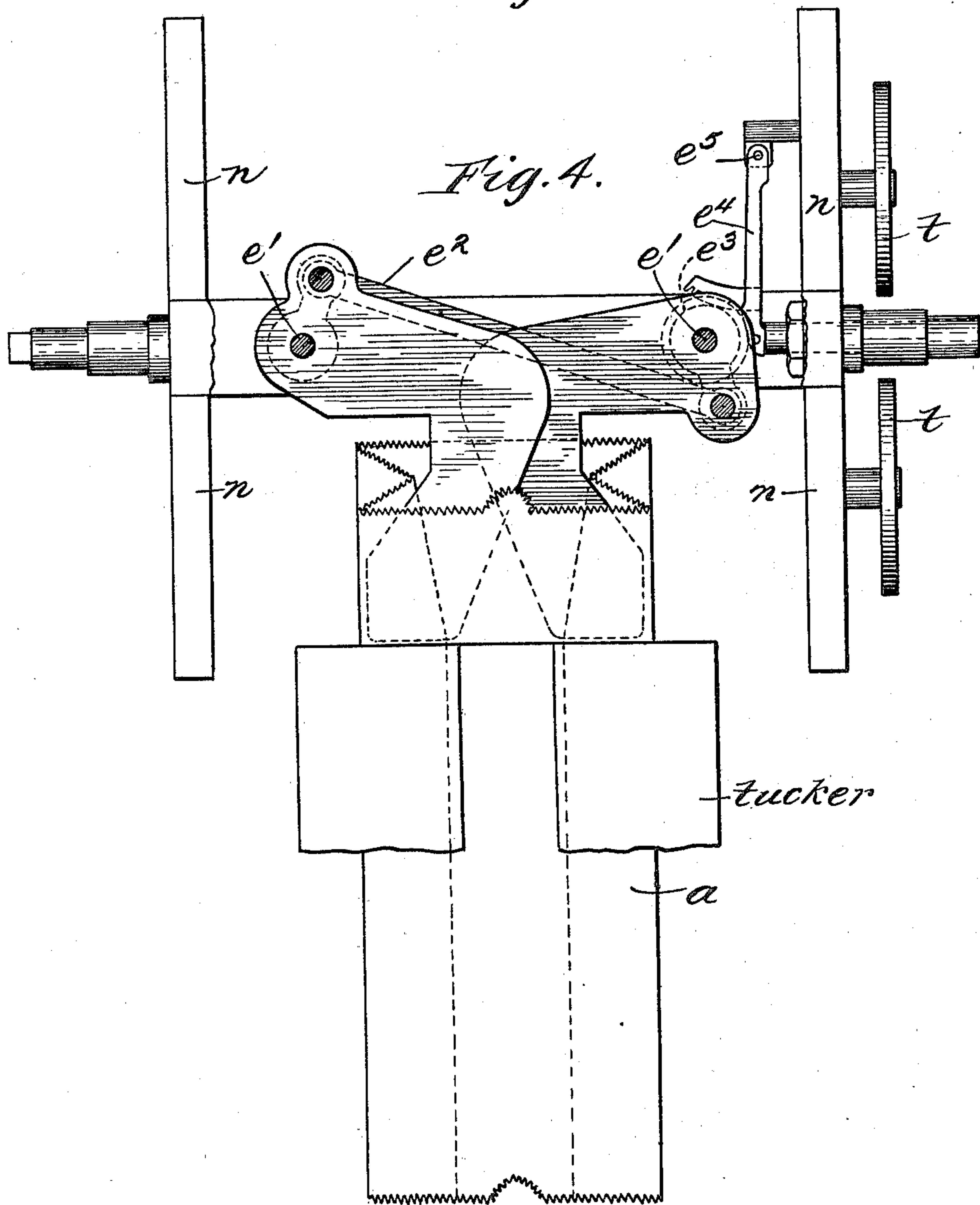


Fig. 4.

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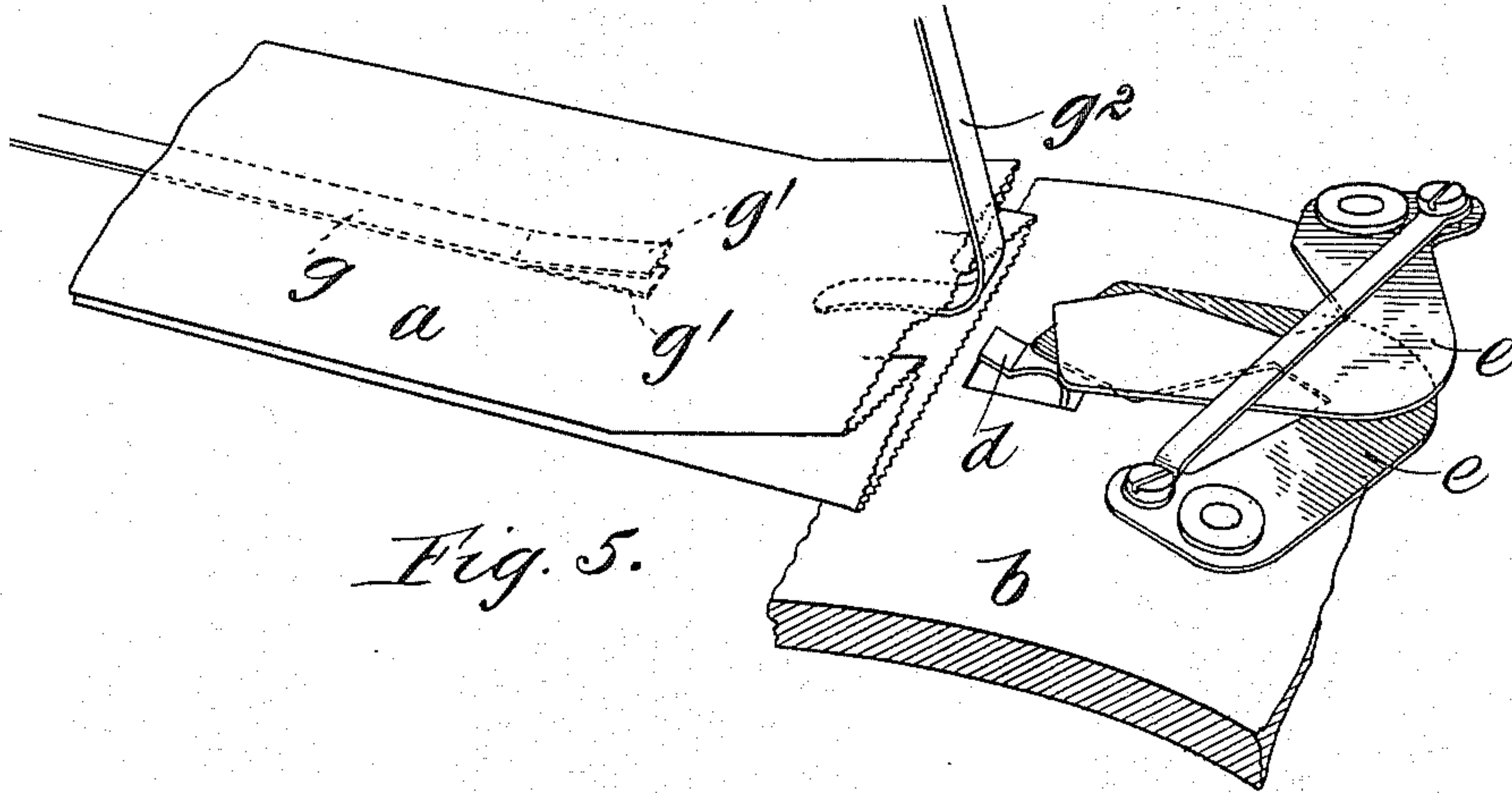


Fig. 5.

