

(No Model.)

4 Sheets—Sheet 1.

G. SICKLES, Jr.

MACHINE FOR MAKING ENVELOPES.

No. 271,282.

Patented Jan. 30. 1883.

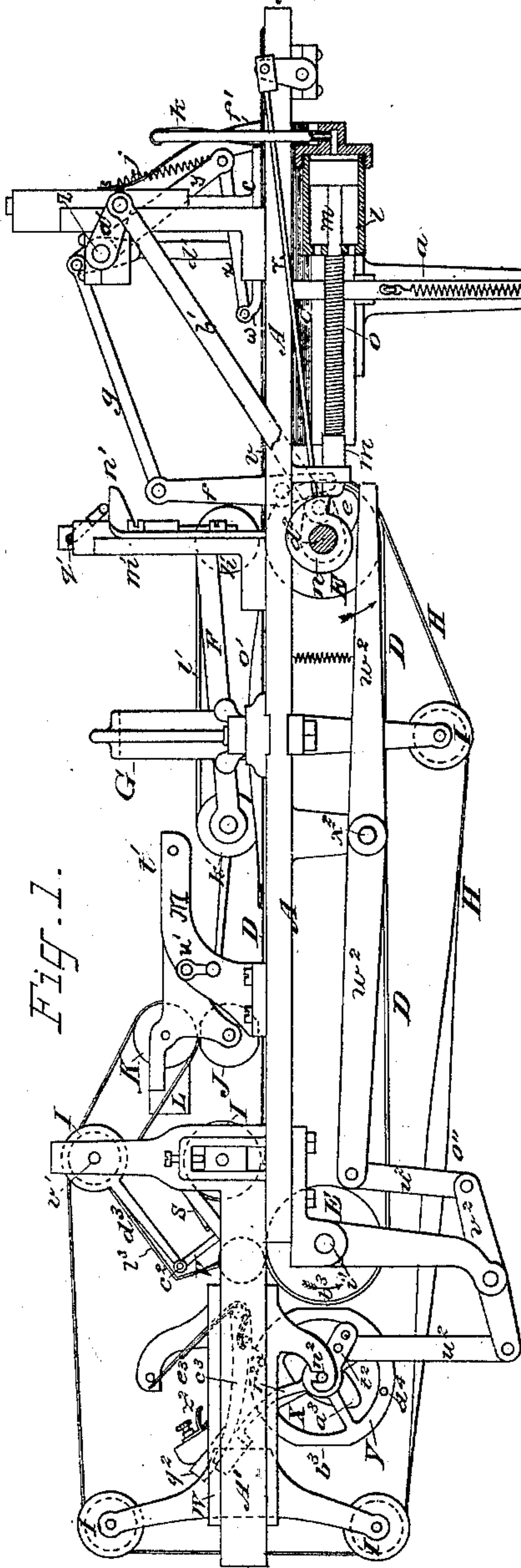


Fig. 1.

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Geo. Bainton

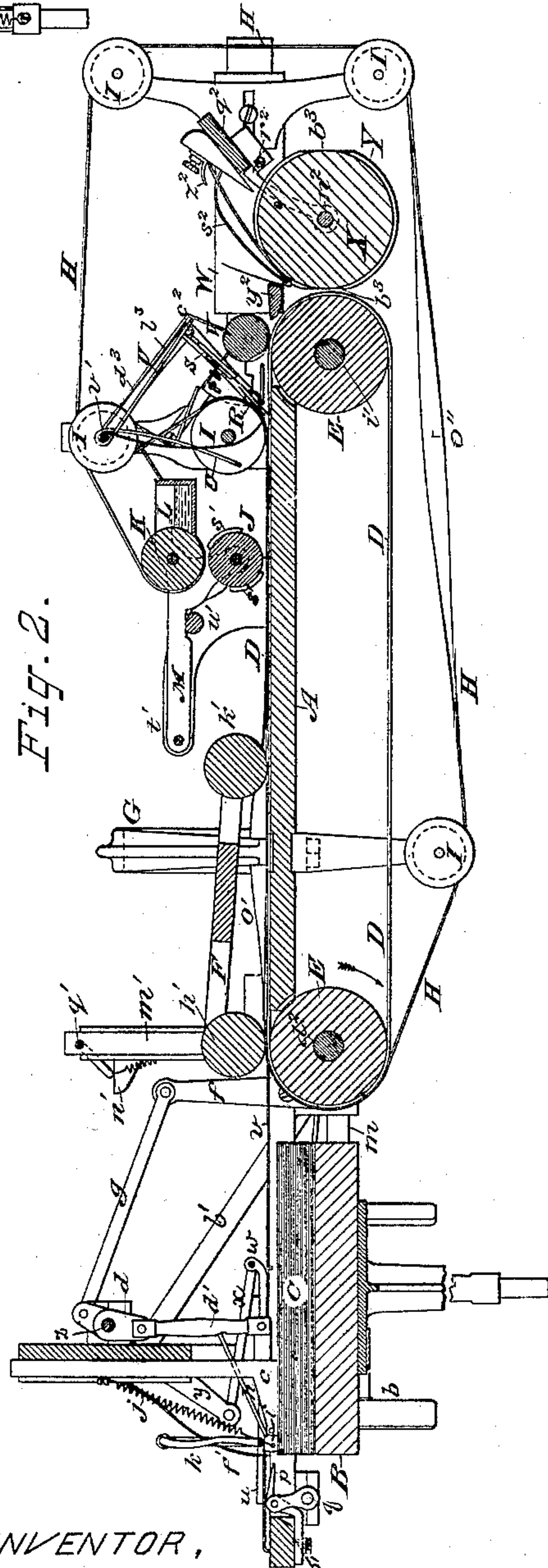


Fig. 2.

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Burke, Fraser & Connell

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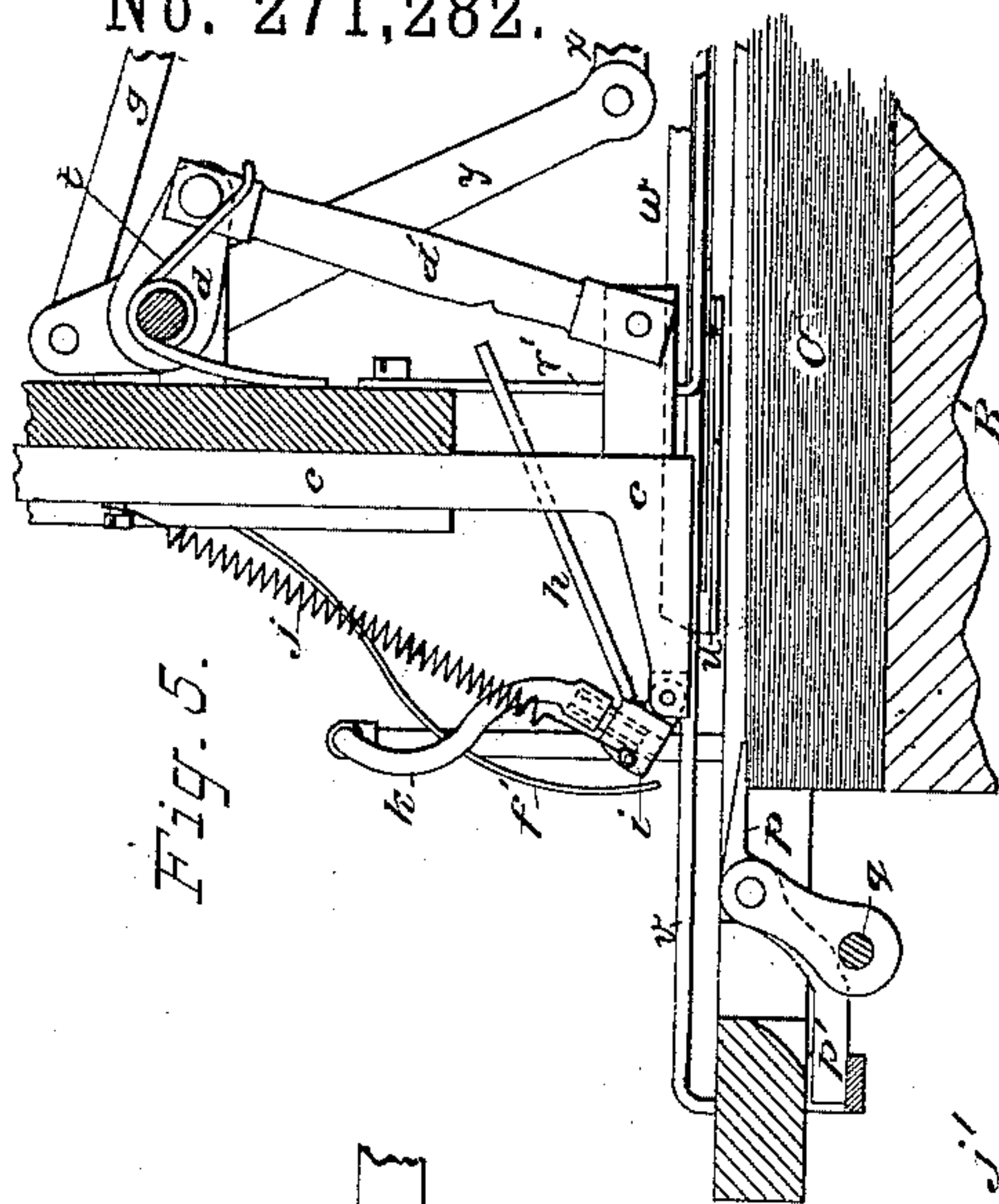


Fig. 5.

