

(No Model.)

3 Sheets—Sheet 1.

W. J. HUTCHINS.
NAIL MACHINE.

No. 312,996.

Patented Feb. 24, 1885.

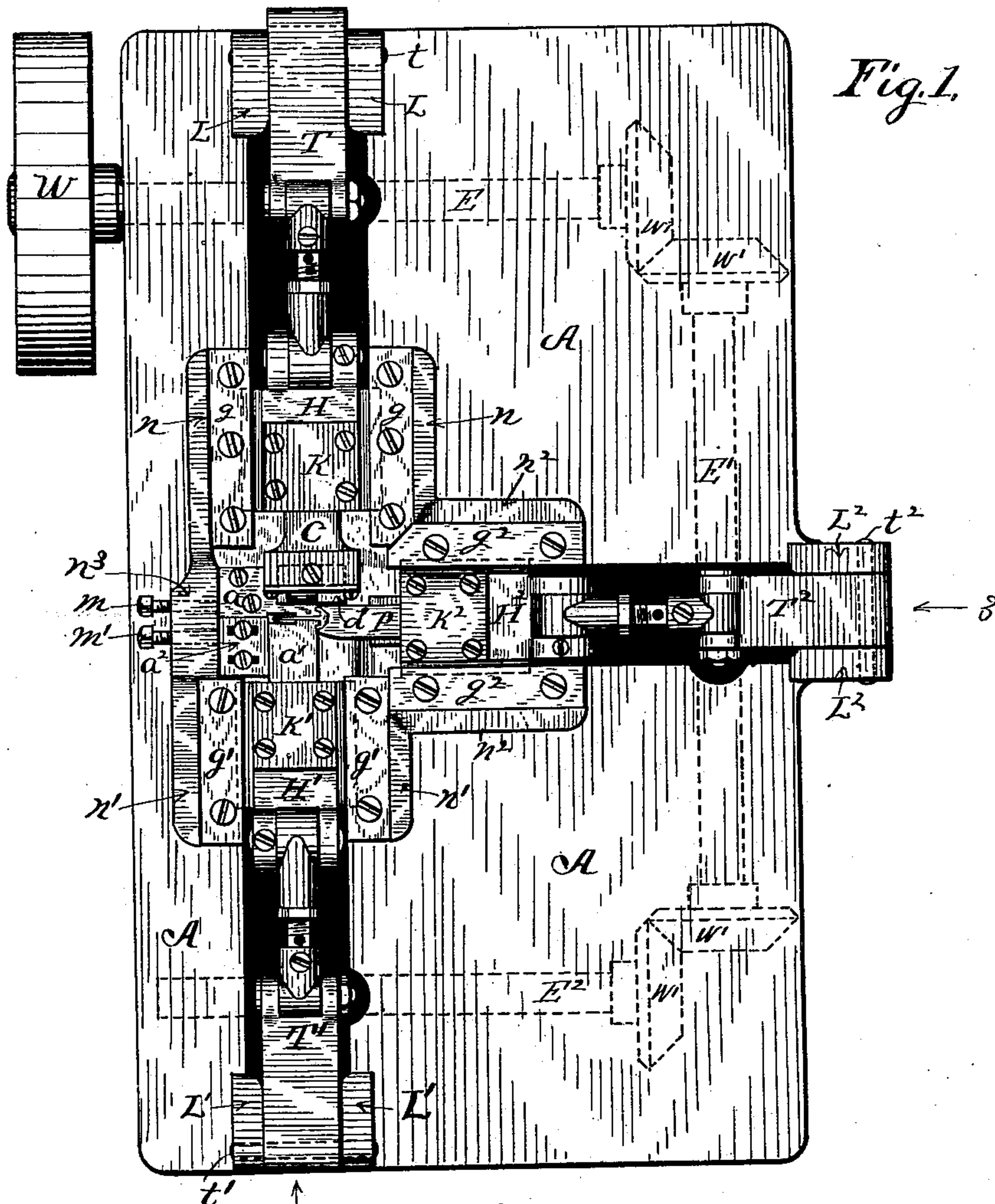


Fig. 1.

Fig. 2.

