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# G. E. LLOYD.

## PAPER FOLDING, PASTING, AND TRIMMING MACHINE.

No. 353,638. Patented Nov. 30, 1886.

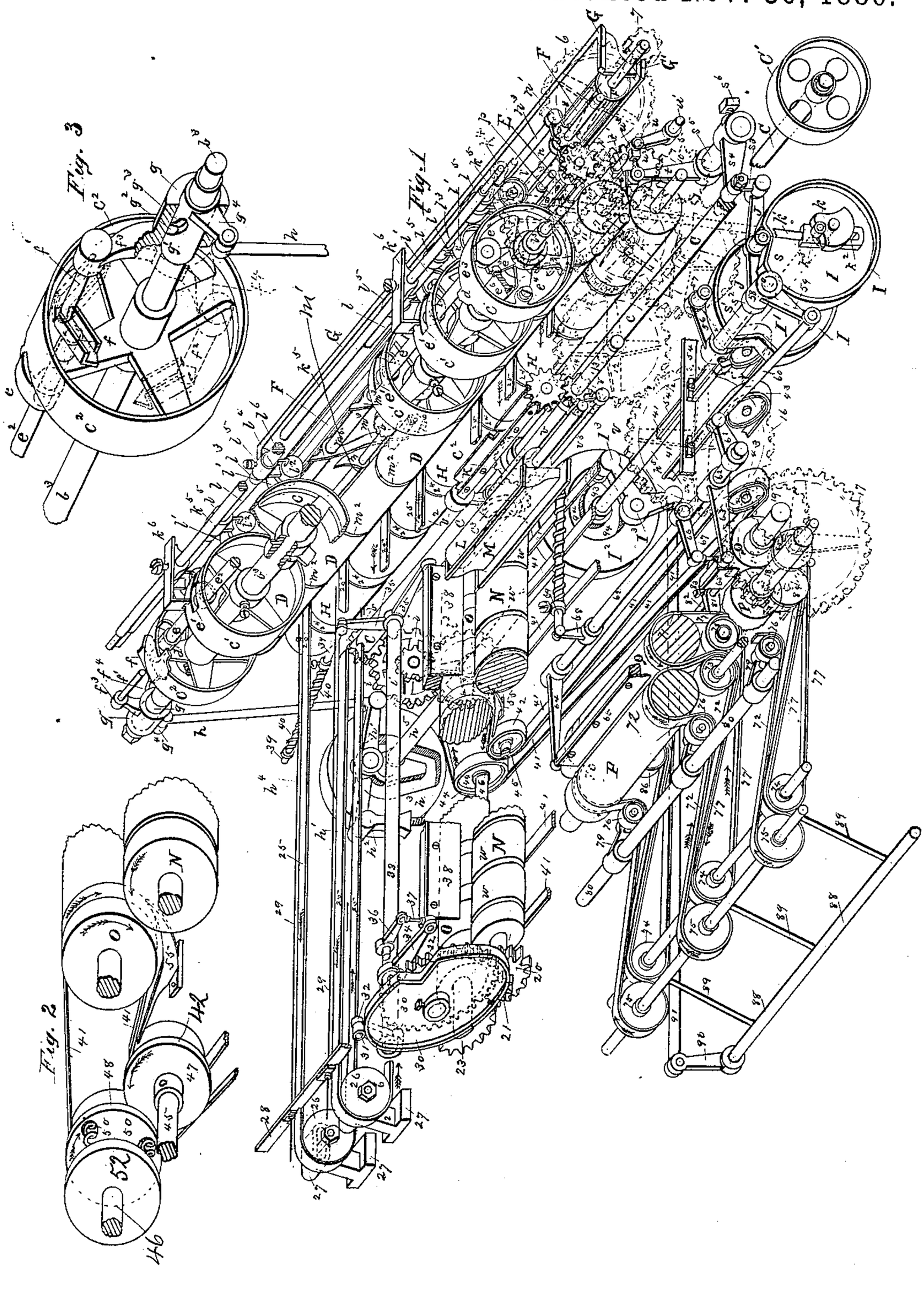

Fig. 3



Fig. 2



Fig. 1

WITNESSES

Wm. C. Hutting

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attorneys

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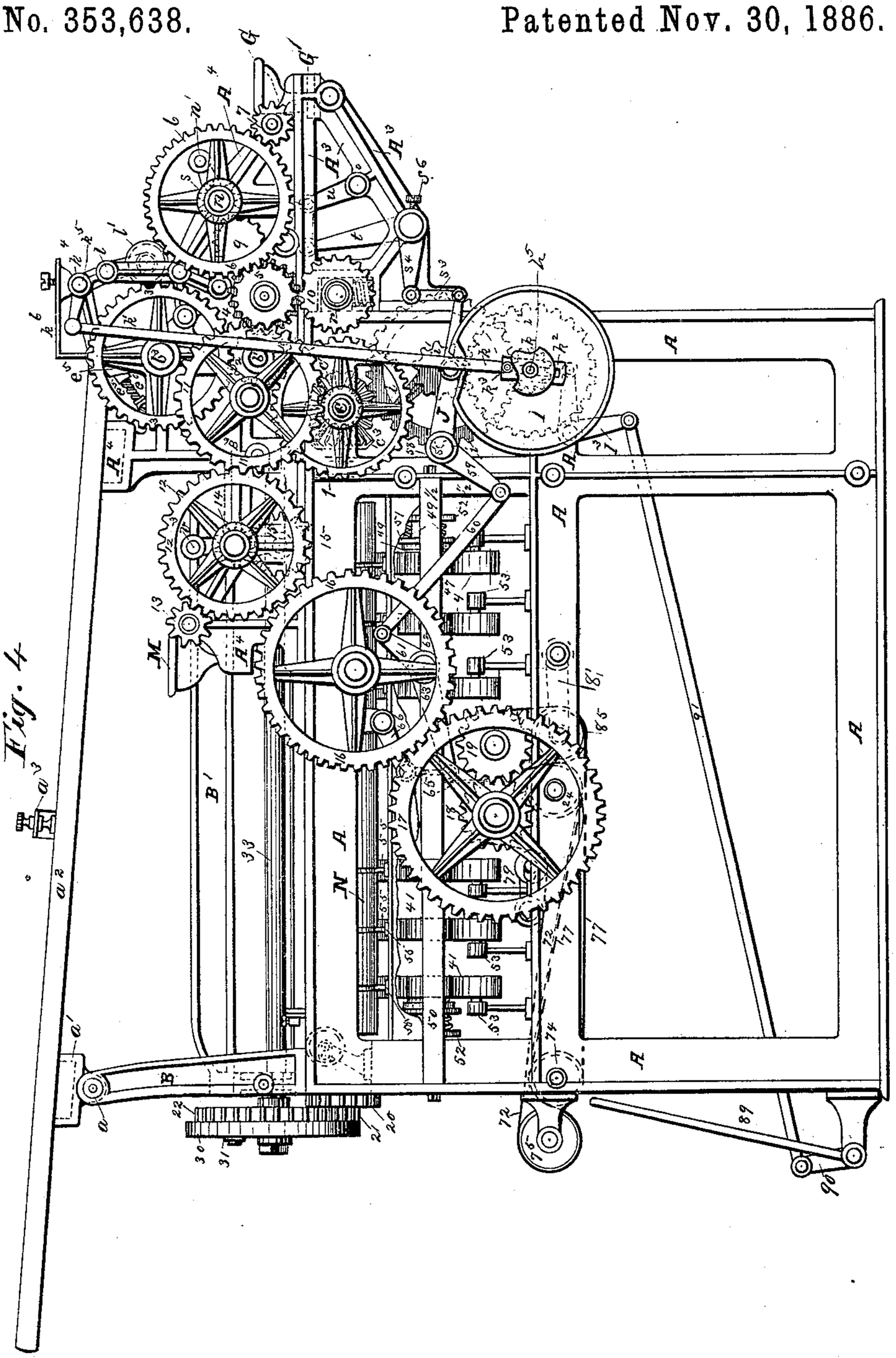

Fig. 4

WITNESSES

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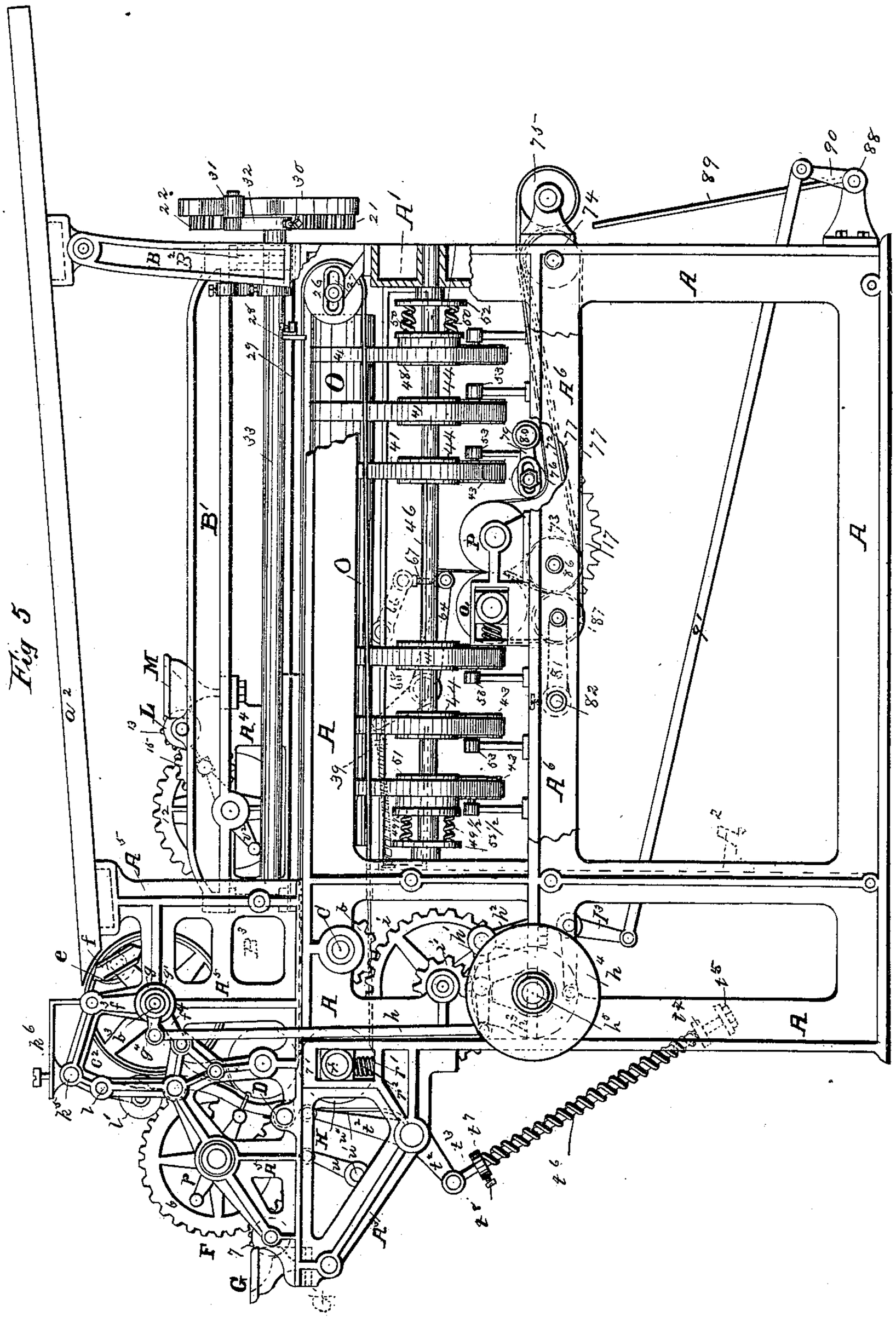
# G. E. LLOYD.

## PAPER FOLDING, PASTING, AND TRIMMING MACHINE.

No. 353,638. Patented Nov. 30, 1886.

Fig 5



WITNESSES

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# G. E. LLOYD.