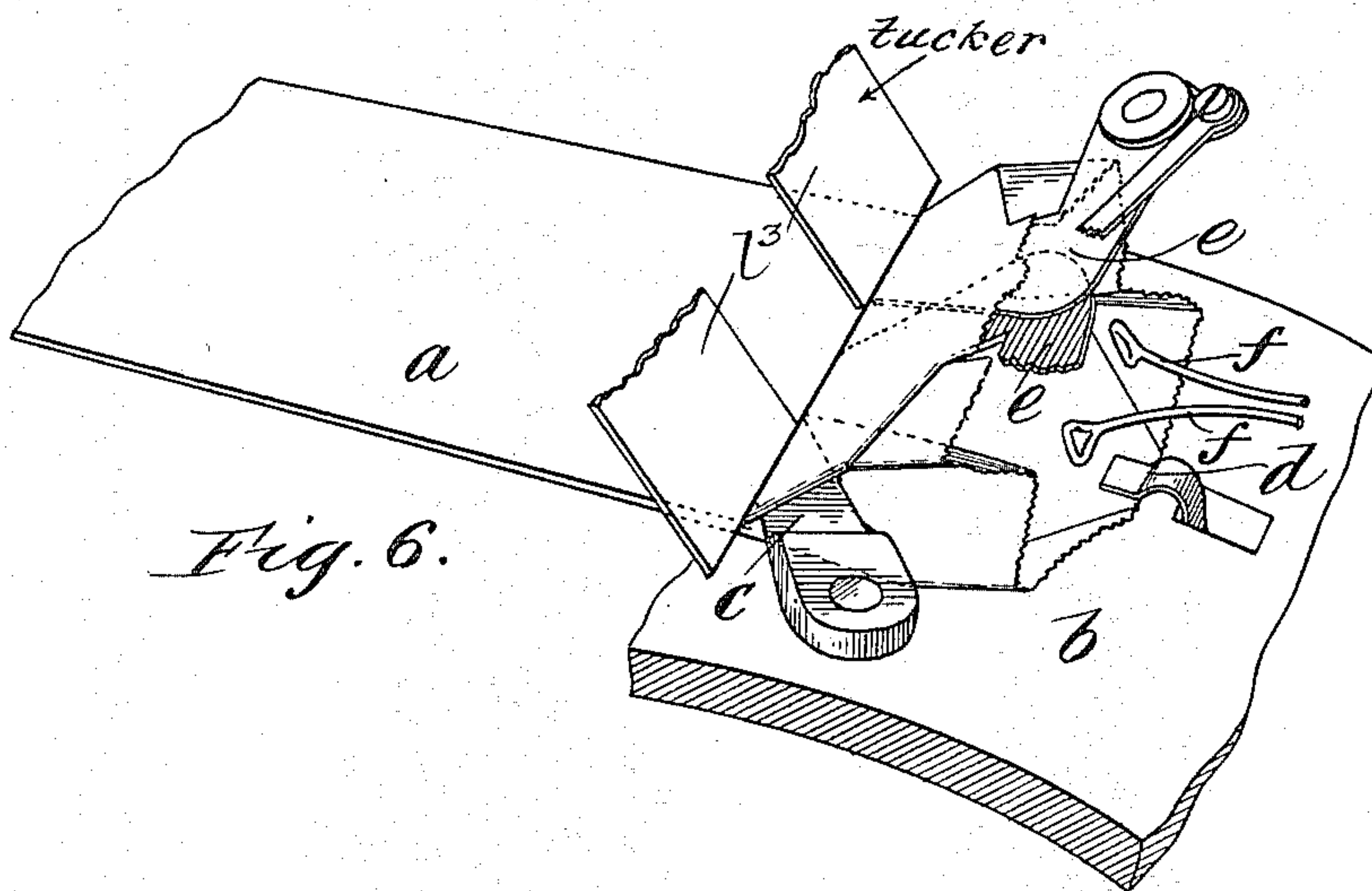


Fig. 6.

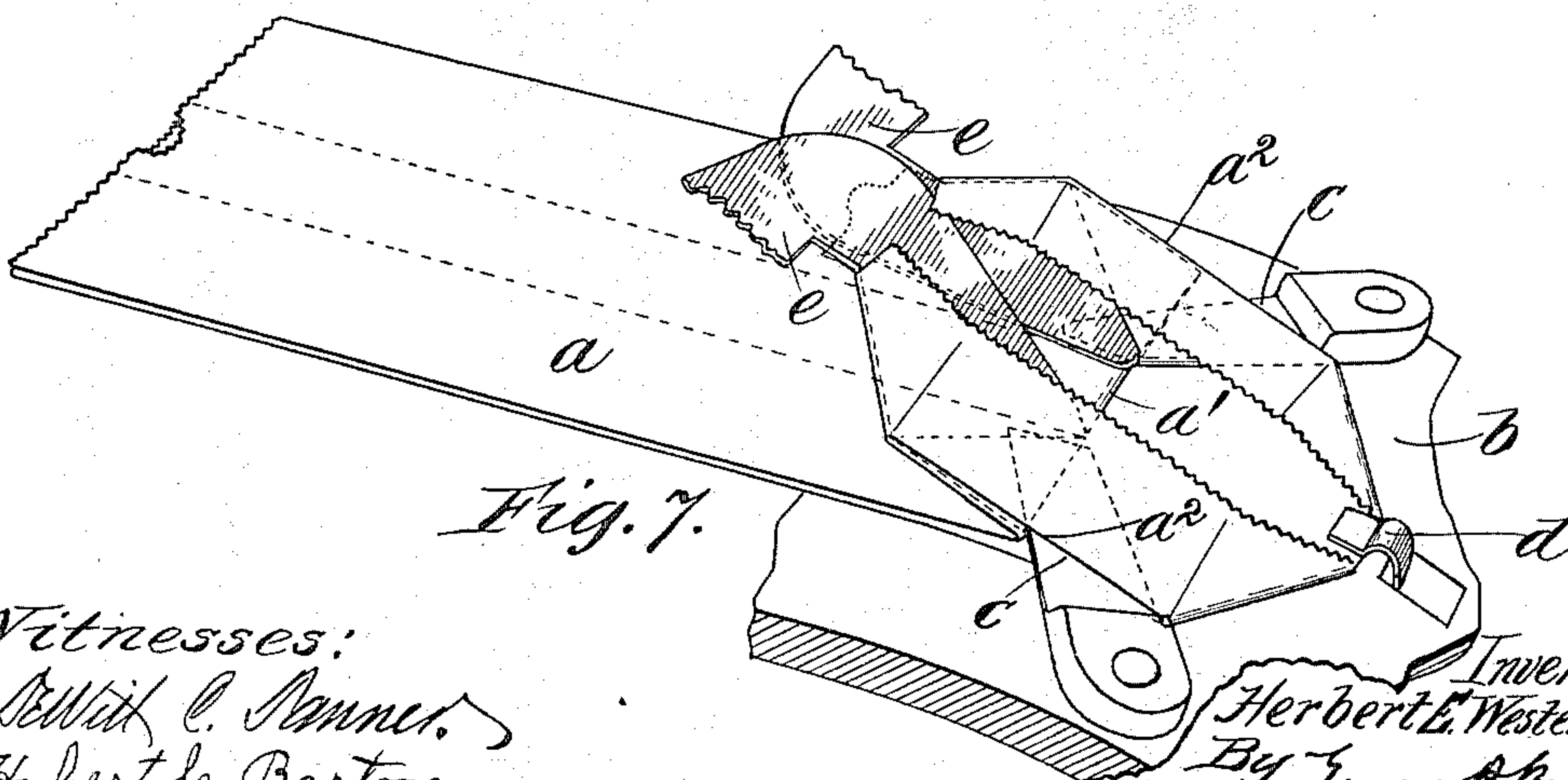


Fig. 7.