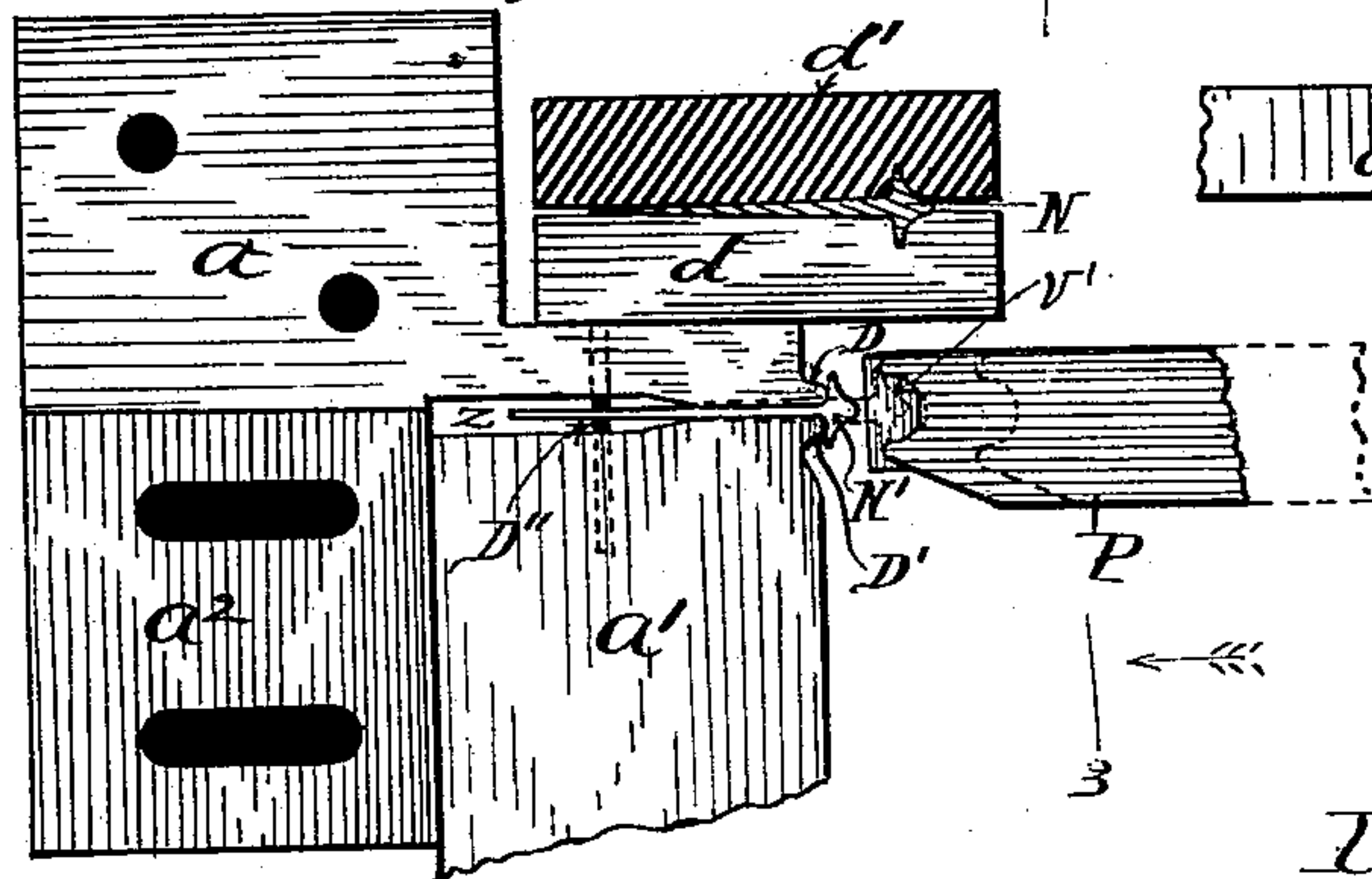
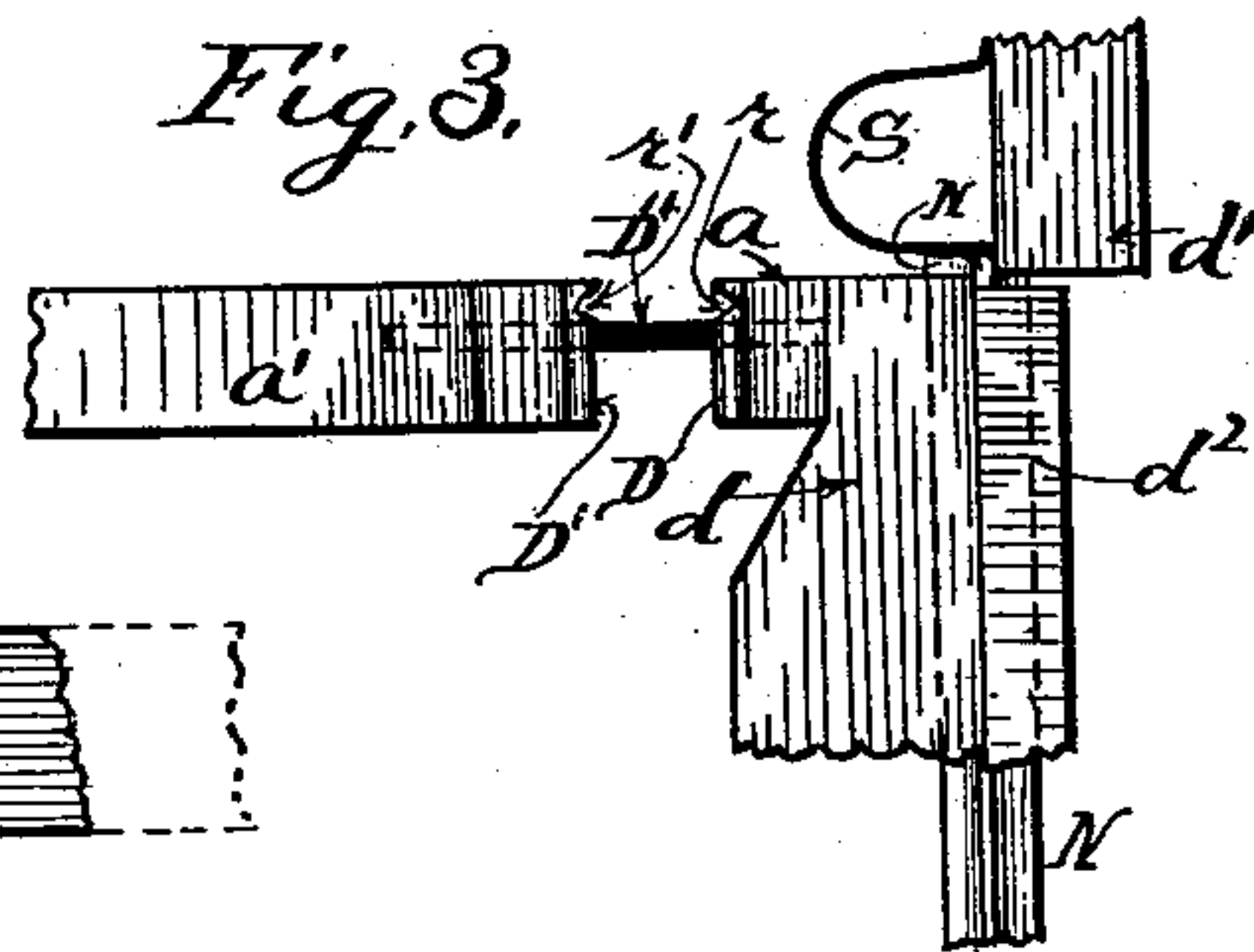


Fig. 3.