## PAPER FOLDING, PASTING, AND TRIMMING MACHINE.

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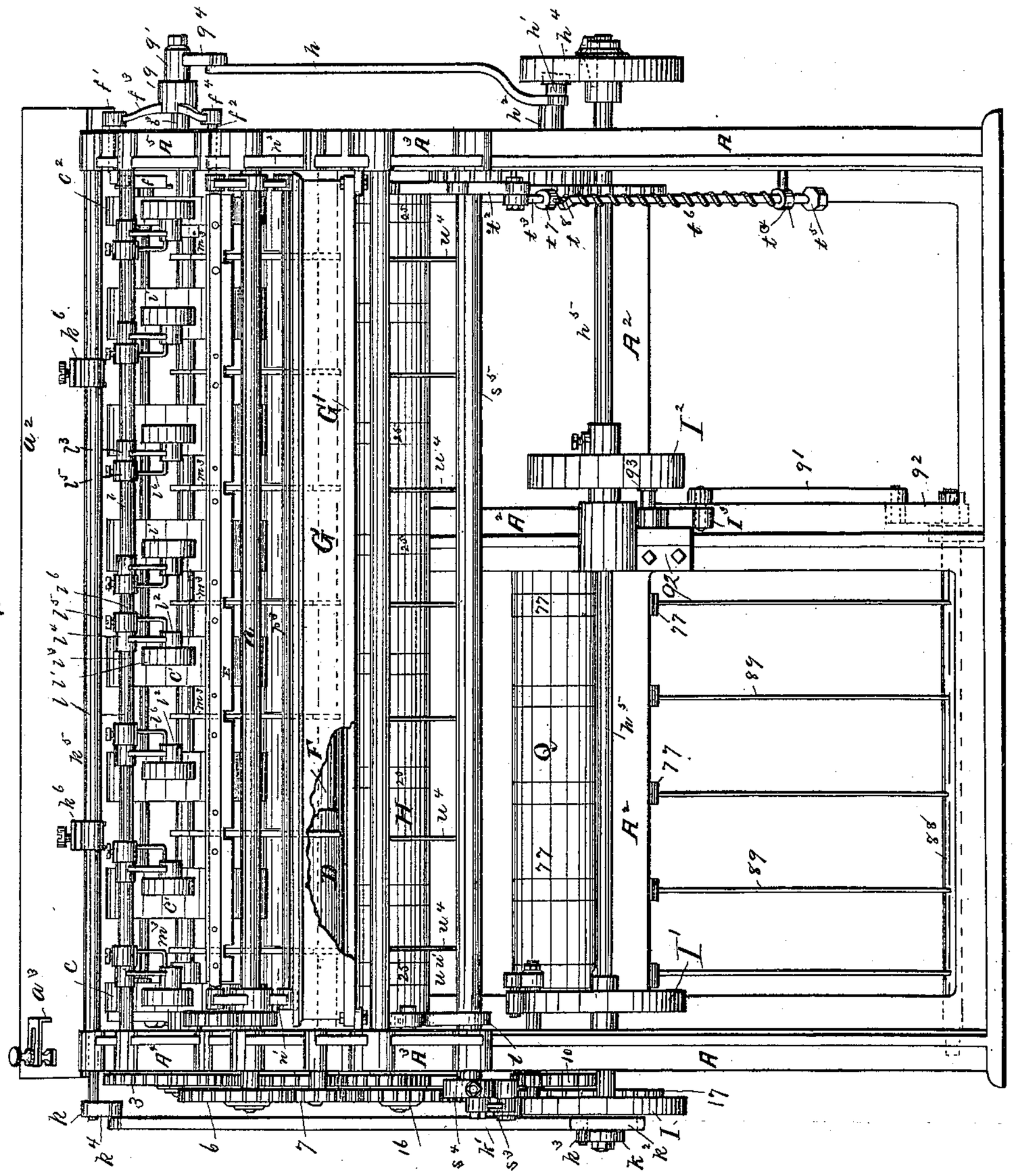

Fig. 6.

WITNESSES

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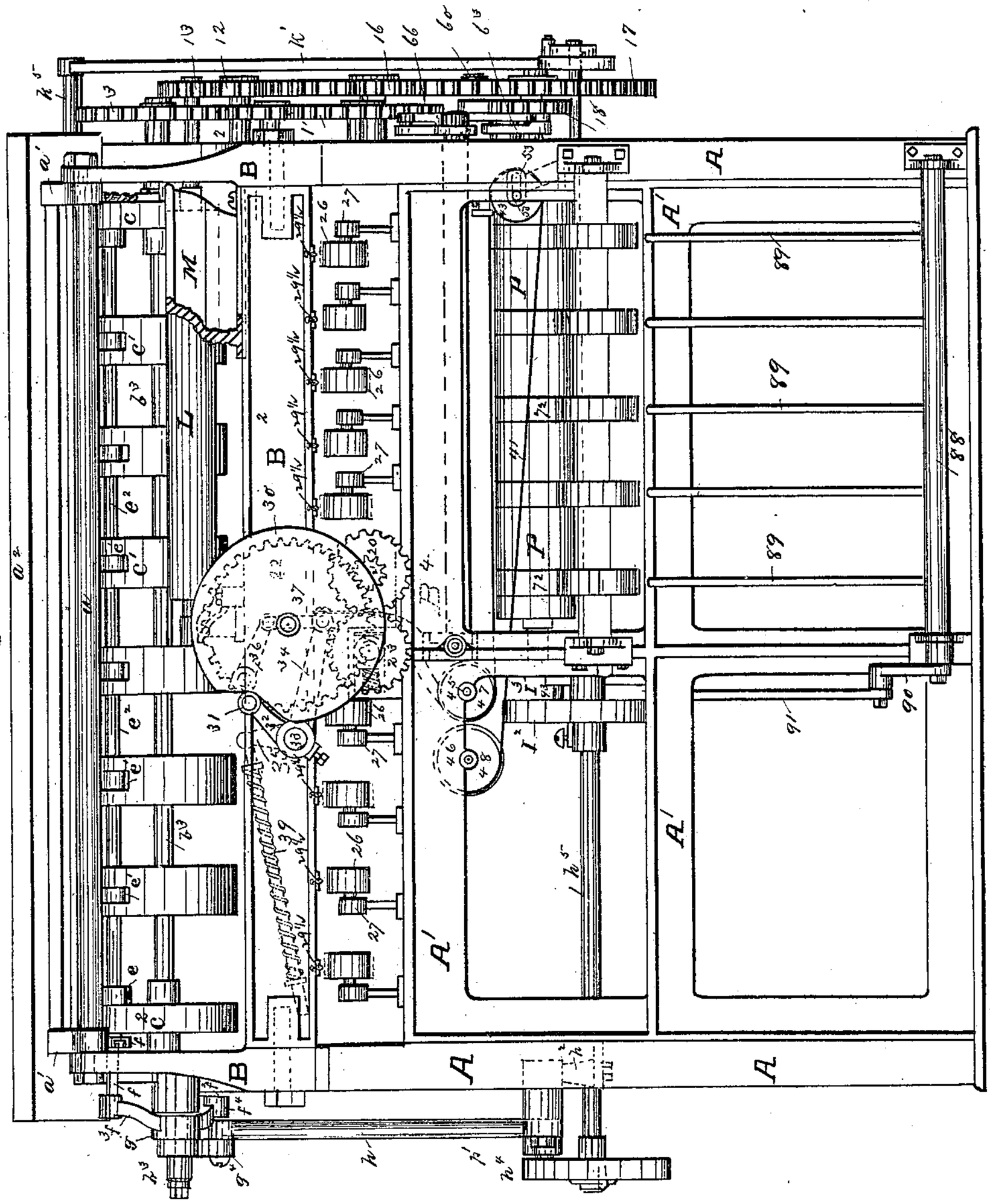
# G. E. LLOYD.

## PAPER FOLDING, PASTING, AND TRIMMING MACHINE.

No. 353,638. Patented Nov. 30, 1886.

Fig. 7



WITNESSES

Wm. C. Whiting

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## PAPER FOLDING, PASTING, AND TRIMMING MACHINE.

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Fig. 8.

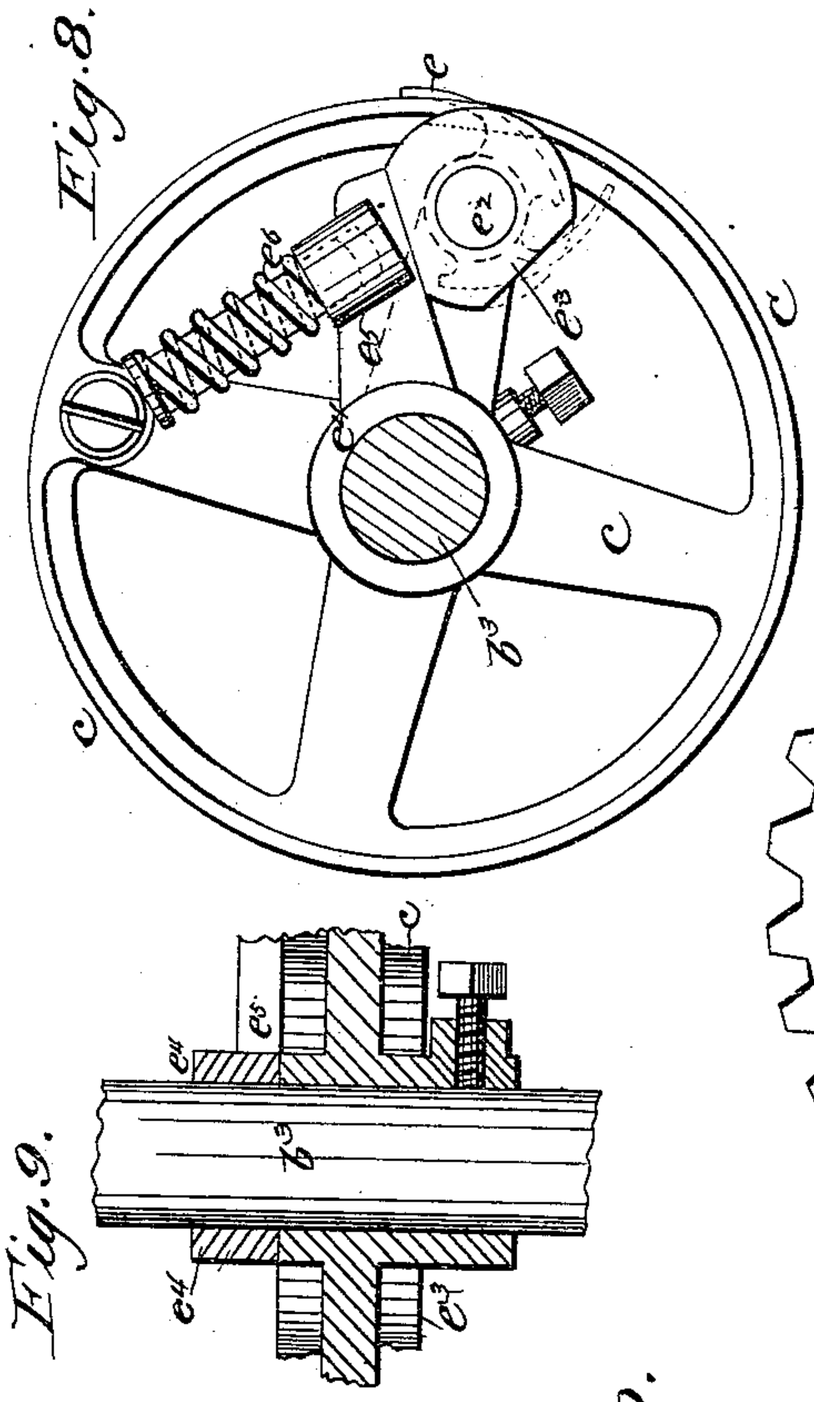



Fig. 9.




Fig. 10.

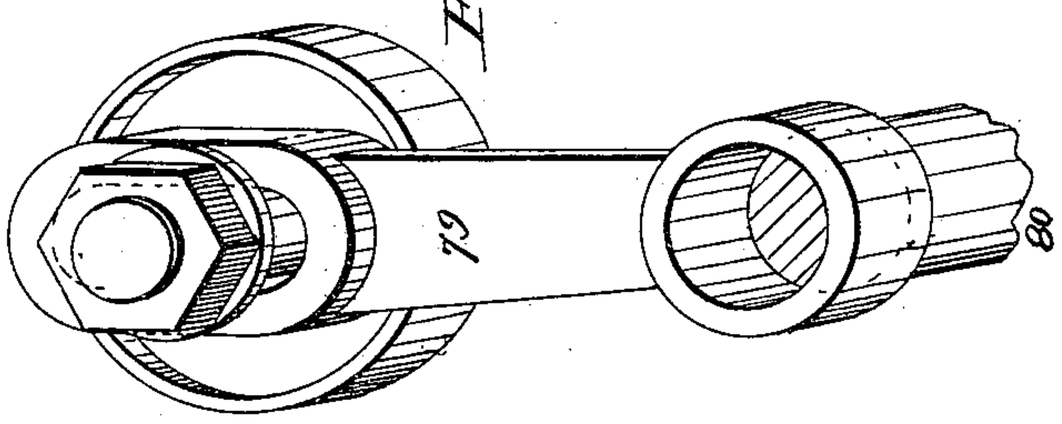
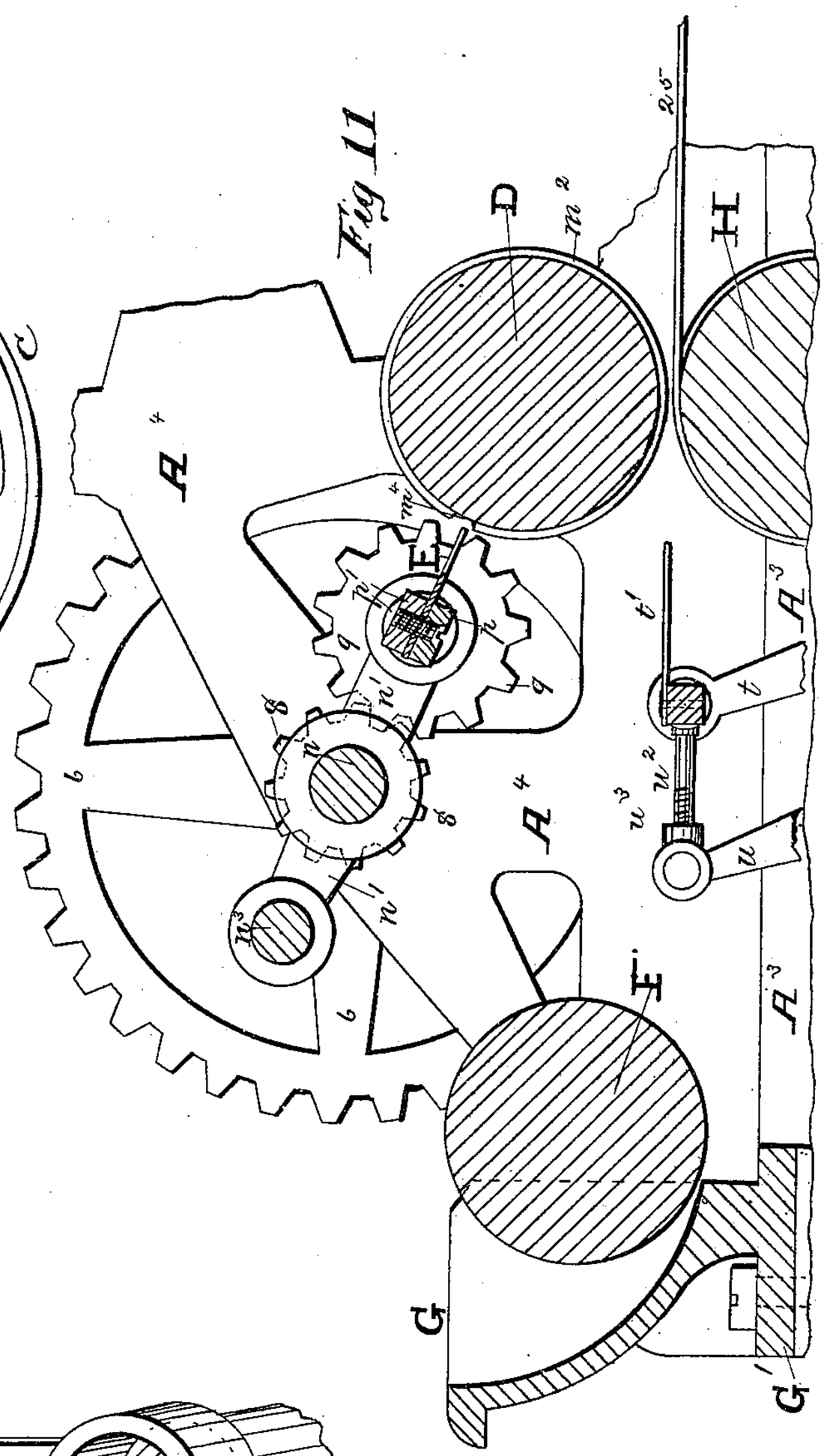



