

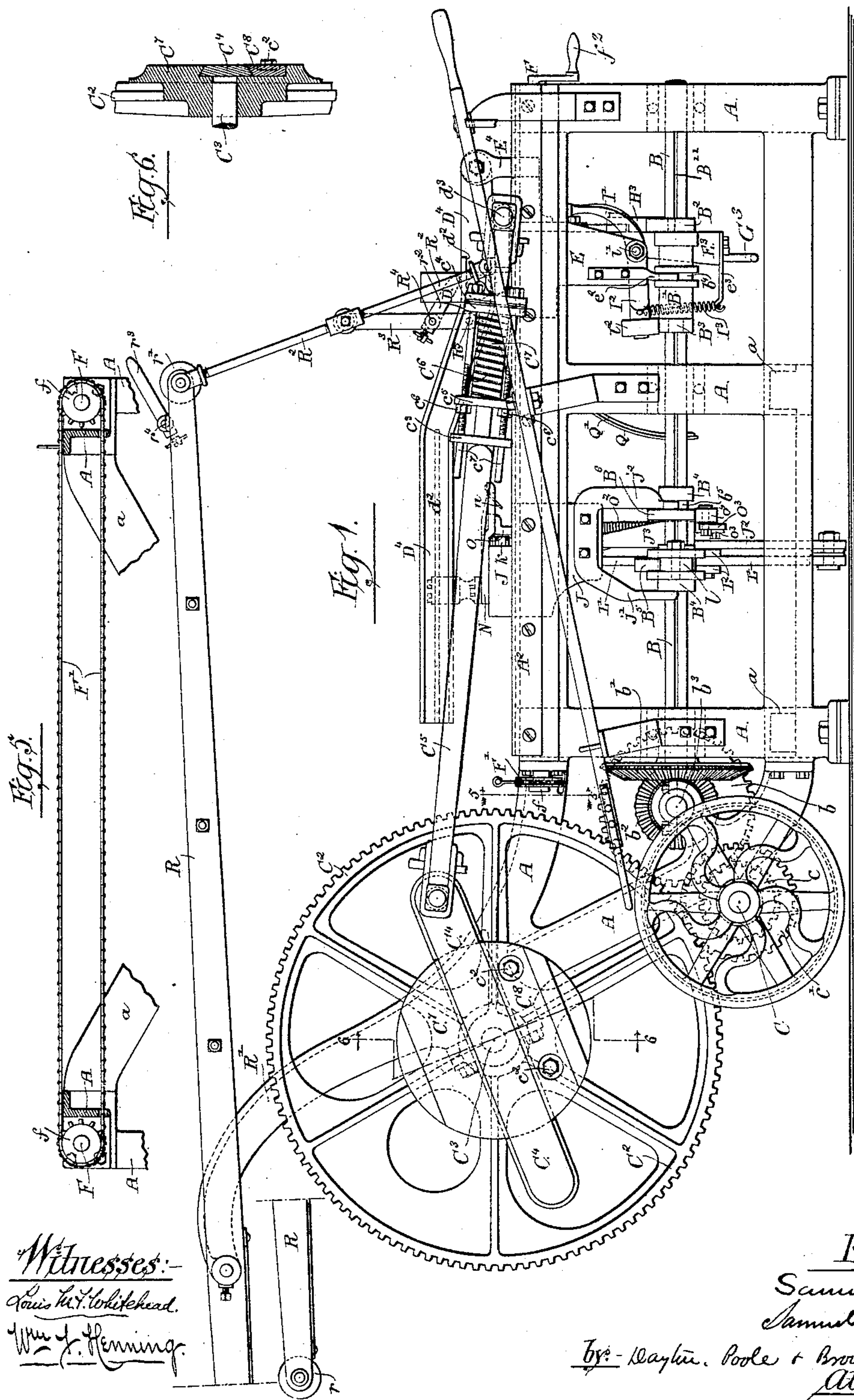
(No Model.)

6 Sheets—Sheet 1.

S. T. LOCKWOOD & S. K. WHITE.
CLOTH FOLDING MACHINE.

No. 482,373.

Patented Sept. 13, 1892.



Witnesses:
Louis H. Whitehead.
Wm. J. Henning.

Inventors
Samuel K. White.
Samuel T. Lockwood.
by: Clayton, Poole & Brown
Attorneys.

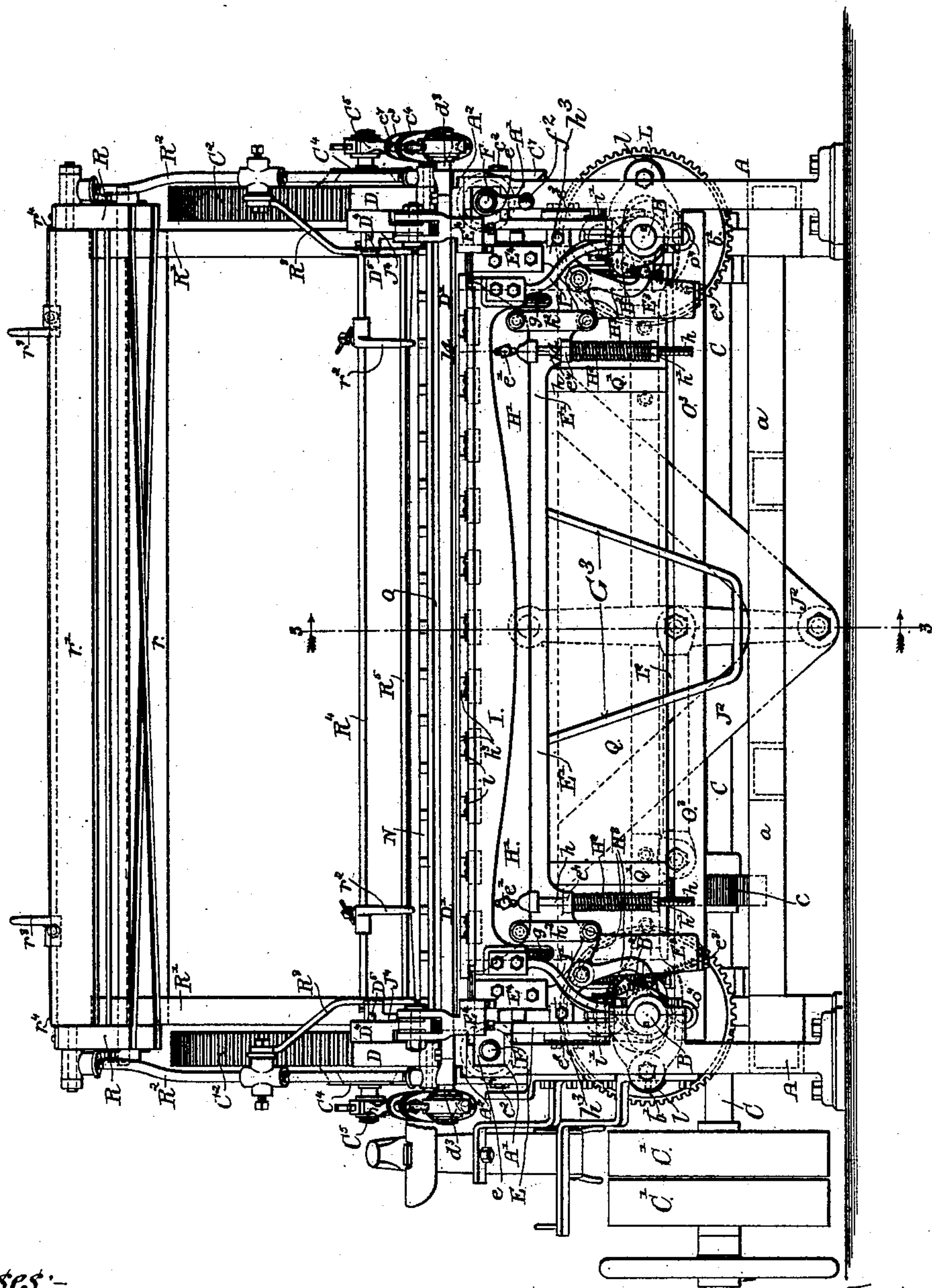
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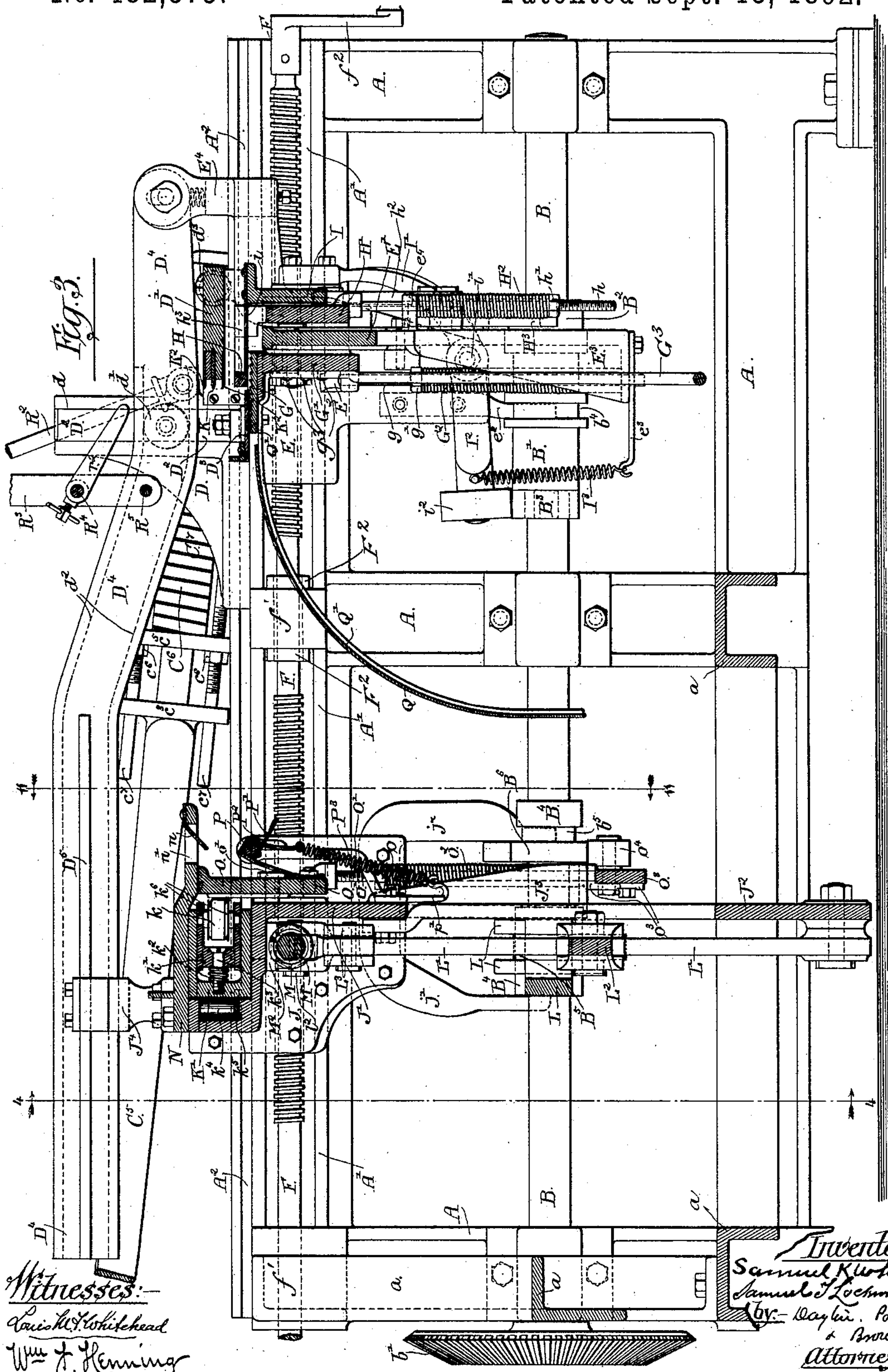
Inventors
Samuel White
Samuel T. Lockwood