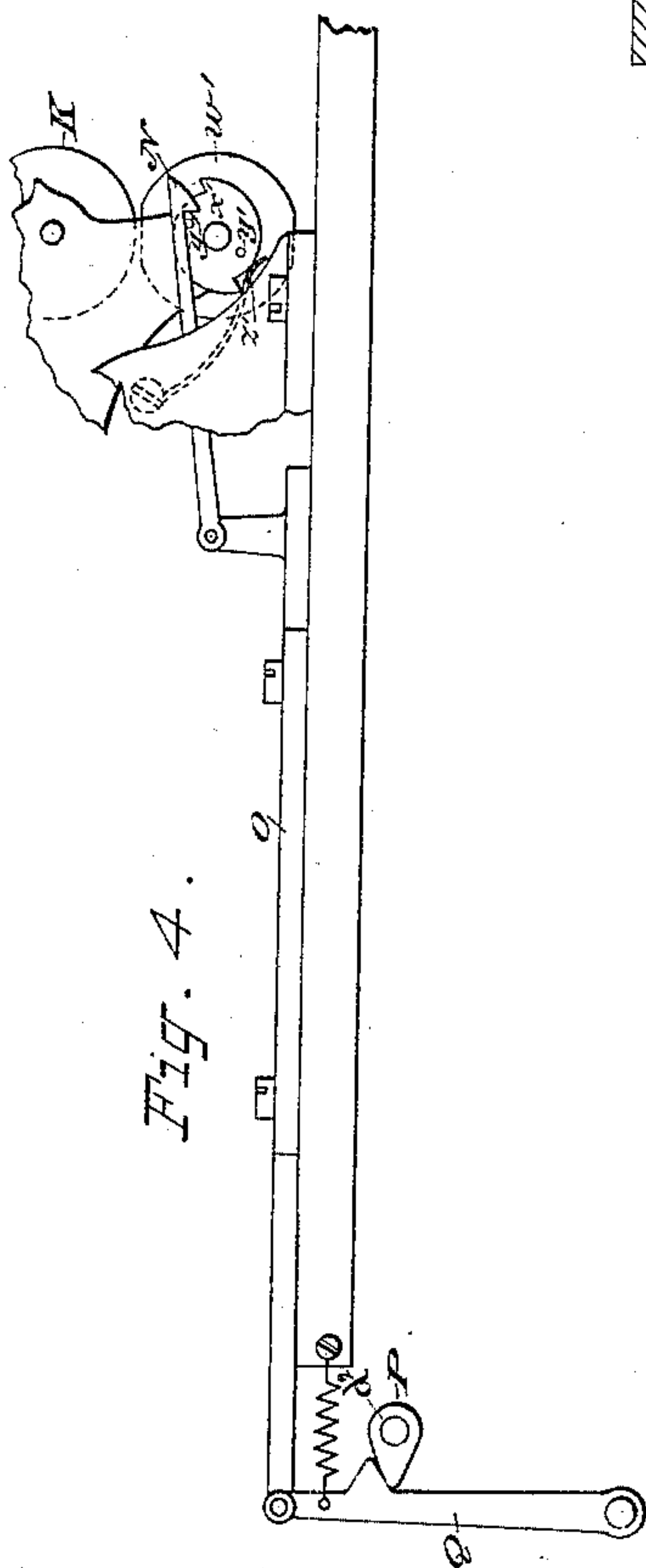


Fig. 4.

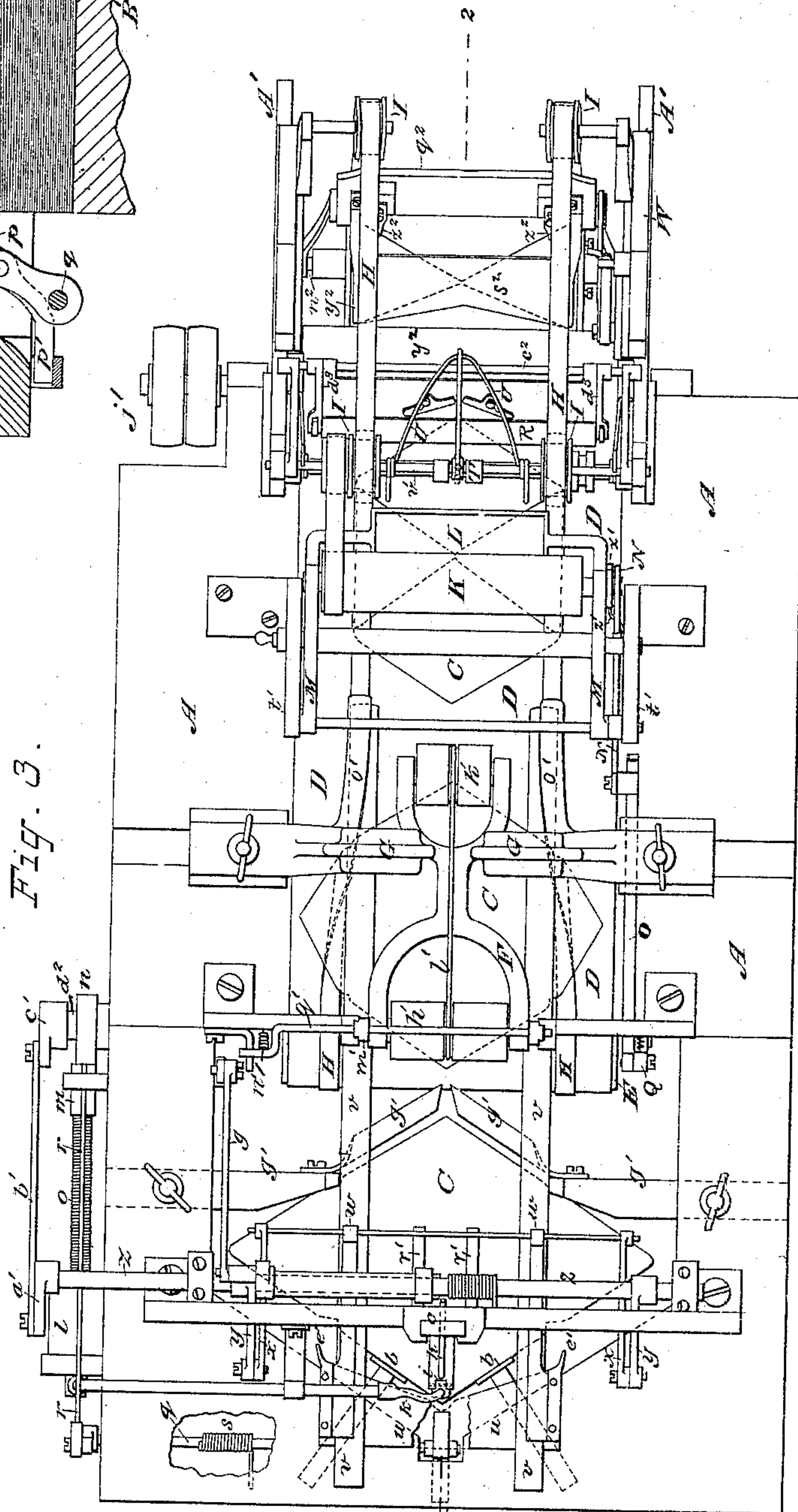


Fig. 3.