Fig. 11




WITNESSES

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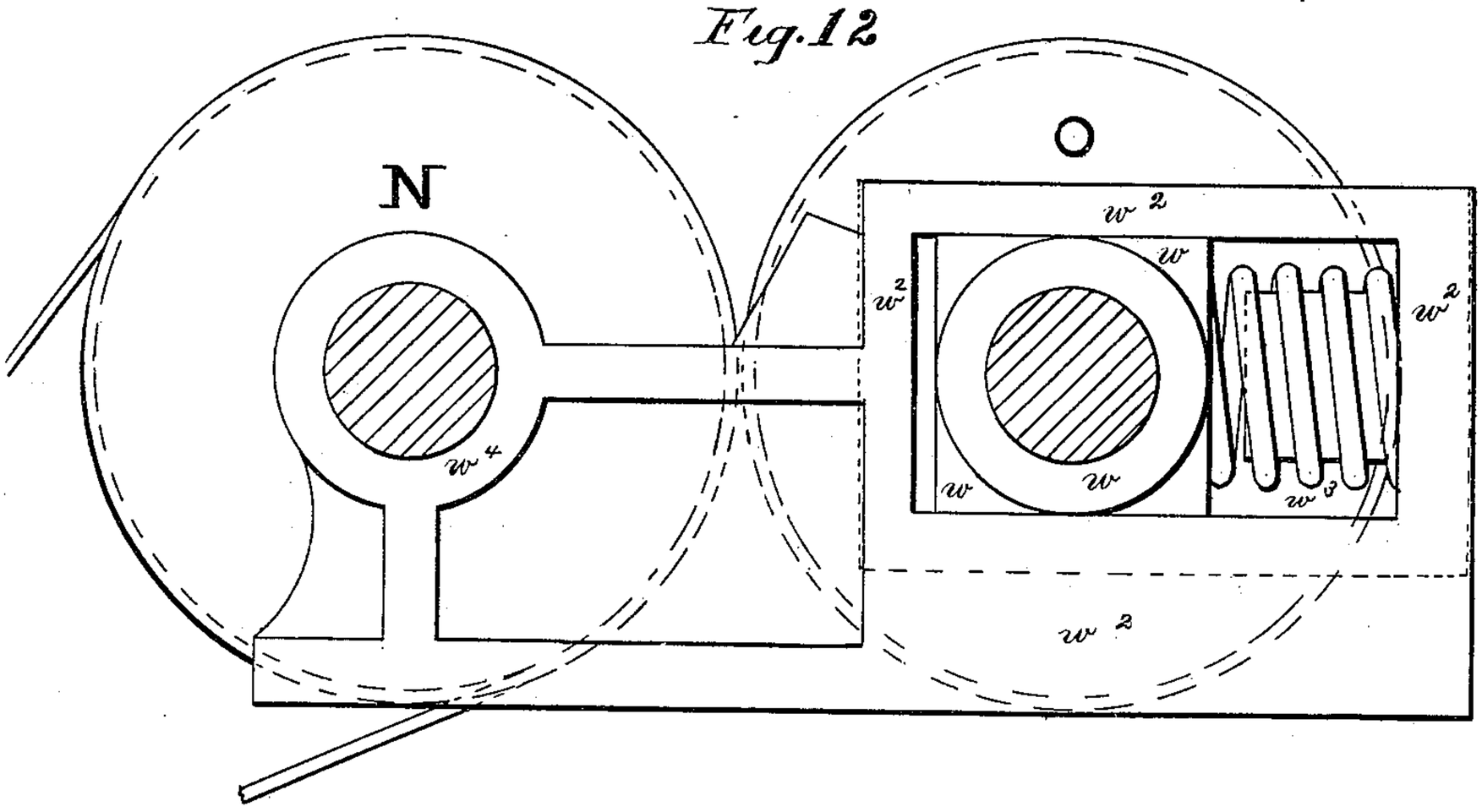
# G. E. LLOYD.

## PAPER FOLDING, PASTING, AND TRIMMING MACHINE.

No. 353,638. Patented Nov. 30, 1886.

*Fig. 12*



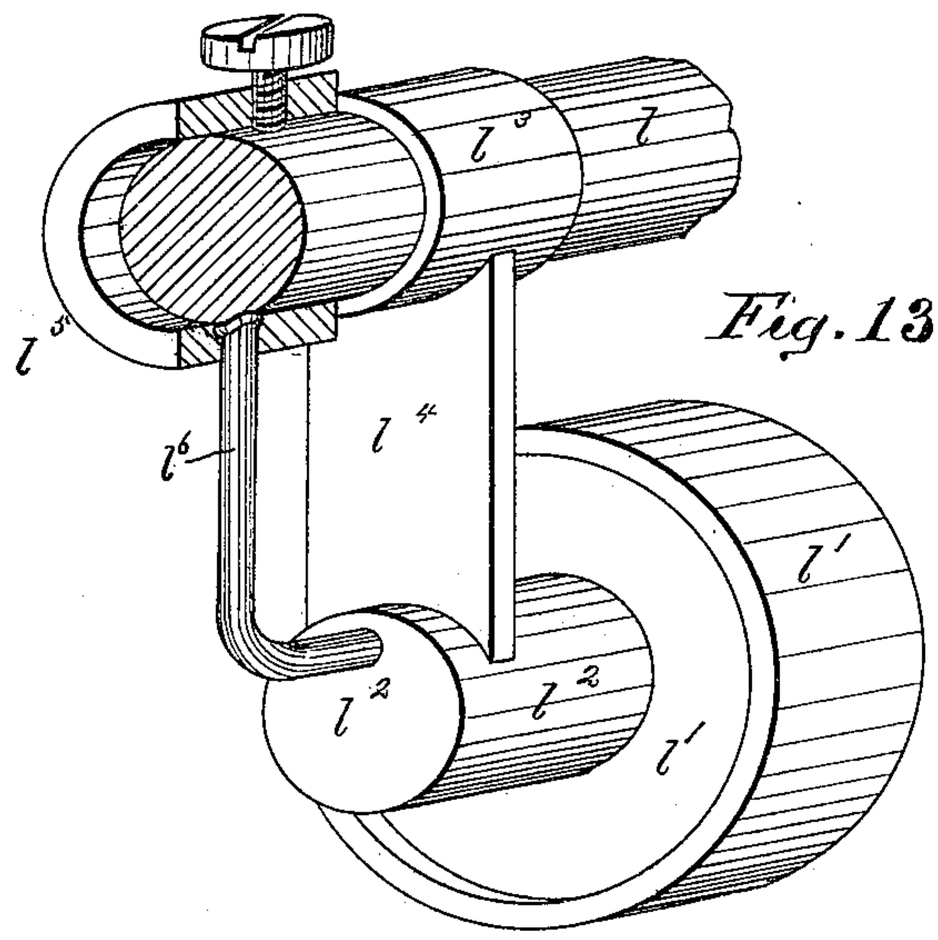
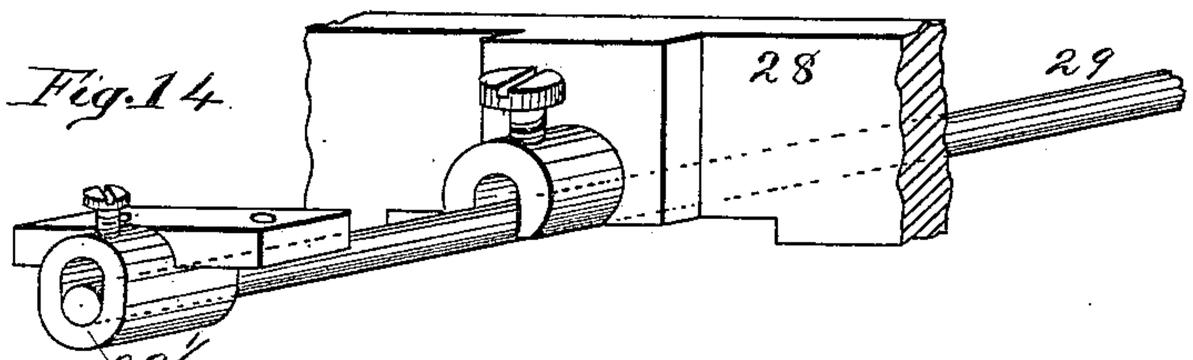




*Fig. 13*

*Fig. 14*




WITNESSES

Wm. C. Whiting

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# G. E. LLOYD.

## PAPER FOLDING, PASTING, AND TRIMMING MACHINE.

No. 353,638. Patented Nov. 30. 1886.

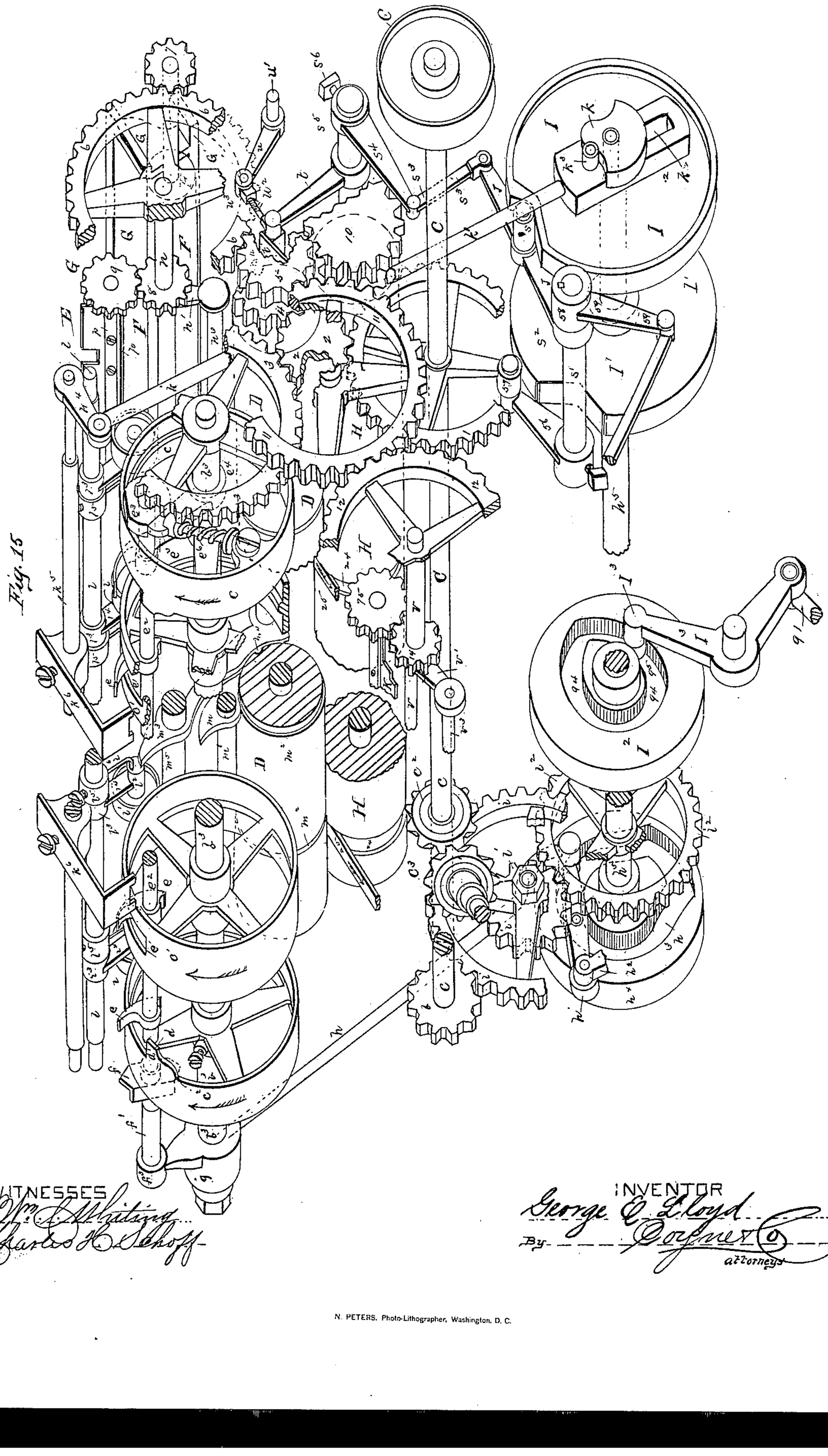

Fig. 15.