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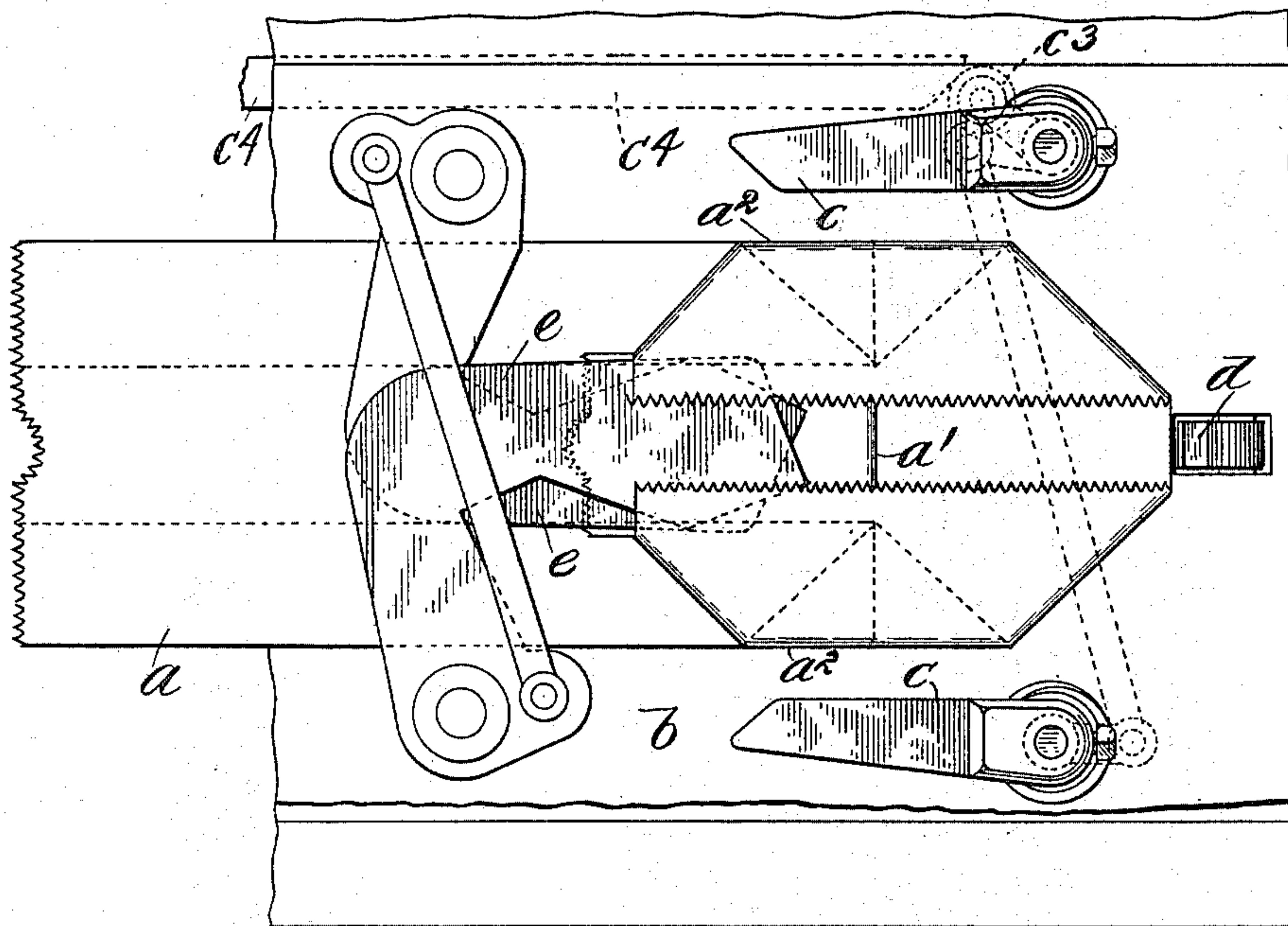


Fig. 8.

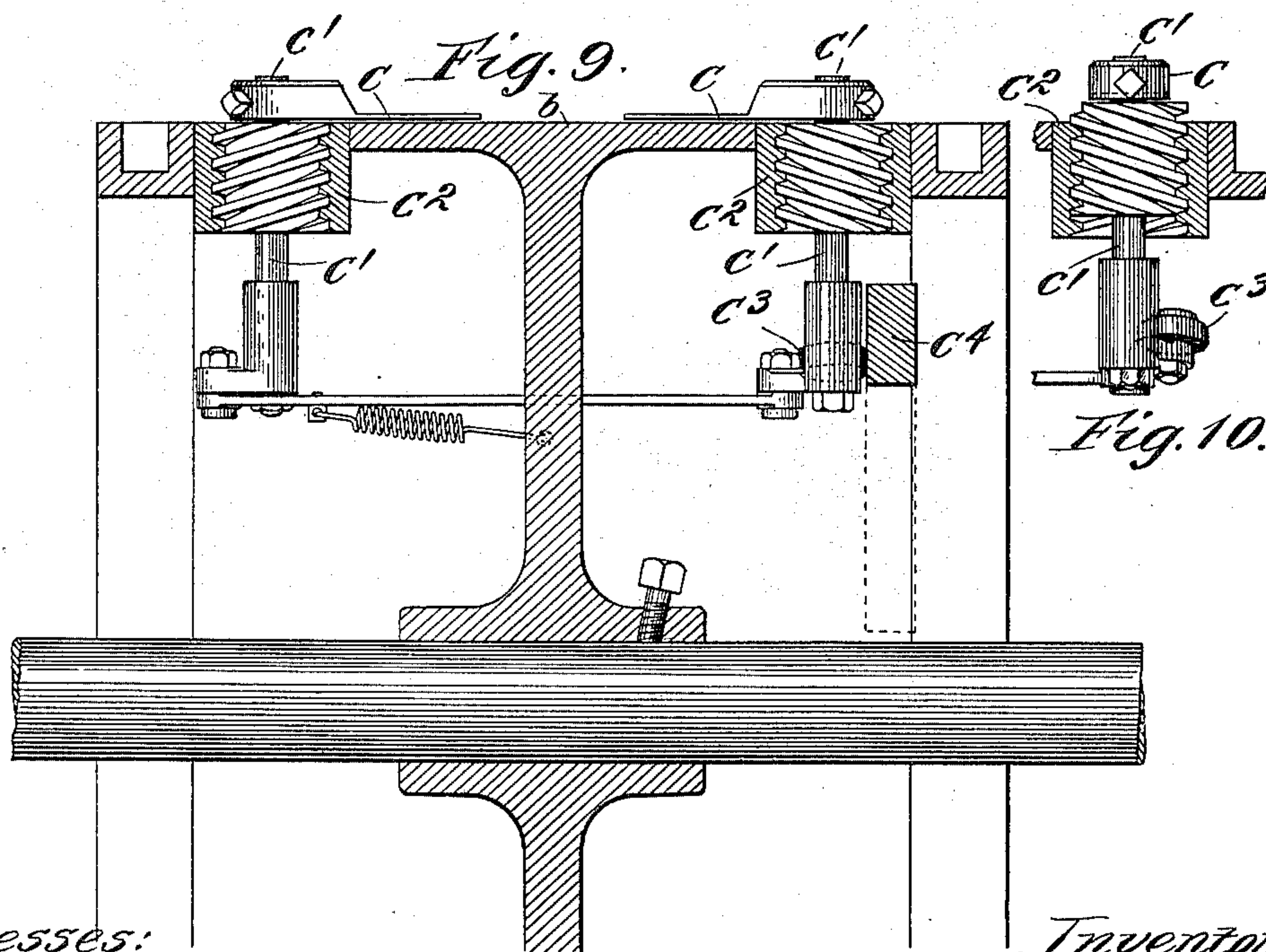


Fig. 10.