By:- Mayhew, Poole & Brown
Attorneys:-

6 Sheets—Sheet 3.

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Patented Sept. 13, 1892.



Witnesses:-
Louis H. Whitehead
Wm. F. Henning

Inventor's
Samuel K. Noble
Samuel Lockwood
By: Weylin. Poole
& Brown
Attorneys.

(No Model.)

6 Sheets—Sheet 4.

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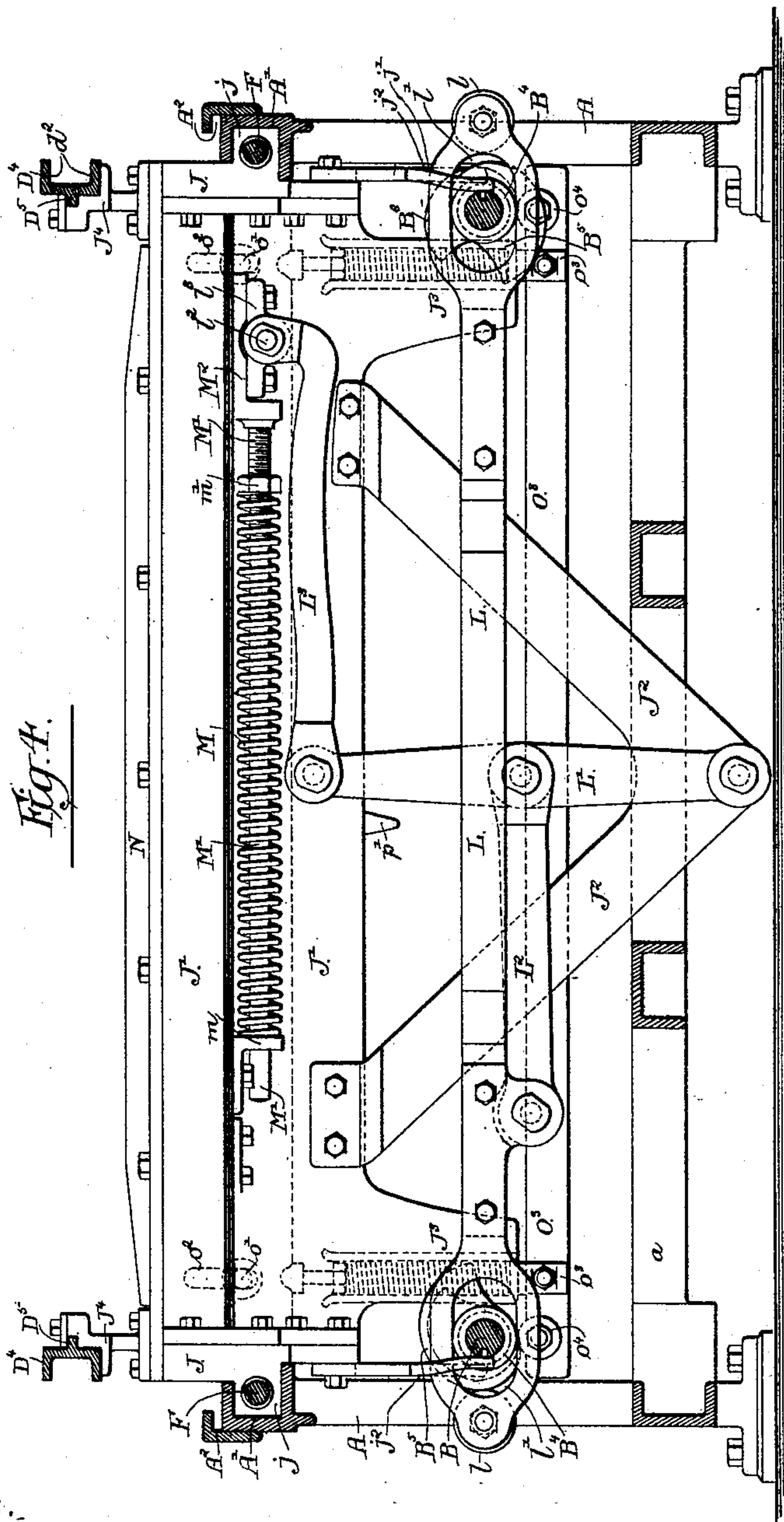


Fig. 4.

Witnesses:-

Louis M. F. Whitehead.

Wm F. Henning.

Inventor's:

Samuel K. White-
Samuel T. Lockwood

By: Daykin, Poole & Brown
ATT

Attorneys:—

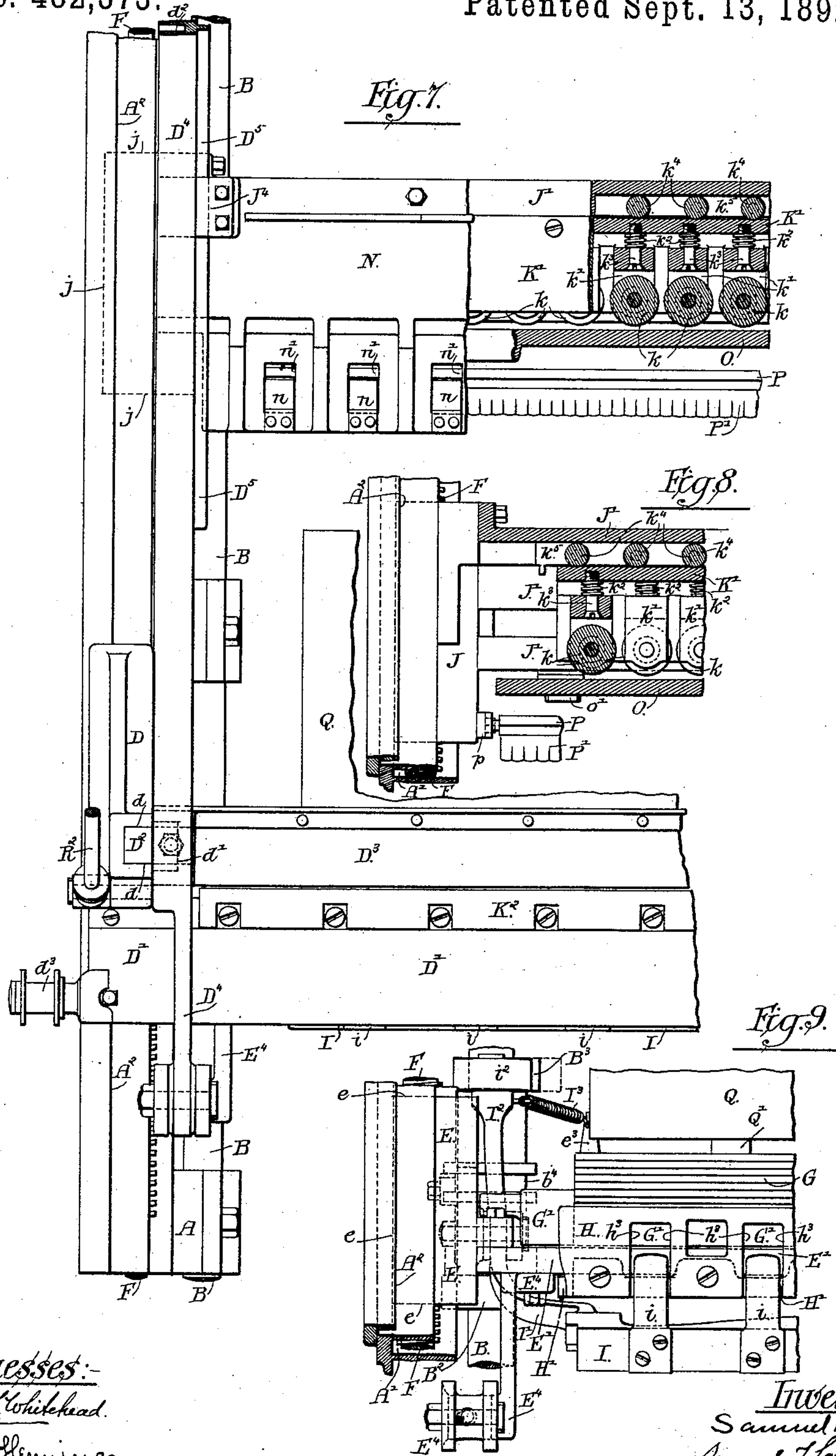
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6 Sheets—Sheet 5.

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No. 482,373.

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Witnesses:
Louis M. Whitehead.
Wm. J. Fleming.

Inventors
Samuel K. White
Samuel Lockwood
by: Mayhew, Poole & Brown
Attorneys.

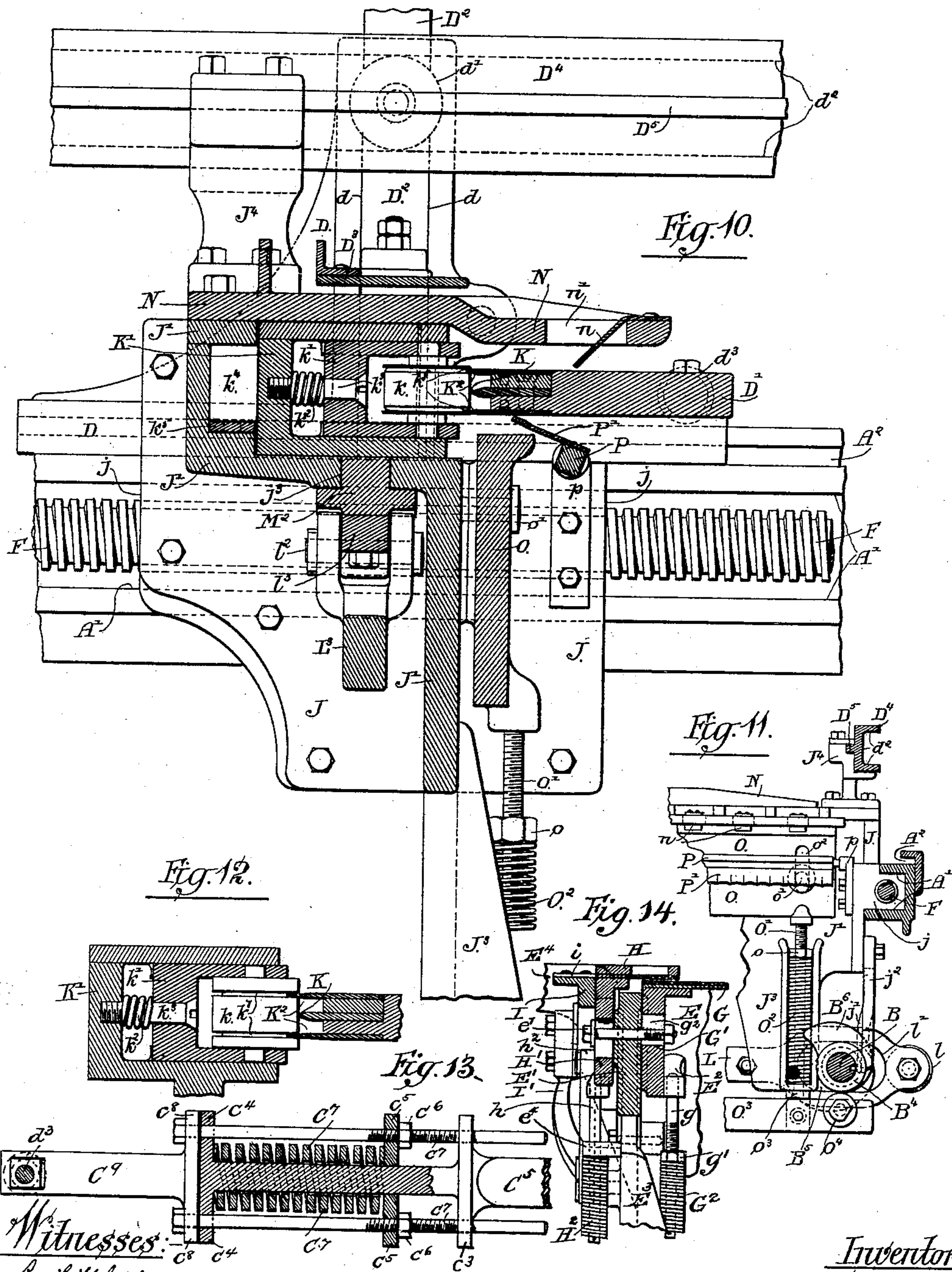
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6 Sheets—Sheet 6.

S. T. LOCKWOOD & S. K. WHITE.
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Patented Sept. 13, 1892.



Witnesses:
Louis H. Whitehead.
Wm. J. Henning.

Inventors
Samuel K. White
Samuel Lockwood
By Clayton, Poole & Brown
Attorneys.

UNITED STATES PATENT OFFICE.

SAMUEL T. LOCKWOOD AND SAMUEL K. WHITE, OF CHICAGO, ILLINOIS.

CLOTH-FOLDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 482,373, dated September 13, 1892.

Application filed January 19, 1889. Serial No. 296,826. (No model.)

To all whom it may concern:

Be it known that we, SAMUEL T. LOCKWOOD and SAMUEL K. WHITE, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Cloth-Folding Machines; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to cloth-folding machines, and embraces improvements not only in the cloth-folding devices proper, but also in devices for cutting the folded cloth, as is desirable in preparing the same for making bags, and for creasing or folding the cut edges to facilitate the subsequent sewing of the bags, as will be made hereinafter more fully to appear.

The invention consists in the matters hereinafter described, and pointed out in the appended claims.

In the accompanying drawings, illustrating our invention, Figure 1 is a side elevation of a machine embodying the same. Fig. 2 is a front elevation of the said machine. Fig. 3 is a longitudinal central section of the same, taken upon the section-line 3 3 of Fig. 2. Fig. 4 is a transverse section of the same, taken upon line 4 4 of Fig. 3. Fig. 5 is a section taken upon line 5 5 of Fig. 1. Fig. 6 is a section taken upon line 6 6 of Fig. 1. Fig. 7 is an enlarged broken plan of the gripping and cutting devices. Fig. 8 is a horizontal section, partly in elevation, of the parts of the cutting-off devices adjacent to the side frame-plates of the machine. Fig. 9 is a broken plan of certain gripping devices and parts for actuating the same. Fig. 10 is an enlarged sectional view of the cutting-off devices and illustrates a changed position of the parts. Fig. 11 is a broken section, partly in elevation, taken upon line 11 11 of Fig. 3. Fig. 12 illustrates a modified form of cutting-roller. Fig. 13 is an enlarged sectional view showing one of the yielding spring connections between the folding-bar and the pitmen for actuating the same. Fig. 14 is a vertical section of a portion of the machine on the line 14 14 of Fig. 2 and on an enlarged scale.

As shown in the drawings, the main part of

the frame of the machine consists of two side plates A A, which are connected by cross-girts *a a a*.

The operative parts of the machine embrace generally a reciprocating cloth-carrying device, which carries the cloth back and forth in the act of folding, a gripping device adapted to engage and hold the cloth at one limit of the movement of the folding device, and a combined gripping and cutting-off device adapted for severing the cloth at the opposite limit of the movement of the carrying device and arranged to grip and hold the cut end of the cloth until a new fold is made.

For convenience the gripping device connected with the cutting-off device is herein denominated the "rear gripping device" and the opposite one the "front gripping device." The gripping devices are both mounted in frames which are separate from the main frame of the machine and adapted to slide thereon horizontally in such manner that the two gripping devices may be moved bodily toward and from each other, as necessary for making folds of different lengths or bags of different sizes, provision being made for changing the throw of the reciprocating cloth-carrying device to correspond with the distance apart of the gripping devices.

