

No. 668,393.

Patented Feb. 19, 1901.

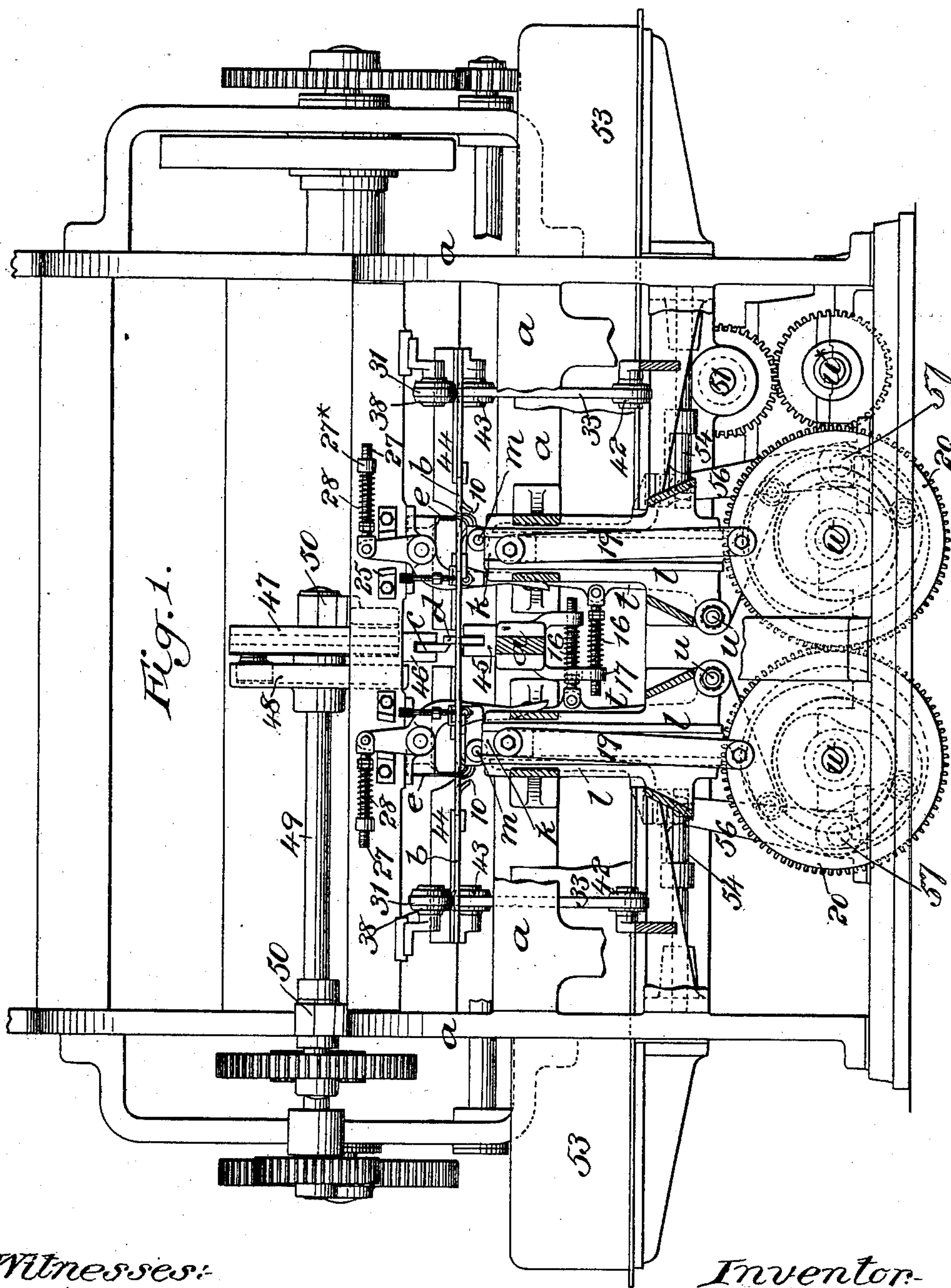
R. C. SEYMOUR.

APPARATUS FOR CUTTING AND FOLDING PAPER, &c.

(No Model.)

(Application filed Sept. 29, 1900.)