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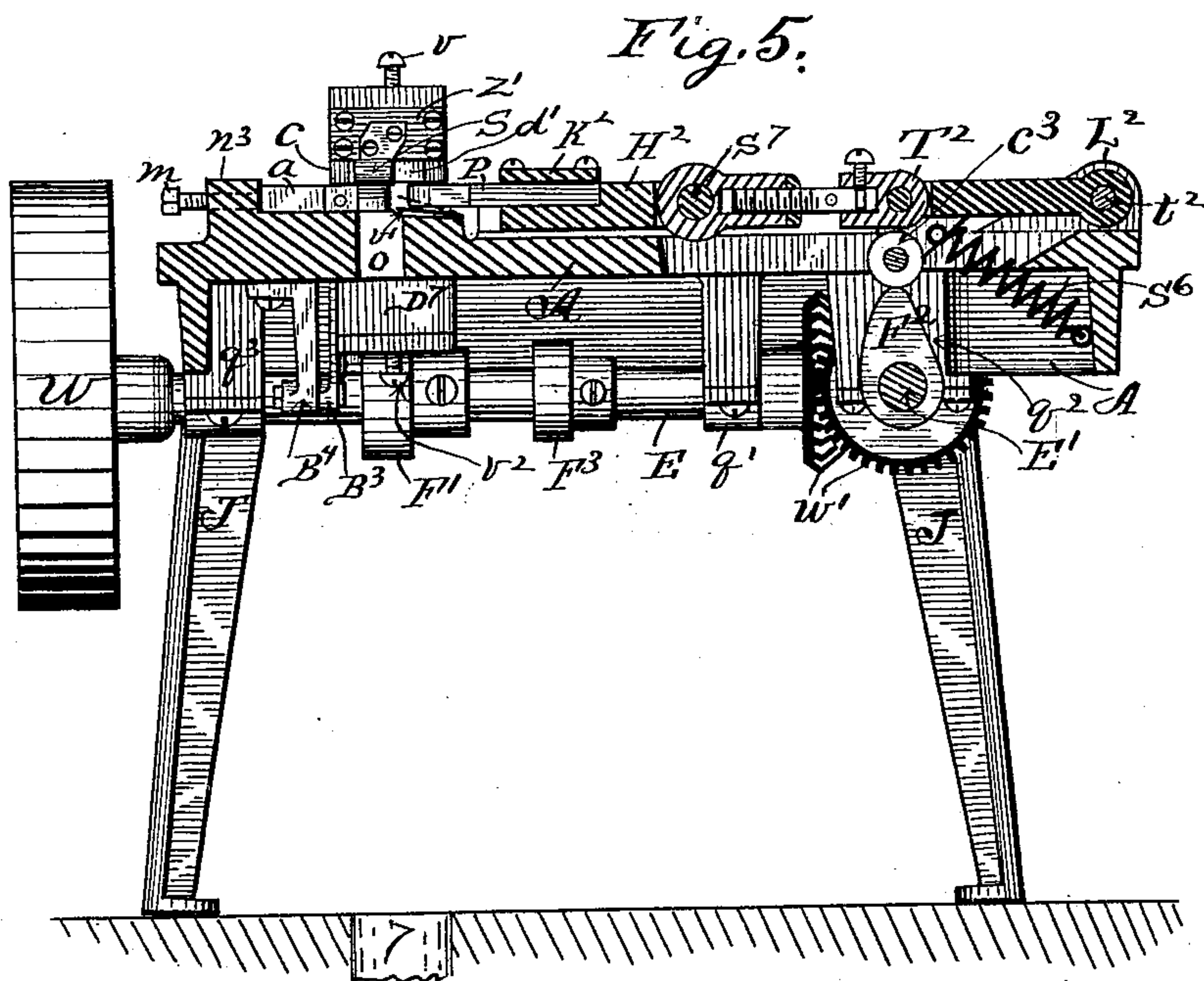
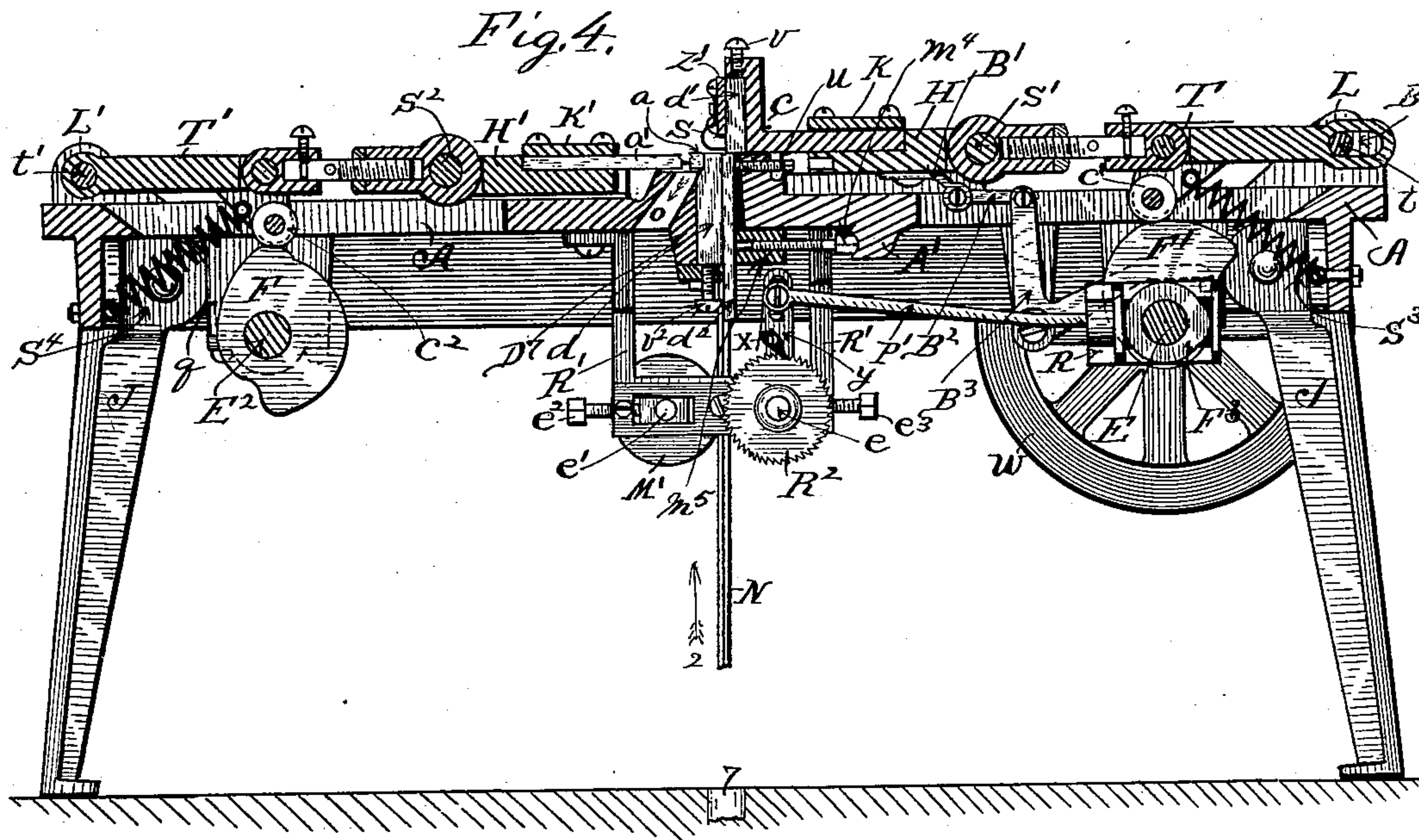
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