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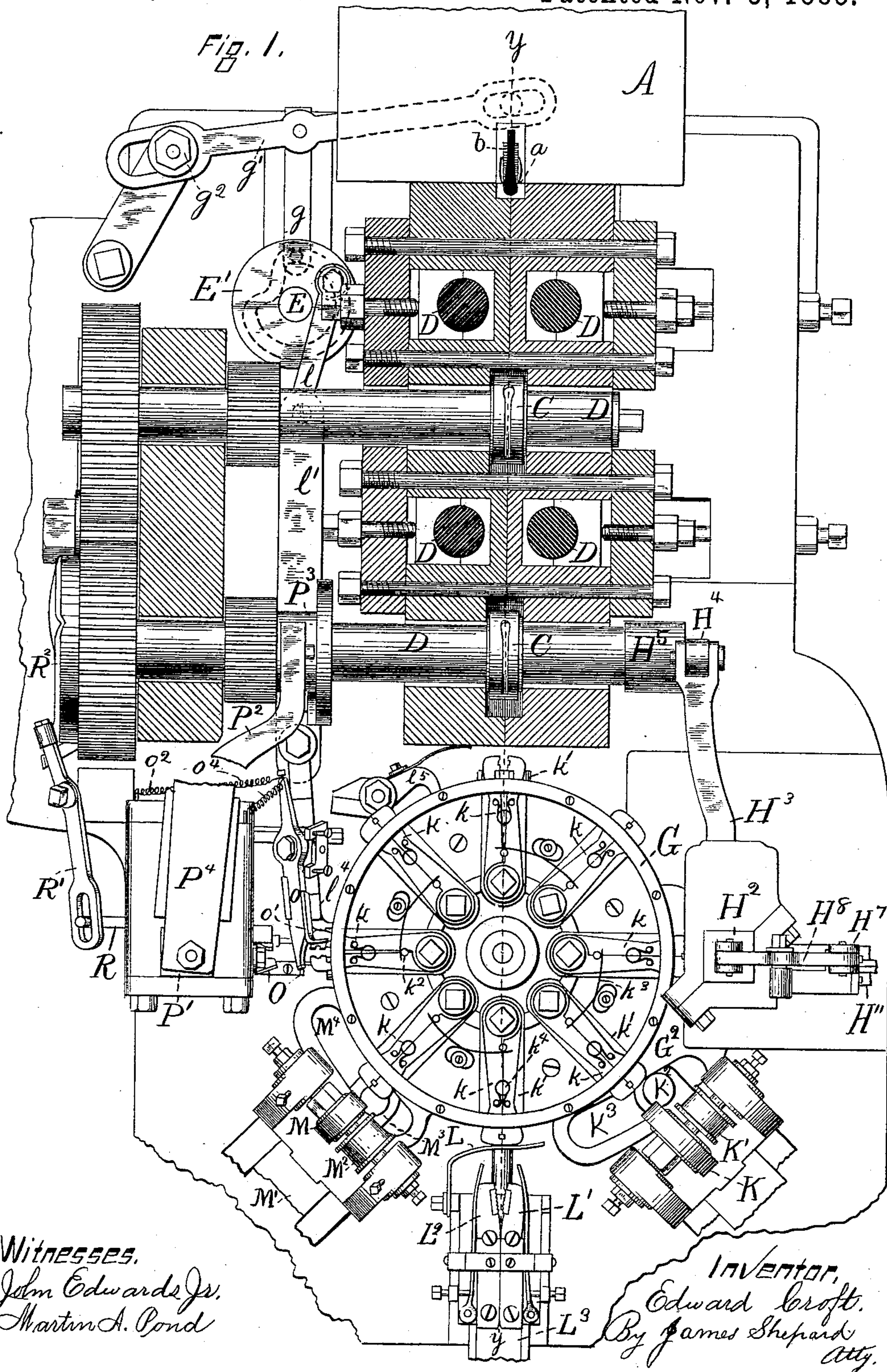
E. CROFT, Dec'd.

M. CROFT, Administratrix.

MACHINE FOR FINISHING HORSESHOE NAILS.