In the upper part of the frame-plates A A are provided parallel horizontal guides A' A', which sustain the sliding frame upon which the gripping devices are supported, and upon said side plates, at opposite sides of the machine, are located two horizontal drive-shafts B B, by means of which motion is communicated to the gripping and cutting-off devices. Said shafts B B are provided at their rear ends with beveled gear-wheels *b' b'*, which engage similar gear-wheels *b² b²* upon a transverse shaft *b³*, arranged at the rear end of the machine.

C is the pulley-shaft of the machine, arranged parallel with the shaft *b³* and provided with fast and loose belt-pulleys C' and having a gear-wheel *c*, intermeshing with a gear-wheel *b* upon the shaft *b³*, and having, also, a gear-wheel *c'*, which intermeshes with a large gear-wheel C², the shaft C³ of which is located about on a level with the top of the machine-frame and which carries a crank-arm C⁴, through the medium of which the re-

ciproating cloth-carrying device is actuated,
 as hereinbefore fully described. Said carrying
 device comprises two end plates D D, located
 at opposite sides of the machine and mounted
 5 to slide horizontally in guides A² A², located
 above and parallel with the guides A' A'
 hereinbefore referred to. Said plates D D
 are rigidly connected by a transverse bar D',
 (see Fig. 2,) which also acts to carry the cloth
 10 in folding and forms part of the cutting-off
 device. Said bar D' is herein denominated
 the "folding-bar." Each of said plates D D is
 provided with a vertical guide-groove d, in
 which are mounted vertical slide-bars D² D²,
 15 to the lower ends of which is connected a flat
 horizontal folder or carrying-blade D³. Said
 folder D³ is moved vertically during the hori-
 zontal movement of the plates D D by means
 of rollers d' d' upon the slide-bars D² D²,
 20 which rollers engage cam-grooves d² d², formed
 in the outer faces of stationary cam-bars D⁴
 D⁴, which are mounted upon the frames of the
 gripping and cutting-off devices in a manner
 hereinafter described. The said folding-bar,
 25 together with the carrying-blade and parts
 sustaining the same, are herein collectively
 denominated the "cloth-carrier." Said carry-
 ing-blade D³ is moved vertically with refer-
 ence to the folding-bar D', so that it may be
 30 lifted above said bar D' and pass over the
 rear gripping devices at the limit of its rear-
 ward throw and will be depressed below the
 said bar D', and thereby carry a fold of the
 cloth into engagement with the front grip-
 35 ping devices at the opposite limit of its for-
 ward throw, its action with relation to the bar
 D' being similar to the movement of similar
 carrying-blades heretofore employed in fold-
 ing-machines, and therefore requiring no more
 40 extended description.

Motion is communicated from the crank-
 arm C⁴ to the folding devices by means of
 pitmen C⁵ C⁵, which are connected with out-
 wardly-extending studs d³, affixed to the ends
 45 of the bar D'. Said pitmen C⁵ C⁵ are pro-
 vided with spring-sections C⁶, constructed and
 operating in the manner hereinafter de-
 scribed, in connection with the cutting-off de-
 vice, of which they form a part. The crank-
 50 arms C⁴ C⁴, with which the pitmen are con-
 nected, are made adjustable radially to in-
 crease or decrease the throw of the said crank-
 arms when a change in the extent of move-
 ment of the cloth-carrying device is made
 55 necessary in adjusting the machine for mak-
 ing bags of larger or smaller size. For this
 purpose said crank-arms are made separate
 from the shaft C³ and are held in disks C⁷,
 which are rigidly attached to the ends of said
 60 shaft. Said disks are provided with dove-
 tailed grooves, and also with gibs C⁸, each of
 which forms a side wall of one of the grooves,
 and which are clamped against the crank-
 arms by set-screws c², Fig. 6, thereby holding
 65 the same firmly in position.

The front gripping devices, which are
 adapted for holding the cloth in folding the

same and for retaining the cut and folded
 pieces, are constructed as follows: E E, Figs.
 1, 2, 3, and 9, are vertical plates located adja- 70
 cent to the side plates A of the frame and pro-
 vided at their upper parts with outwardly-ex-
 tending lugs or projections e e, which engage
 the guides A' A' of said frame-plates. E' is
 a horizontally-arranged transverse bar, which 75
 extends across the machine from side to side
 and is bolted at its ends to the said plates E
 E, Fig. 9. Said plates E E and bar E' con-
 stitute a rigid frame which supports the sev-
 eral movable parts of the gripping device and 80
 is adapted to slide upon the frame by its en-
 gagement with the guides A' A' of said frame.
 F F are two screw-shafts mounted in bear-
 ings f' f' on the frame-plates and which ex-
 tend parallel with and adjacent to the guides 85
 A' A', said screw-shafts being herein shown
 as arranged to engage screw-threaded aper-
 tures in the lugs e of the plates E E. Said
 screw-shafts are employed for the purpose of
 accomplishing the bodily movement of both the 90
 front and rear gripping devices, being for this
 purpose provided with screw-threads engaging
 the frame of the rear gripping device, as will
 hereinafter appear. The front bearings f' are
 large enough to allow the screw-shaft F to pass 95
 through them in assembling the machine, and
 the portion of the shaft forming the journal
 working in the bearings will be enlarged, so
 as to fit said bearings. The shafts are held
 from endwise movement by means of collars 100
 F², secured to said shaft, one close against
 each side of the lug in which are the front
 bearings f'. Said screw-shafts F F are ex-
 tended to the rear end of the machine-frame,
 where they are provided with sprocket-wheels 105
 f f, Fig. 5, over which passes a chain belt F',
 by which the screw-shafts are connected, so
 that they will turn together. Any suitable
 means may be employed for turning the shafts
 F—such, for instance, as a hand-crank, which 110
 may be applied to the end of one of said shafts,
 as shown at f² in Fig. 3. G is a yielding
 clamp-plate roughened on its upper surface
 and secured to the upper edge of a transverse
 bar G', which is located inside of and adjacent 115
 to the transverse frame-bar E'. Said clamp-
 plate G and the bar G', supporting it, are
 adapted to slide vertically with reference to
 the frame-pieces E E' and are held at the up-
 ward limit of their movement by means of 120
 springs G² G², which are placed around rods
 g g between nuts g' upon said rods and the
 horizontal parts of depending brackets E³ E³,
 cast upon the bar E'. The vertical movements
 of this bar G' are guided and controlled by 125
 the rearwardly-extending portions of bolts e',
 which extend horizontally from the cross-bar
 E' and pass through vertical slots g² in the
 bar G', as shown in Fig. 14. Said springs G²
 tend to hold the clamp-bar G in a position 130
 slightly below the carrier-blade D³, which
 blade is adapted to pass over said clamp-plate
 in the operation of folding the cloth. The
 clamp-plate G and the bar G', upon which

it is supported, are not actuated automatically, but may be depressed at will by means of a bracket or stirrup G^3 , both ends of which are secured to the bar G' in any suitable manner, as by screws g^3 . The only times when it will be necessary to depress said bar and plate are when adjusting a roll or bolt of cloth in said machine preparatory to cutting it into cut and folded lengths and in removing from said machine the cut and folded lengths clamped therein. H is an upper clamp-plate which acts, in connection with the clamp-plate G , to receive and hold the folds of cloth carried or inserted between said clamp-plates by the carrier-blade D^3 . Said plate H is arranged horizontally and extends over the bar E' and is supported by means of a flat vertically-arranged bar H' , extending across the machine in front of the said bar E' in the manner illustrated, Fig. 3. The upper clamp-plate H and the bar H' are adapted to be moved vertically and are thrust downward, so as to bring the upper clamp-plate H against the lower clamp-plate G , by means of springs $H^2 H^2$. Said springs are placed around vertical rods $h h$, which are secured to the lower edge of the bar H' and extend through lugs $e^4 e^4$ upon the bar E' and are provided near their lower ends with nuts h' , between which and the lugs e^4 the springs H^2 are placed. The clamp-plate H is held and guided at its upper end by means of the forwardly-extending portions of the bolts $e' e'$, Fig. 2, inserted through the vertical slots in the bar H' into the frame-bar E' .