5 Sheets—Sheet 1.



Witnesses:
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Fred Haynes

Inventor:
Ralph C. Seymour
by attorney
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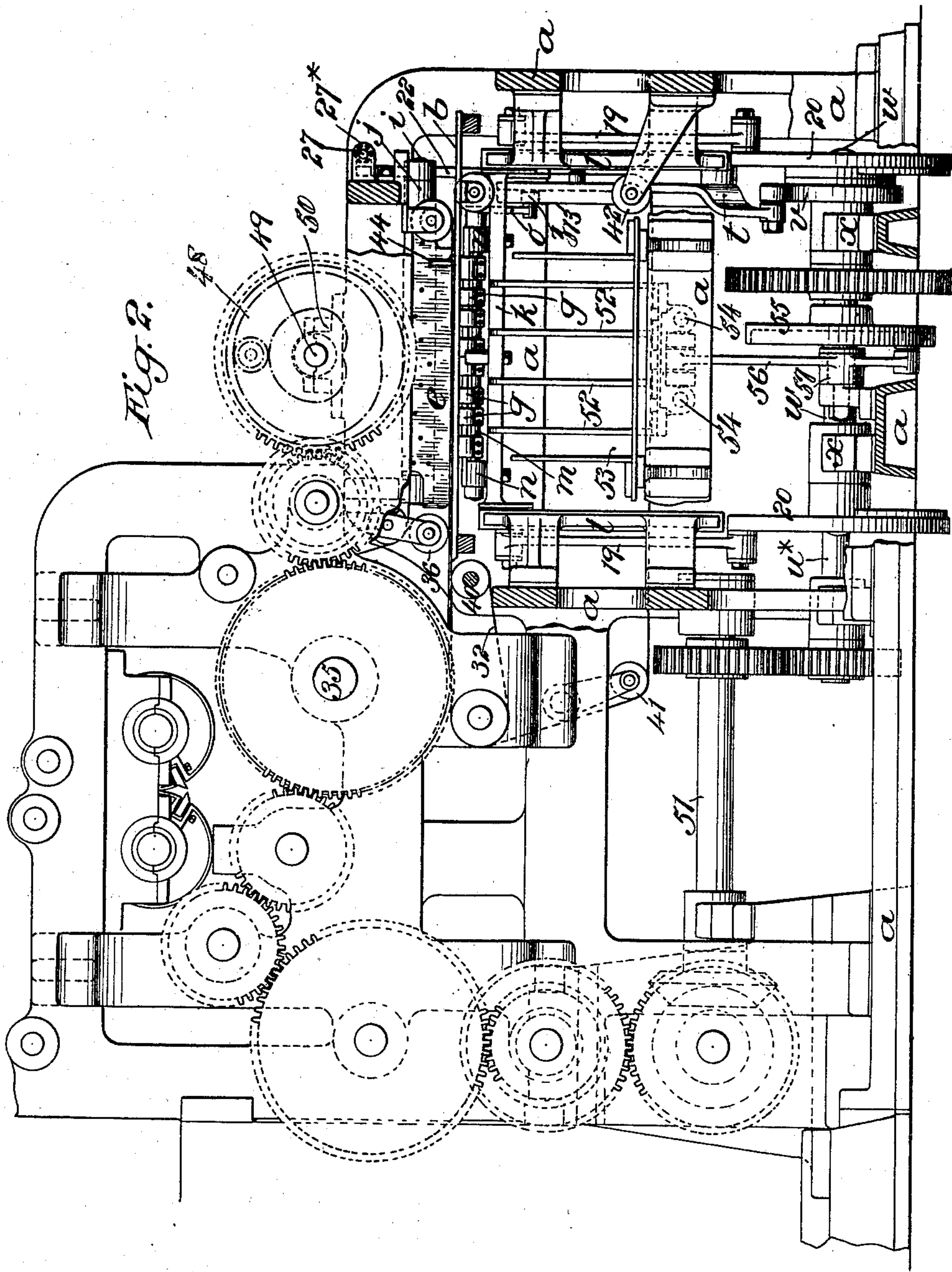
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(No Model.)

(Application filed Sept. 29, 1900.)

5 Sheets—Sheet 2.



Witnesses:

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5 Sheets—Sheet 3.

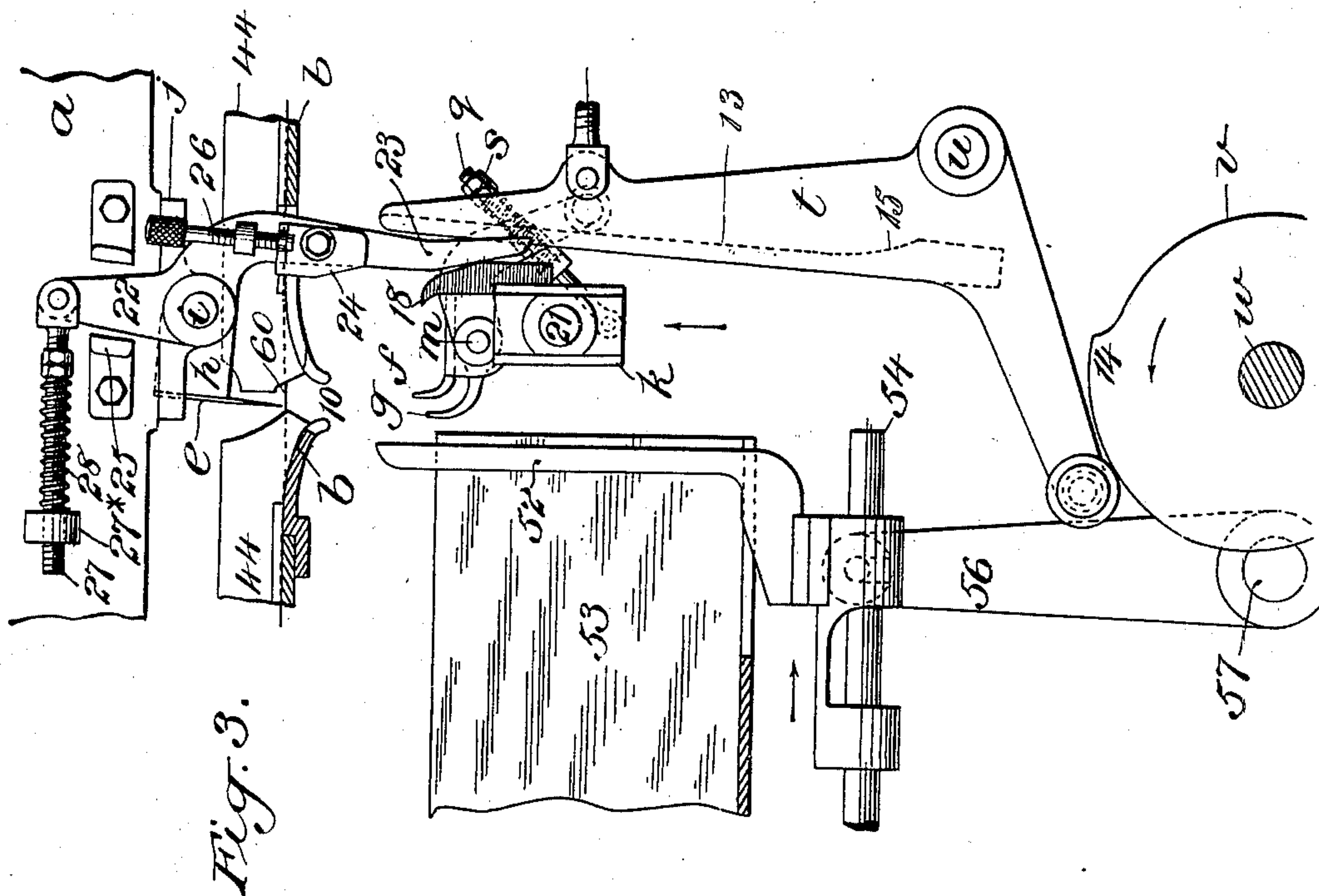


Fig. 3.