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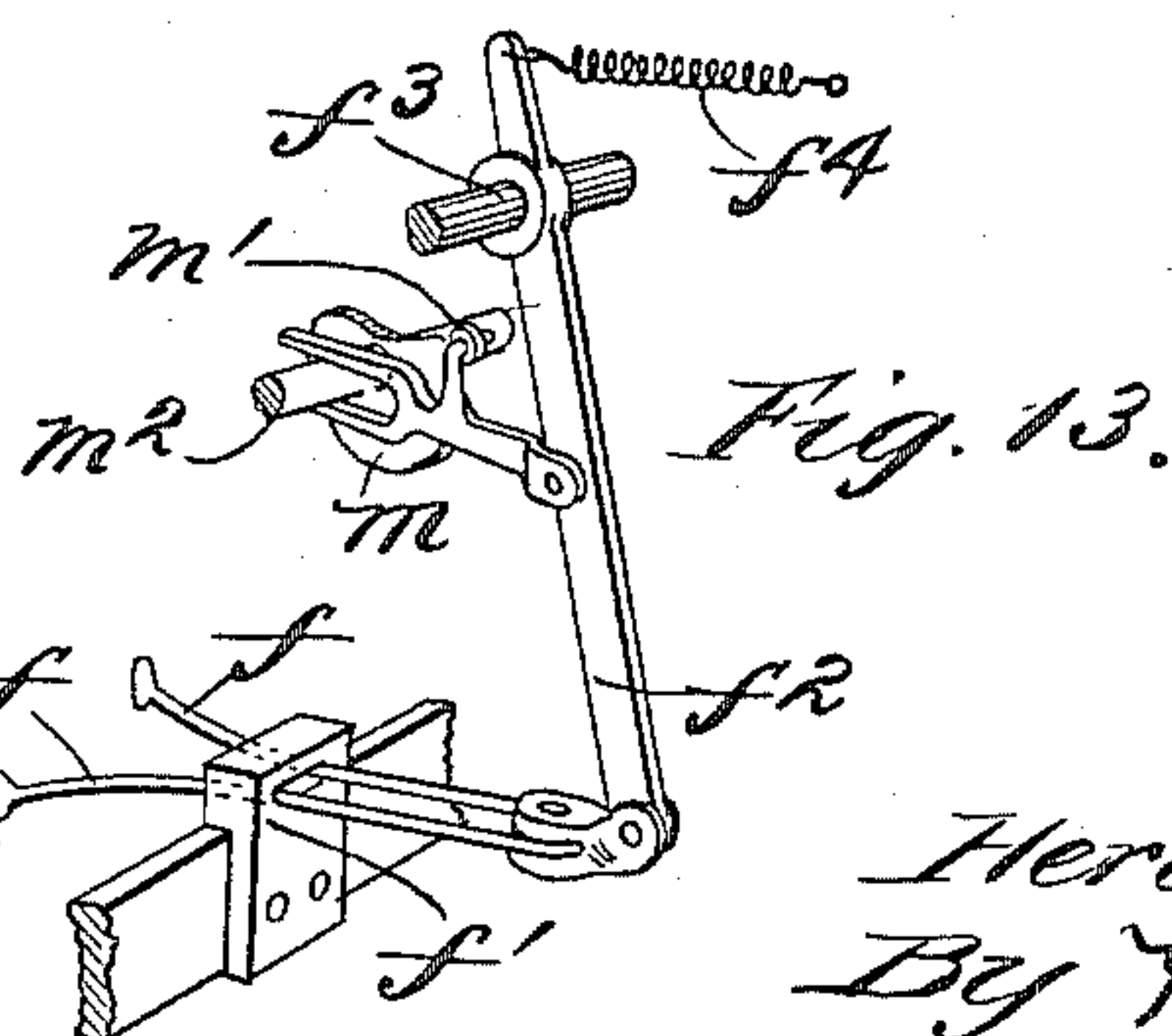
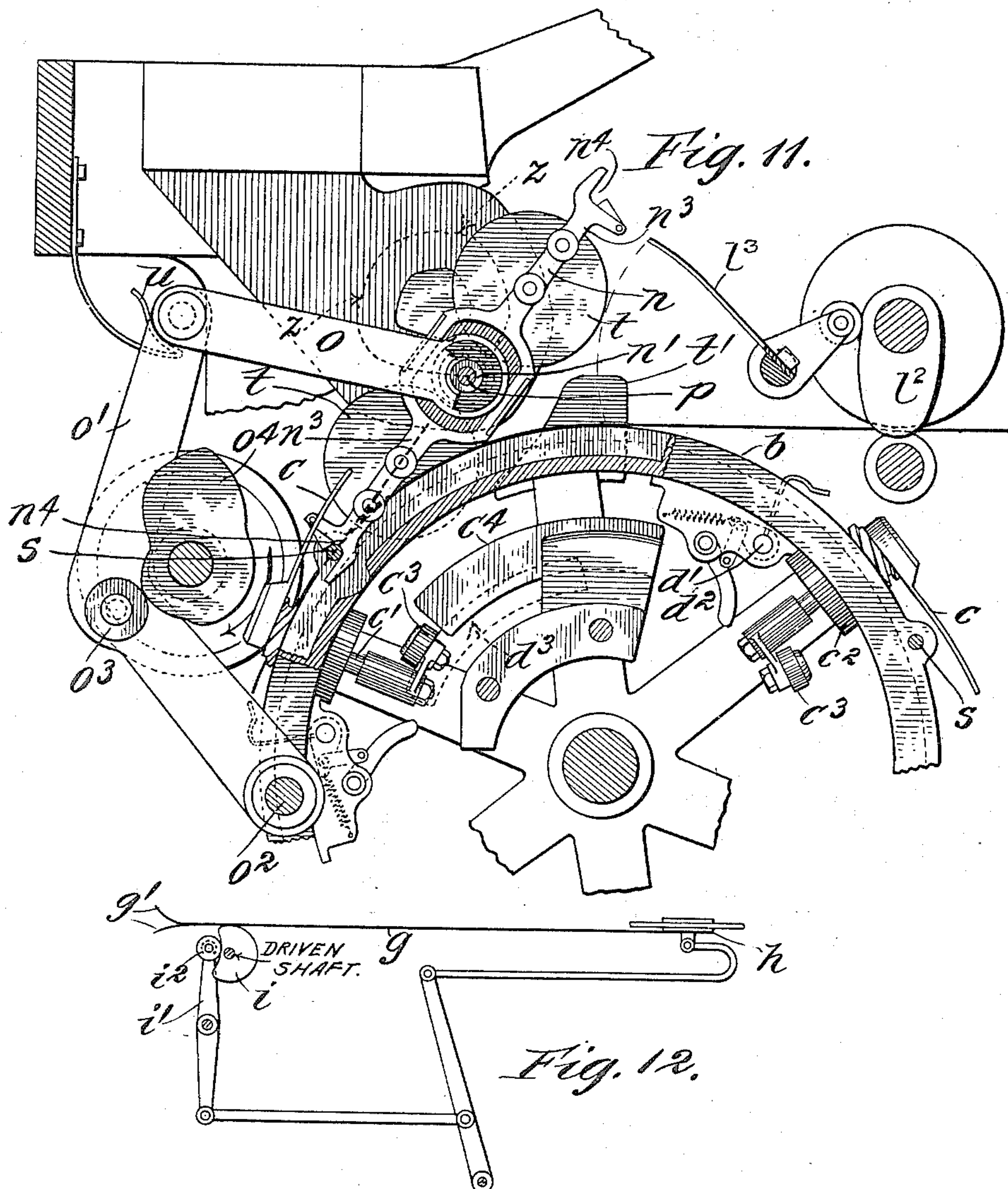
Patented Nov. 6, 1900.

H. E. WESTERVELT.  
PAPER BAG MACHINE.

(Application filed Aug. 19, 1899.)

(No Model.)

**7 Sheets—Sheet 6.**



Witnesses:

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No. 661,330.

Patented Nov. 6, 1900.