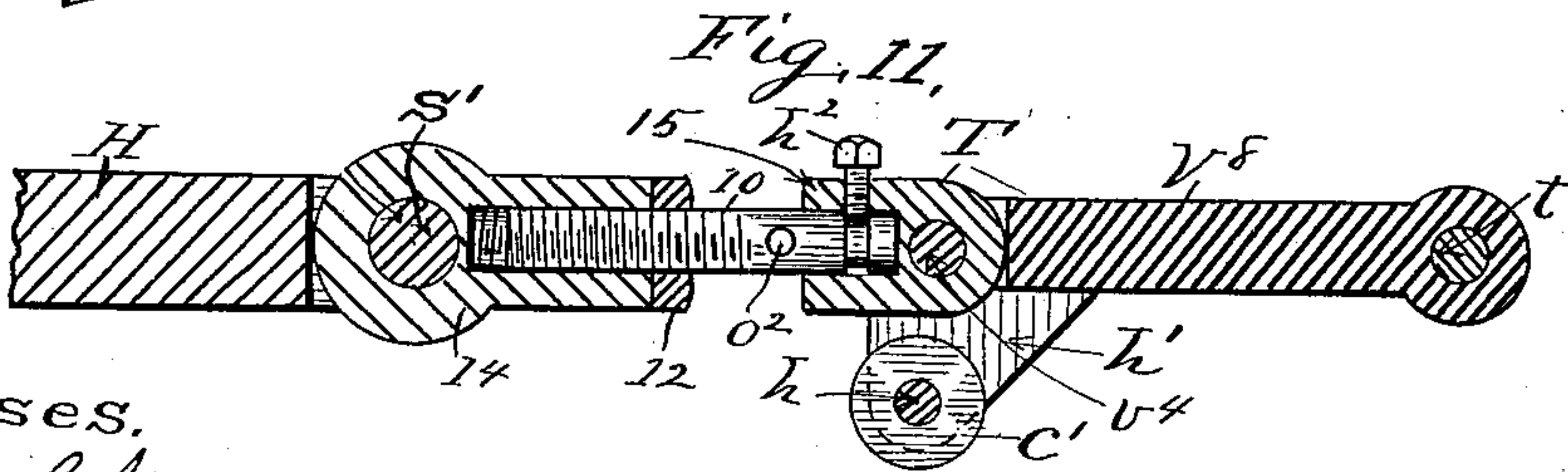
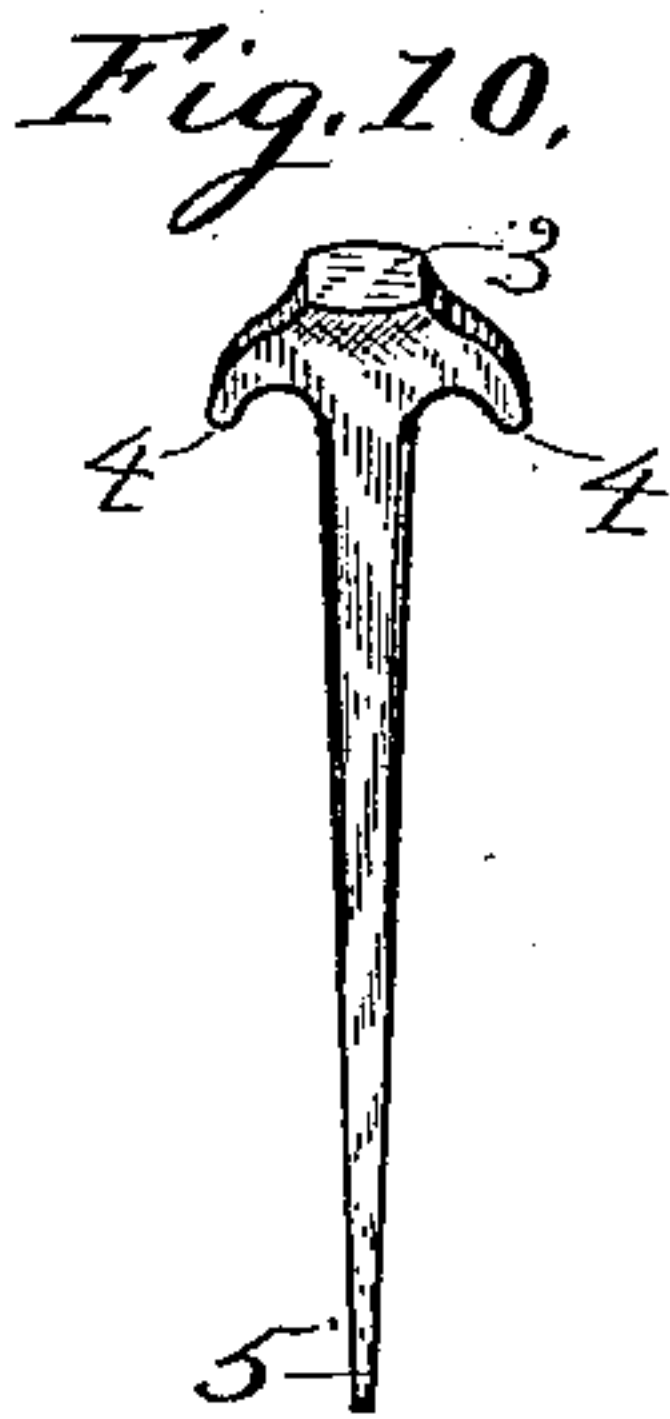
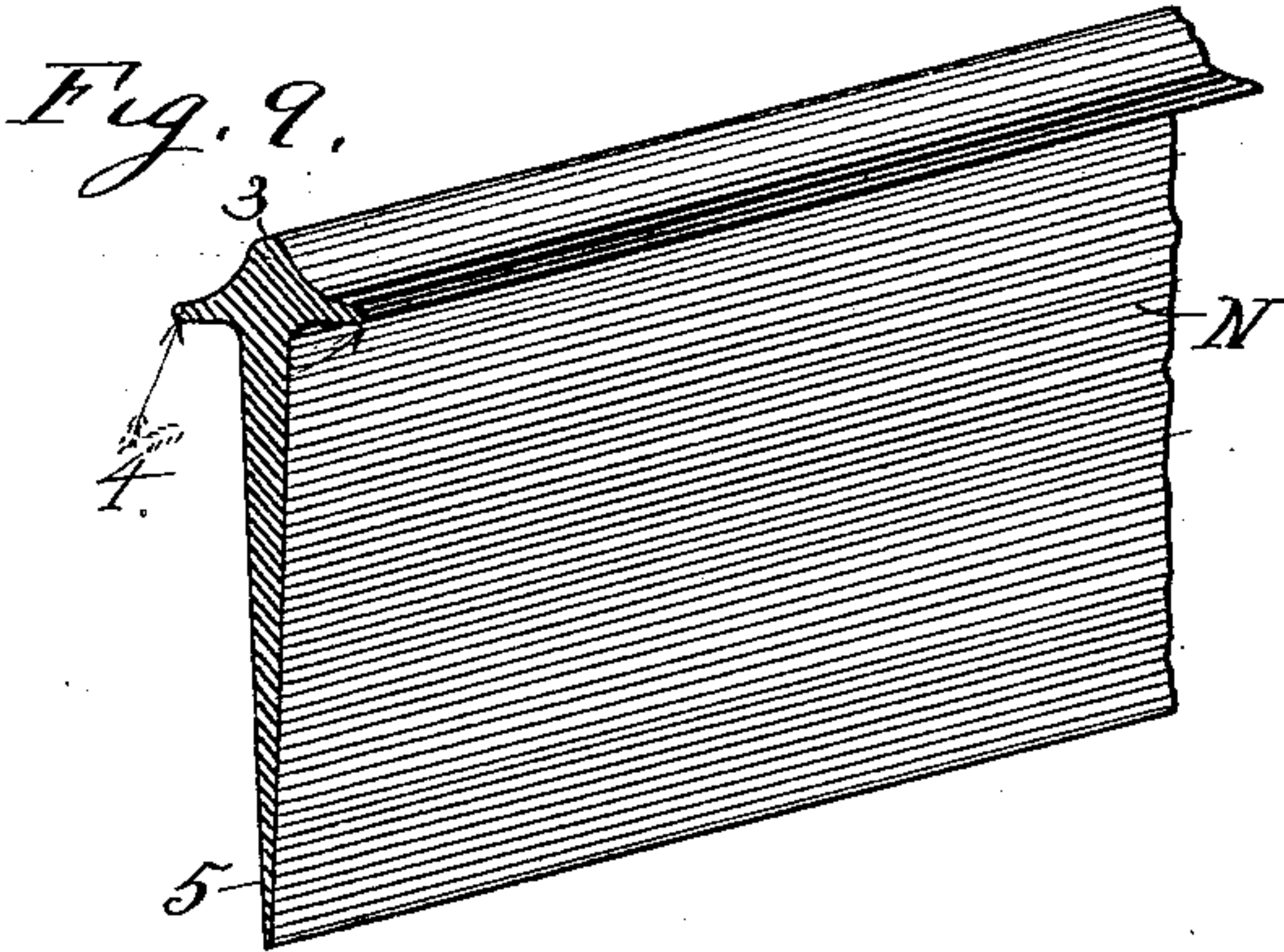
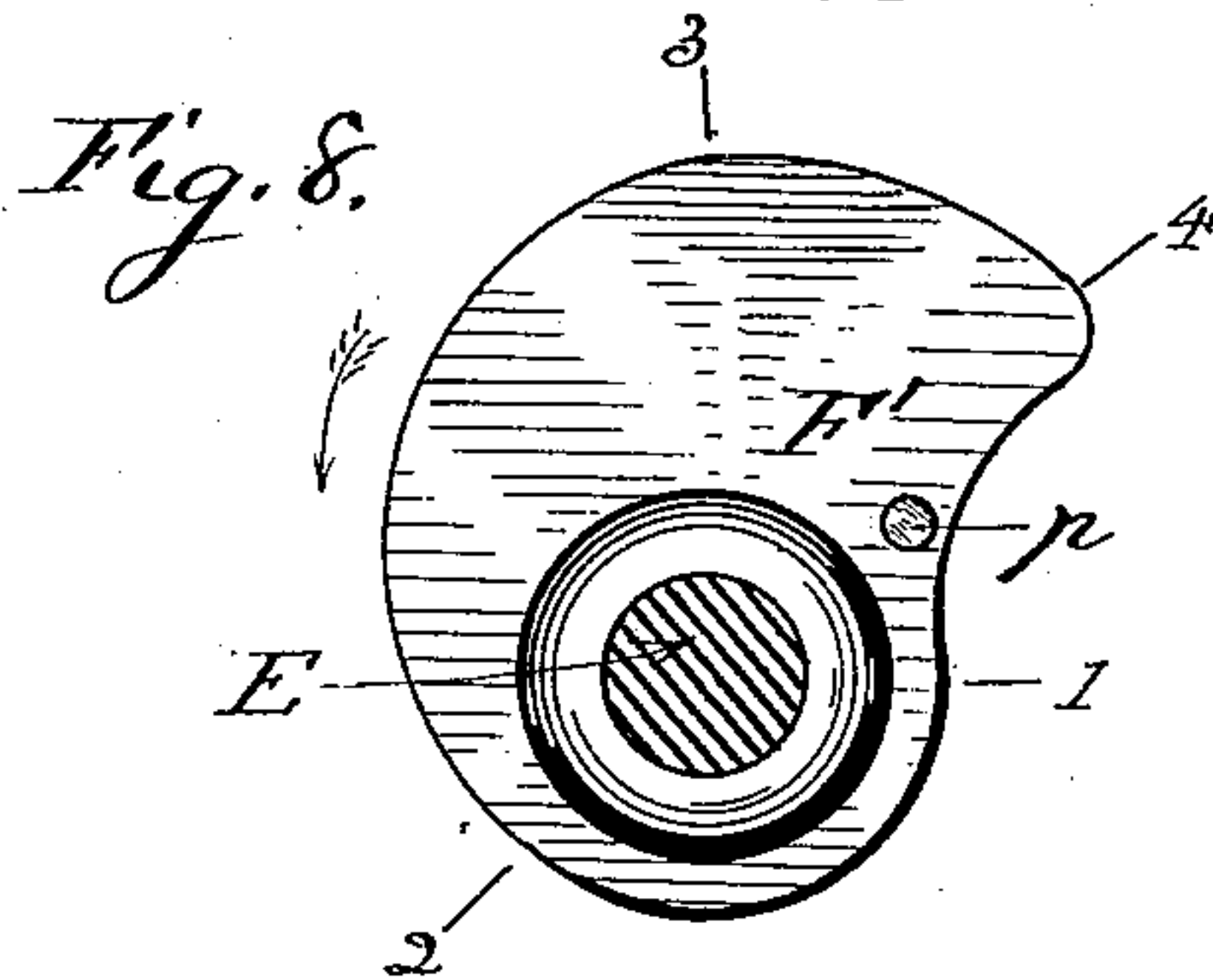