The clamp-plate H is lifted periodically during the operation of folding the cloth to allow the passage between said clamp-plate and the lower clamp-plate G of the carrying-blade D^3 , devices for giving this movement to the clamp-plate H being made as follows: $B' B'$ are sleeves mounted upon the shafts $B B$ and having splines engaged with longitudinal grooves B^{22} in said shafts. Said sleeves are each provided with a groove b^4 , which is engaged by a rigid arm e^2 upon the end plate E of the movable frame, whereby the sleeves are moved endwise with the frame when the latter is shifted upon the main frame of the machine by the screw-shaft F before referred to. Upon the said sleeves $B' B'$ are mounted cams $B^2 B^2$, Fig. 2, which act upon the vertical arms of bell-crank levers $H^3 H^3$, pivoted on brackets $h^3 h^3$, cast integral with or bolted to the side plates E of the movable frame supporting the gripping device, the horizontal arms of which bell-crank levers are connected with the bar H' by means of links h^2 , Fig. 2. The cams $B^2 B^2$ are so arranged and shaped that the upper clamp-plate H will be lifted as the carrying-blade D^3 approaches the same and will be forced toward the lower clamp-plate under the action of the springs $H^2 H^2$ after the carrying-blade has reached the forward limit of its movement, so that said upper and lower clamp-plates will grasp the folded edge of the cloth

upon the blade and retain the folded edge between them when the said blade passes outwardly from between said clamp-plates. As far as above described the clamp-plates operate in a manner heretofore common and well understood. I is a horizontal bar located adjacent to the upper clamp-plate, said bar I being arranged to support a series of horizontal inwardly-extending clamp-fingers $i i i$, which enter notches cut through the outer part of the clamp-plate H , so that said clamp-fingers $i i i$ may act upon the fold of cloth held between said upper and lower clamp-plates. Said bar I is attached at its ends to arms $I' I'$, which are connected by pivots $i' i'$ to the side plates E of the movable frame supporting the gripping device, said pivots $i' i'$ being arranged approximately beneath the inner or free ends of clamp-fingers $i i i$. Rigidly attached to the lower ends of the arms $I' I'$ are horizontal arms $I^2 I^2$, which extend rearwardly and are provided with antifriction-rollers $i^2 i^2$, which are adapted to engage cams $B^3 B^3$ upon the sleeves $B' B'$. Said rollers are held in engagement with the cams and the clamp-fingers are thrown downward toward the lower clamp-plate by means of spiral springs $I^3 I^3$, attached to the arms $I^2 I^2$ and to an adjacent part of or upon the movable frame, said springs in the particular construction shown being attached to arms $e^3 e^3$, secured to the lower ends of the brackets $E^3 E^3$. The movements of the parts are so timed by the relative arrangements of the cams B^2 and B^3 that the clamp-fingers $i i i$ will press upon the folds of cloth located between the clamp-plates during the time the upper clamp-plate is lifted and the carrying-blade is entering between and receding from said clamp-plates.

In folding devices as heretofore made, embracing upper and lower clamp-plates and a horizontally-reciprocating carrying-blade, the folds of cloth previously inserted between the clamp-plates are likely to escape from the same when the said clamp-plates are separated to receive another fold, this being especially liable to occur when there is a considerable quantity of folded cloth in the machine. The clamping-fingers, operating in the manner described, however, serve to hold the previously-completed folds firmly in place while the clamp-plates are opened to take in another fold, said clamp-fingers being withdrawn from beneath each fold as it is completed and brought over or above the same before the upper clamp-plate is lifted for making the next fold. It follows that during the operation of the machine the several folds within the clamp-plates are constantly held either by the upper and lower clamp-plates or by the lower clamp-plate and clamp-fingers and that the carrying-blade passes over the fingers and between the same and the upper clamp-plate when the new fold is brought between the clamp-plates by said blade. It will of course be understood that the clamp-fingers

are withdrawn from beneath the fold last made and again brought into contact with the top of said fold during the time the upper and lower clamp-plates are pinching the cloth.

5 The presence of the clamp-fingers beneath the carrying-blade at the time the latter carries the new fold between the clamp-plates does not interfere with the operation of the upper and lower clamp-plates in grasping the
10 cloth folded over said blade for the reason that the fingers are made quite thin and ample pressure is exerted upon said new fold by the parts of the cloth between the fingers properly to grip and hold the cloth of the new
15 fold as the carrying-blade is withdrawn from such new fold.

In view of the advantages obtained by the employment of the clamp-fingers in connection with the upper and lower clamps and re-
20 ciprocating carrying-blade the same are herein claimed as part of our invention, and inasmuch as such clamp-fingers may be moved and actuated at proper times by any one of a great number of well-known devices our in-
25 vention as it relates to this feature of the machine is not limited to the particular actuating devices illustrated, except as the same may be made the subject of specific claims herein.

The rear gripping device and cutting-off
30 mechanism forming part of the machine shown are made as follows: Said parts are mounted upon a rigid frame movable on the main frame of the machine in the same manner as the frame of the front clamping de-
35 vice above described. Said frame consists of two vertical end plates J J, to which is rigidly attached a casting J', extending transversely across the machine. Said plates J J are provided with outwardly-extending lugs
40 or projections j j, Fig. 4, which engage the guides A' A' of the frame-plates A A. Said lugs or projections j j are engaged by the screw-shafts F F above described. Said screw-shafts in their parts engaged by said
45 lugs are provided with screw-threads inclined in the opposite direction from those engaged with the end plates E belonging to the front gripping device, so that when said screw-
50 shafts are turned both the front and rear gripping devices will be bodily moved to the same extent toward and from each other.

The cutting-off devices are constructed to sever the fold of the cloth carried toward the same by the folding-bar D', while the rear
55 gripping device is adapted to clamp and hold the cut edge belonging to the main part of the cloth, so that such edge will be properly retained in carrying the next fold to the front gripping device. Said folding-bar D' moves
60 horizontally with the carrying-blade D³; but said bar has no vertical movement, the devices for cutting off and gripping the fold of cloth carried by said folding-bar being arranged in a plane somewhat above the clamp-
65 ing-plates of the front gripping devices.

The cutting-off devices are made as follows: Upon the edge of the folding-bar D', over

which the cloth is drawn, is placed a longitudinal knife-edge K, and upon the frame-
70 piece J' is mounted a longitudinally-sliding bar K', carrying a series of rollers k k k, Figs. 3, 7, and 10, which rollers are adapted to press against the roll along the knife-edge, so as to sever the cloth extending over the said knife-
75 edge between the same and the rollers. The knife-edge need not be, and is preferably not, sharpened, but is usually made by beveling the edge of the plate at an angle of forty-five degrees and dulling or slightly rounding the
80 angle thus formed. The position of the parts when the bar D' is advanced to bring the knife-edge against the rollers is shown in Fig. 10.

In order to insure an equal and uniform pressure of all the rollers against the knife-
85 edge, said rollers are severally mounted in sliding blocks k', which blocks are mounted in the bar K' and are held or thrown outwardly by means of springs k² k², placed be-
90 hind said blocks. In the particular construction shown the bar K' is made of U shape in cross-section, with transverse guides k¹¹, Fig. 12, upon its upper and lower walls for the sliding blocks k' k', and the springs k² k² are of coiled form and placed around screws k³ k³,
95 which are inserted through blocks and into the vertical part of the bar at the rear of the same, so as both to support the said springs and to limit the outward movement of the blocks under the action of said springs. To
100 lessen frictional resistance to the endwise movement of the bar K' when the rollers are cutting, the inner edge of said bar is desirably arranged to rest against a series of antifric-
105 tion-rollers k⁴ k⁴ k⁴, mounted on a longitudinal bar k⁵, which rests on the frame-bar J' in the manner illustrated, Figs. 3, 7, and 10. As the bar K' slides longitudinally the bar k⁵ is caused to play or to move endwise slightly
110 by reason of the frictional contact between bar K' and the rollers k⁴, the frictional resistance to the movements of the bar K' being thus reduced to a minimum. By the employ-
115 ment of a large number of rollers k, arranged close together, we are enabled properly to sever the cloth by a relatively slight movement of the bar K', it obviously being necessary to move said bar for a distance only slightly
120 greater than the distance between two adjacent rollers k in order to sever the cloth throughout the entire width of the same.

Devices are provided for giving endwise movement to the said bar K' as follows: The drive-shafts B B are provided adjacent to the rear gripping and cutting-off devices with
125 sleeves B⁴ B⁴, splined to the shaft in the same manner as described in connection with the sleeves B' B'. Said sleeves are held constantly in proper position with relation to the gripping
130 j' j², one of which j' engages the rear end of the sleeve and the other j² a groove b⁵ in said sleeve. L, Figs. 3 and 4 is a horizontal bar extending across the machine-frame and hav-

ing a free endwise movement, said bar being provided at its ends with antifriction-rollers ll , each of which is adapted to engage a cam B^5 upon the adjacent sleeve B^4 . In the particular construction illustrated the bar L is provided at its ends with longitudinal slots $l'l'$, which engage opposite sides of the sleeves B^4 B^4 , so that the bar is in this instance supported and guided by engagement with said sleeves. The ends of said bar adjacent to the slots $l'l'$ are, furthermore, vertically divided or forked, so as to extend at opposite sides of the cams B^5 B^5 , the antifriction-rollers ll being pivoted between the ends of the bar outside of the said cams in the manner illustrated. The bar K' , carrying the cutting-rollers, is supported and slides upon a horizontal part of the frame-plate J' , and said bar K' is moved in one direction by a spring and in the other direction by suitable operative connections with the bar L , which latter is moved by the cams B^5 B^5 in the manner above described. M in the drawings is a spring for moving the said bar K' , said spring being of spiral form and placed around a horizontal rod M' , with one end bearing against a bracket m , attached to the bar J' , Fig. 4, and with its other end bearing against a nut m' upon the said rod M' . Said rod M' is rigidly attached to the said bar K' through the medium of a sliding block M^2 , to which said rod is secured at one end, said block being extended through a longitudinal slot j^3 in the horizontal part of the plate J' and being bolted to the under surface of the said bar K' , Fig. 10. At its free end the rod M' is arranged to slide in the bracket m .