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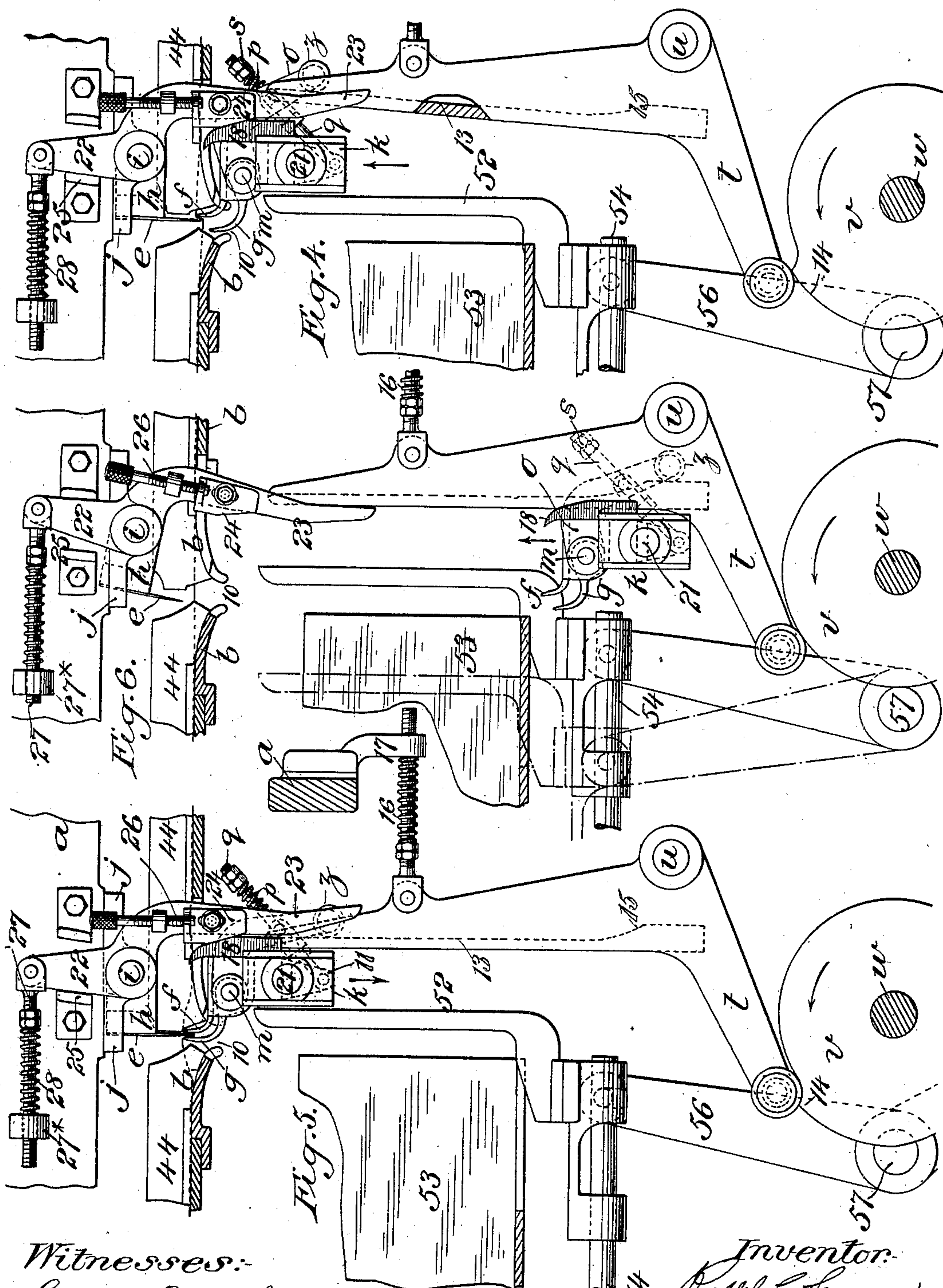
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(Application filed Sept. 29, 1900.)

(No Model.)