WITNESSES
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# G. E. LLOYD.

## PAPER FOLDING, PASTING, AND TRIMMING MACHINE.

No. 353,638. Patented Nov. 30, 1886.

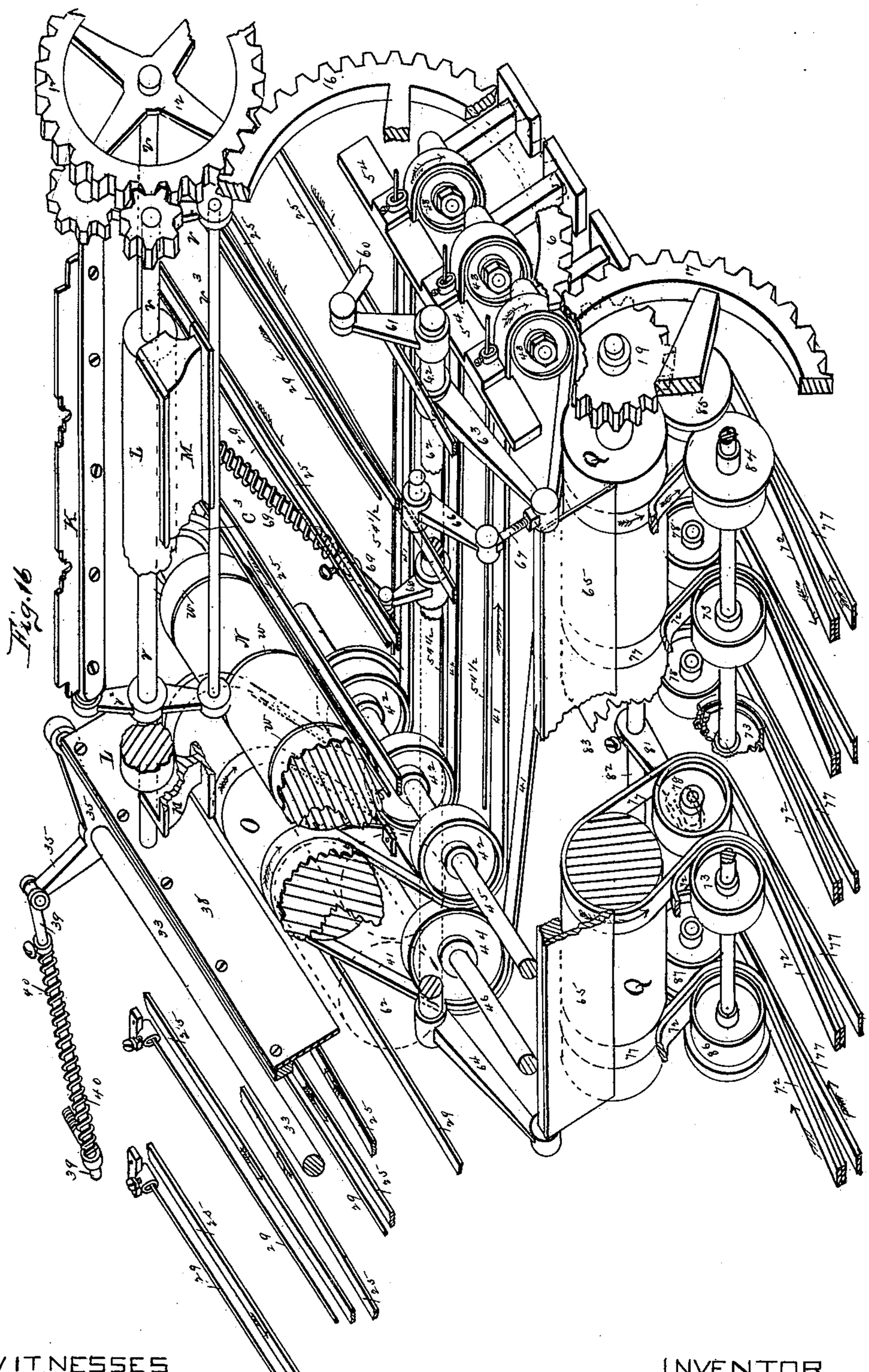

Fig. 16.

WITNESSES

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# G. E. LLOYD.

## PAPER FOLDING, PASTING, AND TRIMMING MACHINE.

No. 353,638. Patented Nov. 30, 1886.

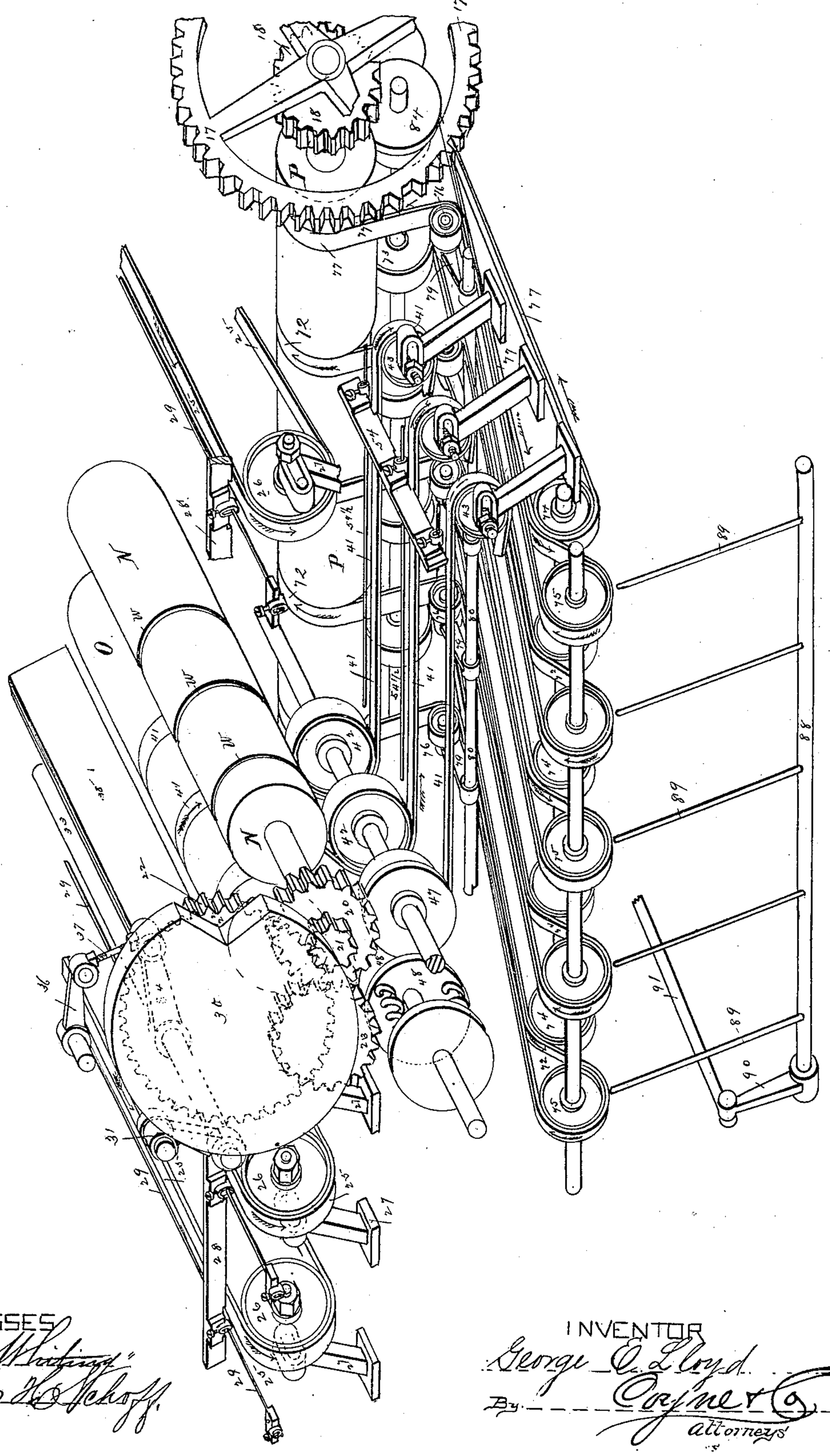

Fig. 17

WITNESSES

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# G. E. LLOYD.

## PAPER FOLDING, PASTING, AND TRIMMING MACHINE.

No. 353,638. Patented Nov. 30, 1886.

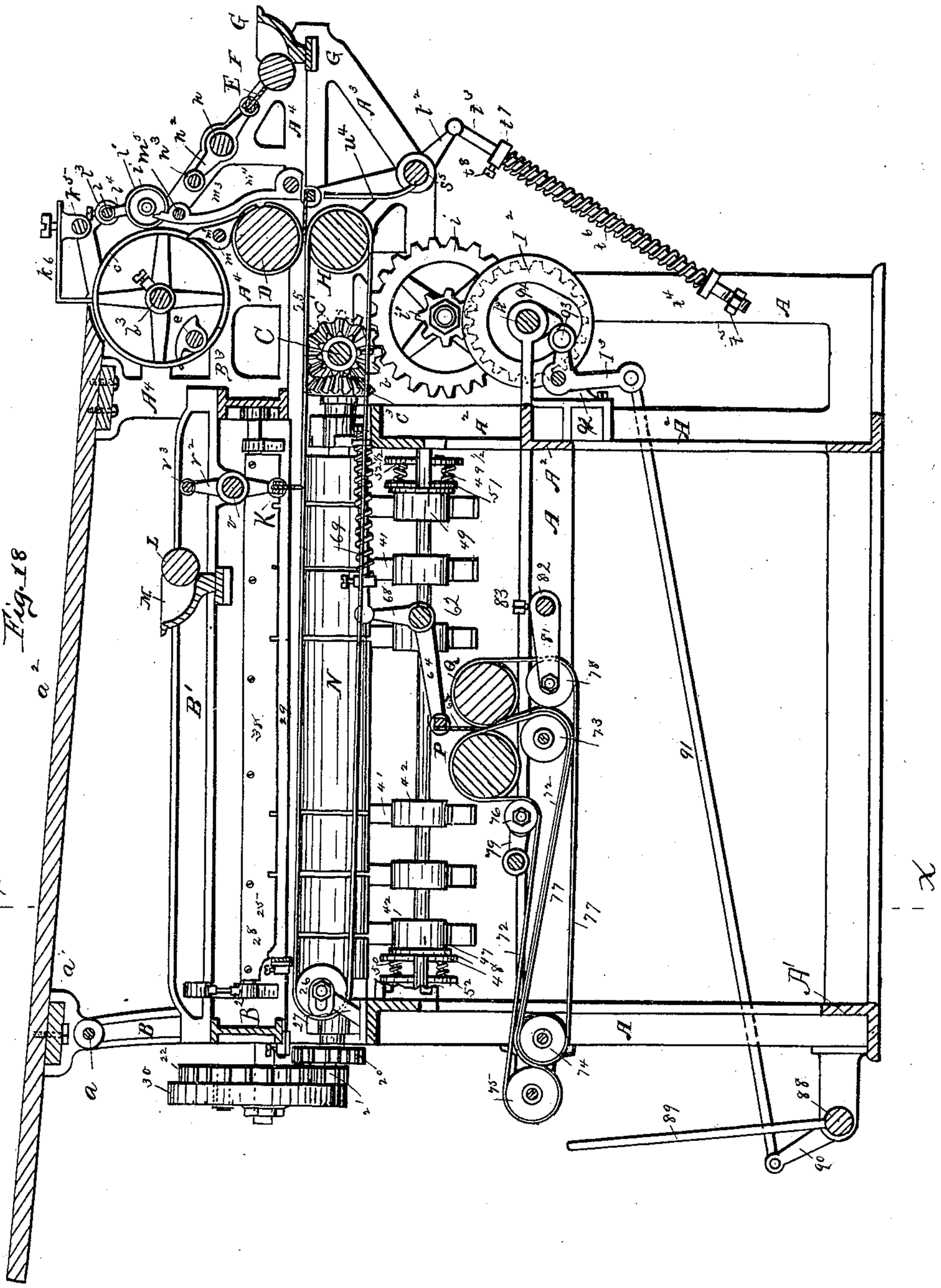

Fig. 18.

WITNESSES

Wm. E. Whiting

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INVENTOR

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By Carter & Co.

attorneys

(No Model.)

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# G. E. LLOYD.

## PAPER FOLDING, PASTING, AND TRIMMING MACHINE.

No. 353,638. Patented Nov. 30, 1886.