Connections between the sliding bar K' and the rod L are made as follows: L' is a vertical lever arranged near the center of the machine and pivoted at its lower end to a depending bracket J^2 , which is attached to the frame-plate J' . Said lever L' is connected at or near its middle with the bar L by means of a connecting-rod L^2 , pivoted at its ends to said lever and bar in the manner illustrated, Fig. 4. At its upper end the lever L' is pivoted to one end of a connecting-rod L^3 , the opposite end of which is connected by a pin l^2 with the plate M^2 , which, as before described, is connected with the roller-carrying bar K' . The end of said connecting-rod L^3 , engaged by the pin l^2 , is herein shown as forked and arranged to embrace a separate block l^3 , through which the said pin passes, said block being bolted to the plate M^2 in the manner illustrated, Figs. 4 and 10. With the arrangement of parts shown in the drawings one of the cams B^5 —the left-hand one in Fig. 4—is so connected and adjusted that it will move the bar K' endwise shortly before the folding-bar D' reaches the cutting-off devices, said cam operating against the spring M . Said cam is provided with an abrupt part or shoulder adapted to allow the sudden or rapid endwise movement of the bar K' and of the rollers carried thereon at the mo-

ment or shortly after the knife-edge K upon the folding-bar D' is brought against the roller k . This construction affords a means of quickly severing the cloth throughout the entire width of the web thereof, so that a pause or dwell of the knife-edge K of any considerable duration while in contact with the cutting-rollers is unnecessary. The only office of the cam B^5 shown at the right side of said Fig. 4 of the drawings is to insure that the bar K' shall be fully retracted in case the spring M should for any reason fail to fully retract said bar. The right and left hand cams do not operate simultaneously, but one after the other, the left-hand cam, as shown in Fig. 4, operating first to shift the bar K' , as above stated, and the right-hand cam operating after said left-hand cam has ceased to act in case the spring M has not sufficiently retracted the bar K' . It is obvious that the right-hand cam is not essential to the successful operation of the machine and that it may be omitted without departing from the spirit of the invention, and it is not, therefore, desired to limit the invention to the particular construction shown. In order, however, that the said bar D' may remain stationary during the brief period while the cutting-rollers are acting, the main connecting-rods C^5 C^5 , by which the said folding-bar is actuated, are provided with the yielding or spring sections C^6 hereinbefore mentioned, such yielding or spring sections allowing the bar D' and parts connected therewith to come to rest a short time before the crank-arm C^4 reaches the limit of its throw, so that during the time the cutting-rollers are acting on the knife-edge K said rollers are pressed against the cutter with a pressure due to the tension of the yielding section C^6 and the backing springs of the rollers.

The yielding or spring connection in the connecting-rod C^5 may be of any well-known or preferred construction. As herein illustrated, and more clearly shown in Fig. 13, such connection is made as follows: The said rod is made in two parts or sections C^5 C^9 , arranged end to end. Upon the part C^5 , near the end of the same, is placed a rigid cross-bar c^3 and at the extreme end of the said part C^5 a second rigid cross-bar c^4 . A third cross-bar c^5 is placed upon the part C^5 between the cross-bars c^3 and c^4 , said cross-bar c^5 being adapted to slide upon the said part C^5 . Two bolts c^7 c^7 , which are screw-threaded and provided with nuts c^6 c^6 , are inserted through guide-apertures in the cross-bars c^4 and c^5 and are connected with the part C^9 of the rod by means of a cross-bar c^8 , which is rigidly affixed to the end of said part C^9 , said bolts being inserted through holes in the cross-bar c^8 and secured thereto by heads on the bolts in the manner shown. A spring C^7 , of coiled form, is placed between the fixed cross-bar c^4 and the movable cross-bar c^5 , and the nuts c^6 c^6 upon the bolts are arranged to bear upon the said movable cross-bar in opposition to

the action of the spring, so as to keep the latter compressed and to retain the ends of the parts C^5 and C^9 in contact with each other. When the tension on the rod C^5 is greater than the spring can withstand, the said spring yields and allows the parts of the rod to separate, thereby elongating the rod. By turning the nuts c^6 upon the bolts the tension of the spring may obviously be adjusted so that it will yield under a greater or less tension, as desired.

In the manufacture of bags made of bur-laps and other similar material it is found necessary to fold each cut edge of the cloth before sewing the edges together, in order that strong seams may be made. Such folding or creasing of the cut edges has heretofore been accomplished by hand at the time of sewing; but the operation of so folding the edge is found to be a slow and tedious one and wasteful of material, inasmuch as the operator is likely to make the fold unnecessarily deep, thereby wasting material, while if the fold is too narrow the seams are weak and the bag not sufficiently strong. The machine illustrated is adapted to crease or fold the cut edges of the cloth at both sides of the cut made therein by the combined action of the cutting-rollers and knife-edge K , such creasing or seaming being accomplished at the same time the cut is made. For this purpose the cutting-rollers k are each provided at their ends with yielding plates or disks k^6 , which form with the adjacent edges of the roller, which are preferably slightly beveled or rounded, circumferential grooves adapted to receive two thin creasing-plates K^2 , located upon the advance edge of the bar D' above and below the knife K . Said plates K^2 are provided with thin or acute but unsharpened edges and are adapted to enter between the said disks k^6 , (which are constructed of spring metal or otherwise made yielding,) so that when the cloth which rests between the said rollers and creasing-plates is thrust by the plates K^2 between said plates k^6 and the ends of the rollers and said rollers are moved along the bar the cloth will be folded closely or tightly over the said narrow acute edges and will be thereby given a permanent crease.

It is obviously necessary after the cloth has been severed by the cutting devices described that that end of the cloth which is connected with the roll or bolt should be held or gripped while a succeeding fold is being formed. Such edge will of course be the upper edge, or that adjacent to the top of the folding-bar D' , the lower cut edge being arranged to drop freely after the cutting has taken place.

Devices for gripping the said upper edge of the cloth are constructed as follows: N is a horizontal plate attached to the transverse plate J' and extending forwardly from the rollers k , so as to overhang the bar D' when the latter is in position adjacent to said roll-

ers. Said plate N is herein shown as arranged to extend rearwardly over and cover the bar K' and adjacent parts. Secured to the said bar N is a series of yielding prongs or spring-fingers n , which extend downwardly and inwardly with their free ends adjacent to the cutting-rollers. Said fingers are adapted to press forcibly against the top of the bar D' as the latter is advanced or carried beneath the overhanging part of the plate N in approaching the cutting-rollers. In the particular construction illustrated said plate N is provided with apertures n' , and the fingers n extend through said apertures and are secured to the upper surface of the plate adjacent to the front or overhanging margin of the same. The said spring-fingers, while allowing the cloth which is folded over the folding-bar D' to pass freely beneath them in approaching the cutting-rollers, tend to hold said cloth from backward movement in the withdrawal of the said folding-bar, the fingers being pointed or roughened, so as to catch in the cloth while the latter is supported by the said bar. O is a vertically-movable clamp-plate supported upon the frame-plate J' , and adapted to move up and down in front of the cutting-rollers. The upper edge of said clamp-plate is adapted to engage the under surfaces of the plate N at the rear of the fingers n , between said fingers and the cutting-rollers. Said clamp-plate is moved vertically such distance, furthermore, that in its lowermost position it will allow the folding-bar D' to pass freely over it in approaching the cutting-rollers. The vertical movement of the clamp-bar is so timed, moreover, that it approaches the plate N as soon as the said folding-bar D' begins to recede from the rollers, and is thereby adapted to clamp the free edge of the cloth (which is held from backward movement with the folding-bar) as soon as said folding-bar has moved away from the rollers sufficiently to allow the clamping-plate to come against the said plate N . It will of course be understood that the cloth is held by the fingers n from backward movement by being held or clamped between the ends of the fingers and the smooth horizontal upper surface of the folding-bar D' , which surface is adapted to slide freely beneath the cloth while the latter is thus held by the fingers. The cloth would of course fall away from the fingers, and thereby free itself from the latter, as soon as the folding-bar had passed clear of the fingers; but the movement of the clamp-bar O is so timed that it encounters and holds the edge of the cloth against the plate N before the fingers have passed from the rear edge of the folding-bar.