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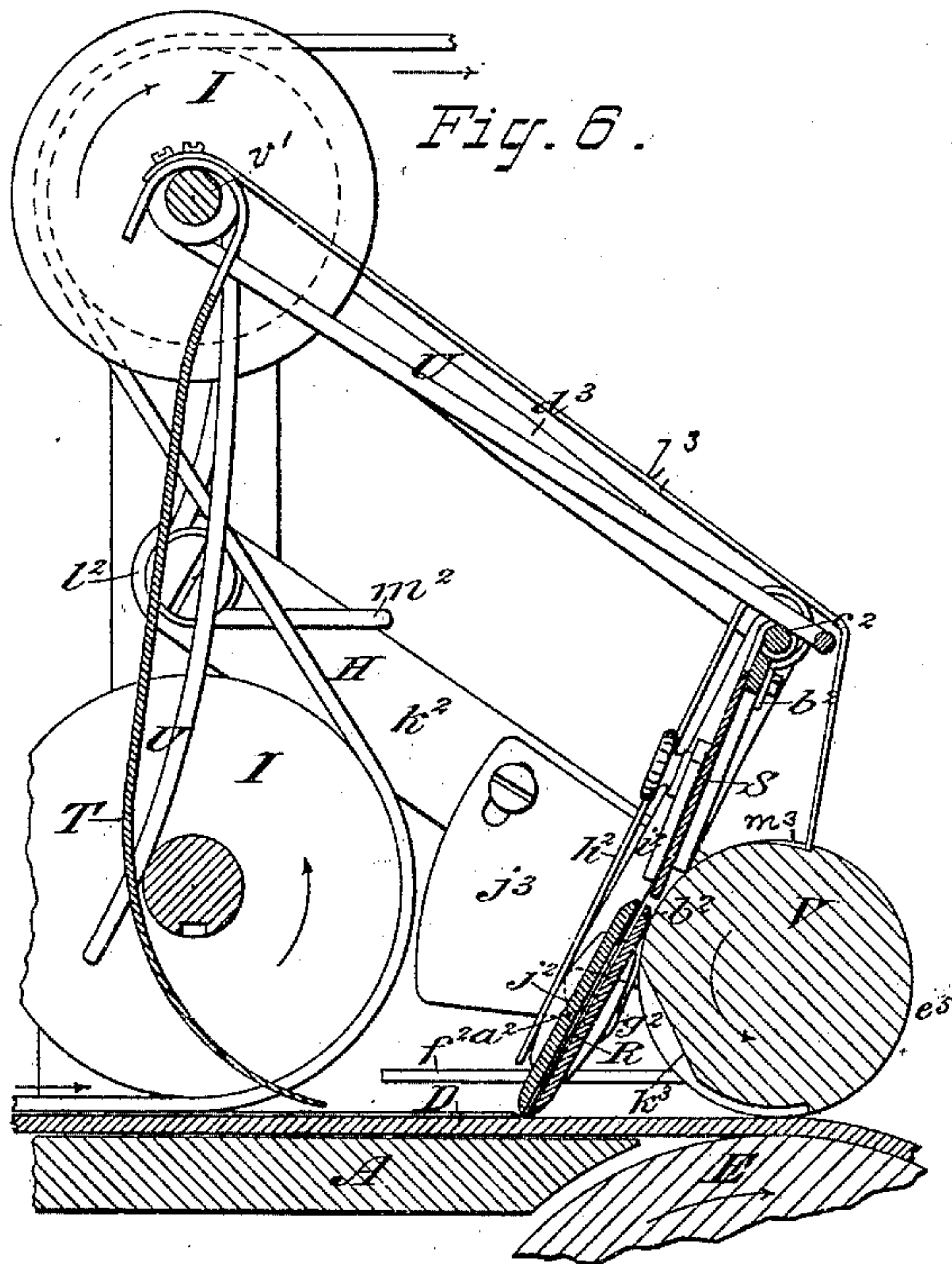


Fig. 6.

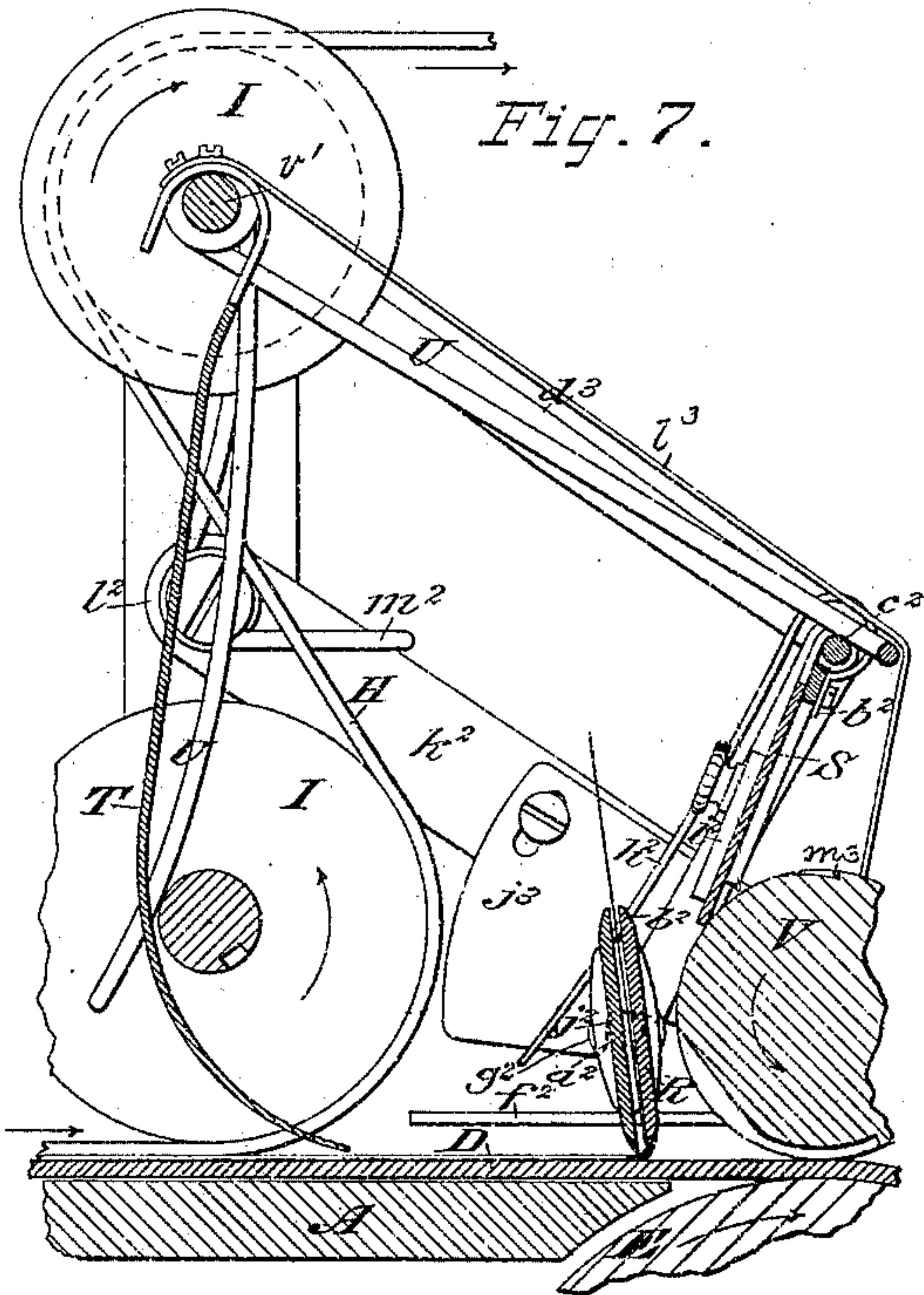


Fig. 7.