No. 329,538.

Patented Nov. 3, 1885.



Witnesses.
John Edwards Jr.
Martin A. Pond

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Edward Croft.
By James Shepard
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(No Model.)

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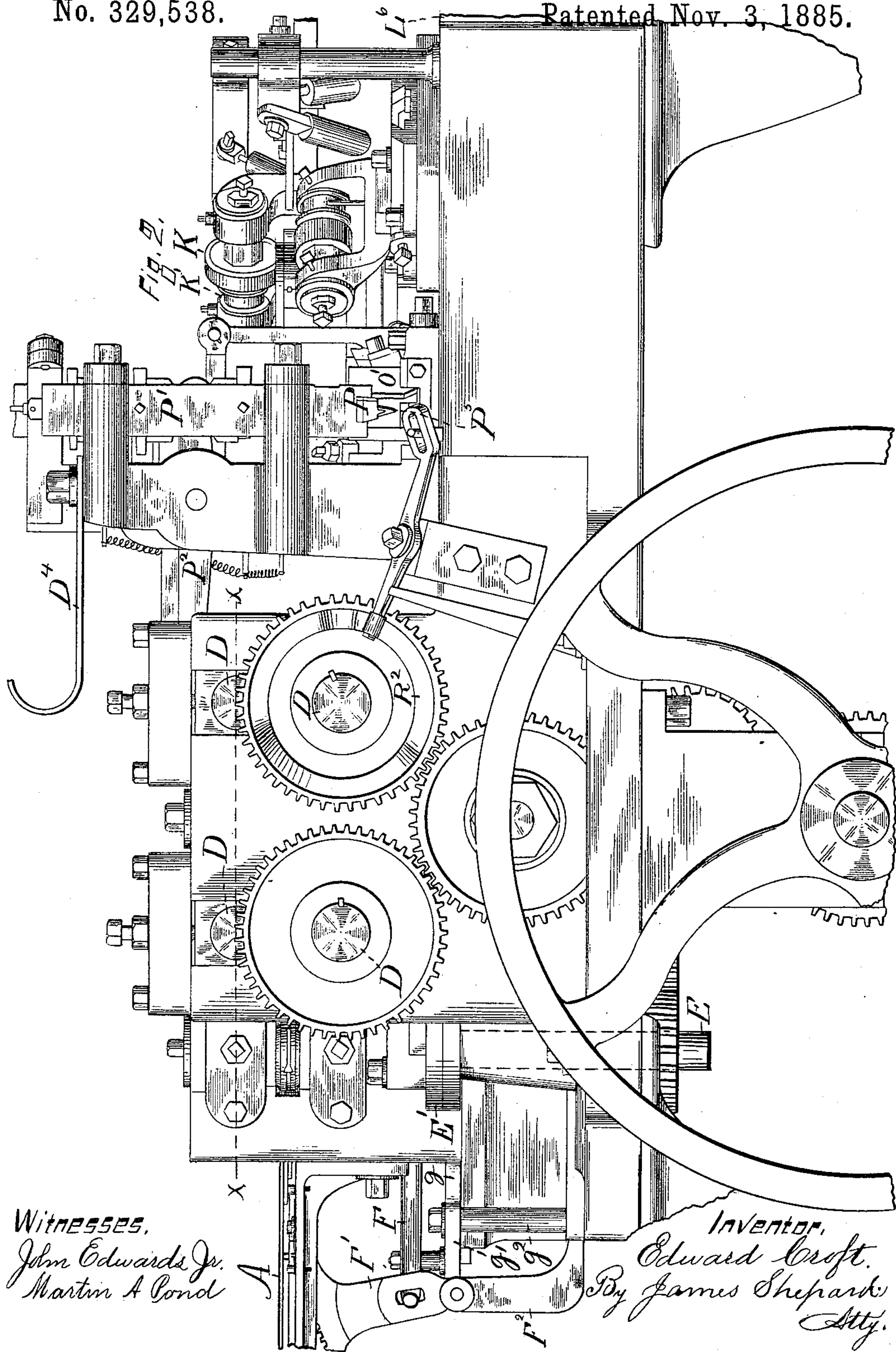