Devices are provided for actuating the clamp-bar O , as follows: O^1 O^2 , Figs. 3 and 11, are two vertical rods attached to the lower edge of said bar. Said rods slide at their lower ends in guide-apertures formed in the lower ends of depending brackets J^3 , cast upon the transverse frame-plate J' . O^2 O^2 are coiled

springs placed between the lower ends of said
 brackets J^3 and adjustable nuts o , placed upon
 the screw-threaded upper parts of the said
 rods O' . Said springs tend to lift the clamp
 5 O toward the plate N . Said clamp-plate O is
 held and guided at its upper part during its
 vertical movement by means of headed bolts
 o' , which pass through vertical slots o^2 in the
 plate and are secured in the frame-plate J' .
 10 O^3 is a horizontal bar extending across the
 machine beneath the clamp-bar O and at-
 tached to the lower ends of the rods O' by
 means of angle-pieces o^3 , Figs. 3, 4, and 11.
 The ends of said bar O^3 extend outwardly
 15 beneath the shafts $B B$ and are provided with
 antifriction-rollers $o^4 o^4$, which engage cams
 B^6 upon the sleeves B^4 . Said cams act upon
 the rollers to depress the bar O^3 and thereby
 to draw downwardly the clamp-plate O against
 20 the action of the springs $O^2 O^2$. Said cams
 are provided with abrupt parts or shoulders,
 furthermore, and are so constructed as to
 draw the clamp-plate O gradually downward
 during the approach of the folding-bar D'
 25 toward the cutting-rollers and to allow the
 quick or prompt upward movement of the
 said clamp-plate as soon as the said folder-
 bar begins its movement away from the roll-
 ers, so as to grip the end or edge of the cloth
 30 before the same is released from the spring-
 fingers in the manner above described. The
 position of the said clamp-plate O when the
 folding-bar is engaged with the cutting-rollers
 is clearly shown in Fig. 10, while the elevated
 35 position of said clamp-bar is shown in Fig. 3.

It is obviously desirable that the lower edge
 of the cloth, or that beneath the folding-bar,
 should be promptly or quickly released from
 the lower creasing-plate and grooves, in order
 40 to prevent the clamp-bar O from catching the
 same as said clamp-bar rises to grip the up-
 per edge of the cloth. For effecting such re-
 lease of the lower edge of the cloth we have pro-
 vided an automatically-acting device, which is
 45 made as follows: P , Figs. 3, 10, and 11, is a hori-
 zontal rock-shaft located in front of the clamp-
 bar O and mounted at its ends in brackets $p p$,
 attached to the frame-plate J . Attached to
 said rock-shaft is a flat blade P' , having a
 50 fluted, serrated, or otherwise roughened outer
 edge. Attached to the said shaft is a flexible
 strap P^2 , one end of which is secured to the
 lower part of the vertically-movable clamp-
 plate O and the other end of which is attached
 55 to a spring P^3 , the lower end of which spring is
 connected with an arm p' , secured to the lower
 part of the transverse frame-plate J' . The
 strap P^2 is placed around the shaft P and se-
 cured thereto at one point, so that when the
 60 end of said strap attached to the plate O is
 pulled or drawn downwardly in the downward
 movement of said plate the shaft will be
 turned, the spring P^3 yielding to allow the
 strap to wrap itself about the shaft. The
 65 shaft is turned through a distance of about
 one-half of a rotation, and the blade P' thereon
 is so arranged that when the clamp-plate O is

depressed the free edge of said blade will stand
 near the top or over the said clamp-plate O
 and adjacent to the under surface of the said
 folding-bar and in position to engage the
 70 cloth stretched over the said bar, this posi-
 tion of the parts of the blade being clearly
 shown in Fig. 10. When the folding-bar is
 retired and the clamp O ascends, however,
 75 the said blade is thrown forwardly and down-
 wardly into the position shown in Fig. 3, this
 movement being accomplished by the con-
 traction of the spring P^3 , which pulls down-
 wardly upon the end of the strap attached
 80 thereto as the said clamp-plate rises. This
 outward and downward movement of the
 blade P' , which begins as soon as the back-
 ward motion of the folding-bar D' commences,
 casts or throws the free edge of the cloth out-
 85 wardly from the space above the clamp-bar
 O , thereby preventing possibility of the cloth
 being caught by the said clamp-bar in the up-
 ward movement of the latter. Q is a curved
 supporting-plate for the cut-off and folded
 90 pieces of cloth, said plate being located be-
 tween the clamping and cutting-off devices,
 with its upper end adjacent to the clamp-
 plate G . Said plate is herein shown as sup-
 ported upon curved bars $Q' Q'$, which are
 95 bolted to the under surface of the said plate
 G and the plate G' . Said plate Q is for the
 purpose of sustaining a part of the weight of
 a pile of cut pieces held at their folded edges
 between the clamp-plates G and H , it being
 100 obvious that in the absence of any such sup-
 porting-plate the weight of said pieces would
 come directly upon the said clamp-plates,
 thereby tending to depress the lower plate
 and to draw the folded pieces of cloth from
 105 between the same.

It is obvious that the cam-bars $D^4 D^4$, by
 means of which vertical motion is given to
 the carrying-blade D^3 , must have sliding con-
 110 nection either with the frame of the front or
 of the rear clamping device in order to allow
 the said frames to be bodily moved toward and
 from each other upon the machine-frame in
 the manner above described. In the particu-
 115 lar construction of the parts illustrated the
 said cam-bars D^4 are pivoted at their lower
 or forward ends upon brackets E^4 , which ex-
 tend upwardly from the frame-plates $E E$ of
 the front clamping devices. At their oppo-
 site or rear ends said cam-bars have sliding
 120 connection with the frame of the cutting-off
 device by means of longitudinal guide-ribs D^5
 D^5 upon the inner faces of said cam-bars,
 which engage suitable guide-grooves in brack-
 ets $J^4 J^4$, which are secured to the top plate N
 125 of the rear clamping device.

R is a frame or rack located over the top of
 the machine for guiding the cloth to the same,
 said rack being provided with guide-rollers r
 130 r' , the latter of which is located centrally over
 the path of the carrying-blade. As hereto-
 fore made such racks have been stationary
 and the cloth has been drawn over the same
 solely by the action of the reciprocating fold-

ers or folding-blades. It is found, however, in the use of a stationary rack that when the machine is run fast the cloth is fed in a series of jerks, being drawn rapidly over the guide-rollers in the approach of the carrying-blades or reciprocating folders toward the front or rear clamp-jaws and slackened up when the said blades or folders are receding from the clamp-jaws. To avoid this result, we make the end of the rack which carries the roller r' vertically movable by pivoting the opposite end of the rack upon arms $R' R'$ of the frame and provide a connection between the overhanging free end of the rack and the moving parts of the machine, so arranged that the said free end of the rack R will be drawn downwardly toward the folding devices as the reciprocating parts of the folder approach the front and rear clamping devices. By this construction as the fold of the cloth is carried toward the clamping plates or jaws the cloth is supplied mainly by the downward movement of the free end of the rack, the cloth being fed or carried over the roller r' in the upward movement of the said roller, which occurs when the reciprocating parts of the folder are moving backwardly from the clamp-plates, so that the feeding of the cloth past or over the said roller r' is practically continuous.

Any suitable means may be employed for moving the free end of the rack R at the proper time. In the particular construction illustrated said rack is supported by means of two rods $R^2 R^2$, which are pivoted to the end of the rack and to the sliding end plates $D D$ of the reciprocating folding devices. Attached to said rods R^2 are two depending bars $R^3 R^3$, which are bent inwardly to points inside the frame and support at their lower ends two transverse guide-rods $R^4 R^5$, between which the cloth passes before reaching the carrying-blade D^3 and folding-bar D' . The rod R^4 is herein shown as provided with adjustable guide-fingers $r^2 r^2$, which act to hold the cloth from lateral displacement. $r^3 r^3$ are guide-fingers applied to a cross-bar r^4 of the rack for a similar purpose.

To provide for the lateral adjustment of the fingers $r^2 r^3$ on the rod R^4 and cross-bar r^4 , said fingers are attached to hubs which slide on said rod and bar and which are provided with set-screws for holding them at any desired place, as shown in the drawings.

The operation of the main parts of the machine is as follows: The cloth is led from the rack R downwardly between the folding-blade D' and carrying-bar D^3 and thence to the cloth gripping or clamping devices. After each cut and creasing is completed the cut-off end of the cloth is held between the clamp-plates N and O and the cloth-carrier is adjacent to said clamp-plates. In making the next fold the said cloth-carrier moves toward the clamp-plates G and H , and in so doing the carrying-blade is depressed by the action of the rollers $d' d'$ in the cam-grooves $d^2 d^2$

until the said blade is brought into the same horizontal plane with the said clamp-plates. As the carrying-blade approaches the clamp-plates the upper plate H rises, allowing the carrying-blade and the fold of cloth thereon to enter between the plates and to pass over the lower plate G and the fingers $i i i$, which are then clamped down against the lower plate to hold in place the previously-made folds when the clamp-plates G and H are apart. After the carrying-blade has completed its stroke the upper clamp-plate descends and engages the fold of cloth extending over the carrying-blade, and the latter then begins its backward movement and slips out from between the clamp-plates and the fold of cloth which it has carried between them. After the carrying-blade has left the clamp-plates G and H the plate I is operated to withdraw the fingers $i i i$ from between the cloth - folds previously made and the new or uppermost cloth-fold and to bring said fingers down over the said uppermost fold. As the folding-bar moves away from the clamp-plates G and H the cloth is drawn from the rack R over the said folding-bar and is brought into contact with the rollers $k k k$, the clamp-plate O being moved downward away from the plate N before the folding-bar reaches the same, so as to allow the said folding-bar to pass over said clamp-plate O . As soon as the cloth is brought against the rollers the latter are moved endwise along the knife-edge to sever the cloth, as hereinbefore described. After the cloth is severed and the folding-bar begins its backward movement the part or end of the cloth above the folding-bar is engaged and held from backward movement with the bar by means of the fingers $n n n$, acting upon the flat top surface of the bar. Said fingers engage the cloth at some distance from its cut edge, so that the latter remains over the clamp-plate O after the advance edge of the folding-bar has retired from over the said clamp-plate, and the latter then rises, so as to catch and clamp said cut-off edge. As each folded piece is cut off its ends fall to and rest upon the curved plate Q , and when a sufficient number of cut pieces have been clamped between the plates G and H the latter are opened and the bundle or pile of cut pieces is removed.