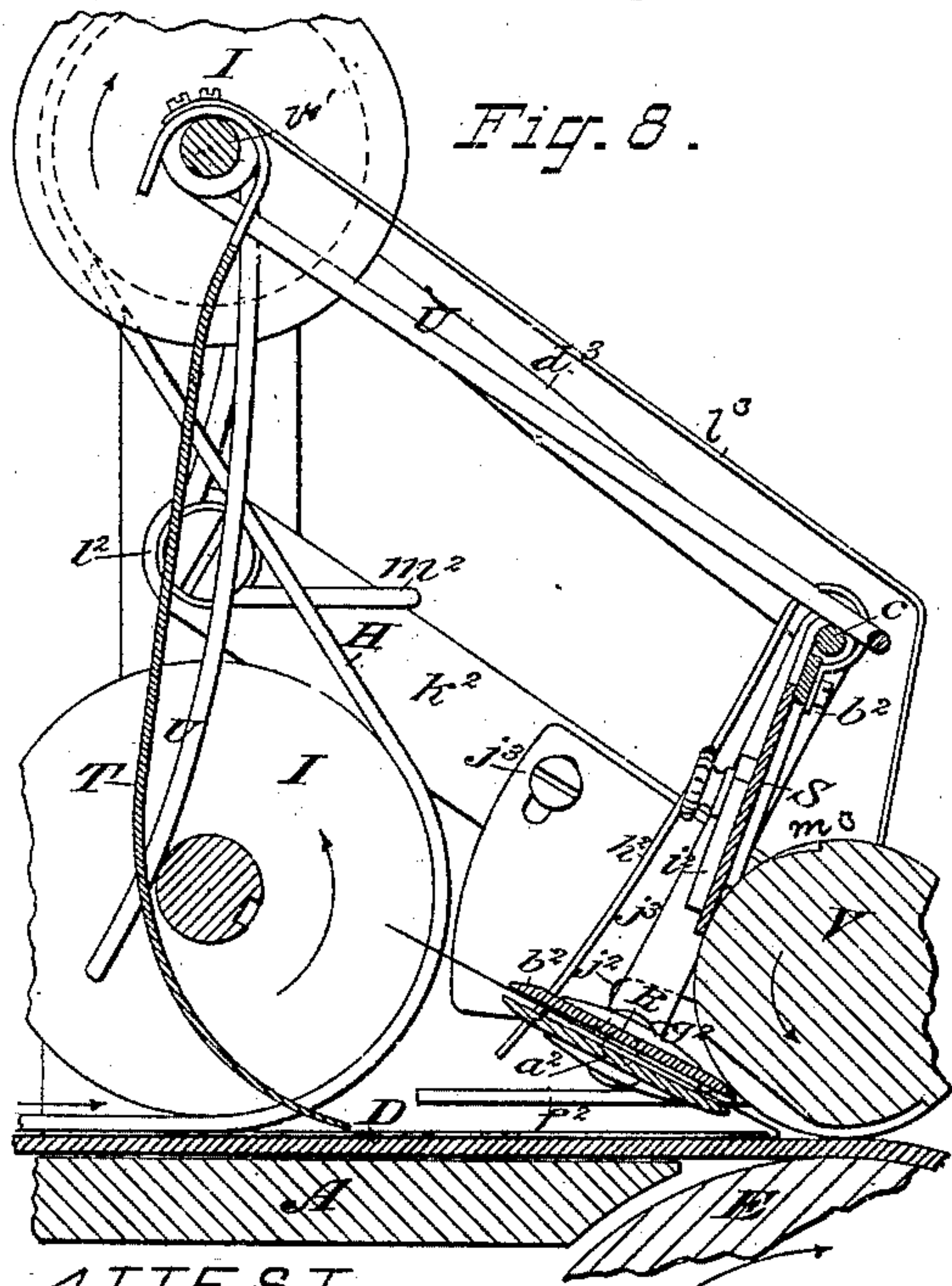


Fig. 8.

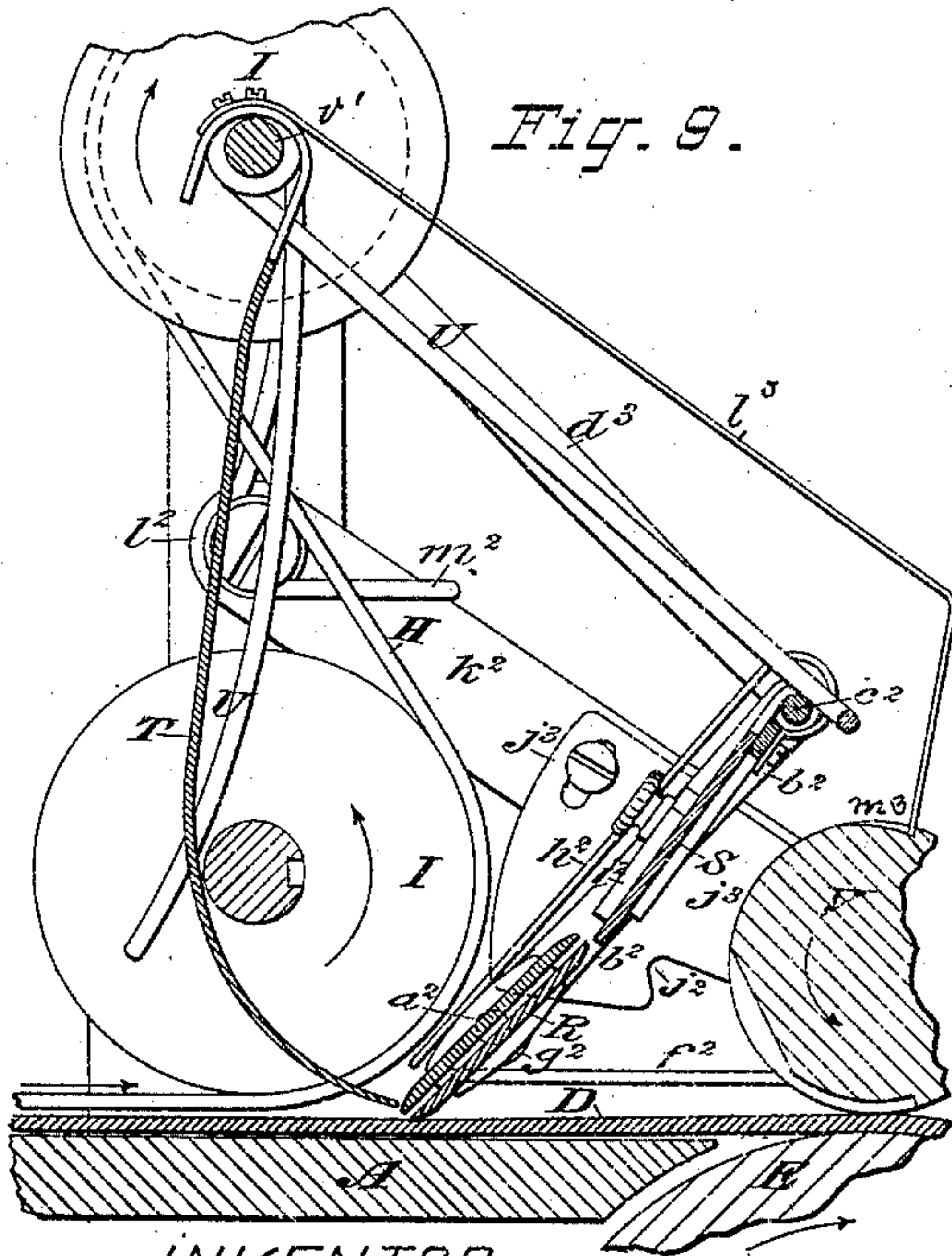


Fig. 9.

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MACHINE FOR MAKING ENVELOPES.

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Fig. 10.