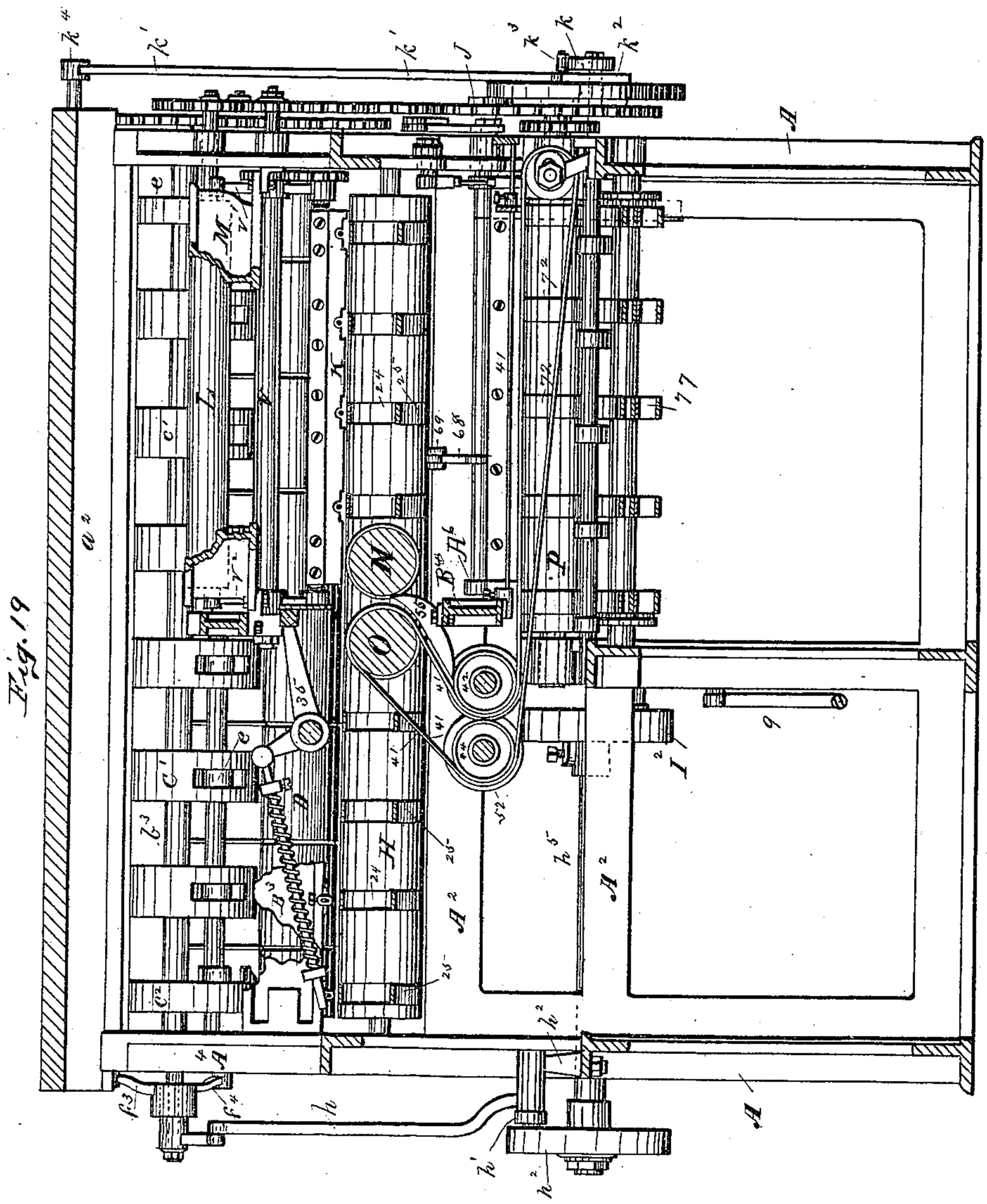

Fig. 19

WITNESSES

Wm. C. Whitney

Charles H. Schoff.

INVENTOR

George E. Lloyd

By Coyne & Co.

attorneys

# UNITED STATES PATENT OFFICE.

GEORGE E. LLOYD, OF CHICAGO, ILLINOIS.

## PAPER FOLDING, PASTING, AND TRIMMING MACHINE.

SPECIFICATION forming part of Letters Patent No. 353,638, dated November 30, 1886.

Application filed December 20, 1880. Serial No. 22,539. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE E. LLOYD, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Paper Folding, Pasting, and Trimming Machine, of which the following is a specification.

My invention relates to new and useful improvements in combined folding, pasting, and trimming machines, whereby a sheet of paper is folded, pasted, and trimmed automatically in the manner hereinafter described.

I attain the objects of my invention by mechanism illustrated in the accompanying drawings, in which—

Figure 1 is an isometrical perspective of the machinery with the frame and supports removed. Fig. 2 is a detail (shown in perspective) of one pair of the cutter-heads or rotary shears and the connection of the adjacent rollers therewith. Fig. 3 is a detail (shown in perspective) of the device for operating the grippers, the rotary traveling tumbler, the studded arms on the reciprocating sleeve, and the spirally-slotted sleeve with its lever-arm, and the pitman operating the same. Fig. 4 is an elevation of one side of my machine. Fig. 5 is an elevation of the opposite side of the machine. Fig. 6 is a front elevation. Fig. 7 is a rear elevation of the same; Fig. 8, a detail of wheel *c*, showing cam $e^3$ on the end of shaft $e^2$, and $e^5$ on the loose sleeve $e^4$, and the spring $e^6$; Fig. 9, a vertical central section of the wheel *c*. Fig. 10 is a detail of slotted arm 79, carrying the journal of tape-pulleys; Fig. 11, a view of the pair of rollers D H and the pasting-blade E, showing the carrier-frame and gear, &c.; Fig. 12, a detail of spring-seated journal-box for one pair of folding-rollers. Fig. 13 is a detail of the contact or friction rollers *l' l'*. Fig. 14 is a detail showing the construction of the stops 28 28 and guards 29 29. Fig. 15 is a rear view in perspective, and partly in section, of the gripping, first-folding, and first and second pasting mechanism in the front of the machine, the cam-wheels and gearing operating a portion of the remaining mechanism; Fig. 16, a similar view of the second-pasting and second-trimming, and second and third folding mechanism; Fig. 17, a similar view showing the second-folding blades and rollers, the cutting-disks under the outer ends of said rollers, the third-folding rollers and outer cutting-disks, and the delivery mechanism; Fig. 18, a vertical longitudinal section of the machine, cutting through the center of length of the second-pasting and third-folding blades, shown in Fig. 19. Fig. 19 is a vertical section of the machine, taken on the line *x x* of Fig. 18.

Similar letters of reference indicate the same parts in the several figures of the drawings, in which—

A A represent the longitudinal side frames, which are constructed of L and T iron, bolted together, so as to form an open rectangular frame, each side having three vertical posts and three horizontal bars or beams. A' is a similar frame in the rear. $A^2$ is a similar frame, recessed from the front of the machine, situated between and bolted to the intermediate vertical posts of the frame A.

$A^3$ $A^3$ are open brackets bolted to the fronts of the frames A A on either side of the machine.

$A^4$ $A^5$ are open irregularly-shaped auxiliary frames supported by and bolted to the upper flanges of frames A A and brackets $A^3$ $A^3$.

$A^6$ is a longitudinal frame, similar to the frames A A, but having only two horizontal beams, this frame only extending to the height of the middle beams of the other frames. (See Fig. 5.)

B B are vertical posts bolted to the frames A A at their rear ends. They provide bearings for a shaft, *a*, on which are pivoted boxes *a'*, to which a feed-board, $a^2$, is secured. Feed-board $a^2$ may be raised to a vertical position parallel to and in the rear of posts B B, thereby giving access for oiling or other purposes to the mechanism below.

$A^3$ is an ordinary side guide adjustable on the feed-board $a^2$ in the manner side guides are usually made adjustable on such feed-board.

B' is a longitudinal girt carrying one set of the bearings for the shafts of the second-pasting mechanism. This girt B' is supported by and bolted to transverse girts $B^2$ $B^3$. (See Figs. 4 and 7.) Transverse girt $B^2$ is situated between and secured to the vertical posts B B. Transverse girt $B^3$ is situated between and secured to the auxiliary frames $A^4$ and $A^5$.

$B^4$ is a similar longitudinal girt passing

through the center of width of the machine in a plane below the transverse girt $B^2$, and is bolted to frames A′ and $A^2$, near the tops of the same, and forms a support for the guards conducting the sheet from the second set of folding-rollers to the second set of tape-pulleys and first set of rotary shears. (See dotted lines, Fig. 7.)

C is a drive-shaft, which has its bearings in the frames A A, and is actuated by belt or other suitable means applied to wheel C′. Said shaft carries about midway its length bevel-gear $C^2$, and at its end opposite C′ a pinion, *b*, while a gear-wheel, 1, (see Figs. 1 and 4,) is also secured upon said shaft next the belt-wheel C′.

The pinion 2, journaled on a stud, *b′*, projecting from and secured to frame A, meshes with the gear-wheels 1 and 3 and pinion 4. Gear-wheel 3 is secured to shaft $b^3$, which has its bearings in the frames A A, and carries near its opposite ends wheels *c* and $c^2$, respectively, and between said wheels a series of wheels, *c′ c′*. These wheels are all sleeved on shaft $b^3$, and adjusted by means of set-screws in the sleeves pinching the said shaft.

The wheels *c′ c′* and $c^2$ are open-faced wheels with broad peripheries. *c* and $c^2$ have lugs *d* and *d′* projecting from their inner faces, as a lateral extension of their peripheries, to allow the grippers *e* to pinch against their surface. The wheels *c′* and *c′* have slots *e′* in their peripheries to permit the passage of the grippers *e* and allow them (the grippers) to pinch against the surface of the peripheries of those wheels. The grippers *e* are carried upon and secured to a shaft, $e^2$, having its bearings in the radiating arms or spokes of wheels *c* and $c^2$. The shaft $e^2$ extends through the frame of wheel *c* and carries a reciprocating cam, $e^3$, fixed to its end. This cam has two straight faces and two opposite curved faces or surfaces on its periphery.

On shaft $b^3$ there is a loose sleeve, $e^4$, carrying an arm, $e^5$. A spiral spring, $e^6$, working over a stud, (which stud is pivoted to the frames of wheel *c* near its periphery,) abuts against the arm $e^5$ and presses it against the cam $e^3$. (See Figs. 8 and 9.)

On shaft $e^2$, at its end opposite cam $e^3$, is a traveling tumbler, *f*, rigidly secured to the end of said shaft $e^2$. (See Fig. 3.) The tumbler *f* has a socket or cap, which projects from the center, fits over the shaft $e^2$, and is rigidly secured thereto. This tumbler is so constructed that its opposite ends will alternately engage with studs *f′* and $f^2$, projecting from the arms $f^3$ and $f^4$, radiating from a sleeve, *g*. (See Figs. 1, 3, and 5.) The sleeve *g* is loose on sleeve *g′*, and has a pin, $g^2$, on its inner face which traverses the spiral slot $g^3$. A rigid arm, $g^4$, upon the sleeve *g′*, is pivoted to a pitman, *h*, by means of which the sleeve is oscillated to reciprocate the sleeve *g*. The pitman *h* is pivoted to the end of a lever, *h′*, which in turn is pivoted to a stud stationary on the frame A. This lever *h′* is operated by means of a friction-roller revolving on a stud projecting from the center of length of said lever and traveling in the groove $h^3$ of the cam-grooved wheel $h^4$, which is keyed on shaft $h^5$. A gear-wheel, *i*, is fixed on a stud journaled in the frame A, which meshes with and is driven by the pinion *b* on the power-shaft C. A pinion, *i′*, fixed on the same stud and moving with gear-wheel *i*, meshes with the gear-wheel $i^2$ on the shaft $h^5$. By a correct arrangement of the respective sizes of the pinions *b* and *i′* and the gear-wheels *i* and $i^2$ the cam-grooved wheel $h^4$ makes one revolution while wheels *c*, *c′*, and $c^2$ are making five revolutions. The shape of the groove $h^3$ is such that the lever *h′* is idle during the time that the wheel $h^4$ is making one-half of its revolution. The lever *h′* then gradually rises to the top of its throw, rests for an interval, and returns gradually to its former position as idler. (This may be easily understood by reference to the shape of groove, as shown in Fig. 1.)

It will be noticed that by operating the lever *h′* from its center a stroke is gained of double the length of that which would be obtained by operating it at the end. As the lever *h* rises and falls, the sleeve *g′*, by means of its stud or arm $g^4$ and the pitman *h*, is oscillated. The spiral slot $g^3$ forces the pin $g^2$ to traverse its course, forcing the sleeve *g*, with its arms $f^3$ and $f^4$, toward the frame $A^5$. (See Fig. 7.) The studs *f′* and $f^2$ pass through perforations in the frame, and are projected on the inside of the same sufficiently to engage with the tumbler *f*. The upper or outer part of tumbler *f* on the shaft $e^2$, traveling with the wheels *c*, *c′*, and $c^2$, reaches the vertical center of those wheels at the time the studs *f′* and $f^2$ are projected through the perforations, as above described. When the lower or that part of the tumbler *f* nearer the center of the wheel $c^2$ stands back from or at an angle of about sixty degrees with a vertical line, the stud *f′* engages with and detains the upper end of the tumbler. The center of said tumbler being carried forward in the direction in which the wheel $c^2$ is revolving, the position of the tumbler is thus reversed, as shown by dotted lines in Fig. 3. The tumbler *f*, without moving on its own axis, is then carried forward by the revolution of the wheel $c^2$, until the lower or inner part of tumbler engages with the stud $f^2$, the shaft $e^2$ continuing to turn with the wheel $c^2$, and being outside of the arc in which the stud $f^2$ engages with the tumbler *f*. That tumbler is turned back to the position it was in before engaging with stud *f′*.

The grippers *e* are so secured on shaft $e^2$ that before the tumbler *f* engages with stud *f′* the grippers are open. The tumbler *f* and the cam $e^3$ being stationary on the respective ends of the shaft $e^2$, they move together, so that as the tumbler *f*, by engagement with stud *f′*, turns on its axis it also turns cam $e^3$. Spring $e^6$ yields sufficiently to allow one of the straight faces of the cam to be turned back. The shorter curved face of the cam then engages

arm $e^5$, and the other straight face becomes opposed to that arm, thus holding the grippers $e$ firmly closed until the tumbler $f$ engages with the stud $f^2$, when a reversal of the above movement takes place, and the grippers are again thrown open, in which position they remain for nearly four and a half revolutions of the shaft $b^3$. The studs $f'$ and $f^2$ then come forward and the operation described above is repeated.