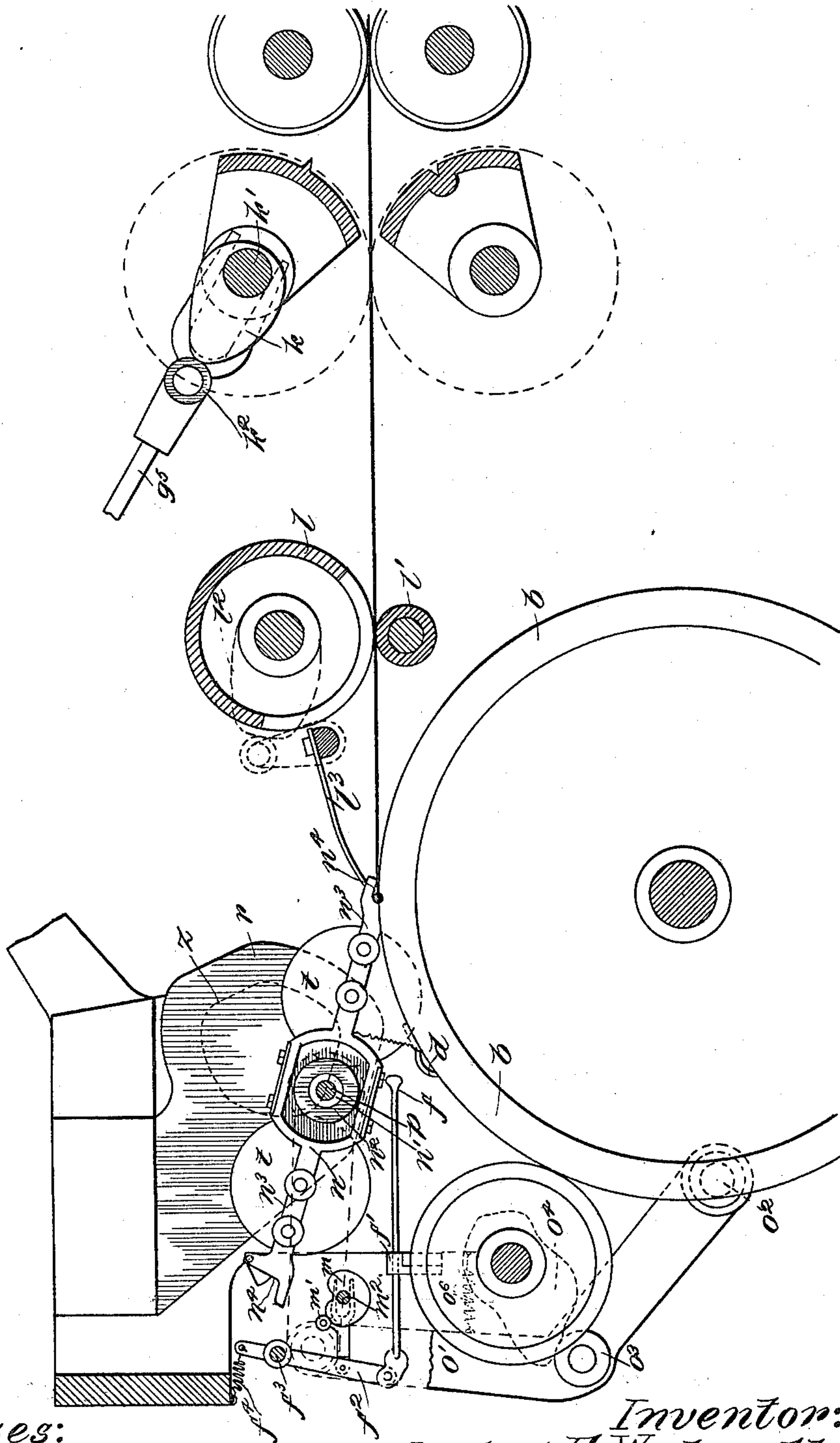
H. E. WESTERVELT.  
PAPER BAG MACHINE.

(Application filed Aug. 19, 1899.)

(No Model.)

7 Sheets—Sheet 7.

Fig. 1A.



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# UNITED STATES PATENT OFFICE.

HERBERT E. WESTERVELT, OF SOUTH BEND, INDIANA.

## PAPER-BAG MACHINE.

SPECIFICATION forming part of Letters Patent No. 661,330, dated November 6, 1900.

Application filed August 19, 1899. Serial No. 727,788. (No model.)

*To all whom it may concern:*

Be it known that I, HERBERT E. WESTERVELT, a citizen of the United States, residing at South Bend, in the county of St. Joseph and State of Indiana, have invented a certain new and useful Improvement in Paper-Bag Machines, (Case No. 1,) of which the following is a full, clear, concise, and exact description.

My invention relates to a paper-bag machine, and more particularly to that portion of the machine which forms the "diamond fold" in bellows-folded paper tubing, the formation of this well-known fold being the principal step in the manufacture of square satchel-bottomed paper bags.

In a prior patent granted to me March 28, 1899, No. 621,881, I have disclosed an expansible defining-plate which is adapted to be entered in its contracted position between the plies of the folded paper tubing and then expanded and given a rearward circular sweep to fold the paper into the required form. In the machine of said prior patent the folding-plate was assisted by a lower defining-plate at all times contained within the bag-blank. The upper or expansible defining-plate formed the fold in the upper ply of the tubing, while the lower plate defined the creases in the lower ply.

My present invention contemplates the use of a sweeping expansible folding or defining plate; but I have now obviated the necessity of the inner defining-plate which was contained within the tubing. I have further provided improved mechanism for operating the defining-plate and employ auxiliary grippers upon the folding-bed (which is preferably cylindrical) which attack the lower ply of the tubing from the outside, holding it down to the folding-bed and defining the required creases therein.

A further feature of my invention consists of a carriage whereon a plurality of defining-plates are mounted, said carriage being adapted to be rotated to give the required rearward sweep to the defining-plates and to bring one plate after another into position to engage the tubing, so that no time will be lost, one plate being brought into the proper initial position with respect to one section of tubing

or bag-blank while another plate is forming the fold upon a preceding bag-blank.

Still another feature consists in the provision of means whereby bags of different sizes may be manufactured by the one machine without the necessity of interchanging or readjusting many of the operating parts.

I will describe my invention more particularly by reference to the accompanying drawings, wherein—

Figure 1 is a vertical sectional elevation of a portion of a paper-bag machine containing the improvements of my invention, some of the parts being broken away and some well-known parts being omitted entirely, so that the salient features of my invention may not be obscured. Fig. 2 is a plan view of the defining-plates, together with the carriage whereon they are mounted and the mechanism for expanding and contracting the same. Fig. 3 is an end elevation of the mechanism shown in Fig. 2. Fig. 4 is a plan view showing a single defining-plate consisting of two coacting members in the act of engaging the upper ply of a bellows-folded tubular bag-blank preparatory to the formation of the diamond fold. Figs. 5, 6, and 7 are perspective views indicating somewhat diagrammatically the successive steps of the operation of forming the diamond fold in a section of bellows-folded tubing in accordance with my invention. Fig. 8 is a plan view showing the defining-plate in its contracted position in the act of withdrawing from the completed diamond-folded bag-blank, this figure being a continuation of the series Figs. 5, 6, and 7, the cylindrical folding being here indicated as developed into a plane. Fig. 9 is a vertical sectional view of the rotary cylindrical folding-bed illustrating the mechanism for operating a pair of side grippers which hold the lower ply of the tubing and assist in defining certain creases therein. Fig. 10 is a detail view of one of the side grippers of Fig. 9, showing its open and elevated position. Fig. 11 is a detail view in sectional elevation, similar to Fig. 1, showing the parts in an alternative position. Figs. 12 and 13 are detail views of portions of the mechanism herein-after to be explained; and Fig. 14 is a similar



view to that of Fig. 1, showing the striking-fingers and their operating mechanism in position upon the bag-machine, some portions of said machine being omitted the more clearly to illustrate certain other features thereof.

Corresponding parts are indicated by the same letters of reference wherever shown throughout the several figures.

I will first briefly describe the successive steps of the operation of forming the bellows-folded tubing into diamond-folded bag-blanks in accordance with my invention, together with the various instrumentalities which directly operate on the tubing to produce this result, after which I will proceed to explain more in detail the mechanism which I have devised for operating said instrumentalities.

The machine can best be understood by referring first to Figs. 5, 6, 7, and 8. The bellows-folded tubular bag-blank *a*, which is formed from a roll of paper by means well known in the art, is fed through the machine onto the rotary cylindrical folding-bed *b*, whereon the forward end of the blank is attached by the folding mechanism of my invention. The folding bed or cylinder *b* is armed with side grippers *cc*, which are adapted to engage the lower ply of the tubular blank from the sides, entering the bellows fold between the upper and lower ply and serving to assist in defining certain creases of the diamond fold while holding the lower ply tightly down to the surface of the cylinder. The cylinder is further armed with a front or center gripper *d*, which is adapted to engage the lower forward edge of the open mouth of the bag-blank as the latter is advanced, holding this part of the blank down to the surface of the cylinder and coacting with the side grippers to define the creases which are presently to be formed in the lower ply.

The expansible folding or defining plate, which is formed by two reciprocally-acting flat arms or members *ee*, is moved into position to be automatically entered between the folds of the upper ply of the bellows blank as the latter is fed forward onto the cylinder *b*, and after having been expanded within the upper ply of the blank the plate is given a rearward circular sweep about its lower edge as an axis to fold the paper. The creases in the upper ply of the bag-blank incident to a diamond-folded bag-bottom are thus defined by the outer edges of the expanded folding-plate, the primary cross-crease *a'* being formed by the lower edge of the plate, which presses against the surface of the cylindrical folding-bed *b* and forms the axis about which the plate rotates in making its rearward sweep.