5 Sheets—Sheet 4.



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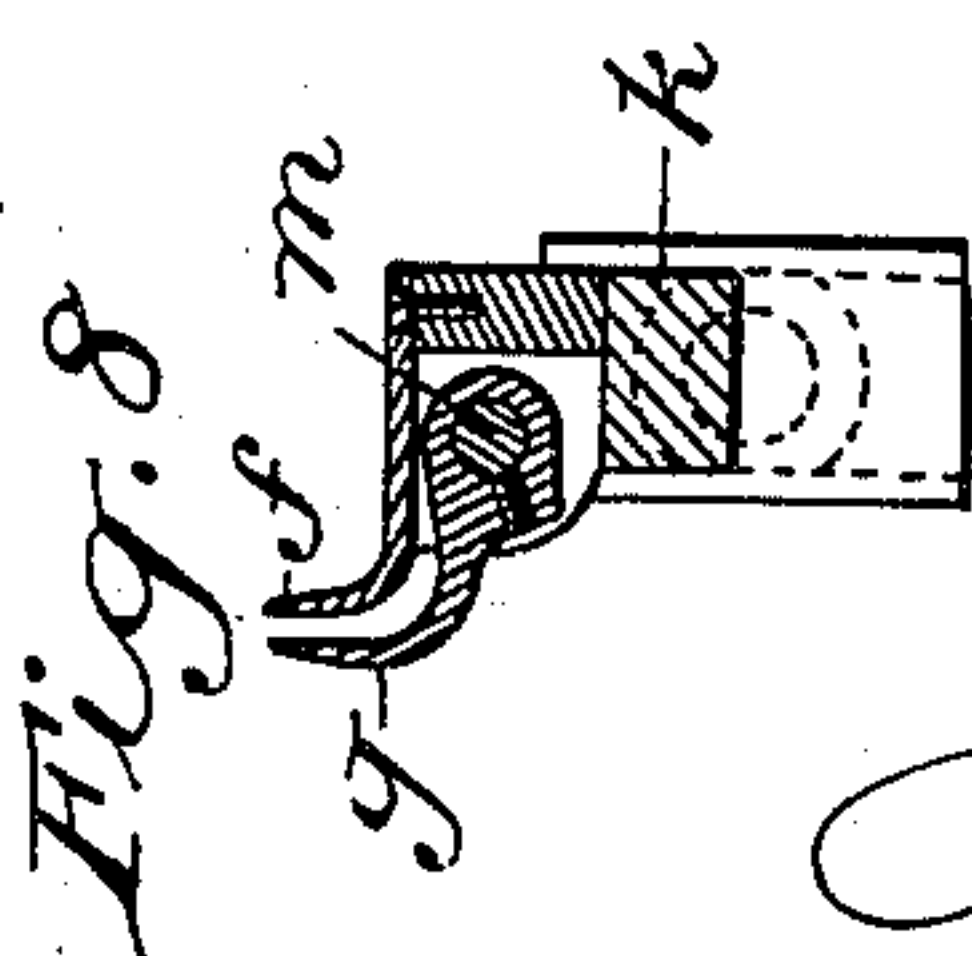
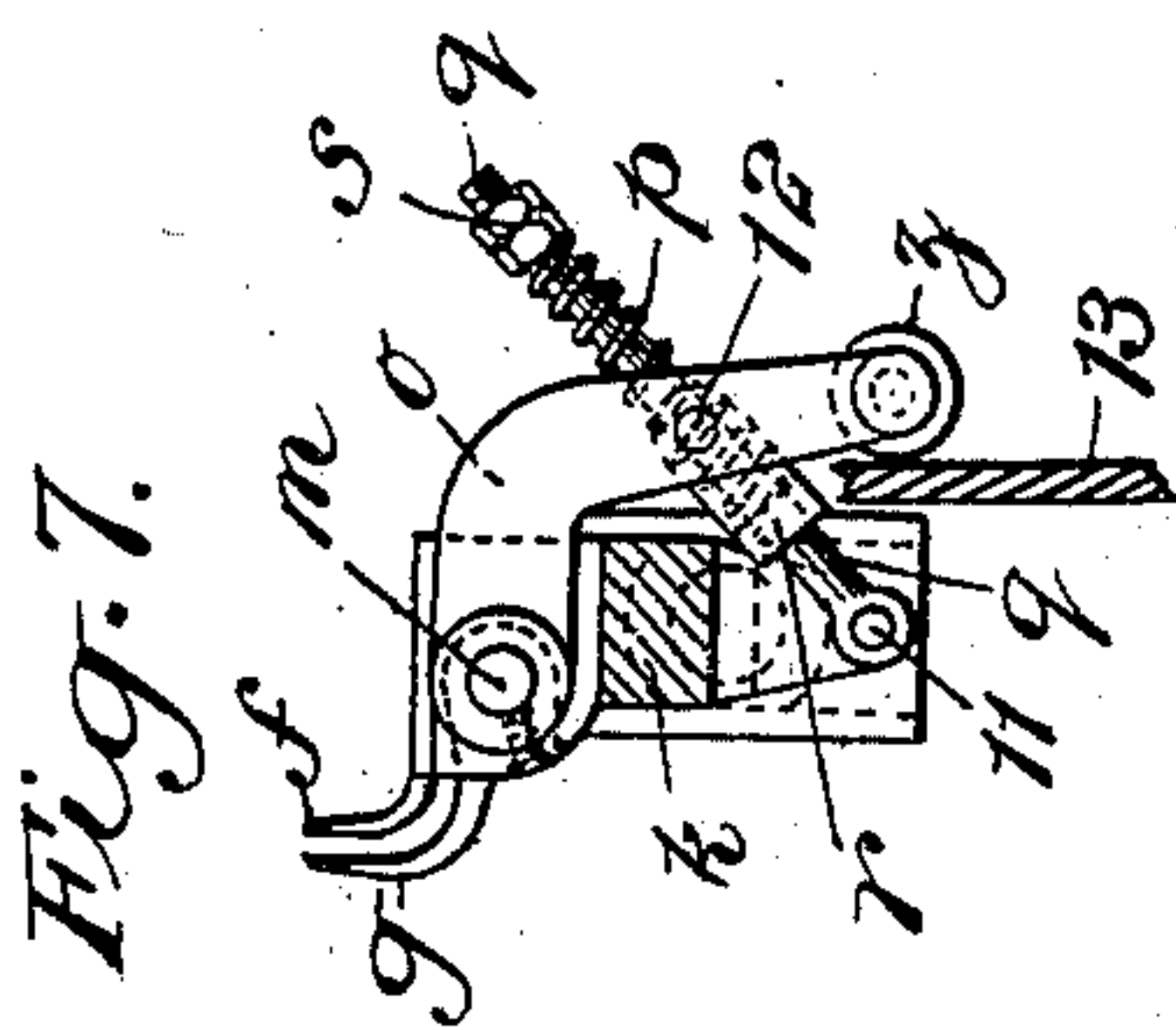
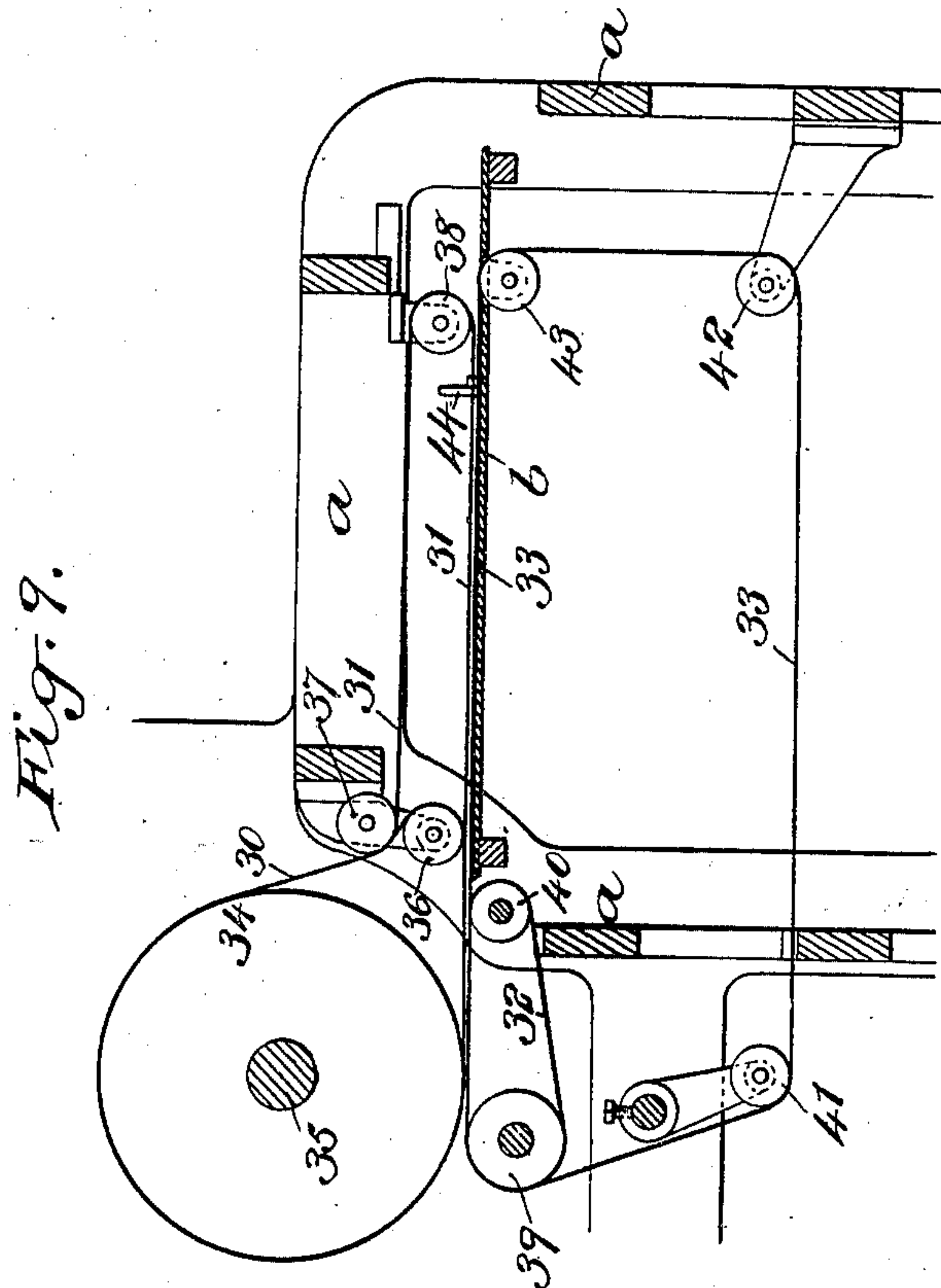
R. C. SEYMOUR.