Fig. 12 illustrates a construction in a cutting-roller which may be used in place of the roller k hereinbefore described when the machine is intended for working upon cloth of one thickness only. In this case the said rollers, instead of being provided with yielding plates at the ends beneath, which the creasing-plates enter, are provided with two narrow annular grooves $k^7 k^7$, into which the said creasing-plates force the fold of the cloth, the grooves being of such width as to clamp the cloth tightly against or over the edges of the creasing-plates, and thus give to the cloth a permanent crease or fold. The advantage of the cutting-rollers having yielding disks

is that the same rollers may be used for cloth of any thickness, so that no change is required in the machine for operating upon different kinds of cloth.

5 It will of course be seen that the disks k^6 (shown in Fig. 10) form with the ends of the rollers annular grooves to receive the edges of the creasing-plates, so that the same general construction is, in fact, present in the rollers shown in Fig. 12 as is illustrated in the other figures of the drawings, the grooves in one case being automatically variable or adjustable by reason of the yielding of the disks and in the other case non-adjustable.

15 The appended claim covering a grooved cutting-roller is therefore intended to include both of the forms of roller above referred to.

Some of the improvements herein illustrated and described are applicable to folding-machines which are without any devices for cutting off the folded cloth, and as far as these features are concerned, therefore, our invention is not limited to a machine embracing such cutting-off devices.

25 We are, as far as we are aware, the first to employ an automatic cutting-off device in a folding-machine, and such cutting-off device is therefore herein broadly claimed without restriction to the particular details of construction in the cutting-off devices themselves herein shown. The employment of a cutting-off device acting in connection with a bar which carries the cloth in folding is, however, of great advantage and is also herein claimed as a specific improvement, as are other details of construction herein illustrated.

We claim as our invention—

1. A cloth folding and cutting machine comprising a cloth-clamp for holding the folded edges of the cloth, cloth-cutting mechanism, operating to sever the cloth transversely, and a reciprocating cloth-carrier operating to carry the folds of cloth alternately to the cloth-clamp and cutting mechanism, substantially as described.

2. A cloth folding and cutting machine comprising clamping-plates for holding the folded edges of the cloth, a cloth-cutting mechanism a a reciprocating cloth-carrier consisting of a carrying-blade constructed to carry the cloth to and insert it between the clamping-plates and a folding-bar constructed to carry the cloth to the cutting mechanism, said cutting mechanism being constructed to sever the cloth along the fold held by the said folding-bar, substantially as described.

3. The combination of clamping-plates constructed to hold the folded edge of the cloth, a reciprocating carrying-blade for carrying the cloth to the said clamp-plates, a reciprocating folding-bar provided with a knife-edge, a series of cutting-rollers acting upon the knife-edge to sever the cloth, and means for supporting and actuating said rollers, said folding-bar being constructed to carry the cloth to and into contact with the said rollers, substantially as described.

4. The combination of a reciprocating carrying-blade and two clamp-plates, one of which is movable toward and from the other and one of which is provided with notches or spaces, means for actuating the movable clamp-plate, a series of movable clamp-fingers acting upon the opposing clamp-plate through the said spaces or notches, and means for actuating said fingers, substantially as described.

5. A folding-machine comprising two clamp-plates constructed to hold the folded edge of the cloth, a carrying-blade, a folding-bar provided with a knife-edge and two creasing-plates, a series of bodily-movable grooved rollers acting in connection with said knife-edge, and means for supporting and actuating said rollers and creasing-plates to sever and crease the cloth, said folding-bar being constructed to carry the cloth to and into contact with the rollers, substantially as described.

6. The combination of two clamp-plates constructed to hold the folded edge of the cloth, a horizontally and vertically reciprocating carrying-blade for carrying the cloth to the clamp-plates, a horizontally-reciprocating folding-bar provided with a knife-edge, a plurality of horizontally-movable rollers acting against said knife-edge, and means for sustaining and actuating said rollers, said folding-bar being constructed to carry the cloth to and into contact with the rollers, substantially as described.

7. The combination, with the machine-frame, of a cloth-clamp constructed to hold the folded edge of the cloth, a cutting mechanism for severing the cloth transversely, a reciprocating cloth-carrier consisting of a carrying-blade operating to carry the cloth to and into the cloth-clamp and a folding-bar constructed to carry the cloth to the cutting-off mechanism, and separate frames severally supporting said cloth-clamp and cutting mechanism, said frames having sliding connection with the machine-frame, substantially as described.

8. The combination, with the machine-frame, of a cloth-clamp, a reciprocating carrying-blade for carrying the cloth to the cloth-clamp, a reciprocating folding-bar provided with a knife-edge, a plurality of rollers acting upon said knife-edge, said folding-bar being constructed to carry the cloth to and into contact with the rollers, a longitudinally-sliding bar sustaining and giving motion to the said rollers, means for actuating said sliding bar, and yielding blocks mounted in said sliding bar and immediately supporting the said rollers.

9. The combination, with the machine-frame, of a cloth-clamp, a reciprocating carrying-blade for carrying the cloth to the cloth-clamp, a reciprocating folding-bar provided with a knife-edge, a plurality of rollers acting upon said knife-edge, said folding-bar being constructed to carry the cloth to and into contact with the said rollers, a longitudinally-sliding bar sustaining said rollers, and means for actuating said bar, comprising a spring acting to throw said bar in one direction and a cam

connected with said bar and acting to move the latter in the opposite direction, substantially as described.

10. The combination of a cloth-clamp for holding the folded edges of the cloth, cloth-cutting mechanism operating to sever the cloth transversely, a reciprocating cloth-carrier consisting of a carrying-blade constructed to carry the cloth to the cloth-clamp and a folding-bar constructed to carry the cloth to the cutting mechanism, and a second cloth-clamp located adjacent to the cutting mechanism and constructed to grip the cut-off edge of the cloth above the folding-bar, substantially as described.

11. The combination, with a cloth-clamp, of a reciprocating carrying-blade for carrying the cloth to the clamping device, a reciprocating folding-bar, a cutting mechanism comprising a knife-edge on the bar and a series of rollers acting against the knife-edge, said folding-bar being constructed to carry the cloth to the rollers, means for supporting and actuating said rollers, a stationary clamp-plate located above the rollers, a vertically-movable clamp-plate located in front of the rollers and acting upon said stationary plate, and means for actuating said clamp-plate, substantially as described.

12. The combination of a cloth-clamp for holding the folded edges of the cloth, cloth-cutting mechanism operating to sever the cloth transversely, a reciprocating cloth-carrier consisting of a carrying-blade acting to carry the cloth to and into the cloth-clamp and a folding-bar having a flat top surface and operating to carry the cloth to the cutting mechanism, a stationary clamp-plate located above the cutting mechanism, a series of spring-fingers acting upon the top surface of the said bar, a vertically-movable clamp-plate located in front of the cutting mechanism and acting against said clamp-plate, and means for actuating said movable clamp-plate, substantially as described.

13. The combination, with a cloth-clamp, of a carrying-blade, a folding-bar having a knife-edge operating to carry the cloth to said cloth-clamp, a series of rollers acting against said knife-edge, said folding-bar being constructed

to carry the cloth to and against the said rollers, means for sustaining and actuating said rollers, a stationary clamp-plate located above the rollers and folding-bar, a vertically-movable clamp-plate located in front of the rollers, a pivotally-supported oscillating blade acting upon the cloth beneath the folding-bar to free the same from said folding-bar, and means for actuating said clamp-plate and oscillating blade, substantially as described.

14. The combination, with front and rear cloth-clamps and a reciprocating cloth-carrier, of a horizontally-arranged cloth-rack pivotally supported at one end and having its opposite or free end located over and movable toward and from the cloth-carrier and means for actuating said rack, substantially as described.

15. The combination of two clamp-plates constructed to hold the folded edges of the cloth, a carrying-blade, a folding-bar provided with a knife-edge and with two creasing-plates, a series of bodily-movable rollers having grooves at their ends, which grooves are formed by yielding disks attached to the ends of the rollers, and means for sustaining and actuating said rollers, substantially as described.

16. The combination of cloth-clamps arranged at different elevations at opposite ends of the machine, a folding-bar moving in a horizontal plane and adapted to carry the cloth to one of said cloth-clamps, and a carrying-blade constructed to carry the cloth to the other of said cloth-clamps, having both a horizontal and vertical movement, means for giving a horizontal reciprocatory movement to said folding-bar, and means for giving a combined horizontal and vertical reciprocatory motion to the said carrying-blade, substantially as described.

In testimony that we claim the foregoing as our invention we affix our signatures in presence of two witnesses.

SAMUEL T. LOCKWOOD.
SAMUEL K. WHITE.

Witnesses:

C. CLARENCE POOLE,
GEORGE W. HIGGINS, Jr.