Just before the entry of the expansible defining-plate within the mouth of the bag-blank the side grippers *cc* are entered in the bellows fold of the blank and simultaneously given a downward movement toward the sur-

face of the cylinder, thus acting to clamp down the lower ply of the blank. The forward edges of the side grippers are given an oblique position at an angle of substantially forty-five degrees with the longitudinal edge of the bag-blank and coacting with the front gripper *d* serve to define the angular creases which are formed in the lower ply of the blank incident to the diamond fold. Just as the expansible defining-plate is beginning its rearward sweep a pair of striking-fingers *ff* are engaged suddenly with the inner edges of the bellows fold at the mouth of the oncoming bag-blank, giving these edges an outward push to start the formation of the creases *a<sup>2</sup> a<sup>2</sup>*, which are formed at right angles with the inner longitudinal bellows crease and which are to constitute the opposite edges of the square bag-bottom when the bag is completed.

To keep the mouth of the forward end of the bag-blank open as it advances onto the cylinder, a reciprocating tongue *g*, carrying upon its end a pair of distending-fingers *g' g'*, is provided within the tubing, moving forward as the bag-blank advances onto the cylinder and later moving rearwardly again, so as to be out of the way when the rear end of the bag is cut off. I provide an auxiliary tongue *g<sup>2</sup>*, which is adapted to engage the upper edge of the open mouth of the oncoming bag-blank as the tongue *g* recedes, said auxiliary tongue serving to hold the mouth of the bag open at the time the contracted members of the defining-plates are inserted between the folds of the upper ply thereof—that is to say, the inner reciprocating tongue, with its distending-fingers *g' g'*, opens the mouth of the bag sufficiently to allow the tongue *g<sup>2</sup>* to enter, whereupon as the tongue *g* recedes the upper edge of the bag-blank is transferred from its distending-finger *g'* to the tongue *g<sup>2</sup>*, which in turn transfers the upper ply of the bag-blank to the defining-plate. As soon as the defining-plate is well within the mouth of the bag-blank the finger is quickly withdrawn and returned to its initial position.

The successive steps of the operation above described will be understood upon a brief explanation of Figs. 5, 6, 7, and 8. Fig. 5 shows the bag-blank *a* advancing on the cylinder *b*. The tongue *g* has just transferred the upper edge of the open mouth of the bag-blank to the tongue *g<sup>2</sup>* and is receding, so as to be out of the way when the tubing is cut off to form the tubular section or individual bag-blank. This view also illustrates the front gripper *d* lifted and about to engage the lower edge of the mouth of the bag-blank, and the contracted members *ee* of the defining-plate are shown in position to enter the mouth of the oncoming blank, between the folds of the upper ply thereof. Fig. 6 illustrates the next step. The members *ee*, which constitute the defining-plate, have entered the mouth of the



blank and have been expanded therein, the front and side grippers having engaged with the lower ply of the blank. The defining-plate is beginning its rearward circular sweep, and the striking-fingers  $f f$  are shown in the act of advancing upon the inner edges of the bellows crease to push them outward and start the formation of the creases  $a' a'$ . Fig. 6 also shows a depressing-plate  $l^3$ , which is engaged with the top of the bag-blank, crosswise thereof, over all the plies of the bellows fold. This depressing-plate  $l^3$  performs the function of holding down the upper ply at the time the defining-plate is expanding, thus insuring the expansion of the defining-plate within the upper bellows fold immediately below the upper ply and above the tucks. It also coacts in a measure with the defining-plate and assists in preventing wrinkles in the primary cross-crease which is formed at the edge thereof. Fig. 7 shows the defining-plate in the act of completing its rearward sweep, the diamond fold having been formed as before described, the creases of the upper ply being formed by the defining-plate and the creases in the lower ply being defined and formed by the side grippers  $c c$  and the front gripper  $d$ . The defining-plate is now ready to be withdrawn from the diamond fold, and in Fig. 8 the defining-plate is illustrated as being withdrawn in its contracted position. Fig. 8 also illustrates the front and side grippers removed from engagement with the lower ply of the bag-blank. The diamond-folded bag-blank is now ready to be passed through the pasting and final flap-folding mechanism. These last steps of the operation after the diamond fold has been completed are well known in the art and need not be particularly described. Having now set forth the successive steps in the operation of forming the diamond fold, together with the various instrumentalities which directly engage the bag-blank to produce this result, I will now proceed to describe the mechanism by which the movements of the several parts may be produced.

The mechanism for forming a strip of paper into bellows-folded tubing and the mechanism for feeding the tubing forward onto the cylindrical folding-bed and for cutting off sections of the tubing as bag-blanks is well known in the art and will not be described. I have omitted from the drawings as many of the old and well-known parts of the paper-bag machine as possible to avoid uselessly obscuring the drawings with a multiplicity of unimportant details, retaining, however, enough to show clearly the application of my invention.

The mechanism for working the tongue  $g$  has been omitted in Fig. 1 and is shown in detail in Fig. 12. Such tongues have heretofore been known in the art, and any desired machinery may be employed to produce the required reciprocating movement thereof.

I have shown in Fig. 12, however, a reciprocating block or cross-head  $h$ , whereon the tongue is mounted, which is adapted to slide to and fro upon a suitable bed at the rear of the machine. Lever mechanism is connected with the sliding block for moving the same, said lever mechanism being actuated by a rotating cam  $i$ , which is adapted to engage a cam-roller  $i^2$ , carried by an actuating-lever  $i'$ , said actuating-lever being connected by the intermediate lever mechanism with the sliding block or cross-head.

The auxiliary tongue  $g^2$  is mounted upon a rocking shaft  $g^3$ , (shown at the top in Fig. 1,) whereby it may be swung to and fro, as indicated by the dotted lines. A rotating cam-plate  $k$  is carried by one of the shafts  $k'$  of the machine and is adapted to cause the tongue  $g^2$  to be swung to and fro at the proper times, a connecting-rod  $g^5$ , which carries a cam-roller  $k^2$ , engaged by the cam-plate  $k$ , being connected with an operating-lever attached to the shaft. The auxiliary tongue  $g^2$  is shown in dotted lines in two alternative positions. It occupies the position  $g^{2x}$  when transferring the tubular bag-blank to the defining-plate and occupies the position  $g^{2y}$  when the bag-blank is being transferred to it from the distending-fingers  $g'$  of the reciprocating tongue  $g$ . As shown in full lines in Fig. 1, it has reached the forward end of its journey after having transferred the bag-blank to the defining-plate and is on the point of returning by a quick movement to the position  $g^{2y}$ , so that it will be out of the way when the carriage of the defining-plate is making its rearward sweep and to receive the next bag-blank.

It will be noted that of the pair of feeding-rollers  $l l'$ , which carry the bellows-folding tubing onto the cylinder  $b$ , the upper roller  $l$  is mutilated, having a portion of its periphery cut away, so that it will engage the strip of paper tubing during a portion only of its revolution. This mutilation of the roll  $l$  permits the tubing to be opened out or expanded ready for the insertion of the defining-plate. Mounted upon an oscillating shaft immediately in front of roll  $l$  is the depressing-plate  $l^3$ , which is actuated by means of suitable cams  $l^2$ , carried upon the shaft of said roll  $l$ , and springs. (Not shown in the drawings.)

The speed at which the paper is fed forward is preferably less than the surface speed of the cylinder. This permits various lengths of bags to be made on the one machine without changing or adjusting the cylinder or the speed thereof, the slower speed of the feed-rollers acting to hold the paper tubing back while each section or bag-blank is carried swiftly forward by the rotary cylinder.

The operation of the side grippers  $c c$  will be clearly understood upon an inspection of Figs. 8, 9, and 10. Each gripper is mounted upon a shaft  $c'$ , which is adapted to be rotated in screw-threaded bearings  $c^2$ , mount-



ed in the cylinder, and cross-lever mechanism is provided which connects the pair of grippers and causes them to act reciprocally. A cam-roller  $c^3$  is carried by a lever mounted upon the shaft of one of the grippers and is adapted as the cylinder rotates to engage a cam  $c^4$ , stationarily mounted upon the frame of the machine. This cam is shown in cross-section in Fig. 9 and is indicated diagrammatically by dotted lines in Fig. 8. The cam is also shown in dotted lines in Fig. 1, wherein it may be seen that the cam-roller will be pushed to one side, as shown in Fig. 9, during about one-sixth of the revolution of the cylinder—that is, from the time the bag-blank is fed onto the cylinder until the diamond fold has been completed. When the cam-roller  $c^3$  is in its normal position, as indicated in Figs. 8 and 10, the grippers will occupy positions out of the path of the bag-blank and will be slightly elevated above the surface of the cylinder, owing to the screw-threaded bearings.