APPARATUS FOR CUTTING AND FOLDING PAPER, &c.

(No Model.)

(Application filed Sept. 29, 1900.)

5 Sheets—Sheet 5.



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UNITED STATES PATENT OFFICE.

RALPH C. SEYMOUR, OF SOUTH ORANGE, NEW JERSEY, ASSIGNOR TO C. B. COTTRELL & SONS COMPANY, OF NEW YORK, N. Y., AND STONINGTON, CONNECTICUT.

APPARATUS FOR CUTTING AND FOLDING PAPER, &c.

SPECIFICATION forming part of Letters Patent No. 668,393, dated February 19, 1901.

Application filed September 29, 1900. Serial No. 31,489. (No model.)

To all whom it may concern:

Be it known that I, RALPH C. SEYMOUR, a citizen of the United States, and a resident of South Orange, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Apparatus for Cutting and Folding Paper and other Fabrics, of which the following is a specification.

A cutting and folding apparatus embodying the present invention includes as its folding devices a slotted table upon which the sheet to be folded is placed, a blade situated at the face of said table and presented edge-wise opposite to the slot therein, and reciprocating gripping-jaws operating through said slot to first crease the sheet over the edge of said blade in the intended line of fold and to afterward complete the folding of the so-creased sheet by drawing it from said blade and through said slot. In combination with such folding devices the said invention includes cutting or slitting devices, on opposite sides of which there are two sets of such folding devices for the purpose of first creasing in two places preparatory to the folding a sheet which has been placed upon the folding-table, next slitting said sheet into two smaller sheets between the creases, and finally folding the said smaller sheets on the lines of the creases.