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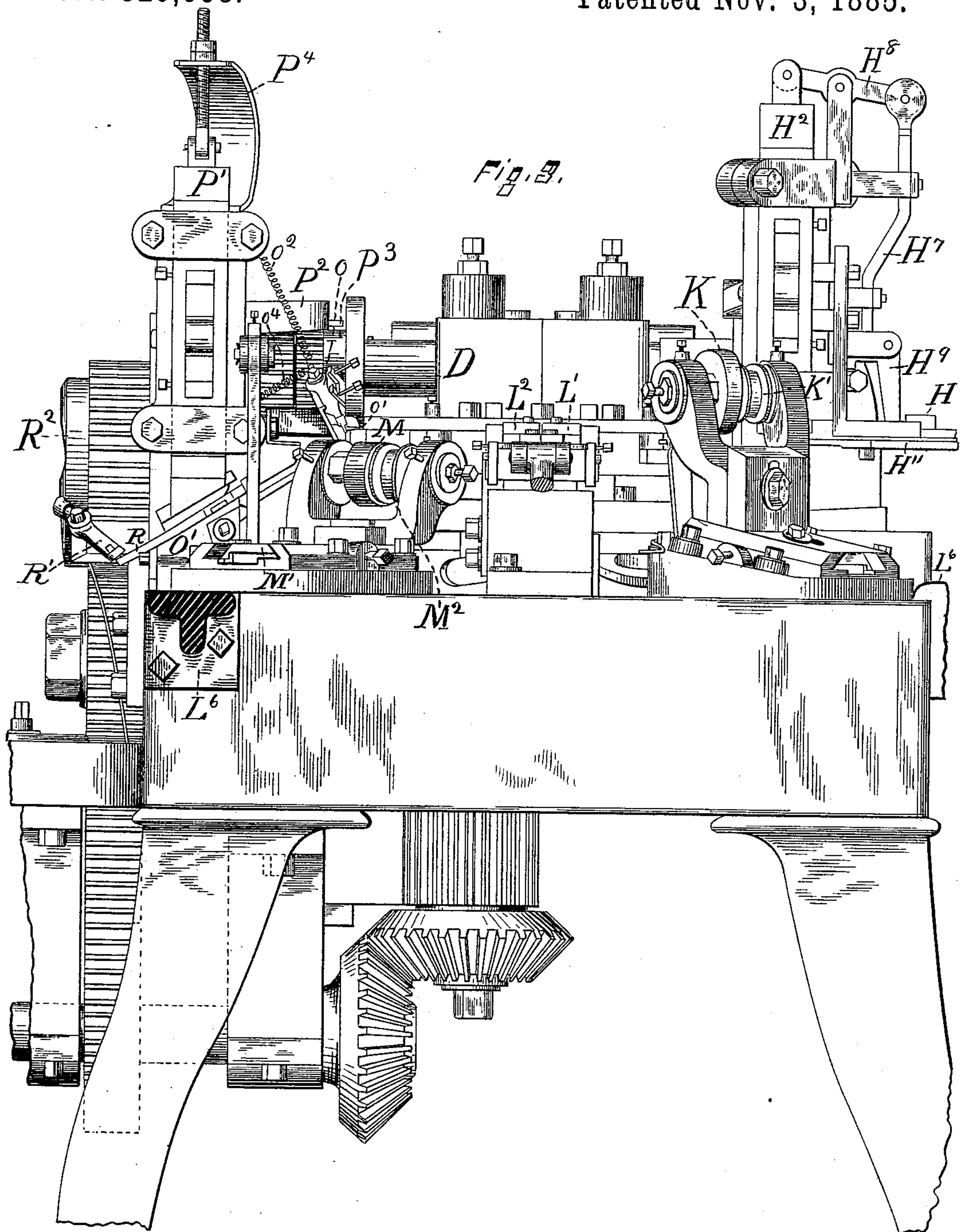
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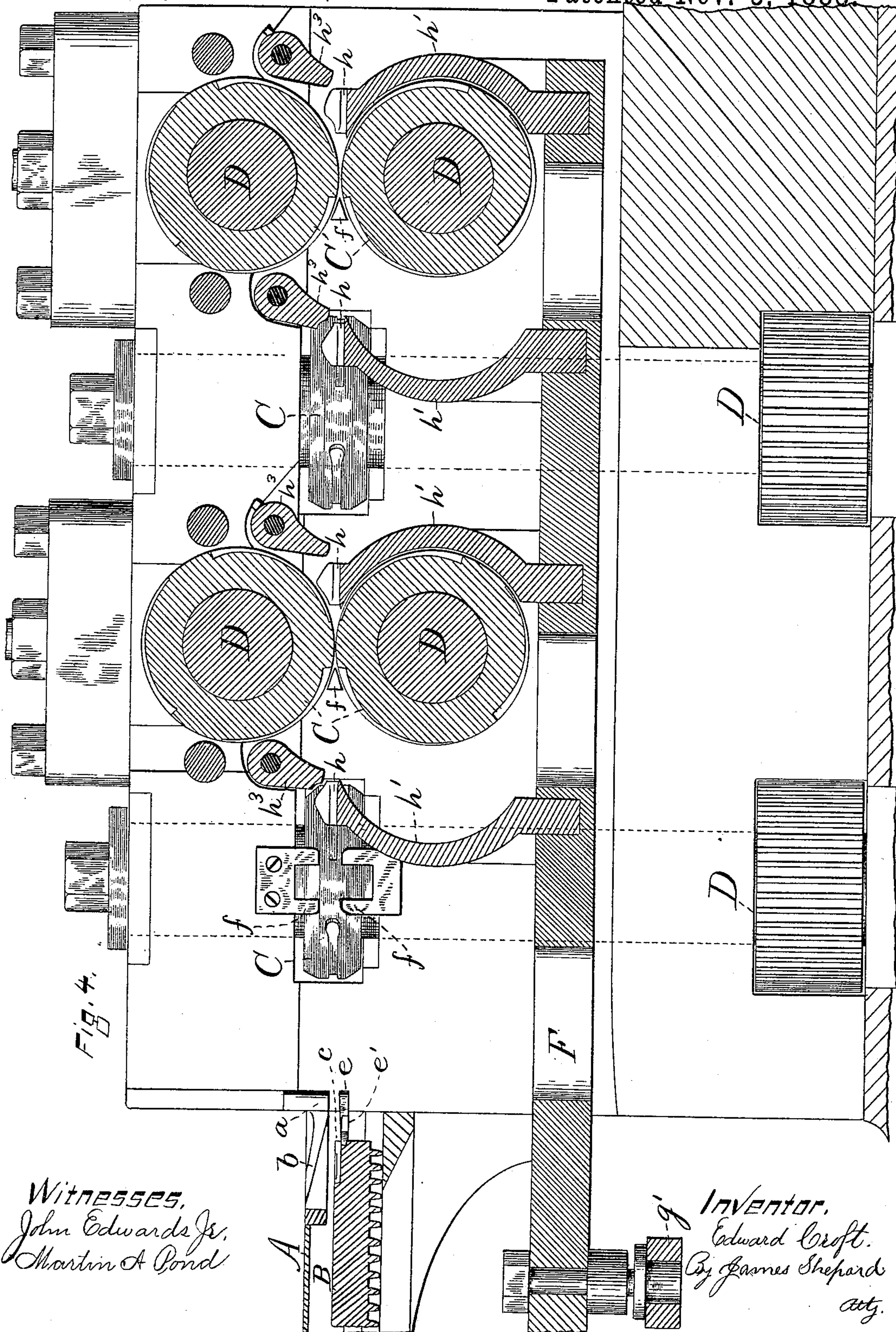


Fig. 4.