It will readily be perceived that a continuous cylinder with slots, similar to $e'$, might be subitituted for the series of wheels $c$, $c'$, $c'$, and $c^2$ without departing from the spirit of my invention.

At the end of shaft $h^5$ opposite to that on which cam-grooved wheel $h^4$ is secured a small cam, $k$, is rigidly secured. A connecting-rod, $k'$, has an enlarged foot in which there is a slot, $k^2$, to allow the rod to play vertically over the shaft $h^5$. $k^3$ is a friction-roller turning on a stud projecting from the enlarged foot of the connecting-rod $k'$. This roller $k^3$ travels on the periphery of the cam $k$, and is operated by that cam. The connecting-rod $k'$ is pivoted at its upper end to a lever-arm, $k^4$. This lever-arm $k^4$ is fixed on the rock-shaft $k^5$ and oscillates the same.

$k^6$ $k^6$ are guides or stops sleeved on the shaft $k^5$, and are adjustable on the said shaft by means of set-screws. (See Fig. 1.) The shaft $h^5$, as stated above, makes one revolution while the shaft $b^3$ makes five.

By reference to the drawings, Fig. 1, it will be noticed that the cam $k$ is so shaped that the friction-roller travels within the circumference of the largest diameter of the said cam for one-half the revolution of said cam, so that the guides will remain down for one half of the time that the cam $k$ consumes in making one revolution and will be up the other half; or, in other words, the guides $k^6$ $k^6$ are held up during two and a half revolutions of the wheels $c$ $c'$ $c^2$ and are down for two and a half revolutions.

$l$ is a shaft carrying a series of friction-rollers, $l'$ $l'$.

$l^5$ is a collar made fast to shaft $l$ by a set-screw, as shown in Fig. 13. Secured in and depending downward from this collar is the spring $l^6$, the lower end of which is turned laterally, (or in the direction of and parallel to shaft $l$,) and is rigidly and permanently fixed in the journal-box $l^2$. Journal-box $l^2$ is supported by and made integrant with bracket $l^4$, which depends from sleeve $l^3$, loose on shaft $l$. The tension of spring $l^6$ is increased or decreased, so as to press the friction-roller $l'$ against the wheels $c$ $c'$ $c^2$, by oscillating collar $l^5$, and maintaining it in such oscillated position by manipulating the set-screw passing laterally through said collar and impinging against said shaft $l$. These rollers $l'$ $l'$ are hung so as to come in contact with the periphery of each of the wheels $c$, $c'$, $c'$, and $c^2$, and are held against them by means of the springs $l^6$. These rollers are all driven by contact with the wheels $c$, $c'$, $c'$, and $c^2$.

In each of the spaces between the wheels $c$, $c'$, $c'$, and $c^2$ is a stripper, $m$, carried on a rod, $m'$, fixed at its ends in the frames $A^4$ $A^5$. The strippers $m$ have curved surfaces, and are so secured on the rod $m'$ as to lead from the surface of the wheels $c$, $c'$, $c'$, and $c^2$ to the folding-roller D. The upper ends of the strippers $m$ $m$ are curved backward considerably within the line of a vertical tangent to the wheels $c'$ $c^2$, and the lower end terminates in a circumferential groove, $m^2$, in the folding-roller D.

Directly opposed to the strippers $m$ $m$ are guards $m^3$ $m^3$, rigidly secured at each end on rods $m^4$ and $m^5$, respectively, fixed in frames $A^4$ and $A^5$, in the same manner as rod $m'$ carrying the strippers. These guards $m^3$ $m^3$ conform at their upper ends to the curvature of the surface of wheels $c$ $c'$ $c'$ $c^2$, and between them and the folding-roller D conforming to the shape of strippers $m$. Below the strippers they conform to the curvature of the surface of folding-roller D. The strippers and guards $m^3$ are stationary and serve only as guiding or conducting channels for the sheets of paper between the wheels $c$, $c'$, $c'$, and $c^2$, &c., and the folding-roller D. The folding-roller D is cylindrical, extending across the machine and having its bearings in the frames $A^4$ and $A^5$.

On the outer end of the journal of the roller D (see Figs. 1, 11, and 4) the pinion 4 is rigidly secured. This pinion meshes with the pinion 2, driven by the gear-wheel 1 on the power-shaft C, as has been described hereinbefore. The roller D, besides the circumferential grooves $m^2$ $m^2$, receiving the strippers $m$, has a longitudinal groove, $m^4$, extending from end to end of the roller. (See Fig. 11.) The object of the groove $m^4$ is to allow the pasting-blade E to pass the roller at any time during the operation of the machinery, when the roller D shall not be carrying or folding a sheet, without transferring paste to the naked roller, which would materially interfere with the folding of the succeeding sheets and clog the rollers with the paste. The pasting-blade E is pivoted at its ends in a rotary frame whose axial shaft $n$ is driven by the gear-wheel 6, which meshes with pinion 5, secured on the same shaft with pinion 4, or, in other words, on the shaft of the folding-roller D.

The frame carrying the pasting-blade consists of two terminal arms, $n'$ $n^2$, on the axial shaft $n$, and an idling or balancing shaft, $n^3$. (See Figs. 1, 5, 6, and 11.) The frame $A^4$ has cast or otherwise rigidly secured to it, and encircling the axial shaft $n$ of the pasting-blade mechanism, a pinion, 8, with which pinion 9 upon the contiguous end of the pasting-blade shaft meshes.

The pasting-blade E is made of thin metal. Pieces of the metal are cut out of the blade at points in the same opposite the guards $m^3$ $m^3$, thus leaving spaces in the blade, which permit the same to pass beyond the guards and

apply the paste to the sheet while in transit between the guards $m^3$ $m^3$ and folding-roller D. The pasting-blade E is secured in place by a covering bar or plate, *p*, through which screws are driven, passing through perforations in the blade E and secured in a rod, *p'*. Rod *p'* is a plate-metal bar or rod with round ends, having its bearings, respectively, in the terminal arms *n'* and $n^2$. Rod *p'* carries at its end outside of the arm *n'* the pinion 9. The pinion 9 meshes with and revolves around the pinion 8, thus acquiring an independent revolution on its own pivotal axis, and also the revolution of the axial shaft *n*, in other words, giving the pasting-blade E a planetary motion around the axial shaft.

The gear-wheel 6 meshes with the pinion 7, which is fixed in the end of the journal of the paste-roller F. The paste-roller F projects about one-third of its diameter into a paste fountain or reservoir, G. The fountain or reservoir G is secured to the brackets $A^3$ $A^3$ by means of bolts passing through a flange, G', of the paste-reservoir into lugs projecting from the brackets $A^3$ $A^3$. The upper part of the fountain G, on its inner faces, is cast in the form of an elongated basin with vertical ends, and having its front cut away. Into this front the paste-roller F projects, forming a front for the basin and retaining the paste in the fountain. As the roller F is revolved it becomes covered with a thin coat or film of paste from the fountain.

The amount of paste taken can never exceed the required quantity, as it can only equal in thickness the quantity that will pass between the surface of the roller and the lower edge of the basin, where the roller F closes it.

The pinion 4, fixed on the journal of folding-roller D, meshes with pinion 10, fixed on the journal of roller H, and roller H with roller D from the first pair of folding-rollers. The roller D, as before described, is journaled in the frames $A^4$ and $A^5$. The roller H is journaled at each end in a vertically-yielding journal-box, *r*. This will be better understood by a reference to Fig. 12 of the drawings, which is a detail of a similar journal-box, *w*, which, however, has a different shell from journal-box *r*. The shell of journal-box *r* is indicated by dotted lines. (See Fig. 5.)

The journal-box *r* (see Figs. 4 and 5) is inwardly cylindrical to conform to the journal of the roller, but outwardly square, and is inclosed between the lateral walls of a shell, *r'*. A spiral spring, $r^2$, working on a stud projecting from the bottom of said shell, abuts against the lower side or seat of the journal-box *r*. The shell *r'* is inclosed between flanges of the brackets $A^3$ $A^3$. The journal-boxes *r r* are by these means made yielding, thereby keeping the roller H in a firm though yielding contact with the passing sheet, and enabling the pair of rollers to feed the sheet through and upon endless tapes 25 25 in the rear part of the machine.

On the shaft $h^5$, besides the cams $h^4$ and *k*, already described, are the cams I I' and cam-grooved wheel $I^2$.

I is a cam-wheel on which a friction-roller, *s*, travels. Friction-roller *s* revolves on a pin projecting from a point at or near the center of the lever J. One end of that lever terminates in a sleeve turning loosely on the shaft or arm *s'*, which is journaled in and passes through frame A. The other end of lever J is pivoted to the lower end of a connecting rod or arm, $s^3$, which in turn is pivoted to one end of a lever-arm, $s^4$, secured by a set-screw, $s^6$, to a shaft, $s^5$, having its bearings in the bracket $A^3$ $A^3$.

*t* is a lever-arm rigidly secured to the shaft $s^5$, and carrying at its upper end the folding-blade *t'*, which folding-blade is secured by screws or bolts to a bar or rod with round ends turning freely in its bearings in the upper part of lever-arm *t* and in the upper part of crank-arm $t^2$, which is secured in the shaft $s^5$, at its end opposite lever-arm *t'*, and turns with it. The crank-arm $t^2$ is pivotally secured to a rod, $t^3$, which rod passes through an eye, $t^4$, bolted to frame A, near its lower end. The rod $t^3$ at its lower extremity has a nut, $t^5$, secured to it for the purpose of preventing the rod from being withdrawn from the eye. A spiral spring, $t^6$, works around the rod $t^3$ and abuts against the eye $t^4$. The upper end presses against a collar, $t^7$, secured on the rod $t^3$ by means of a set-screw, $t^8$. (See Figs. 5 and 6.) This spring operates so as to keep the friction-roller *s* on the lever J in contact with the cam-wheel I.

*u* is a short lever-arm about half the length of *t*, and sleeved loosely on a stud, *u'*, projecting from the bracket $A^3$. The position of the stud is about opposite the center of lever-arm *t*, and at a distance from that lever of about half its length. An adjustable connecting-rod, $u^2$, is pivoted at the upper end of lever *u*, and is fixed to the bar or rod carrying the folding-blade *t'*. The manner of making $u^2$ adjustable is by means of a block, $u^3$, cast on the sleeve to which the upper end of lever *u* is articulated. The rod $u^2$ is screwed into the block $u^3$ until the correct position is attained.

$u^4$ and $u^4$ are guards secured to the rod $s^5$, for preventing the sheet of paper from flying out or striking the rod $s^5$.

The object of operating the folding-blade by two levers of the construction above described is to obtain a stroke of the blade *t'* as nearly at right angle with the surface of the sheet of paper to be folded as is possible with a pivotal construction. This is accomplished through the connecting-rod $u^2$, moving on its separate axes at either end of rod *u*, causing an oscillation of the blade *t'* on its own axis, which swings the edge of the blade out of the arc of a circle in which the lever *t* carries its bearings, thus diverting the stroke from being delivered in the arc of a circle until it is in fact delivered so nearly at right angles with the

sheet that the variation is imperceptible to ordinary observation.

Having described the construction of the mechanism making the first fold and pasting the sheet at the place where the sheet has first to be attached, which is also on the same line in the sheet as the line in the last fold, I believe a short review of the operation will be of advantage to the further description.

A number of sheets ready to be folded having been placed on the fly-board $a^2$, and combed down in the usual manner, the top sheet is moved down to the guides or stops $k^6$ $k^6$, and there held until the grippers $e$, carried on the shaft $e^2$, which is secured in the wheels $c'$ and $c^2$, have been closed on the sheet by the engagement of the tumbler $f$ on the end of shaft $e^2$ with the stud $f'$, in the manner and by the means above described. The grippers $e$ hold the sheet securely to the wheels $c$, $c'$, $c'$, and $c^2$ until it has passed some distance under the spring-actuated friction-roller $l'$. The tumbler $f$ then becomes engaged with the stud $f^2$, and the grippers are thrown open. The free end of the sheet is then stripped from the wheels $c$ $c'$ $c'$ $c^2$ by strippers $m$ $m$. The wheels $c$ $c'$ $c'$ $c^2$, in connection with the friction-rollers $l'$, continue to feed the sheet through, and the guards $m^3$, with the strippers $m$ $m$, conduct the sheet to the front of the folding-rollers D and H. The sheet passes down in front of them till its center line is opposite the space between the rollers through which the sheet is pasted after contact with the folding-blade. The folding-blade $t'$ is then carried forward by the system of levers, rods, &c., before described, striking the sheet at its center line and folding it between the rollers D and H. When that part of the sheet which is to receive the first impression of paste reaches or intersects a line connecting the center of the axial shaft $n$ with the center of the roller D, the pasting-blade E, having before taken paste from the paste-roller F, at this instant applies the paste to the sheet while it is in motion between the guards and roller D and between the rollers D and H. The pasting-blade E is withdrawn instantaneously from the sheet, not by its movement in the arc of the circle, but by the movement of the blade E around its own axis, or the axis of its bearings in the arms $n'$ $n^2$.

The folding-roller H has a set of circumferential grooves, 24 24. They are just deep enough to hide the endless tapes 25 25, which run in them, and which extend longitudinally through the machine to and around pulleys 26 26. These pulleys 26 26 have their bearings in elongated slotted journal-boxes 27 27, so that they may be set to stretch or slacken the tapes, and thus regulate the tension of the same. The sheet is conveyed by the tapes 25 in the direction shown by the arrows (see Fig. 1) till it reaches a stop 28. The stops 28 28 extend across the machine from frame A nearly to the second set of folding-rollers, and again from them to frame A on the other side of the machine.