I have shown but a single pair of grippers, but it should be understood that in the machine illustrated in Fig. 1 three such pairs of grippers are provided at equidistant intervals around the periphery of the cylinder—that is to say, the cylinder is so large that in order to save time three sets of gripping devices for attacking the lower ply of an oncoming bag-blank are provided.

The front gripper  $d$  is simply a little flat finger mounted upon a rocking shaft  $d'$ , which is adapted to be operated by a cam-lever  $d^2$ . A cam  $d^3$ , stationarily mounted upon the frame of the machine, is adapted to be engaged by the cam-lever  $d^2$  of each front gripper. This cam  $d^3$  is shown in Fig. 1 and is of such length that the front gripper is caused to engage the front edge of the lower ply of the bag-blank during the same time that the bellows folds thereof are engaged by the side grippers—that is, during the time that the diamond fold is being formed. It is to be understood that three of these front grippers are provided upon the cylinder  $b$ , corresponding to the three sets of side grippers.

Referring now to Figs. 6, 13, and 14, I will describe the means for causing the striker-fingers  $f f$  to perform their function. These striker-fingers, it will be remembered, push the inner edges of the bellows folds or creases outward just as the defining-plate is beginning its rearward circular sweep and serve to start the paper in a direction to form the creases  $a' a'$ . The striker-fingers  $f f$  are mounted to move longitudinally in a bearing-block  $f'$  and are connected with an operating-lever  $f^2$ , pivoted at  $f^3$  to the frame of the machine. A spring  $f^4$  tends to move the fingers in a direction to strike the paper—that is, in a rearward direction—and a cam  $m$  is provided for controlling this striking movement. The cam  $m$  is engaged by a cam-roller  $m'$ , which is connected with the operating-lever

$f^2$ , and the cam  $m$  is mounted upon a suitably-driven shaft  $m^2$ .

Turning now to the mechanism for operating the defining-plates, the expansion of the same will be readily understood by reference to Figs. 2, 3, and 4. The members  $e e$  of the defining-plate are pivoted at  $e' e'$  and are connected together by a cross-lever  $e^2$ , which causes them to act reciprocally. A toothed wheel  $e^3$  is carried by one of the members of each defining-plate, which is adapted to be engaged by a segmental rack  $e^4$ , pivoted at  $e^5$  to the framework of the carriage  $n$ . The carriage is formed with trunnions  $n' n'$  at its ends, which are carried by the arms  $o o$ , whereby the carriage may be rotated or turned end for end upon its trunnions. The trunnions are hollow, and reciprocating rods or pins  $p p$  are mounted to be moved longitudinally within the bores thereof. Each rod  $p$  is connected with one of the segmental racks  $e^4 e^4$  for rocking the same upon its pivot, so that as the rods are moved to and fro within the bores of the hollow trunnions the defining-plates associated with the said rods through the medium of the toothed wheels  $e^3$  and segmental racks  $e^4$  will be expanded or contracted accordingly as said rods move out or in. Springs  $p' p'$  are provided upon the carriage  $n$ , which tend to maintain the defining-plates in a contracted position—that is, with the pins  $p p$  protruding from the ends of the trunnions  $n' n'$ —and when the pins are pushed in until they are substantially flush with the ends of the trunnions the defining-plates will be expanded. Cam-rollers  $p^2 p^2$  are provided in the ends of the pins  $p p$  for engaging certain cam-grooves, hereinafter to be described, whereby the defining-plates may be expanded and contracted.

In order to cause the defining-plate to occupy its proper angular positions and to make its rearward circular sweep, the carriage  $n$ , upon which the two sets of defining-plate members are mounted, is caused to rotate upon its trunnions, and the trunnions are themselves moved around in the path indicated by the dotted line  $z$  in Figs. 1 and 11, an arrow serving to indicate the direction of such motion. Cam-rollers  $n^2 n^2$  are provided upon the projecting ends of the trunnions  $n' n'$  of the carriage, said cam-rollers being adapted to travel upon the peripheries of cams  $r' r'$ , formed upon the plates  $r r$ , which are stationarily mounted upon the frame of the machine. Cam-grooves  $q q$  are cut in the plates  $r r$ , into which the extremities of the pins  $p p$  are adapted to be forced during a portion of their journey, permitting the defining-plates to be contracted at such times, while during the remainder of the journey the cam-rollers  $p^2 p^2$  in the ends of the pins simply ride upon the surface of the cam-plates  $r r$ , thus maintaining the defining-plates expanded. The cam-grooves are of such length and position that the defining-



plates are maintained expanded during the formation of the diamond fold and contracted when they are removed from the fold and until they have been entered in the mouth of the next bag-blank to be folded. The arms  $o o$ , which directly support the carriage  $n$ , are pivoted at their ends to cam-levers  $o' o'$ , the opposite ends of which cam-levers are pivoted at  $o^2 o^2$  to the framework of the machine. Cam-rollers  $o^3 o^3$  are carried by the levers  $o'$ , said rollers being engaged by rotating cam-plates  $o^4$ , which are mounted upon the shaft  $o^5$ . Springs  $o^6$  connect the levers  $o'$  with rigid portions of the frame and serve to maintain the rollers  $o^3$  in operative engagement with their respective cam-plates.

The carriage  $n$  is formed with projecting arms  $n^3 n^3$ , which have jaws  $n^4 n^4$  formed upon the ends thereof, said jaws being adapted to be engaged by transverse pins  $s s$ , carried by the cylinder  $b$ . In Fig. 1 one of the pins  $s$  is shown at the beginning of its engagement, with the jaw formed at one of the ends of the arm  $n^3$ , and in Fig. 11 the pin is shown as it is just breaking its engagement with said jaw. It will be understood, then, that as the cylinder rotates the pins  $s s$ , carried thereby, engage the extensions or arms  $n^3$  of the carriage  $n$  and cause the same to turn upon its trunnions. There is, however, a certain arc through which the carriage cannot be turned merely by the action of the cylinder—that is to say, from a position similar to that shown in Fig. 11 to a position similar to that shown in Fig. 1 the carriage must be rotated by other means. Such means are provided in the shape of the wheels  $t t$ , which are mounted at one end of the carriage and which are adapted to be engaged by cam-plates  $t' t'$ , carried by the rotary cylinder  $b$ . Further, a projecting arm  $u$  is mounted upon the frame of the machine, having the extremity thereof formed with an inclined surface, whereon the extremity of the arm  $n^3$  is adapted to slide, causing that end of the carriage to be elevated as the other end is pushed on by the movement of the cylinder. The rotation of the carriage upon its trunnions is thus accomplished partly by the cams  $t'$ , which engage the wheels  $t$  of the carriage, next by the engagement of the extremity of the arm  $n^3$  with the inclined surface of the arm  $u$ , and then by the operation of the pins  $s s$ , which engage the jaws  $n^4$  of the carriage. The whole mechanism thus coacts to give the defining-plates their proper rearward sweep, and the relation of the cam-grooves  $q q$ , which cause the expansion and contraction of the blades or members of the defining-plates, is such that the said defining-plates will be expanded and contracted at the proper time, as has been explained.

It will be evident to those skilled in the art that many modifications can be made in the structure shown in the drawings without departing from the spirit of my invention, and

I do not, therefore, desire to be understood as limiting myself to the precise construction set forth; but,

Having thus described one embodiment of my invention, I claim as new, and desire to secure by Letters Patent, the following:

1. In a paper-bag machine, the combination with a folding-bed for receiving the bag-blank, of an expansible defining-plate comprising blades  $e e$  adapted to be inserted within the bag-blank to define the primary cross-crease and form the diamond fold, means for expanding and moving the defining-plate to fold the upper ply of the blank back upon itself, a gripper  $d$  disposed in advance of the bag-blank, adapted to engage the forward edge of the lower ply of the bag-blank and hold it down to the folding-bed while the upper ply is being folded back, and means for operating said gripper, substantially as set forth.