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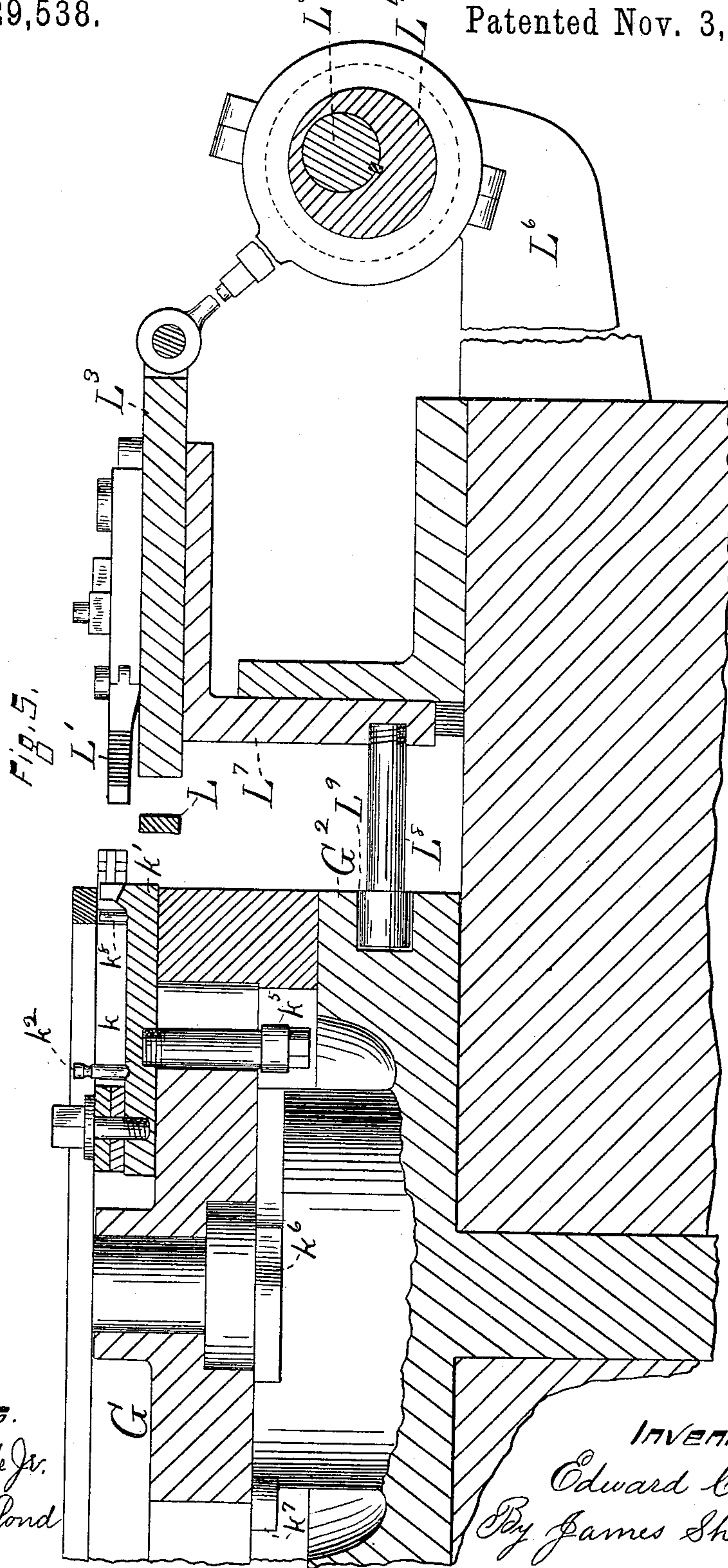