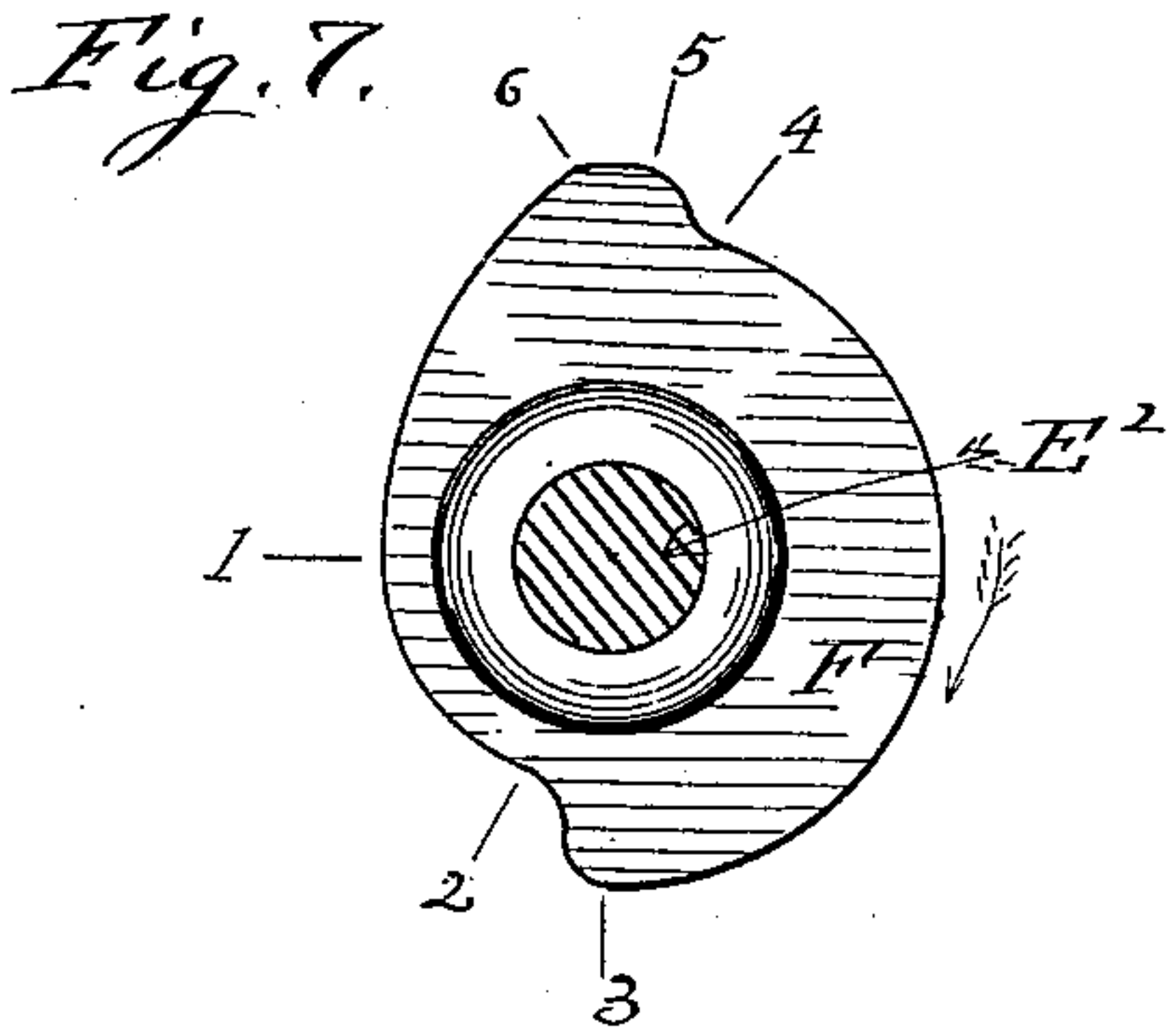
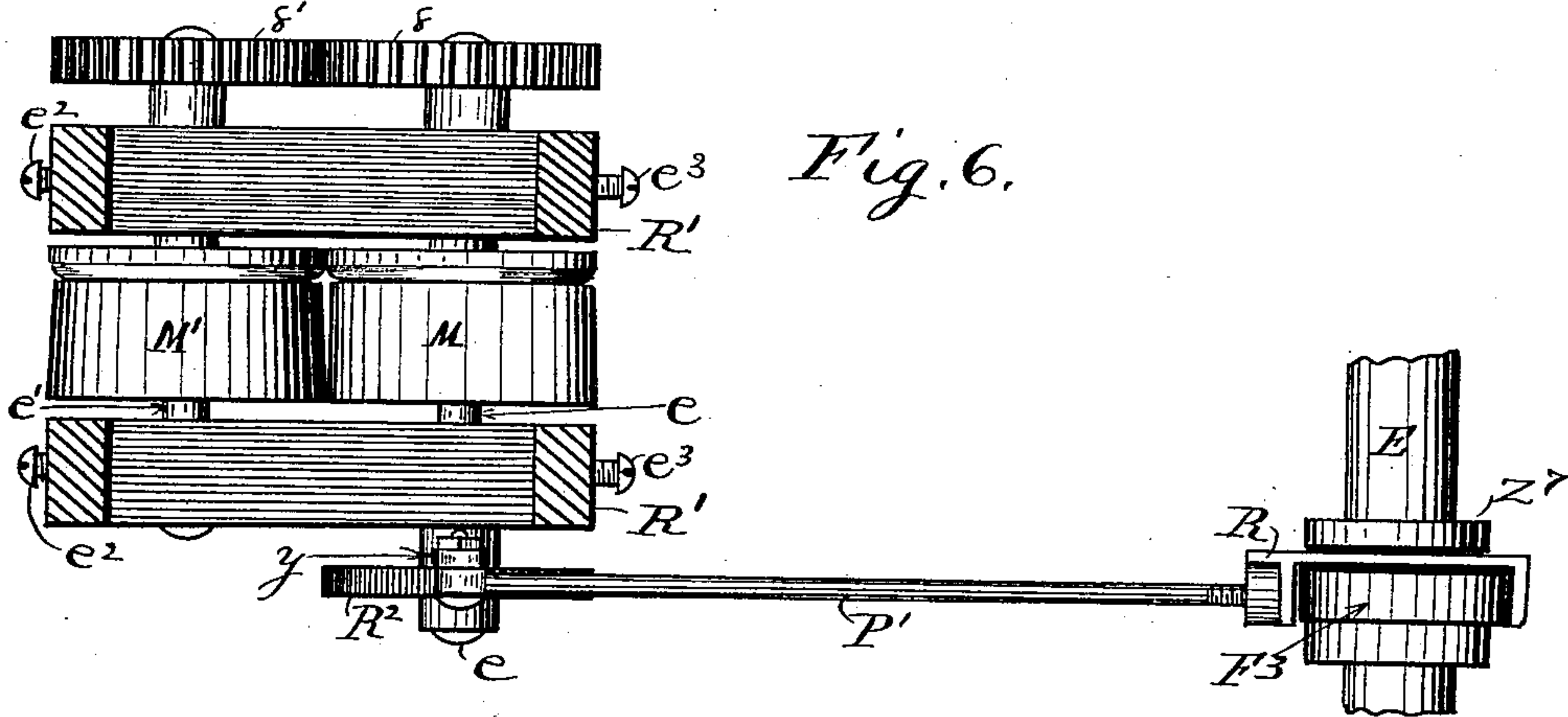
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UNITED STATES PATENT OFFICE.