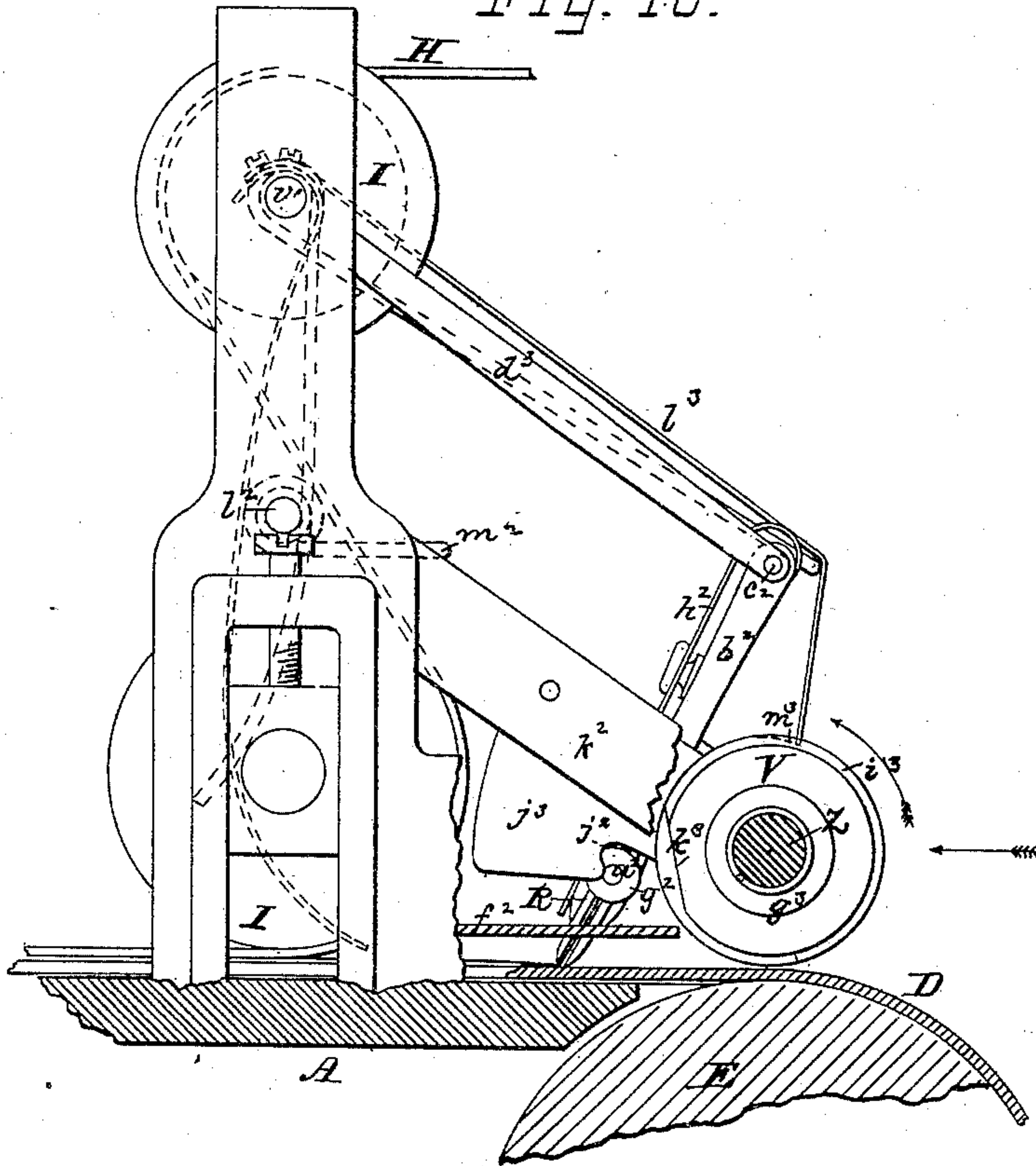
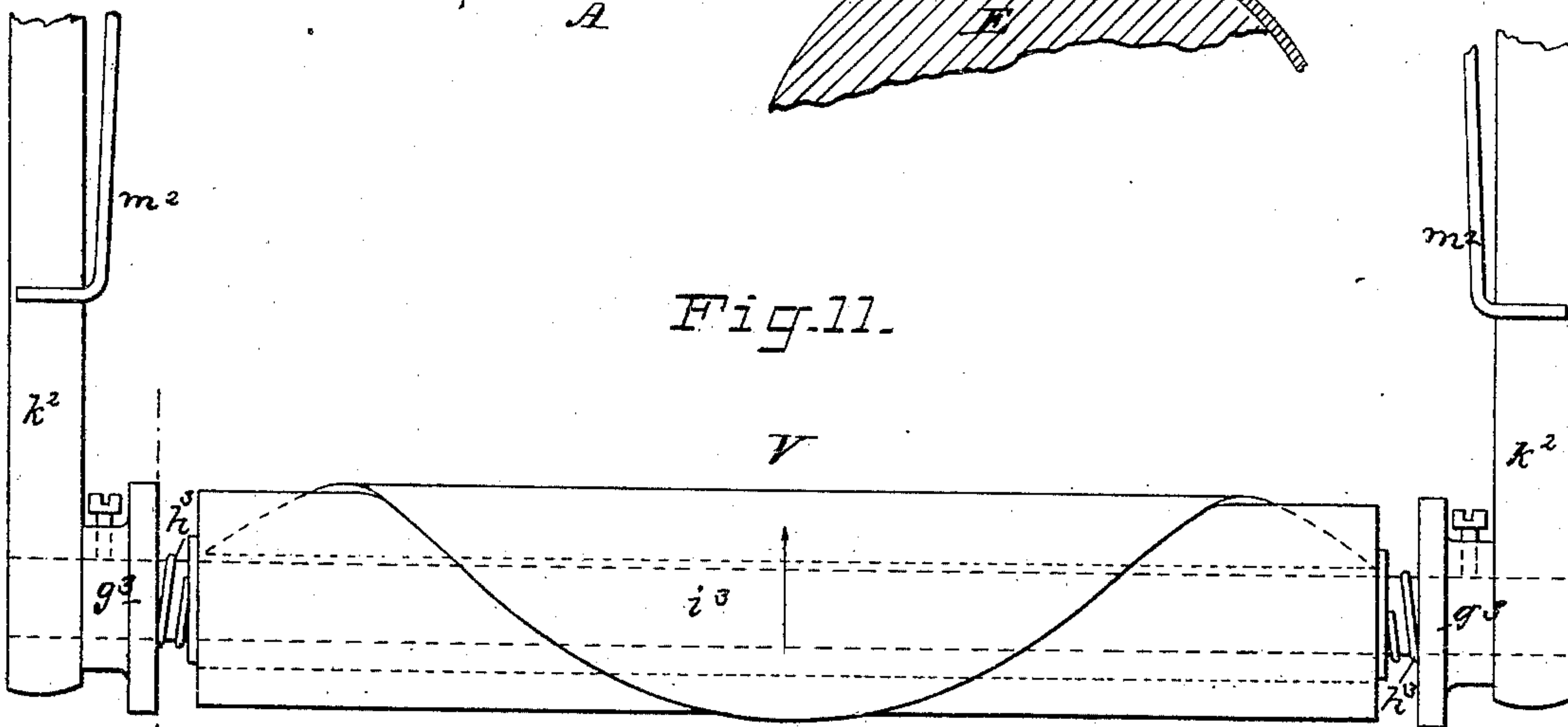


Fig. 11.



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Gerard Sickles, Jr.
by his Attys -
Burke, Francis Boninette

UNITED STATES PATENT OFFICE.

GERARD SICKLES, JR., OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-HALF
TO ABEL T. HOWARD, OF SAME PLACE.

MACHINE FOR MAKING ENVELOPES.

SPECIFICATION forming part of Letters Patent No. 271,282, dated January 30, 1883.

Application filed February 23, 1881. (No model.)

To all whom it may concern:

Be it known that I, GERARD SICKLES, Jr., a citizen of the United States, residing at Brooklyn, Kings county, New York, have invented certain Improvements in Machines for Making Envelopes, of which the following is a specification.

My invention relates to that class of machines which are employed for making envelopes, bags, or receptacles of paper and similar materials, this machine being designed primarily for folding and gumming paper blanks to form letter-envelopes.

The novel features of the invention will be set forth in the claims.

My machine performs five distinct operations automatically and successively in the formation of the envelopes—that is to say, it first “individualizes” the blank or separates it from the pack, then folds over the end flaps, then applies the gum for securing the bottom flap to the end flaps, then folds down the bottom flap, and, finally, folds the top or sealing flap.

The mechanism whereby I accomplish these successive operations I will now describe with reference to the accompanying drawings, in which—

Figure 1 is a side elevation of the operative parts of the machine, some portions being in section. Fig. 2 is a longitudinal vertical mid-section of the machine, looking in the opposite direction from the view in Fig. 1, the section being taken on line 2 2 in Fig. 3. Fig. 3 is a plan of the machine. Figs. 4 and 5 are enlarged detail views, the first showing the mechanism for operating the gumming-roll and the latter the pneumatic mechanism for separating the blanks. Figs. 6, 7, 8, and 9 are enlarged sectional views of the mechanism for folding the bottom flap, the several views illustrating the position of the folder at different stages of the operation. Figs. 10 and 11 are enlarged detail views of the roll for pressing down the bottom flap. These views will be referred to more particularly hereinafter.

In the drawings I have shown the machine in the act of performing its functions, and I will describe the mechanism together with the operation as far as possible.

The operative mechanism is mounted upon a suitable table or frame, A, and takes the envelope-blank at one end, carries it through to the other end, performing the necessary operations on it in transit, and delivers it finished.

B is a platform, upon which is placed the pile of envelope-blanks C. This platform is upheld normally by springs *a a*, which feed up the platform as fast as the blanks are taken off the top by the pneumatic separator. The pile of blanks is properly placed and registered by means of adjustable guides *b b*, and the topmost blank is pressed upward against mechanism which will be hereinafter described.

The topmost blank is separated from the pile or individualized by means of the following-described mechanism: Over the diamond-shaped blank and near the front angle (which is to form the sealing-flap) is a presser-foot, *c*, (best shown in Fig. 5,) arranged to play in fixed vertical guides or keepers, and to be pressed down upon the blank by means of toggle-links *d d'*, actuated at the proper moment by a cam, *e*, Fig. 1, on a shaft arranged transversely under the bed of the machine, through a lever, *f*, and connecting-rod *g*.

By referring to Fig. 2 it will be seen that when the link *d'* has reached a vertical or nearly vertical position the foot *c* will have been pressed firmly down upon the blank, the upward pressure of the springs *a a* being opposed to the downward pressure of the foot; but the cam *e* is arranged to swing the toggle-link forward a little farther, whereby, while it will not further materially depress the foot *c*, it will strike the end of a rod, *h*, which passes obliquely through the foot, and drive it forward. The front end of this rod impinges against a “sucker” or nozzle, *i*, hinged to the projecting toe of the foot *c* and upheld normally by a retracting-spring, *j*. This nozzle is connected by a tube or pipe, *k*, partly flexible, with a cylinder, *l*, (shown in section in Fig. 1,) in which plays a piston, from which a rod, *m*, extends to and presses against a cam, *n*, on the same shaft with the cam *e*.

On the stem of the rod *m* is a spring, *o*, which serves to keep the end of the rod pressed normally up to the cam, which is in the form

of a volute, and has a radial shoulder or offset, as clearly shown.

The cams *e* and *n* being set to perform their functions in unison, it follows that at the instant the presser-foot is firmly seated on the blank and the nozzle *i* depressed the piston in the cylinder *l*, which has been driven to the forward end of the cylinder, is suddenly retracted by the spring *o*, this result being effected by the end of the rod *m* slipping off the shoulder or offset on the cam *n*. The sudden retraction of the piston in the cylinder *l* exhausts the air from the tube leading to the nozzle or sucker *i*, and causes the topmost blank to adhere to the latter by atmospheric pressure. At this moment the cam *e* ceases to act upon the lever *f*, and the spring *j* is permitted to lift the nozzle *i*, which turns on its hinge and bends or deflects the angle or corner of the blank upward. The pressure of the foot *c* upon the blanks has also a tendency to slightly separate those blanks nearest the top at the angle and prevent more than one from being lifted by the nozzle.