2. In a paper-bag machine, the combination with a folding-bed for receiving a bellows-folded bag-blank, of an expansible defining-plate adapted to be entered between the plies of the bag-blank when contracted, means for expanding and moving the plate to fold the upper ply of the blank back upon itself, grippers  $c c$  adapted to engage the lower ply of the blank to hold it down to the folding-bed and define the creases made in the lower ply while the upper ply is being folded back by the defining-plate, and means for operating said grippers, substantially as set forth.

3. In a paper-bag machine, the combination with a folding-bed for receiving a bellows-folded tubular bag-blank, of an expansible defining-plate consisting of two reciprocally-acting blades or members  $e e$ , means for entering the contracted defining-plate between the plies of the bag-blank, means for expanding and moving the defining-plate to fold the upper ply back upon itself, a front gripper  $d$  adapted to engage the central portion of the edge of the lower ply and hold the same down to the folding-bed, side grippers  $c c$  adapted to be entered at the sides of the blank in the bellows fold thereof, to hold the lower ply down to the folding-bed, said front and side grippers coacting to define the creases of the lower ply when the upper ply is folded over whereby a diamond-folded bag-bottom is formed, and means for operating said grippers, substantially as set forth.

4. In a paper-bag machine, the combination with a folding-bed for receiving a tubular bag-blank, of a reciprocating tongue  $g$  within the blank, adapted to open the mouth thereof, an auxiliary tongue  $g^2$  adapted to be inserted from the outside into the mouth of the tubular blank to hold the mouth of said blank open as the tongue  $g$  recedes, means for carrying the tongue  $g^2$  forward as the bag-blank advances, whereby the open mouth of the tube is carried forward farther than can be done by tongue  $g$ , a folding-plate adapted



to be inserted in the mouth of the blank, said tongue  $g^2$  being adapted to transfer the open blank to the folding-plate, and means for operating the folding-plate, whereby a bag-bottom is formed, as set forth.

5. In a paper-bag machine, the combination with means for feeding a tubular bag-blank, of a rotary cylindrical folding-bed adapted to receive the bag-blank, folding mechanism adapted to attack the blank upon the bed and fold the same, a pair of feed-rollers  $l l'$  adapted to carry the paper tubing forward onto the folding-bed, one of said feed-rollers being mutilated, having a portion of its periphery cut away, whereby the mouth of the bag-blank is permitted to expand as it reaches the cylindrical folding-bed, and means for driving the cylindrical bed and the feed-rollers, the surface speed of the mutilated feed-roller being less than the surface speed of the cylindrical bed, whereby tube sections or blanks of different lengths may be manipulated upon the one cylinder, as set forth.

6. In a paper-bag machine, the combination with means for feeding or advancing a bellows-folded tubular bag-blank, of a folding-bed adapted to receive the bag-blanks one after another as they are fed onto the same end foremost, a rotary carriage  $n$ , a plurality of expansible folding-plates mounted upon said carriage and adapted to attack the oncoming blanks to fold the same, means for expanding and contracting the folding-plates, and means for rotating the carriage to bring each folding-plate successively into position to attack the advancing blanks, as set forth.

7. In a paper-bag machine, the combination with means for feeding or advancing a bellows-folded tubular bag-blank, of a rotary cylindrical folding-bed for receiving the bag-blanks one after another as they are fed onto the same end foremost, a carriage  $n$  and a plurality of expansible folding or defining plates projecting radially therefrom adapted when contracted to be inserted within the mouths of the advancing bag-blanks, means for expanding and contracting the folding-plates, a pivotal mounting for the carriage, whereon the same may be rotated to bring one folding-plate after another in position to attack the advancing bag-blanks, and pins or projections  $s$  on the cylindrical folding-bed for engaging projecting parts of the carriage, whereby, as the cylinder turns, the carriage will be rotated or given a rearward sweep, substantially as and for the purpose set forth.

8. In a paper-bag machine, the combination with a folding-bed for receiving a bag-blank, of a reciprocating tongue  $g$ , and means for moving the same to and fro within the blank, said tongue being adapted to open the mouth of the blank, an auxiliary tongue  $g^2$  adapted to be inserted into the mouth of the tubular blank and to carry the same forward as the tongue  $g$  recedes during the further advance of the bag-blank, whereby the open

mouth of the tubular bag-blank is carried forward farther than can be done by the inner tongue  $g$ , a rotatable carriage  $n$  and a plurality of defining-plates carried thereby, adapted to attack the bag-blanks, means for expanding and contracting the defining-plates, and means for rotating said carriage to bring one defining-plate after another into position to attack the advancing bag-blanks, substantially as set forth.

9. In a paper-bag machine, the combination with a rotary cylindrical folding-bed for receiving a bag-blank, of an expansible defining-plate adapted when contracted to be entered between the plies of the blank, means for expanding the defining-plate and for giving the same a rearward sweep upon its lower edge as an axis to form the primary cross-crease and to fold the upper ply of the blank back against itself, grippers carried by the cylindrical folding-bed for holding the lower ply of the blank down to the folding-bed and for defining the creases formed in the lower ply when the upper ply is folded back, and striking-fingers  $ff$ , adapted to enter the open mouth of the blank as the defining-plate is beginning its rearward sweep, and to push the inner edges of the bellows fold outwardly to start the formation of longitudinal creases  $a^2 a^3$  in the diamond fold, substantially as described.

10. In a paper-bag machine, the combination with a folding-bed adapted to receive a tubular bag-blank, of a reciprocating tongue and means for moving the same to and fro within the blank, said tongue having distending-fingers upon the end thereof for opening the mouth of the bag-blank, an expansible defining-plate formed of two reciprocally-acting blades or members adapted to be entered within the mouth of the bag-blank as the same is held opened by the distending-fingers of the tongue, means for expanding the defining-plate within the tubular bag-blank and for pressing the lower edge of the expanded plate down against the folding-bed, to form the primary cross-crease, means for giving the defining-plate a rearward sweep about the said lower edge as an axis, whereby the upper ply of the blank is folded back upon itself, means for simultaneously holding the lower ply down to the folding-bed, and means for contracting and withdrawing the defining-plate from the completed fold, as set forth.

11. In a paper-bag machine, the combination with a folding-bed adapted to receive a tubular bag-blank, of an expansible defining-plate formed of two reciprocally-acting blades or members adapted to be entered within the mouth of the advancing bag-blank, means for expanding the defining-plate within the bag-blank and for pressing the lower edge of the expanded plate against the folding-bed, to form the primary cross-crease, a depressing-plate adapted to engage over all the plies of the tubing to hold the same down to



the cylinder at the time the defining-plate is expanded, said depressing-plate being thus adapted to assist in preventing wrinkles in the primary cross-crease, means for giving the defining-plate a rearward sweep about its lower edge, as an axis, whereby the upper ply of the bag-blank is folded back upon itself, means for simultaneously holding the lower ply down to the folding-bed and defining the angular creases incident to a diamond fold, and means for contracting and withdrawing the defining-plate from the completed fold, substantially as set forth.

12. In a paper-bag machine, the combination with a folding-bed for receiving the bag-blank, of an expansible defining-plate adapted when contracted to be entered between the plies of the blank and engage the same with the folding-bed, means for expanding and moving the plate about its lower edge as an axis, to fold the upper ply of the blank back upon itself and form the primary cross-crease, a gripper *d* disposed in advance of the bag-blank, adapted to engage the forward edge of the lower ply of the bag-blank and hold it

down to the folding-bed while the upper ply is being folded back, and means for operating said gripper, substantially as set forth.

13. In a paper-bag machine, the combination with a folding-bed for receiving a bag-blank, of an expansible defining-plate adapted when contracted to be entered between the plies of the blank and engage the same with the folding-bed, means for expanding and moving the plate about its lower edge as an axis, to fold the upper ply of the blank back upon itself and form the primary cross-crease, grippers *c c* adapted to engage the lower ply of the blank to hold it down to the folding-bed and define the creases made in the lower ply while the upper ply is being folded back by the defining-plate, and means for operating said grippers, substantially as set forth.

In witness whereof I hereunto subscribe my name this 15th day of August, A. D. 1899.

HERBERT E. WESTERVELT.

Witnesses:

GEORGE P. BARTON,  
DE WITT C. TANNER.