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EAST WHEATLAND, ILLINOIS.

NAIL-MACHINE.

SPECIFICATION forming part of Letters Patent No. 312,996, dated February 24, 1885.

Application filed May 24, 1884. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. HUTCHINS, a citizen of the United States of America, residing at Joliet, in the county of Will and State of Illinois, have invented certain new and useful Improvements in Machines for Making Nails, of which the following is a specification, reference being had therein to the accompanying drawings.

Figure 1 is a plan view; Fig. 2, a plan view of the forming ends of the forming punches and dies; Fig. 3, a side view of the parts shown in Fig. 2 on line 3, looking in the direction of the arrow, omitting the head-forming punch P; Fig. 4, a longitudinal vertical sectional view of Fig. 1 on line 2, looking to the left; Fig. 5, a vertical cross-sectional view of Fig. 1 on line 3, looking toward the right-hand end of the machine; Fig. 6, a plan view of the feed-rollers and their operating parts, detached from the machine; Fig. 7, an enlarged side view of cam F on shaft E², and which operates toggle-joint T'; Fig. 8, a similar view of cam F' on shaft E, that operates toggle-joint T; Fig. 9, a perspective view of a section of the metal-strip plate N, from the end of which the nail is cut; Fig. 10, a perspective view of a finished nail, being the product of the machine; Fig. 11, a central longitudinal sectional view of the toggle-joint T, detached from the machine, to show its construction and means for its adjustment as to length, in order to set the tool attached to its sliding head to its work.

This invention relates to certain improvements in nail-making machines, having the nail cutting and forming parts formed in this instance so as to produce such a nail as is shown in perspective in Fig. 10 from a plate such as is shown in Fig. 9; but the parts that cut and form the nail may be varied to make nails of various other shapes and kinds or other analogous products.

The nail shown in Fig. 10 is designed for use in attaching the wires of a wire fence to the posts; and the improvements I have made are fully set forth in the following specification and claims.

Referring to the drawings, A represents the main frame and bed-plate of the machine, having cast as integral with it all the necessary hanger-boxes to support the shafting under-

neath it, guideways for the reciprocating heads of the toggles, and lugs to properly attach them to the working parts of the machine. It is also provided with openings through its face for the parts to operate in, and so the upper and lower working parts can be connected with each other, and it stands on suitable legs, J.

T, T', and T² are sliding heads, that are caused to reciprocate back and forth in their respective guideways *n n' n²*, and are secured therein by the guide-blocks *g g' g²* held by proper cap-screws, as shown in Fig. 1. Each sliding head is formed on its inner end to receive its special tool to do its particular work, and said tools are held therein by means of the respective cap-plates K K' K² and a set of proper cap-screws, as shown.

The reciprocating head H is formed on its inner end to hold a cutting-punch, *d'*, as shown in Figs. 4 and 5, to cut off the nail from the end of the nail-strip N, the said punch being secured in the chuck *c* by a cap-plate, Z', and proper cap-screws.