At the instant following the lifting of the blank by the nozzle a separating finger or guard, *p*, springs forward under the corner of the lifted blank and over the pile of blanks, so as to be in readiness to hold down the pile when the presser-foot lifts. This finger is mounted on a cross-shaft, *q*, Fig. 3, and to the end of this shaft is fixed a short crank, from which a rod, *r*, extends back to the cam *n*, its extremity being normally pressed up to said cam by means of a suitable spring, *s*, around the shaft *q*. As the end of the rod *r* bears upon the cam just above or in front of the piston-rod *m*, it follows that the shoulder of the cam will pass it an instant after the corner of the blank is lifted and allow the finger to be thrown forward at the proper time. To give the finger *p* a nearly horizontal movement to and fro, I provide it with a heel, *p'*, which plays in a suitable keeper in the table or frame, and hang the finger by a pin to a crank-arm on the shaft *q*, as clearly shown in Fig. 5. As before stated, the cam *e* has now ceased to act upon the presser-foot, and this latter will be lifted by means of a suitable retracting-spring, *t*, (best shown in Fig. 5,) thus separating the topmost blank from the pile which is now held down by the finger *p*. To release the blank from the nozzle *i* when the latter is lifted by the lifting of the presser-foot, I provide a finger, *f'*, attached to some fixed part of the table and arranged to push the blank off as the foot lifts. The finger *p* also begins to recede slowly under the influence of the cam *n*.

At the moment the blank is released by the nozzle it is borne forward by a carrier, which I will now describe. This carrier is a plate, *u*, arranged to reciprocate under guides *v*, raised a little above the general level of the table-bed or frame *A*. To the plate *u* are affixed arms *w*, and the extremities of these arms are connected by links *x* with crank-arms *y* on a cross-

shaft, *z*; and to the projecting end of this shaft is affixed a crank-arm, *a'*, which is connected by a link or rod, *b'*, with a short crank, *c'*, on the shaft *d²*, which bears the cams *e* and *n*. Rotation of this crank *c'* gives to the carrier *u* a horizontal reciprocating motion on its supports or guides *v*. The carrier moves forward under the lifted blank, and fingers *e'* on its front edge engage the edge of the blank and carry it forward. As the blank is carried forward its angular rear edge strikes upon the beveled or inclined faces of guides *g'*, secured adjustably to the table, and these act to adjust and slightly retard it and to raise it slightly, so that its angle or corner may enter between the carrying-belt and a bearing-roll, *h'*, at exactly the right time. To understand the function of these guides, it must be borne in mind that to insure the proper registry of the blank with the gumming roll the blank must be kept up to the fingers *e'*, and should the blank from any cause be drawn away from said fingers or be slightly awry the guides *g'* will exert retarding force enough to replace it.

D is a broad endless belt or apron, which passes around two rolls or drums, *E E*, mounted on shafts *d²* and *i'*, which have bearings in the main frame *A*. The latter shaft bears, by preference, the driving-pulley *j'* of the machine. The apron *D* travels horizontally over the table-bed, as indicated by the arrows, and on it rests the roller *h'*. This roller is mounted in one end of a frame, *F*, and in the other end of said frame is mounted another or driving roller, *h'*, which rests at all times upon the apron *D*, and is driven thereby. The two rollers *h'* and *h'* are connected by a cord belt, *l'*, which rests in a circumferential groove in each. The forward end of the frame *F*, bearing the roller *h'*, is hung in a sliding frame, *m'*, arranged to play up and down in fixed guides or keepers, so that the roller *h'* may be lifted slightly above the apron *D* at the proper moment. It is lifted by means of a cam (not shown) on the shaft *d²*, which, at the right moment, lifts a toe, *n'*, which takes under a crank on the end of a cross-shaft, *q'*, which extends across the frame *m'*, and has bearings in the fixed guides or keepers before mentioned. The shaft *q'* is flattened on one side where it rests in its bearings, and it rests normally with its flattened faces down; but when the cam lifts the toe *n'* and the shaft is rotated the rounded parts of the shaft are turned down, and the frame *m'*, with the roller *h'*, is lifted slightly from the apron *D*. In this elevated position it stands when the advanced corner or angle of the blank is passed between it and the apron by the carrier *u*.

The carrier moves the blank with the same speed that the apron *D* travels, and inserts its advanced corner or angle under the roller *h'* a considerable distance just as the latter is allowed to fall upon it. To prevent the friction of the apron *D* from starting the blank from the carrier prematurely, which it might do, I provide a leaf spring or springs, *r'*, attached

to some fixed part of the table, and arranged to press gently on the blank as it is carried along.

The object in arranging the roller *h'* to hang suspended over the apron, but at the same time revolving, is that the corner of the blank while moving at the same speed as the apron D and the periphery of said roller may be inserted between the apron and the roll far enough to give the roll a broad bearing on it at the moment the blank is nipped between them. This insures the blank against being drawn awry. The moment the blank is advanced far enough the roller *h'* is permitted to drop on it and press it down to the traveling apron D, and it is borne back to the folding mechanism, which I will now describe.

The guides *v v*, before referred to, are placed wide enough apart to form folding-blades for the end flaps of the blank, their outer edges being on the line of the fold, and they extend back over the apron D, the space between the two being just sufficient to permit the blank to move along freely. The rear ends of these blades are secured to the inner ends of "goose-neck" supports G, mounted on the table and arranged to arch over so as to leave a clear space for the end flaps to turn in. To these goose-necks are secured plates shaped so as to form folders *o' o'* for turning the end flaps of the blank over on the folding-blades as the blank is borne along. This device would turn the flaps, but to insure against excessive friction between the stationary folders and the blank and avoid one end of the blank being retarded more than another from this cause—a difficulty to be apprehended when the paper of the blank is thin and flexible—I provide narrow endless belts H H, arranged to pass over suitable idler-sheaves, I I, and over the main apron D, as shown. These belts pass through the convolutions of the folders *o' o'*, which are made extra large to admit of their passage and press upon the upper side of the folded flaps, thus assisting to bear the blank along. With the apron D bearing upon the underface of the blank and the belts H upon the upper faces of the flaps, and both apron and belts traveling at the same speed, it will be seen that the only retarding friction on the blank will come from the folding-blades, and this will be practically nothing. In this arrangement the belts H must of necessity twist once in passing through the folders, and I give them a second twist at *o''* to bring them back again properly, as will be well understood; or they might be twisted once and then sewed. These belts are spread apart under the machine by properly arranging the pulleys I I so that the envelopes may fall between them when folded and dropped. The blank, having passed through the folders *o' o'*, has its end flaps folded down and passes next to the gumming-roll J, which is provided with raised angular imprinting-faces *s'*, arranged to receive the paste or gum from a feed or "doctor" roll, K, ar-

ranged to rotate in connection with a paste fount or trough, L. The rolls J and K and the fount L are all mounted in a frame, M, which is pivoted at *t'* in fixed provisions on the bed of the machine. This frame is supported on a cam-pin, *u'*, which passes through the fixed provision (see Fig. 2) and has a flattened face, as shown. By turning this pin the frame will be raised, as will be well understood. This device is merely to lift the gumming mechanism up out of the way temporarily, and not automatically.

The doctor-roll K is driven from a shaft, *b'*, through the medium of suitable pulleys and belts, but rotating normally opposite the body of the roll J does not rotate the latter, as they are not in contact; but when at the proper time the roll J is turned slightly by other means, and one of the raised faces *s'* is brought opposite the roll K, the roll J will then be rotated for a part of a revolution, or until the raised face passes from contact. In the meantime the opposite raised face will have imprinted the gum or paste it bears upon the envelope which has been carried under it. In addition to this, and to render the operation of the roll J more positive still, I affix to its ends (see Fig. 4) two disks, *w'*, corresponding in diameter with the roll J, when measured through the raised faces *s'*, and flatten these disks on opposite sides, as shown, these flattened faces being set to come opposite the roll K at the proper time, as will be well understood. These disks are merely precautionary devices.

The mechanism I prefer to employ for giving the roll J its partial rotation is best illustrated in Fig. 4. On the same shaft on which the roll J is fixed is secured a sort of ratchet-wheel, *x'*, with but two teeth or notches, and with two pins, *y' y'*, projecting from its face. A claw, N, hinged to a horizontally-arranged slider, O, is arranged to hook over one of the pins *y'*, and when the slider is retracted by means of a cam, P, on the shaft *d''*, which bears on or against a hinged lever, Q, connected with said slider, the claw N acts to rotate the roll J far enough to bring a part of its periphery into frictional contact with the doctor-roll, when the latter will continue its rotation far enough for the claw to engage the other pin *y'*. A detent-spring, *z'*, springs over one of the teeth in the ratchet and prevents the roll from rotating too far or from being started from its proper position, as will be well understood.