In the accompanying drawings, Figure 1 represents a front elevation of a cutting and folding apparatus embodying my invention. Fig. 2 is a left-hand side elevation corresponding with Fig. 1. In both of these views parts of the framing are omitted to show the working parts. Figs. 3, 4, 5, and 6 are front views, on a larger scale than Figs. 1 and 2, of the folding devices, showing the moving parts thereof in four different positions. Figs. 7 and 8 are views of details of the folding devices which will be hereinafter explained. Fig. 9 represents a vertical section on a plane parallel with Fig. 1 of the folding-table and the carrying-tapes for depositing the sheets thereon.

a a designate the stationary framing, on which sheets to be cut and folded are deposited by any suitable means. This table is represented in Fig. 1 as wide enough for

the reception of a sheet which is to be slit centrally by suitably-arranged shears *c d*, Fig. 1, to divide it into two smaller sheets. On opposite sides of and parallel with these shears at suitable equal distances there are provided in the table two folding-slots 10, one for folding one and the other for folding the other of said smaller sheets, which may be hereinafter referred to as "cut" sheets. Over each of the slots 10 there is arranged at the face of or above the table *b* the creasing-blade *e*, the edge of which is presented downward opposite to and parallel with the slot 10. Under or at the back of the table opposite the slot 10 are arranged the gripping-jaws or grippers *f g*, of which there are two sets, one set for each of the creasing-blades *e*, each set consisting of as many aligned pairs as may be necessary, according to the length of the fold to be made. The further description of one of these creasing-blades and its corresponding set of grippers and their appurtenances which I will now proceed to give with reference to Figs. 3, 4, 5 and 6 will apply to both of said blades and their corresponding sets of grippers.

The creasing-blade *e* is represented as rigidly secured to a stock *h*, below which its edge projects some distance. This stock *h* is pivoted at its ends by pivots *i* to bearing-blocks *j* on the framing *a* and is capable of an oscillating movement about those pivots which gives its projecting edge both a slight rising-and-falling movement and a slight lateral movement, as illustrated in Figs. 3, 4, 5, and 6, which represent the stock and blade in four different positions. This movement of the blade and its purpose will be hereinafter more fully explained.

The grippers are attached to a carrier *k*, which consists of a bar which is arranged to reciprocate vertically in upright guides *l*, bolted onto the framing *a a*. These guides are omitted from Figs. 3, 4, 5, and 6, but are shown in Figs. 1 and 2. The reciprocating movement of the said carrier is produced by rods 19, connecting its ends 21 with cranks 20 on a rotary shaft *w*, arranged in suitable fixed bearings *x* on the lower part of the framing *a*. One member *f* of each pair of

grippers is, as shown in Figs. 7 and 8, which represent transverse sections of the grippers and carrier, rigidly secured on the top of the carrier *k*, and the other member *g* is carried by a small rock-shaft *m*, which is common to all of the members *g* and runs the whole length of the carrier *k*, on which suitable bearings *n* (see Fig. 2) are provided for said rock-shaft. The said rock-shaft has on one end a downward projection in the form of a lever-arm *o* (see Figs. 2, 3, 4, 5, 6, and 7) for the purpose of operating it to give the gripper members *g* their opening-and-closing movement. The said members are closed and kept normally closed by means of a spring *p*, applied in any suitable manner. In the example represented the said spring is coiled upon a rod *q*, one end of which is pivoted at 11 to the carrier *k* and which passes through a lug *r*, Fig. 7, which is pivoted at 12 to the lever-arm *o*. The said spring has its abutment at one end against the lug *r* and at the other end against an adjusting-nut *s*, applied to a screw-thread on the rod. The opening of the gripper members *g* has to take place twice for each creasing and folding movement—viz., just before the completion of the upward movement of the carrier and just before the termination of the downward movement of the latter. These opening movements are produced through a lever *t*, which works on a fixed fulcrum *u* and is operated by a cam *v* on the rotary shaft *w*, before mentioned. The lever-arm *o* on the gripper rock-shaft *m* is furnished at its end with a roller *z*, which runs up and down the back of a rib 13 on the lever *t*. The upper opening movement of the grippers is produced, as shown in Fig. 5, by the movement of the lever *t* produced by the offset portion 14 of the cam *v*, and their lower opening movement is produced, as shown in Fig. 6, by the roller *z* running down against a cam-curve 15 on the lower part of the rib 13, while the lever *t* is held stationary on a concentric portion of the rotary cam *v* by means of a spring 16, which is applied between said lever and a fixed bracket 17 on the framing *a*.

The movement of the creasing-blade *e*, hereinabove mentioned, is produced by a wedge-like cam 18, carried by and projecting upward from the gripper-carrier *k*, the said cam 18 acting upon the arm 22 of a lever 22 23, which is attached to one end of the creasing-blade stock *h* for the purpose of giving the said stock the oscillating movement hereinbefore mentioned. When the said stock is in its operative position, with the blade *e* vertical or perpendicular to the face of the table *b* and its lower edge opposite the center of the slot 10 therein, as shown in Figs. 4 and 5, the stock and blade are held rigidly in that position by the action of the cam 18 against the shoe 24 on the downwardly-projecting lever-arm 23, which holds the upwardly-projecting lever-arm 22 against a fixed stop 25, secured to the framing. This shoe 24 is ad-

justable on the lever by a screw 26, so that the lever may be so locked between the cam 18 and stop 25 that there may be no play of the blade *e* and no deviation from the operative position aforesaid while the grippers are taking the sheet. When the lever is not so locked, the blade is held in the inclined position with its edge slightly raised, as shown in Fig. 4, by a spring 28, which is coiled upon a push-rod 27, which is connected with the arm 22 of the lever and works through a fixed eye 27*, which constitutes the abutment for the said spring.