Reciprocating head H² holds what may be termed the "head-upsetting punch" P, (shown in Figs. 1, 2, and 5,) for forming and upsetting the head of the nail and bending its hooked arms 4 4 to the form shown in Fig. 10, and reciprocating head H' holds the punch *a'*, which is for the purpose of grasping and holding the cut-off nail between it and the die *a* while punch P is doing its said work, and for giving the body of the nail a final squeeze to round and form it properly. These sliding heads and the toggle-joints that operate them are all essentially alike in construction and operation, so that a description of one will suffice for all. The outer links of the toggles are each pivoted to the top of the bed A, between the ear-lugs L, L', and L², respectively, by means of the pins *t t' t²*. (Shown in Figs. 1, 4, 5.) The inner links of each toggle are made in two parts, and connected by a shaft, such as is shown at 10, Fig. 11. These shafts are screw-threaded at one end to screw into one part of said link, such as is shown at 14 in said figure, and held in the other part of said link by means of a set-screw, such as is shown at *h²*, Fig. 11, passing through into an annular groove in the end of said shaft to

hold it in. Rotation of said shaft by means of a tool passed through a hole, o^2 , therein furnishes means for adjusting the respective sliding heads to set the special tool they bear to their work.

Fig. 11 is an enlarged view of one of the toggles, to give a clear idea of their construction.

Referring more particularly to said Fig. 11 for more details, S' is a pin that hinges the inner link to the sliding head. 12 is a set-nut to prevent unturning of the shaft 10. H' are a pair of ear-lugs, integral with the outer link, V^8 , between which a friction-roller, c' , is placed to ride over a cam-wheel below, and h is a pin to hold said roller. Each toggle is provided with all these same parts, so it is unnecessary to describe them in all the toggles. Each toggle is operated by means of a cam-wheel directly under the friction-rollers of the outer links. These several cams are shown in Figs. 4 and 5 at F , F' , and F^2 , and are all located on the shafting under the bed of the machine. The location of these shafts E , E' , and E^2 , under the machine is shown by the dotted lines in Fig. 1. They are hung in the hanger-boxes q , q' , q^2 , integral with the frame A , and are connected with each other by means of the bevel-gears W' , W' .

Power may be applied at the pulley w to drive the machine. Cam F is located on shaft E^2 under toggle T' . Cam F' is located on shaft E under toggle T , and cam F^2 is located on shaft E' under toggle T^2 . The friction-rollers c' , c^2 , c^3 of the toggles respectively ride on cams F' , F , and F^2 , as shown particularly in Figs. 4 and 5. The toggle-joints all fold downward, and the forms of the several cams give the proper reciprocating motion to the several sliding heads for the particular work each is to do. The coil-springs S^3 , S^4 , S^6 connect the frame A with the several toggles at or near their elbows, for the purpose of holding them down on their respective cams, and for returning the said sliding heads after they have severally performed their work. The toggle T operates the shear-punch d' , which is attached to sliding head H of said toggle, as is shown in Fig. 4. A chuck, c , is attached to said sliding head by means of the cap-plate and cap-screws K . The end of said chuck turns up at right angles to present a face for the said punch to stand against, and is held thereto by the cap-plate and cap-screws Z' . A set-screw, v , furnishes means for adjusting said punch. Said punch is provided on its front face with the flat spring S , firmly or adjustably secured thereto, as is shown in Figs. 3 and 4, which spring is for the purpose of holding the cut-off nail until it can be delivered by said punch into the space between the punch a' and die a . Said flat spring may be attached to the chuck, if desired, or may be substituted by any device that will accomplish the purpose. The cutting-die d is set in a recess, D' , in the bed A , as shown in Fig. 4, and is held therein by means of the plate d^2 and set-screws n and m^4 . Set-screw m^4 screws into a threaded nut or

block, m^5 , which presents a large bearing-surface on said plate, and heads against the depending lug A' , integral with the under side of bed A . A set-screw, v^2 , furnishes means for vertically adjusting said die d . Said die stands with relation to shear-punch d' as is shown in Figs. 2 and 3. The nail-strip N is fed up into the machine from below, as shown in Fig. 4, in the direction of the arrow 2. If the strip is long, it can come up from the pit 7 below. The nail-strip N passes up between the feed-rollers M , M' and between die d and plate d^2 , all of which are grooved and channeled to correspond in form to said nail-plate. The said feed will be more thoroughly described hereinafter.

The toggle T' operates the forming and grasping punch a' , which is attached to the sliding head H' by means of the cap-plate and cap-screws K' . This punch operates in connection with the stationary die a , secured on the top of the frame A by proper cap-screws. The relation of these two parts to each other is shown more clearly in Figs. 2 and 3. They perform the service of holding the cut-off nail between them in the grooves r , r' in their meeting faces (shown in Fig. 3) until the head of the nail can be upset by the punch P , and also to give a final squeeze to form the sides of the nail.

A set-screw m , Fig. 5, furnishes means for adjusting the die a , and the adjustable plate a^2 (shown in Fig. 2) furnishes a bearing or backing for punch a' , so punch P will not displace it or drive it to one side while upsetting the nail-head, and is made adjustable by means of the set-screw m through the flange n^3 of bed A .

Toggle T^2 operates the nail-head-upsetting punch P , which is attached to the sliding head H^2 of said toggle by means of the cap-plate and cap-screws K^2 , as shown in Fig. 5. This punch P is formed on its outer end so it will bend the shoulders 4 4 of the nail around the projecting shoulders D , D' of the die a and punch a' , as shown in Fig. 2, to form them into hooks, as shown in Fig. 10, and also to upset the head of said nail, as shown at 3, Fig. 10, so as to furnish means for withdrawing the nail from a post with a claw-hammer.

Figs. 2 and 3 are made to show more particularly the relative position of the punches and dies with each other, and the manner in which the nail is cut and formed. The shear-punch a' and die d have shear-edges for shearing off the nail as the plate N is fed up between them. They are each channeled, so as to conform to the shape of said nail-strip, and set so they begin to shear the point of the nail a little before the head is sheared off.

In order to so shear off a nail, the toggle T is straightened by means of cam F' , and moves the shear-punch d' forward over the top of the die d in the direction of the arrow 3*, Fig. 2, carrying the cut-off nail with it under spring S , to hold it down until the nail drops between punch a' and die a , as shown in Fig. 2 by the

dotted lines, while the upsetting-punch P is in the position shown by the dotted lines in said figure, when the toggle T' straightens, by means of cam F, and drives punch *a'* forward to grasp the cut-off nail between it and die-plate *a* in the grooves *r r'* (shown in Fig. 3) and hold it, as shown in Fig. 2. When the nail falls between punch *a'* and die *a*, the point is caught on the dowel-pin D'' and its head on the flat spring *v'*. (Shown in Figs. 2 and 5.) Said spring is attached at its rear end to the top of the bed A, under punch P; as shown in said figures. After the punch *a'* and die *a* have so closed on the nail, toggle T' straightens by means of cam F', and drives the upsetting-punch P forward against the head of the nail. The form of its end is such that it drives the nail forward and bends its shoulders over the shoulders D D', and forms hooks 4 4, (shown at Fig. 10,) and also flattens or upsets the head, as shown in said figure at 3. The form of cam F' is such that it causes punch P to be driven forward with great force against the nail-head, something like a hammer-stroke.