The wire guards 29 29 are supported in vertically-elongated eyes or loops $29\frac{1}{2}$ $29\frac{1}{2}$, and are held in place by set-screws. The eyes $29\frac{1}{2}$ $29\frac{1}{2}$ are secured at one end of the machine to the girt $B^2$ and at the other to girt $B^3$. (See Figs. 7 and 14.) The guards 29 29 are wire rods extending longitudinally over the center of the upper tapes. They guard the sheet of paper against flying from the tapes and support the stops 28 28. Those guards under which the pasted part of the sheet runs are cut out or notched at their centers of length on their under side to prevent the paste getting on the guards as the sheet moves across the guards to and between the second-folding rollers.

The stops 28 28 are bars of thin metal, having cleats riveted in or otherwise secured to their backs, which cleats carry elongated eyes on them, through which the wire guards pass. Set-screws in the top of those eyes impinge on the wire guards and hold the stops in whatever place they may be required to stop the sheet so as to fold the desired size. (See detail, Fig. 14.) The gear-wheel 11 meshes with and is driven by the pinion 4, and meshes with and drives the gear-wheel 12. Wheel 12 is fixed on the end of shaft $v$, which is the axial shaft for a pasting-blade carrier or frame carrying a pasting-blade, K, which frame is similar in every respect to the frame carrying pasting-blade E, which has before been described. The shaft $v$ has its bearings in the frame $A^4$ and in the girt B'. The arms $v'$ $v^2$ of the frame carrying pasting-blade K correspond with arms $n'$ $n^2$ of frame carrying pasting-blade E. The idle shaft or rod $v^3$ corresponds with idle-shaft $n^3$. The pasting-blade K is made in the same manner as blade E. It is obvious that either of them may be made of several pieces of metal set in at intervals between the bars to which they are secured. The spaces thus left between them would serve for the spaces cut out of the blade, as before described.

Pinion 14, encircling the axial shaft V of the second-pasting device, is cast in one piece with or rigidly secured to the frame $A^4$ of the machine and meshes with pinion 15 on the arm V', in the same manner identically as pinion 8 on shaft $n$ meshes with pinion 9 on arm $n'$ of the first-pasting device.

The movement of the pasting-blade K is similar in movement to pasting-blade E, the length being one-half the length of that blade. The pasting-blade K applies the paste to the sheet previous to the second folding of the same on the line of the last fold and while it is in motion across the machine. In other words, the sheet having received the first fold passes across the machine on the tapes until the transverse central line of the sheet as then folded is vertically below the center line or axis of the carrier of pasting-blade K. The blade K, being in length equal to half the width

of the sheet, applies the paste to one-half of the center line of the sheet as then spread on the tapes, the operation being performed while the sheet is supported on the tapes in the position just described. Gear-wheel 12 meshes with the pinion 13, which is rigidly secured on the end of the journal of the paste-roller L. Paste-roller L differs in its length, but is similar in all other respects in its construction and operation to paste-roller F. Paste-fountain M is similar to paste-fountain G, but is in length proportionate to paste-roller L, which it supplies. The rollers N and O are the second pair of folding-rollers and extend longitudinally through the machine from frame $A^2$ to frame A'. Roller N is a folding-roller similar to roller D, having circumferential grooves similar to $m^2$ on roller D. The roller O is journaled at each end in a laterally-yielding journal-box, *w*, (see Fig. 12,) which is inwardly cylindrical and outwardly square. This journal-box *w* is inclosed on the bottom and top between the horizontal walls of a shell, $w^2$ $w^2$. A spiral spring, $w^3$, working on a stud projecting from the inner side of one of the ends of shell $w^2$, abuts against one of the vertical sides of the journal-box *w*. The shell $w^2$ is extended at one end so as to form a rigid journal box or bearing, $w^4$, for the roller N. By this arrangement the bearings for both the rollers forming the pair are inclosed in the one shell, the bearing for roller N being rigid and that for roller O being yielding, or automatically adjustable.

The shaft of the roller N carries the bevel-gear $C^3$, rigidly secured on its forward end, and the pinions 20 and 21, rigidly secured on the opposite end. Bevel-gear $C^3$ meshes with bevel-gear $C^2$ on the power-shaft C, and motion is thus transmitted through roller N to the pinions 20 and 21. (See Figs. 1, 4, and 7.) Pinion 20 meshes with pinion 23, which is rigidly secured to and therefore operates roller O. Pinion 21 meshes with and drives the gear-wheel 22. This gear-wheel and a cam-wheel, 30, are rigidly secured to a stud journaled in the transverse girt $B^2$ at or near its center. The cam-wheel 30 is therefore operated by and with the gear-wheel 22.

32 is a lever-arm rigidly secured on a shaft, 33, by means of a set-screw in lever-arm 32, which arm carries a friction-roller, 31, revolving on a stud projecting from the said lever near its upper end. The shaft 33 extends longitudinally through the machine, and has its bearings in transverse girts $B^2$ and $B^3$. The friction-roller 31 travels on the periphery of the cam-wheel 30, and thus by means of the lever-arm 32 and shaft 33 actuates the second-folding blade. A lever-arm, 34, is rigidly secured on the shaft 33, near the lever-arm 32, and a crank-arm, 35, is similarly secured near the end of said shaft opposite lever-arm 32.

36 is a lever-arm journaled on a stud projecting from the transverse girt $B^2$, vertically over the center of the lever-arm 34.

37 is an adjustable connecting-rod pivoted at its end to lever-arms 36 and 34, respectively.

38 is a folding-blade pivotally secured at its opposite ends in the ends of the lever-arm 34 and crank-arm 35, respectively. Crank-arm 35 is pivotally secured to a spring-actuated rod, 39. Said rod 39 is passed through an eye rigidly secured to the recessed frame $A^2$. A spiral spring works around the rod 39, and at its lower end abuts against the eye through which said rod passes, the upper end passing against the collar adjustably secured on the rod 39. The spring-actuated rod 39 thus acts on the crank-arm 35, which crank-arm is rigidly secured to the shaft 33, tending by this movement to rotate the same, and thus holds the friction-roller 31 in contact with cam 30. The folding-blade 38 is carried at its opposite ends by one end of the crank-arm 35 and one end of the lever-arm 34, which arms have hereinbefore been described as rigidly secured on the shaft 33. The folding-blade is therefore operated by the shaft 33, and that is operated as just above described.

It should be noted that the mechanism operating folding-blade 38 is similar to that operating the folding-blade *t'*, part for part, except the respective cam-wheels and the levers which are operated thereby. The reason for this difference is that the lever-arm 32, directly operated by the cam-wheel 30, is operated at the end of said lever, while the lever-arm J, operated by cam-wheel I, is operated at the center of that lever, thereby necessitating a slight change in the form of the cam-wheel I from that of cam-wheel 30.

The surface of the roller O is grooved at intervals to allow a set or series of endless tapes, 41 41, to pass over or around it in line or flush with its surface. The grooves just above described are similar to the grooves 24 in the roller H.

The tapes 41 41 are endless tapes passing over the roller O in the direction shown by the arrows, (see Figs. 1, 2, and 7,) continuing in an inclined direction below and beyond the roller O, and then passing over the pulleys 42 42 to the under side of same, and continuing in a horizontal direction across the machine to the pulleys 43. The tapes then return in an inclined direction to the pulleys 44, and around them to the roller O, whence they started. (See Figs. 1 and 7.) The series of tape-pulleys numbered 42 42 are rigidly secured on the longitudinal shaft 45, which has its bearings in lugs projecting downwardly from the upper beams of the frames A' and $A^2$. The series of tape-pulleys numbered 44 44 are rigidly secured on a shaft, 46, parallel to and similarly journaled in lugs projecting from the upper beams of frames A' and $A^2$.

On the shaft 45, near its end, is a wheel or pulley, 47, having a tread carrying one of the endless tapes 41, and a flange or cutting edge on the outside of same. As the wheel 47 revolves, the outer face of the wheel, which is

also the cutting-edge of the flange of same, is in close contact with the inner edge of a flange on a wheel, 48. Wheel 48 is in every respect of construction similar to wheel 47, but is loose on the shaft 46, and is so located that the inner edge of its flange shall be in close contact with outer edge of the flange of wheel 47.

49 is a wheel similar to 47, secured on the shaft 45 at its end opposite the wheel 47. A wheel. 51, similar to 48, is loose on that end of shaft 46 which is opposite wheel 48. The two wheels just described as being similar to wheels 47 and 48 on the ends of the shafts 45 and 46, at their respective ends opposite the wheels 47 and 48 form one pair of the cutter-heads or rotary shears for the first-trimming operation that the sheet undergoes in process of folding. The wheels 47 and 48 form the companion pair of cutter-heads or rotary shears to those just described.

The wheels forming the rotary shears just described are kept in contact by springs 50 50, attached to the wheel 48. (See Figs. 2, 4, and 5.) The springs 50 50 are compressed spiral springs operating between a circular disk, 52, (see Figs. 2, 4, and 5,) and the wheel 48, thereby pressing the inner edge of the flange of that wheel against the outer edge of the flange of wheel 47. The inner edge of the flange of wheel 48, with the outer edge of the flange of wheel 47, held in contact by the firm but yielding pressure of the springs, form the shearing-edges of one pair of the cutter-heads or rotary shears, between and by means of which the margins of the sheet are trimmed.

49½ 49½ are compressed spiral springs similar to 50 50, operating between the wheel 51 and a circular disk, 52½, similar to 52, (see Figs. 4 and 5,) acting at that end of shaft 46 which is opposite wheel 48. They press the inner flange of wheel 51 against the outer flange of wheel 49 in the same manner as the springs 50 50, and the disk 52 operates on the wheel 48.

The tension of the tapes 41 41 is adjusted by means of adjustable journal boxes or bearings 53, (see Fig. 7,) in which the pulleys 43 43 are journaled. These adjustable journal boxes or bearings 53 53 are in every respect similar to the adjustable journal boxes or bearing 27, hereinbefore described.

55 55 are guards, one of which is located beneath each of the tapes 41 41, and rigidly secured to the longitudinal girt $B^4$. (See Figs. 1 and 2 and dotted lines, Fig. 7.) These guards 55 55 have their upper edges parallel to the direction of the tapes under which they are located. Their upper ends are concealed or lie in the circumferential grooves in the roller N, while their lower ends terminate just above the peripheries of the pulleys 42 42, and slightly beyond the vertical center of the same. The guards 55 55, it will be seen from the above description, act, in fact, as strippers for the roller N, and guides or guards for the sheet passing over them.

Having now described the mechanism by which the sheet receives its second pasting, second fold, and first trimming, I will now give a short description of that part of the operation as performed by my machine.

After the sheet has received its first fold it is fed through between the folding-rollers D and H to and upon the tapes 25 25, over which it is spread. While in this position the pasting-blade K applies the paste to the sheet in the center of one-half of its double center margin as then folded. The folding-blade 38 then strikes the sheet, folding it between the rollers N and O. These rollers N and O feed the sheet through on the under side of the tapes 41 41. The guards 55 55 conduct it to the pulleys 42 42. The sheet then passes over the pulleys 42 42 and under the tapes 41, and is held by these tapes firmly against the pulleys 42 42. In this way the sheet is held firmly while being trimmed and prevented from turning or twisting during the operation. The sheet is then spread out over the tapes in the horizontal plane in which the tapes 41 41 cross from the pulleys 42 to the pulleys 43. The sheet is stopped before reaching pulleys 43 by stops 54, supported on guards 54½ of the same construction, and secured and set in the same manner as stops 28 and guards 29.

The cam-wheel I′, as hereinbefore specified, is rigidly secured on the shaft $h^5$ near the cam-wheel I. This cam-wheel I′ is precisely similar to cam-wheel 30, already described.

56 is a lever-arm secured to the shaft $s'$ by means of a set-screw, and carries on a stud near its end a friction-roller, 57, which friction-roller travels on the periphery of the cam I′.

58 is a sleeve rigidly secured on the end of shaft $s'$ at its end opposite the lever-arm 56, and next to the loose sleeve, which serves to pivot the lever on the shaft $s'$. The sleeve 58 carries an arm, 59, which is pivoted to a connecting-rod, 60. The rod 60 is in turn pivoted to an arm, 61, rigidly secured on the shaft 62. Shaft 62 has its bearings at the one end in a lug projecting downwardly from the upper part of frame A, and at its opposite end it is journaled in the intermediate longitudinal frame, $A^6$. The said shaft 62 carries at its end near the lever-arm 61 a lever-arm, 63, and at its opposite end a lever-arm, 64. These lever-arms 63 and 64 are precisely similar to the lever-arm 34 of the second-folding mechanism, and are rigidly secured to the shaft 62.

The lever-arms 63 and 64 carry a folding-blade, 65, pivoted in their ends. The said folding-blade is exactly similar to folding-blades 38 and $t'$, which have already been described. 66 is a lever-arm pivoted on a stud projecting from a lug or ear cast on the upper part of the frame A.

67 is an adjustable connecting-rod pivoted at its end to the lever-arms 63 and 66. This rod 67 directs the folding-blade in the same manner that the rod 37 directs the folding-blade 38.

68 is an arm rigidly secured on the shaft 62 and operated by a spring-actuated arm, 69. The arm 69 is exactly similar to the arm 39, forming part of mechanism for operating the folding-blade 38. The arm 69 is secured in the same manner to the middle beam of frame $A^2$ as arm 39 is to the transverse girt $B^3$. Arm 39 serves to hold the friction-roller carried on the lever-arm 32 against the periphery of the cam 30, and in like manner arm 69 serves to hold the friction-roller carried on the arm 56 against the cam I′.