For feeding the sheet to the table *b* any suitable means may be employed. I have represented for that purpose in Figs. 1 and 2, and particularly in Fig. 9, sheet-carrying devices consisting of tapes 30 31 32 33, all driven in a direction parallel with the slots 10 from pulleys 34 on a shaft 35, the tapes 30 running on said pulleys 34 and on rolls 36, the tapes 31 running on said pulleys 34 and on rolls 37 38, the tapes 32 running on rolls 39 40, and the tapes 33 running on the rolls 39 41 42 43; but as these carrying devices are not claimed as parts of the present invention I have merely explained them so far as they appear in the drawings sufficiently to prevent their confusion with other parts of the mechanism, and it is sufficient to say further with respect to them that they move in a direction parallel with the lines on which the sheets are to be cut and folded and on depositing the sheets on the table *b* they carry them up to a stop 44, arranged on the said table transversely to its slots 10.

The slitting-cutters *c d*, hereinbefore mentioned, for dividing into two sheets each of the sheets deposited on the table *b* are shown in Fig. 1 as consisting of a stationary cutter *d* and a reciprocating cutter *c*. The stationary cutter *d* is supported in a stock 45 below the table, and its cutting upper edge projects upward through a slot in the table. The reciprocating cutter is secured in a stock 46, which works in vertical guides 47 (see Fig. 1) and which derives its reciprocating motion from a cam 48 on a rotary shaft 49, working in bearings 50 on the upper part of the framing.

The shaft *u* for producing the reciprocating movement of the gripper-carrier *k*, the shaft 35 for driving the feeding-tapes, and the cam-shaft 49 for operating the slitting-blade *c* may be driven by any suitable means. In Figs. 1 and 2 of the drawings all are represented as driven by gearing from a shaft 51.

Having now separately described the several parts which together constitute my invention and their operating mechanism and movements, I will before describing their combined operations state that the purpose of the lateral movements of the two blades *e*, hereinbefore described, is to provide for the folding exactly in the middle of the two cut sheets produced by the slitting-cutters *c d* from the sheet which is fed onto the table *b*. To in-

sure this exact folding, the preliminary creasing produced by the combined action of said blade and the grippers should be performed before the slitting, and in order that this may be done it is necessary that the lateral gathering in of the sheet which is necessary to form the crease or bight of the fold should be all from the outer edges thereof toward the middle.

The combined operations of the two sets of creasing and folding devices and the slitting-cutters will now be described with reference to Figs. 1, 3, 4, 5, and 6. I will first suppose the sheet 60 to have been just deposited upon the table with its head or front edge up to the stop 44. The creasing and folding devices will then be in the respective positions shown in Fig. 3, the grippers, which are open, having by the upward movement of the carrier *k* been brought to a short distance below the table *b* and the downward movement of the blades *e* having been commenced by the action of the cam 18 on the lower part of the lever-arm 23. The continued upward movement of the carriers *k* raises the points of their gripper members *f* through the slots 10 in the table and at the same time so brings the cams 18 into operation on the shoes 24 that the blades *e* strike the sheet and move downward and laterally toward the gripper members *f* nearly to the upright position shown in Fig. 4, and so gather in the paper from the side edges toward the middle of the sheet for the commencement of the formation of the creases or bights of the folds to be made therein, the blades and their respective gripper members *f* being now side by side in near proximity to each other, with only space enough between them to allow free movement of paper between them in both directions from the edges of the sheet. The further continued upward movement of the carriers causes the cams 18 to produce the final descent of the blades, which then pinch the paper against the grippers *f*. At this moment the movement of the cutter *c* takes place and the sheet is cut in two, and immediately afterward the levers *t*, falling over the edges of the offsets 14 of their cams *v*, liberate the lever-arms *o* of the gripper rock-shafts *m*. The springs *p* then acting on said arms *o* will instantaneously close the gripper members *g* upon the paper between them and the blade *e*, as shown in Fig. 5, and so complete the bights of the folds of the two cut sheets, leaving the paper gripped between the two members of the grippers and the blade *e*. The carrier *k* then descending, the grippers draw the bights of the folds from the blades and so grip the two cut sheets as to draw them down through the slots of the table *b*, and thus complete the folds. After the folds have been thus completed the downward movement of the carriers and grippers is continued far enough to carry the rollers *z* down the cam-curves 15 on the levers *t*, and thereby to produce the opening of the grippers, as illustrated in Fig. 6,

and the liberation of the folded sheet, which may be carried away by any suitable means out of the way of the grippers, which after the liberation of one sheet ascend with their carriers to take a new sheet.

It may be observed that in the operation of this apparatus the folding-blade *e* never enters the slot in the table and never descends below the face of the sheet laid flat on the table. The creasing or commencement of the fold is performed by the grippers passing upward through the slot in the table and carrying the sheet up on opposite sides of the blade. The slot in the table has nothing whatever to do with the creasing, that being done by the grippers and the folding-blade above the table.

Although I at present consider it preferable to so time the operations of the creasing, cutting, and folding devices that the preliminary creasing to form the bight of the fold should be performed before the cutting of the sheet, as above described, the said operations may be so timed that the cutting will be performed before the commencement of the creasing.

The means for removing the folded cut sheets after their liberation from the grippers may be of any known or suitable kind—as, for example, horizontally-moving packers 52, working through the bottoms of packing-boxes 53, into which the sheets drop edgewise from the grippers. These packers are represented as sliding on stationary guide-rods 54 and operated by cams 55 on the two shafts *w* through levers 56, which work on fulcrums 57 and are connected with said packers.

It is obvious that the folding devices herein described may fold at the same time a plurality of superposed sheets or a sheet which has been previously folded and which is presented in two or more thicknesses to such devices.

What I claim as my invention is—

1. In sheet-folding apparatus, the combination of a blade and reciprocating gripping-jaws for creasing the sheet over the edge of said blade preparatory to folding and withdrawing the so-creased sheet from said blade, substantially as herein described.

2. In sheet-folding apparatus, the combination of a blade and spring-closed reciprocating gripping-jaws for creasing the sheet over the edge of said blade preparatory to folding and withdrawing the so-creased sheet from said blade, substantially as herein described.