The form of cam F is shown more particularly in Fig. 7, and is such that it causes punch *a'* to move forward instantly after the nail has been delivered in between punch *a'* and die *a*, and simply holds it firmly until its head is upset, when the form of said cam causes it to move farther forward and then instantly recede, which second forward movement forms the body of the nail into a rounded or any other form desired. When said punch *a'* recedes, the nail instantly drops head first, and passes out of the machine through the spout *o*. (Shown in Figs. 4 and 5.)

The initial forward move of sliding head H of toggle T only serves to shear off the nail from the upper end of the nail-strip, as stated. In order to move said sliding head farther forward to deliver the nail between punch *a'* and die *a*, the outer end of the outer link of said toggle is slotted, as shown at B, Fig. 4, so it can move forward on pin *t*. A strap, B', is attached to the under side of said sliding head, and is connected by means of the link B' to the upper end of the vertical arm of bell-crank B'. The other arm of said bell-crank extends along the side of cam F', so that the extending pin *p* (shown more clearly in Fig. 8) on the side of said cam may engage with said horizontal arm of said bell-crank to raise it, and by such connection with sliding head H move it forward far enough to deliver the nail, as stated. The machine thus automatically cuts and forms such a nail as is shown in Fig. 10 from a strip of metal formed as shown in Fig. 9.

The feed mechanism for feeding in the nail-strip N consists of a pair of rollers, M M', having their faces formed to correspond in shape to the nail-strip, as shown in Fig. 6, and are placed on the shafts *e* and *e'*, respectively, and attached to the machine by the hangers R' R', directly under the punches and dies where the nail is formed. These shafts are

connected at one end by cog-wheels 8 8' of equal diameters; so that one shaft will drive the other at the same speed. The feed-rollers rotate intermittently by means of a ratchet. (Shown in Figs. 6 and 4.) The shaft *e* has a lever, *y*, sleeved loosely on over it and standing by the side of the ratchet-wheel R', keyed to said shaft. A pawl, *x*, attached to said lever, engages with the teeth of said ratchet. The arm *y* of the ratchet-feed is connected with the reciprocating box R by means of the pitman P'. Said box is provided with a rectangular slot through which shaft E passes. The height of said slot corresponds with the diameter of said shaft. The length of said slot is greater than the diameter of said shaft, so that said box may have a horizontal reciprocating motion on it. A cam, F', is keyed to said shaft and stands at the side of said box between a pair of its integral flanges, as shown in Fig. 4, and particularly in Fig. 6. A collar, *z'*, keyed on said shaft on the opposite side of said box from said cam, holds said box up in position at the side of said cam. When said cam rotates, it alternately engages with the flanges on the side of said box, and thereby reciprocates said box and shaft P' connected with arm *y*, and intermittently rotates said feed-rolls M M', for the purpose herein specified.

The special form of the cams F and F' is shown in Figs. 7 and 8, to more clearly illustrate their relative position and operation. The arrows indicate the direction in which they rotate. Cam F' is so formed that when the friction-roller *c'* of the toggle T is at the point 1, Fig. 8, the said toggle will be folded so as to move head H back, so the nail-strip N may be fed up far enough for a nail. While F' rotates from 1 to 2, cam F will be in such position that the friction-roller of toggle T' will be at 3, Fig. 7, having moved its head far enough forward to grasp the nail between punch *a'* and die *a*. While cam F' rotates from 2 to 3 its eccentric surface between those two points causes the punch *d'* to cut off a nail from the upper end of nail-strip N. While cam F' is thus rotating cam F is on its way from 3 to 4, and simply holds the nail between punch *a'* and die *a*. When it rotates to point 5, it raises toggle T' to give a final pinch or squeeze on the body of the nail, as stated, on account of the cam eccentric surface between 4 and 5. This is done at the instant punch *d'* is shearing off the head of a new nail. The cams are all timed so that the heavy work of cutting off the thick end of a new nail, forming the body properly, and upsetting the head, is all done at the same instant, so that each operating part operates to back up and re-enforce the others. The rotation of cam F from between 5 and 6 to 1 opens punch *a'* to permit the finished nail to fall, and permits it to remain open until a new nail is placed in between it and die *a*. When cam F' has rotated to point 3, the nail has been sheared off from the upper end of the nail-strip N, and while it

continues to rotate from 3 to 4 it simply holds toggle T up straight, while the bell-crank B³ carries head H² forward to deliver the nail between punch a' and die a, and when it rotates from 4 to 1 it permits said toggle to again fold and slide head H back, ready to perform another like operation.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows, to wit:

1. In the machine described for making nails, the combination, with the bed A, of the dies d and a, punches d' a', and means for operating them and feeding in the nail-strip N, as and for the purpose set forth.

2. In the machine described for making nails, in combination with the bed A, the sliding head H, arranged to hold the cutting-punch d' by means of the chuck c, toggle-joint T, having the slot B in its outer link, cam F', having the pin p, spring S³, shaft E, bell-crank B³, link B², strap B', and die d, all adapted to operate as and for the purpose set forth.

3. In the machine described for making nails, in combination with the bed A, the sliding head H', arranged to hold the punch a', toggle-joint T', cam F, shaft E², spring S⁴, and die a, all adapted to operate as and for the purpose set forth.

4. In the machine described for making nails, in combination with the bed A, the toggle-joint T², sliding head H², arranged to hold the punch P, punch a', die a, cam F², shaft E', and spring S⁶, all adapted to operate as and for the purpose set forth.

5. In the machine described for making nails, the combination of the dies a d, punches d' a', spring v', and dowel-pin D'', as and for the purpose set forth.

6. In the machine described for making nails, the combination of the punch a', having

the shoulder D' and groove r', die a, having the shoulder D and groove r, punch P, and means for operating said punches and dies, as and for the purpose set forth.

7. In the machine described for making nails, the spring S, for holding the cut-off nail until it is delivered to the formers, in combination with the punch d', die d, chuck c, and means for operating said parts, as and for the purpose set forth.

8. The combination of the bed A, shafts E, E', and E², drive-pulley w, toggle-joints T T' T², having the sliding heads H H' H², friction-rollers c c' c², and screw-threaded shafts 10 respectively, punches d', a', and P, dies d and a, coil-springs S³ S⁴ S⁶, cams F F' F² F³, bell-crank B³, connecting-shaft P', lever y, ratchet R², pawl x, rack R, feed-rollers M M', and means for securing said punches and dies, as and for the purpose set forth.

9. In the machine described for making nails, the combination of the toggle-joints T T' T², friction-rollers c c' c³, shafts E E' E², and bed A, all adapted to operate as and for the purpose set forth.

10. In the machine described for cutting and forming nails, the toggle-joint, constructed substantially as shown, consisting of a rear joint hinged to the bed-frame at its outer end and to an inner joint at its inner end, and having a pair of downwardly-projecting ear-lugs for the support of a friction-roller, and an inner joint hinged at one end to the inner end of the outer joint and at the other end to a working sliding head, and having an intermediate screw-threaded shaft for the adjustment of the working-head, as and for the purpose set forth.

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