The doctor-roll K has a peripheral speed equal to the speed of the belt, and when the belt sets the imprinting-roll in motion the roll K, acting on its opposite side, assists in the operation, it being belted to rotate in the proper direction. I may employ an intermediate distributing-roll between the rolls J and K, if necessary.

The mechanism for folding the bottom flap and gumming it is arranged next beyond the gumming-roll, and is best illustrated in Figs.

6, 7, 8, and 9, where it is shown in the various stages of its operation on a large scale. Fig. 9 shows the parts in their normal position, and also in the position they assume after the envelope has passed or is passing beyond them to the mechanism for folding the sealing-flap. Let I represent the idler or guide sheaves, around which the belts H pass as they are led off from the apron D. At this point the partly-finished envelope passes out from under said belts and its advancing bottom flap enters the folder.

R is the folder, which is constructed of two thin metal plates, connected at their ends and provided with axial pivots a^2 . The plates are brought to an edge, and a space is left between them of sufficient width to let the envelope-flap pass through. This folder is mounted on its axial pivots in a frame, b^2 , fixed to a cross-rod, c^2 , the ends of which are fixed in arms d^3 . These latter arms are hung loosely at their upper ends on the cross-shaft v' , as shown. The disposition of the parts is such that, normally, the folder will stand, as in Fig. 9, with its edge resting on the apron D, and at such an angle with reference to said apron that a slight pressure on it in the direction of travel of the apron will cause the folder to bite into the apron and turn over.

Raised from the table-bed and fixed thereon are ledges f^2 , on which travel rollers g^2 , provided with bearings in the arms of the frame b^2 ; and h^2 is a spring arranged to bear upon a flattened boss on the folder when in its normal position and to keep it steady.

S is a plate hung on or attached to the cross-rod c^2 , and provided with adjustable stops or guides i^2 .

T is a curved finger, hung from the shaft v' , and arranged to prevent the flap of the envelope from curling up as it approaches the folder; and U is a bent wire spring, arranged to bear elastically on the cross-rod c^2 at the proper stage of the folding operation.

As the partly-folded blank approaches the folder its bottom flap passes up between the plates of the latter until it encounters the guide-stops i^2 on the plate S. The pressure it produces is sufficient to drive back the folder and its accessories until they assume the position shown in Fig. 6. The continued pressure of the advancing envelope and the friction of the traveling apron D causes the folder to turn on its axis, as shown in Figs. 7 and 8.

When the folder turns to the position shown in Fig. 7 its axes lift, as will be well understood, and these axes or axial pivots project through and beyond the arms of the frame b^2 , and when they lift they engage recesses j^2 in plates j^3 , secured adjustably to arms k^2 , which are hung in bearings l^2 and kept pressed down elastically by a spring, m^2 . The recesses j^2 engage the prolonged axes or points a^2 , and thus allow the folder to turn "in the air," so to speak, and prevent the spring U, which is now brought into elastic play, from suddenly

turning the folder R and causing it to drag over the gum on the envelope. As the folder turns it makes the fold at the junction of the bottom flap with the envelope-body, and as the operation proceeds (see Fig. 8) the pressure from spring U is relieved, and that from spring h^2 comes in play to turn the folder over. In turning over, the folder acts, in conjunction with the apron D, to bear the envelope on and under a bearing-roll, V, which is hung in the free ends of the arms k^2 . This roll V is pressed elastically down upon the apron D, and when the partly-finished envelope passes under it the bottom flap is pressed down and securely fastened or gummed, as will be readily understood.

The roll V may be a plain cylinder, where it is desired to make the cheaper kinds of flat envelopes; but in making the better kinds, or those where the folds are not flattened, I employ a roll constructed and arranged to operate as herein shown. In Figs. 10 and 11 I have shown this roll and its accessories on a large scale, the first being a side elevation and the latter a plan.

A shaft, Z, is mounted rotatively in bearings in the arms k^2 , and the roll V turns loosely on this shaft. On the same shaft are fixed—by set-screws, for example—rollers or collars g^3 , which rest upon the apron D. Through these (which are kept pressed down by the elastic force of the springs m^2) the shaft Z is rotated by the said apron.

Between the ends of the roll V and the collars g^3 are arranged springs h^3 . These act in a well-known way to frictionally connect the roll with the rotating shaft. The roll has a raised face, i^3 , shaped somewhat like the bottom flap of the envelope, but a little larger. This raised face is intended to press down the said flap upon the moist gum as the roll revolves, so as to cause it to firmly adhere and at the same time not crush or flatten the end folds of the envelope. To avoid flattening or crushing the bottom fold, and to insure its being made in the proper place, I also flatten one face of the roll, as at k^3 . The roll is held stationary by means of an elastic detent, l^3 , which is secured to some non-movable part of the machine at its upper end, and at its lower end it presses gently upon the roll. The tip of the detent engages a recess, m^3 , in the roll when the latter is in the position shown in Fig. 10, and prevents it from revolving.

When the rod c^2 of the folding mechanism is raised in forming the bottom flap it takes under the detent l^3 at the right moment and lifts its tip out of the recess m^3 . The roll V then revolves, and the flattened face of the same coming opposite the bottom fold, as the latter passes under the roll, the said fold avoids being crushed. The raised face i^3 of the roll then presses down and sticks fast the bottom flap. As the roll continues to revolve the detent l^3 again drops into the recess m^3 and stops the roll until the next blank is ready to be acted

on. The collars q^3 are about equal in diameter to the roll when the latter is measured through its raised face.

Other forms of detents may be employed for stopping the roll; but that shown is simple and effective. After the envelope has passed under the roll V it encounters the mechanism for folding the sealing-flap. This mechanism is best shown in Figs. 1, 2, and 3.

W is a frame arranged to slide on a rear portion, A' , of the main frame or table A. In provisions on the frame W a roll, X, has bearings, the said roll being arranged to turn freely on its shaft n^2 .

A frame, q^2 , (see Figs. 2 and 3,) is provided with supporting-arms r^2 , which extend down and have rotative bearings on the shaft n^2 , whereby said frame q^2 may swing part of the way around the roll X and concentric thereto. This frame q^2 bears a slightly-curved plate-folder, s^2 , the free end of which stands off slightly from the roll X. The frame q^2 is oscillated or swung concentrically back and forth around the roll X by means of mechanism best shown in Fig. 1. From the boss of one arm r^2 , which plays around the shaft n^2 , projects an arm, t^2 , and this arm is connected, through the several links u^2 u^2 and a lever, v^2 , with a lever, w^2 , fulcrumed at x^2 . The free end of the lever w^2 is pressed down at the proper time by means of a cam on the shaft d^2 . When the free end of the lever is pressed down by the cam the folder s^2 is borne forward and downward, and when this pressure is removed the plate is retracted by a suitable spring, preferably arranged between the table and lever w^2 , as shown in Fig. 1.

When the envelope passes out from under the roll V it passes over a bar, y^2 , which extends across the bed of the table and under the free edge of the folder s^2 , which at this moment is drawn back. It passes far enough to strike a stop or stops, z^2 . At this moment the folder s^2 , with its frame and stops, starts forward, carrying the envelope with it, and the edge of the folder breaks down the paper of the envelope on the line where the sealing-flap joins the body of the envelope and presses this fold down between the roll X and the bar y^2 . This position of the parts is clearly shown in Fig. 2. The fold of the sealing-flap being now formed, the folder carries the envelope on down until it is nipped between the roll X and the apron D, where it passes around the roll E.

The roll X, as before stated, turns loosely on the shaft n^2 ; and, with the said shaft, rotates two cams or cam-wheels, Y, fixed thereon—one at each end of the roll X. The cams are not attached rigidly to the roll, but springs a^3 , arranged between the cams and the end of the roll, and preferably secured to one of them, produce a frictional attachment in a manner well understood. The cam-wheels Y are a little larger in diameter than the roller X; but their opposite faces are flattened, as at b^3 . When in their normal positions, as shown in Figs. 1 and 2, one flattened face of the cam

stands adjacent or opposed to the roll E, and this permits the roll X to press against the apron D and to be rotated thereby, the cams being held back or stopped by means of a spring-latch, c^3 , (shown in dotted lines in Fig. 1,) which engages one of two pins, d^4 , inserted in the cams on opposite sides of the center. The latch c^3 is held to its place by means of a spring, e^3 , and it has a curved extremity, which extends back over a suitable projection or provision on the frame q^2 or its arms r^2 . When the folder s^2 has advanced the envelope nearly to the point where the roll X contacts with the apron D, the latch c^3 is lifted by the provision on the frame, and the cams Y are freed and allowed to rotate with the roll X; but this brings the full periphery of the cams into contact with the apron D, and the roll X is pressed back therefrom, and the finished envelope is allowed to pass through without being tightly compressed.