3. In folding apparatus, the combination of a table having a slot therein, a blade situated at the face of said table and presented edgewise opposite said slot, and reciprocating gripping-jaws operating through said slot from the back of said table first to crease and grip the sheet upon said blade and afterward draw it therefrom through said slot in a folded condition, substantially as herein described.

4. In folding apparatus, the combination of a table having a slot therein, a blade situated at the face of said table presented edge-wise opposite said slot, reciprocating gripping-jaws arranged opposite said slot and blade, means for moving said gripping-jaws to and from said blade through said slot, and means for opening and closing said jaws, substantially as herein described.
5. In folding apparatus, the combination of a table having a slot therein, a blade presented edgewise opposite said slot at the face of said table, a reciprocating gripper-carrier at the back of said table, grippers, one member of which is fixedly attached to said carrier and the other member of which is movably attached to said carrier and both of which members work through the slot in the table, and means for producing the movements of the latter member for grasping and liberating the sheet, substantially as herein described.
6. In folding apparatus, the combination of a table having a slot therein, a creasing-blade situated entirely at the face of said table and having a lateral movement transverse to the length of said slot, and gripping-jaws operating through said slot first to crease and grip the sheet on said blade and afterward to withdraw it therefrom through said slot, substantially as and for the purpose herein described.
7. In folding apparatus, the combination of a slotted table, a reciprocating gripper-carrier at the back of said table, grippers, one member of which is fixedly attached to said carrier, and the other member of which is movably attached thereto, a creasing-blade situated entirely at the face of said table, means for producing a lateral movement of said blade toward and from the said fixedly-attached gripper member, and means for moving said movably-attached gripper member toward and from the said blade, substantially as herein described.
8. In folding apparatus, the combination of a table having a slot therein, a reciprocating gripper-carrier at the back of said table, grippers, one member of which is fixedly attached to said carrier and the other member of which is pivoted to said carrier, a creasing-blade situated entirely at the face of said table, means for producing a movement of said blade both toward and from the table and toward and from said fixedly-attached gripper member while said member protrudes through the slot in the table, a stop for arresting said blade in a position perpendicular to the table and opposite the slot therein, and means for moving said pivoted gripper member within said slot toward and from said blade, substantially as herein described.
9. In folding apparatus, the combination of a slotted table, an oscillating stock carrying a creasing-blade at the face of said table, a reciprocating gripper-carrier at the back of said table, grippers, one member of which is fixedly attached to said carrier, and the other member of which is pivoted thereto, means for moving said pivoted gripper member for opening and closing the jaws of the grippers, and a cam on the gripper-carrier for acting on a projection from said stock for producing the movement of the creasing-blade toward and from said fixedly-attached gripper member, substantially as herein described.
10. In folding apparatus, the combination of a table having a slot therein, a creasing-blade situated at the face of the table and presented edgewise opposite said slot at the face of said table, a gripper-carrier having a reciprocating movement toward said table at the back thereof, grippers, one member of which is fixedly attached to said carrier and the other member of which is pivoted thereto and both members of which work through the slot in the table, a projection from said pivoted member, a cam-actuated lever for acting on said projection to open the grippers as they approach the table, for taking the sheet to be folded, and a cam-surface on said lever for acting on said projection to open the grippers for liberating the sheet, and a spring for closing the grippers, substantially as herein described.
11. The combination with a folding-table in which are two parallel slots, a cutting device for dividing a sheet on said table between said slots, creasing-blades situated at the face of the table and arranged respectively one opposite each of said slots, grippers, one set for each of said creasing-blades, arranged respectively opposite said slots and blades, and means for producing a reciprocating motion of said grippers by which they are carried to and fro through said slots to crease the divided sheets on said blade and withdraw them therefrom through the slots, substantially as herein described.
12. The combination with a folding-table, in which are parallel slots, a cutting device for dividing a sheet on said table between said slots, creasing-blades arranged respectively one opposite each of said slots and having movements laterally thereto for gathering in the divided sheets from opposite directions, toward the cutting device, and grippers, one set for each of said creasing-blades, arranged respectively opposite said slots and blades, substantially as herein described.
13. The combination with a folding-table in which are parallel slots and on which is a sheet-stop arranged transversely to said slots, of sheet-feeding devices running parallel with said slots, a cutting device for dividing a sheet on said table between said slots, creasing-blades arranged respectively one opposite each of said slots and having movements laterally thereto for gathering in the divided sheets from opposite directions toward the cutting device, and grippers, one set for each of said creasing-blades arranged respectively opposite said slots and blades, substantially as herein described.
14. In folding apparatus, the combination

of a table in which is a slot, a creasing-blade at the face of said table opposite said slot, a gripper-carrier at the back of said table opposite said slot and blade, a pair of grippers 5 of which one member is fixedly attached and the other pivotally attached to said carrier, means for first moving said gripper-carrier and blade to bring the fixedly-attached gripper member and the blade side by side in 10 near proximity to each other at the face of the table with a space between them and means for afterward operating the pivotally-attached gripper member to pinch the sheet between the grippers and the blade at the 15 face of the table, substantially as herein described.

15. The combination of a table in which are two parallel slots, a cutting device for dividing a sheet on said table between said 20 slots, creasing-blades at the face of said table arranged respectively, one opposite each of said slots, gripper-carriers at the back of said table arranged respectively opposite said

slots and blades, a pair of grippers for each creasing-blade, one member of each of said 25 pairs being fixedly attached to and the other member pivotally attached to its respective carrier, means for first moving said gripper-carriers and blades to bring each fixedly-attached gripper member and its respective 30 blades side by side, in near proximity to each other, means for next producing the operation of the cutting device, and means for afterward operating the pivotally-attached gripper members to pinch the sheet between 35 the grippers and the blades, substantially as herein described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 27th day of Sep- 40 tember, 1900.

RALPH C. SEYMOUR.

Witnesses:

FREDK. HAYNES,
HENRY PHIEME.