The gear-wheel 12, secured on the end of the axial shaft *v* of the second-pasting frame, meshes with and drives a gear-wheel, 16, which is journaled on a stud rigidly secured in the upper part of frame A. Said gear-wheel 16 meshes with and drives a gear-wheel, 17. This gear-wheel 17 is rigidly secured on the end of the shaft or journal of a folding-roller, P.

Rigidly secured on the shaft of the said folding-roller P, and situated between the end of said roller and the gear-wheel 17, is a pinion, 18. Pinion 18 meshes with and drives a similar pinion, 19, rigidly secured on the journal of a folding-roller, Q. The rollers P and Q together form the final pair of folding-rollers. They are similar to the other folding-rollers in all respects, except that both the rollers in the last folding operation are provided with tape-grooves 70 and 71, through which the respective endless tapes travel. In order to clearly describe the course of the tapes passing over this last pair of rollers, it will be better to start at the center of the roller P at the upper surface. (See Figs. 1, 4, and 18.) Tapes 72 pass over the roller P in the direction shown by the arrows, and continuing in an inclined direction toward the front of the machine they pass around the tape-pulleys 73, continue in an upwardly-inclined direction toward the rear of the machine, and pass over the pulley 74 outside of or above tapes running in direct contact with the pulleys 74. The tapes 72 then pass under pulleys 75, and return over the same in the direction shown by the arrow. They then travel in a downwardly-inclined direction toward the front of the machine till they reach the pulley 76, under which they pass, and then continue in a nearly vertical direction to the roller P, whence they started. The tapes 77 77 travel on the roller Q, start backward in the direction shown by the arrow, thence downwardly, traveling alongside and in front of the tapes 72, passing around the pulley 73, at first in front of and then under the tapes 72, continuing under those tapes to about the rear horizontal center of pulleys 74, when they leave tapes 72 and return under the pulleys 74 in a nearly horizontal line until they reach the pulleys 78, around which they pass, and continue upward in a vertical direction to roller Q, whence they started.

The pulleys 73 73 are all secured on a shaft having its bearings in the frame $A^6$. The pulleys 74 74, &c., and 75 75, &c., are secured on similar shafts, which shafts have bearings in the frames A′ and $A^2$, similar to the bearing of shaft carrying tapes 72 72. The tape-pulleys 76 76 are loose on the studs, which are adjustable in slotted bearings in or near the extremity of the arms 79, said arms being rigidly secured to a shaft, 80. The adjustable stud on which the tape-pulley 76 is journaled is provided with a head on its free end, and its other end is stepped and screw-threaded to pass through the slot in the arm 79, and is provided with a washer and nut, whereby said stud is secured in any position within the limits of said slots, so as to take up the slack of the tapes 72 72. The bearings of the pulleys 78 are carried on the ends of arms 81 81, one of which is shown in Fig. 1. The arms 81 are carried on loose sleeves on a shaft, 82. These arms may thus be raised or lowered at pleasure, and in that may regulate the tension of the tapes 77. The arms having thus been adjusted are held or secured by a set-screw, 83, in the arm 81, pinching shaft 82. The shaft 82 has its bearings in the frame A and $A^6$.

84 and 85 and 86 and 87 (see Figs. 1, 4, and 5) are cutter-heads or rotary shears, exactly similar to cutter-heads 47 and 48. They take the place of pulleys 73 and 78 in the tapes at each side of the first series of pulleys in the last series of folding mechanism. These cutter-heads operate without the aid of springs. The wheels 84 and 86 are rigidly secured on the shaft which carries them. The wheels 85 and 87 have their bearings in the adjustable arms 81 81, which are so adjusted laterally on the shaft 82 as to bring the flange of wheel 87 in firm and close contact with that of wheel 86, and the face of wheel 85 in like contact with that of 84. The adjustable arms 81 81 possess sufficient elasticity from their length and general form as to supply such lateral yielding movement as is necessary to operate the shearing-edges of the wheels. The wheels 84 and 85, 86 and 87, thus have the cutting-edges of their flanges firmly and closely and yet yieldingly held in contact, and together form the final trimming mechanism of the machine. The shaft 88, having its bearings in brackets bolted to the foot of frame A′, (see Figs. 4, 5, and 7,) carries a series of rods, 89 89, which rods, taken together with shaft 88, form a receiver and deliverer of the folded sheets, or, in other words, a delivery-fly.

On the end of the shaft 88 is secured a lever-arm, 90, pivoted at its upper end to a pitman, 91, which pitman passes longitudinally through the machine, and is pivoted at its other end to the lower end of a crank-arm, $I^3$, which crank-arm is pivoted at its center to a bracket, 92, bolted to or otherwise secured on the frame $A^2$, and carries upon a projecting stud a friction-roller, 93, engaging with and traveling in a cam-groove, 94, in the face of the wheel $I^2$. By thus connecting the fly-delivery with the cam-groove of the wheel $I^2$ the delivery is oscillated at the moment that the sheet has descended the arm and rests upon the shaft,

and by this means each successive sheet is delivered outside of the machine and piled systematically and in regular order upon a receiving fly-board, from which they are removed.

Having described the construction of my machine and the operation of the several parts, I will now give a general description of the operation of folding, pasting, and trimming a sheet of paper as performed by my machine.

The sheets of paper to be folded are to be placed on the feed-board $a^2$, arranged against side guides, $a^3$, in the customary manner for feeding a printing-press from side guides. The sheets should be combed down in the usual manner, so that the upper sheet of the number on the board shall be brought within, say, a half an inch of the front guides or stops, $k^6$. Said guides will hold the sheet in position until the grippers $e$ have nearly closed on it. The grippers $e$, carried on the shaft $e^2$, are closed by the engagement of the stud $f'$ with the tumbler $f$, in the manner hereinbefore described. The grippers thus closed are held against the paper, pinching the same to the peripheries of the grippers-carrying wheels $c$ $c'$ $c'$, &c., by means of cam $e^3$, secured on that end of the shaft $e^2$ which is opposite the tumbler $f$, and operated in the manner before described. The cam $e^3$ thus holds the grippers $e$ closed during a little more than one-third of a revolution of the gripper-carrying wheels $c$, $c'$, $c'$, and $c^2$. While the grippers hold the sheet it is drawn by the revolution of the wheels $c$, $c'$ $c'$, and $c^2$, under the friction-rollers $l'$ $l'$. The rollers $l'$ $l'$ are driven by contact with the wheels $c$ $c'$ $c'$ and $c^2$, and continue to feed the sheet through after the grippers $e$ have been thrown open by the engagement of the stud $f^2$ with the tumbler $f$. The friction-rollers $l'$ $l'$ feed the sheet through the channels or guideways between the strippers $m$ and guards $m^3$, allowing it to feed through until the center line of the sheet is in the plane in which it passes between the folding-rollers D and H. At this instant the folding-blade $t'$ strikes the sheet and folds it between the said rollers D and H. During this movement of the sheet, and at the moment that the center line of the last double margin of the sheet reaches the plane which contains the axis of the roller D, and the axis of the axial shaft of the first-pasting blade, the blade E applies the paste to the line on the sheet above described. The pasting-blade E having applied the paste, as the folding-rollers continue to feed the sheet between them the paste-line on the sheet is immediately covered by that part of the sheet which is folded against it. The sheet passes out at the back of the rollers D and H on the tapes 25 till stopped by the guards 28, where it is held until the paste is applied by the pasting-blade K in a line vertically beneath the axis of its carrier-frame. This line corresponds with the line of the last fold of the sheet. To make this a little clearer, the first fold of the sheet is made on the transverse center line of the sheet as it is laid on the feed-board. The first paste is applied to the center line of the sheet as thus folded which is parallel to first fold, but the paste is applied during the process of completing the fold and while the sheet is in motion on the folding-rollers. To accomplish this the surface-velocity of the gripper-wheels $c$, $c'$, $c'$, and $c^2$ and the folding-rollers D and H must be the same. The velocity of the pasting-blade E as it applies the paste, as well as that of the folding blade $t'$, are equal to the surface-velocity of the wheels $c$ $c$ and that of the rollers D and H. The sheet having been pasted the second time while it is in motion on the tapes 25 25, as before described, then passes across the machine to the stops 28 28, and is there stationary for an instant, and until the folding-blade 38 strikes the sheet and presses it in a vertical line between the rollers N and O, which rollers feed it through the space between the tapes 41 and guards 55. The sheet then passes with a uniform velocity between the tapes and the pulleys carrying the tapes, and is so held while its edges are being trimmed the first time. The sheet is received by the shears at an oblique angle to a vertical line, in consequence of which it is partly drawn around one of the rotary shears before reaching the point between the shears at which it is severed.

As the sheet cannot slip upon the folding-rollers or bands during its passage to the shears, it will be seen that by thus winding the sheet partially around one of the rotary shears it is held in a state of tension and prevented from fulling or buckling, the result of which is that the sheet is smoothly and evenly trimmed. The sheet having thus been folded the second time and trimmed the first, it then crosses the machine from the tape-pulleys 42 42, and is spread centrally over the rollers P and Q. The folding-blade 65 then presses the sheet in a vertical line between the folding-rollers P and Q, which rollers feed it through between the tapes 72 77. These tapes convey the sheet over the tape-pulleys and last set of rotary shears, by which shears the folded sheet is trimmed at both its head and foot. The tapes then carry it forward and upward till it passes over the pulleys 74 74, when it is dropped on the delivery-fly.

What I claim, and desire to secure by Letters Patent, is—

1. The combination, with the oscillating grippers and the gripper-carrying wheels, of the spring-actuated rollers bearing against and receiving motion from the peripheries of said gripper-wheels, the pin or stud upon which said rollers are journaled, the suspended bearings hanging from a loose sleeve on a rigid shaft, and a vertical spring connected at its lower end to said stud, and at its upper end to a sleeve encircling a rigid shaft, secured thereon in any desired position by a set-screw.

2. The combination, with the grippers and the gripper-carrying wheels, of the spring-actuated friction-rollers engaging said gripper-

wheels and adapted to press the passing sheet against said wheel, and the adjustable sleeve $l^5$, substantially as shown.

3. The combination, with the gripper-wheels and grippers and the strippers, of the horizontally-revolving folding-rollers arranged one above the other in a plane below the stripper, substantially as described and shown.

4. The combination, with the folding-blade, of an actuating-lever, the links adapted to oscillate said blade, and adjustable rod connecting said actuating-lever and links, whereby the stroke of said links and the oscillations of said folding-blade are regulated.

5. The pasting mechanism consisting of a pasting-blade having a planetary movement about the axis of its carrying-frame, in combination with a paste-roller and paste-reservoir, said blade being adapted to take paste from said paste-roller and apply it to the sheet of paper as it travels across the upper folding-roller once during a given number of revolutions.

6. The folding-rollers in combination with a rotary pasting-blade having a planetary movement about the axis of the carrying-frame.

7. The combination, with the folding-blade, the directing-lever $u$, and link $u^2$, of a crank-arm, $t^2$, rod $t^3$, an expansion-spring, $t^6$, upon said rod, and arm $s^4$, link $s^3$, lever J, and cam-wheel I, as set forth.

8. The feeding mechanism consisting of the gripper-wheels $c$, $c'$, and $c^2$, the grippers $e$, and means for operating the same, the folding-blade, the folding-rollers, one of which is provided with a longitudinal groove, as set forth, a revolving pasting-blade, and the paste roller and reservoir, all combined and operating substantially as set forth.

9. The combination, with the gripper-carrying wheels $c$ $c'$ $c^2$, grippers $e$, and means for operating the same, strippers $m$ $m$, folding-rollers, the carrier-tapes, and stop 28, of the second-folding blade placed at right angles to the first, and the second set of folding-rollers, as and for the purpose set forth.

10. The folding-rollers N and O, carrier-tapes 41, and guards 55; in combination with the revolving cutting-disks arranged on a plane below said rollers, at one side of a vertical line between them, in the manner shown and described.

11. The combination, with the power-shaft C, gripper-carrying wheels $c$, $c'$, and $c^2$, and intermediate gearing, 1, 2, and 3, of the grippers $e$, tumbler $f$, studs $f'$ and $f^2$, sleeves $g$ and $g'$, pin $g^2$, slot $g^3$, arm $g^4$, and pitman $h$, and means for operating the same.

12. The combination, with the power-shaft C, gripper-carrying wheels, and intermediate gearing, 1, 2, and 3, of the strippers $m$, guards $m^3$, pinions 4 and 5, and folding-rollers D and H.

13. The combination, with the power-shaft, the folding-rollers D and H, the intermediate gearing, 1, 2, 4, and 10, and pinion 5 upon the roller D, of the pasting-blade frame, the planetary pasting-blade E, the gear 6, and intermediate gearings, 8 and 9.

14. The combination, with the power-shaft, the folding-rollers D and H, and intermediate gearing, of the folding-blade $t'$, lever $t$, levers $u$, rods $u^2$, arms $s^4$, connecting-rods $s^3$, lever J, shaft $h^5$, cam-wheel, and gearing connecting said cam-wheel to the power-shaft.

15. The combination, with the power-shaft, the folding-rollers N and O, and intermediate bevel-gear, $c'$ $c^3$, and gears 20 and 23, of the cutting-disks journaled at one side of a vertical line between said rollers N and O, in such manner below them as to trim the passing sheets of paper, as set forth.

In testimony whereof I hereunto affix my signature.

GEORGE E. LLOYD.

Witnesses:
JNO. G. ELLIOTT,
WILLIAM C. WHITING.