The sliding frame W, in which the roll X is hung, also bears two of the guide-sheaves I I for the belt H, and I find that the elasticity of this belt is generally sufficient to keep the roll X and the cams Y pressed up to the apron D; but other elastic mediums might be employed, if desired.

My object in employing the cams Y and their stop devices is partly to prevent too great compression of the envelope and partly to enable me, when desired, to compress the fold last formed just as the envelope is nipped between the roller and belt, and then to ease the pressure and let the finished envelope pass through lightly pressed. This mechanism might be omitted in making some kinds of envelopes.

All of the parts of the machine—such as the folders, folding-blades, paste-rolls, &c.—which it is necessary to make removable or adjustable for envelopes of different sizes may be so made, and some of these parts are so shown as adjustable. I do not, however, contemplate making the largest and smallest envelopes on the same machine; but several sizes within limits may be easily made by properly adjusting the parts.

I also wish it understood that I do not confine myself to the precise arrangement of cams, levers, links, and other common elements of operative mechanism herein set forth, as I am well aware that a skilled mechanic could readily devise other arrangements that would effect like results. Therefore I have not considered it necessary to minutely describe the form of the various cams employed, nor to give the sizes and proportions of the pulleys, drums, &c. It will only be necessary to say that the various moving parts are to move in unison, so that each will perform its duty at the right moment.

The machine, as shown, operates upon several blanks at the same time, one being arranged to follow another in close succession. The several blanks in their various stages of completion are represented in Fig. 3.

My mechanism for separating or individual-

izing the blanks may be employed in separating sheets of paper for various purposes—as, for example, in feeders for printing-presses and ruling-machines. Heretofore the objection to pneumatic feeders has been that the vacuum formed by lifting the top sheet causes the next sheet to adhere to it, and this difficulty has been aggravated by the natural tendency of the sheets to adhere to each other from various causes. My device obviates the first of these difficulties by turning back the edge or corner of the sheet instead of lifting it perpendicularly, and the second by bringing a pressure to bear on the pile near the edges or corners of the sheets, whereby they are caused to slightly turn up and separate before the sucker is applied. I may employ one or more of these suckers or nozzles; but one is sufficient for the form of blank commonly employed for letter-envelopes. The gum for sealing may be applied to the sealing-flap either before or after the envelopes are made and in the usual way.

In lieu of arranging the belts H to twist as they pass through the folders, the folders *o' o'* may be dispensed with and the belts be arranged to pass obliquely over the outer edges of the folding-blades, but at a very acute angle therewith. By means of this arrangement the end flaps, as the blank is borne along, will be folded over by the intercepting belt precisely as in the arrangement shown, and as the belts move with the blank they will oppose no opposition to the forward movement of the latter. Round or flat belts may be employed.

I claim—

1. The combination, with a vertically-reciprocating presser-foot arranged over the elastically-upheld platform for the blanks, of the said platform, the suction-nozzle hinged to the presser-foot and connected with an air-exhausting mechanism, the said air-exhausting mechanism, and a reciprocating finger or guard arranged to resist the upward pressure of the blank-platform when the presser-foot is raised, all arranged to operate substantially as set forth.

2. The combination, to form a mechanism for separating and removing the blanks one by one from the top of the pile or heap, of the elastically-upheld platform for the pile of blanks, the vertically-reciprocating presser-foot, the suction-nozzle hinged thereto, the air-exhausting mechanism connected with the suction-nozzle, the reciprocating guard or finger arranged to resist the upward pressure of the blank-platform when the presser-foot is lifted, the fixed finger for pushing the blank from the suction-nozzle, and the horizontally-reciprocating carrier for removing the blank after it is lifted, all arranged to operate substantially as set forth.

3. The combination, with the presser-foot arranged to play in vertical guides or keepers, of the suction-nozzle hinged thereto and normally upheld by a spring, the toggle-links *d*

d', and the rod *h*, all arranged to operate substantially as and for the purposes set forth.

4. The combination, with the presser-foot and suction-nozzle hinged thereto, and the air-exhausting mechanism, of a reciprocating carrier for the blank or sheet, an endless apron arranged to move at the same speed that the carrier moves at the moment it delivers the blank to the apron, and a bearing-roll hung over the apron at the point where it receives the blank from the carrier, said bearing-roll having a peripheral speed equal to the speed of the apron, and arranged to be dropped when the blank is advanced under it by the carrier, substantially as and for the purposes set forth.

5. The combination of the broad endless apron carrying the blank to be folded, the folding-blades arranged over and close to the carrying-apron, and the narrow flexible folding-belts, which rest on and move with said apron, and are arranged to turn, by twisting, over on the folding-blades, whereby a sharp and true fold is made in the blank, substantially as set forth.

6. The combination of the broad endless apron D, the two folding-blades *v v*, arranged over, near to, and parallel with the movement of the said apron, the folders *o' o'*, and the two narrow folding-belts H H, arranged to rest on and move with the apron at its front end, and to turn over, by twisting, onto the said folding-blades, substantially as and for the purposes set forth.

7. The combination, with an endless apron for carrying the blank, of stationary folding-blades arranged over the said apron, flexible endless folders or folding-belts, and fixed folders to guide and turn the flexible folders, the latter being arranged to move with the blank and at substantially the same speed, as set forth.

8. As a means of imprinting on the moving envelope-blank the gum or paste necessary to secure the bottom flap, an imprinting-roll having a raised imprinting-surface and mounted in bearings over the apron which bears the blank, said roll being provided with a starting mechanism, substantially such as described, whereby the margin or limit of its raised imprinting-surface is brought into contact with the surface of the blank by partial rotation of the roll at the moment the blank reaches the proper position, substantially as and for the purposes set forth.

9. The combination, with the paste-trough and revolving doctor-roll, of the roll for imprinting the gum on the passing envelope-blank, said doctor-roll having a peripheral speed equal to the speed of the apron which carries the envelope-blank, and said gumming-roll having raised imprinting-faces, and arranged to be given a partial revolution at the proper moment, whereby its raised imprinting-faces are brought simultaneously into contact with the passing envelope-blank and the

periphery of the doctor-roll, substantially as set forth.

10. The combination, with the traveling apron which bears the envelope-blank, the paste-trough, the rotating doctor, and the im-
5 printing-roll of the raster x' , fixed to the latter roll or its shaft, the detent-spring z' , the claw N, slider O, lever Q and cam P, all arranged to operate substantially as set forth.

10 11. As a mechanism for folding the bottom flap of an envelope or similar receptacle, a folder, R, constructed of two plates with an opening between them for the passage of the flap, the said folder being hung in a swinging
15 frame on axial pivots, and arranged to rest on the apron which bears the envelope-blank, at an angle thereto, and the said swinging frame being provided with a plate bearing stops arranged to check the passage of the flap through
20 the folder, and thus cause the apron to turn the folder and fold the flap, substantially as set forth.

12. The combination, in an envelope-machine, of the endless apron D, the folder R,
25 hung on axial pivots in the frame b^2 , the plate S, bearing stops i^2 , the spring h^2 , the bar c^2 , the arms d^3 , and the spring U, all arranged to operate substantially as set forth.

13. The combination, with the endless apron
30 D, of the folder R, hung on axial pivots in a swinging frame constructed and provided substantially as shown, and having a spring, h^2 , the arms k^2 , the spring m^2 , the roller V, and the plates j^3 , provided with recesses j^2 , to receive the ends of the pivots on the folder, sub-
35 stantially as and for the purposes set forth.

14. The combination of the apron D, the

folder R, having axial pivots or journals, as shown, the rollers g^2 on said pivots, the flanges or ways f^2 , the frame b^2 , the plate S, bearing
40 stops i^2 , the bar c^2 , the arms d^3 and k^2 , the springs U, m^2 , and h^2 , and the cam-plate j^3 , all arranged to operate substantially as set forth.

15. The combination, with the roll V, provided with a raised face, i^3 , and a flattened
45 face, k^3 , of the shaft Z, mounted rotatively, as shown, the collars g^3 , set thereon, the springs h^3 , and the detent l^3 , arranged to stop the roll and to be lifted by suitable mechanism at the proper time so as to free the roll, substantially
50 as set forth.

16. As a mechanism for folding the sealing-flap of the envelope, the endless apron D and its drums E E, in combination with a roll, X,
hung in a frame, W, and provided with cam-
55 wheels Y, frictionally connected therewith, the swinging frame q^2 , mounted on arms which have bearings on the axes of the roll X, the folding-plate s^2 , mounted on said frame q^2 , and the latch c^3 , arranged to take over pins d^4 in
60 the cams Y, and to be tripped by the swinging frame q^2 , the said frame being arranged to receive from suitable mechanism an alternate reciprocating movement concentrically around the roll X, substantially as and for the pur-
65 poses set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

GERARD SICKLES, JR.

Witnesses:

HENRY CONNETT,
ARTHUR C. FRASER.