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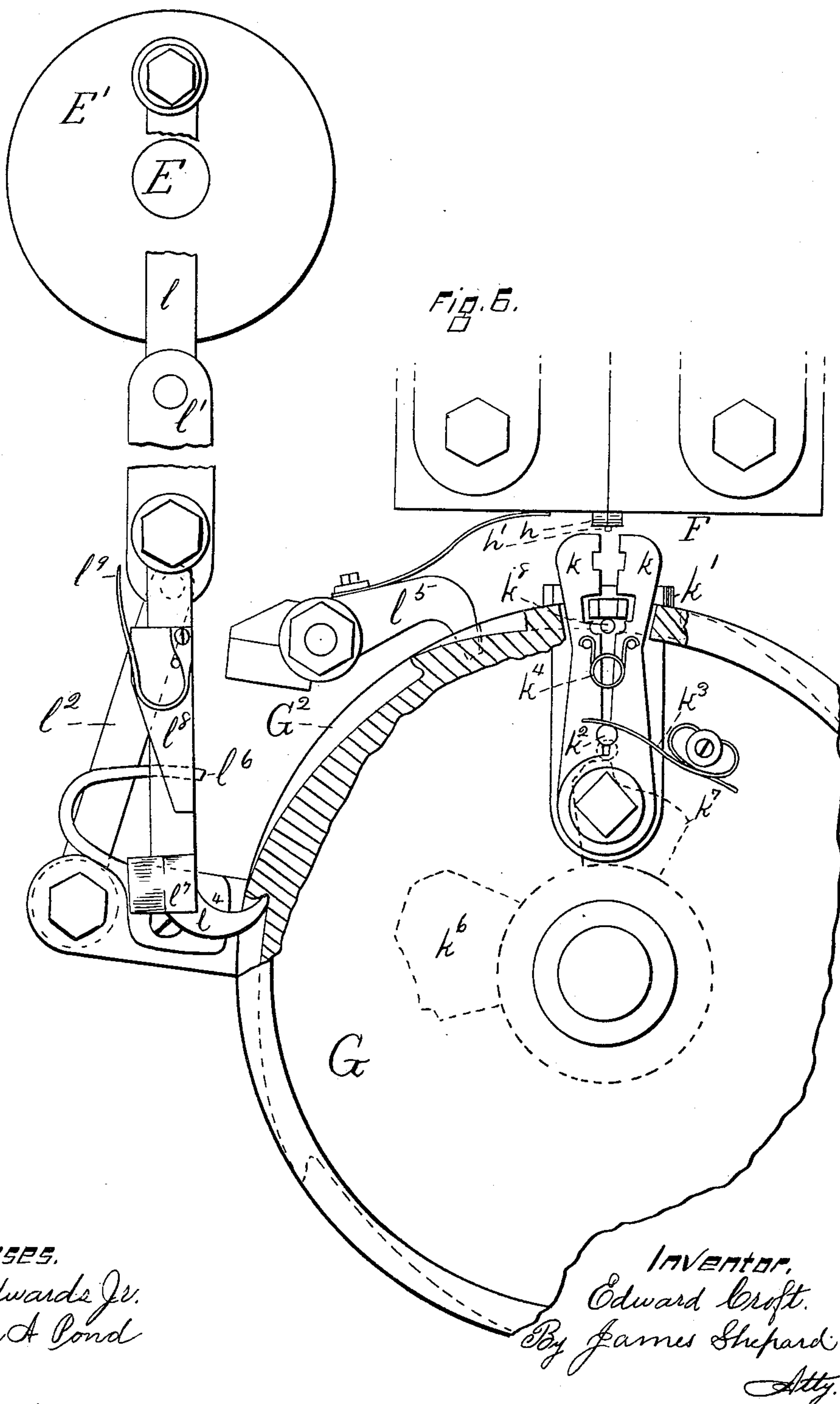
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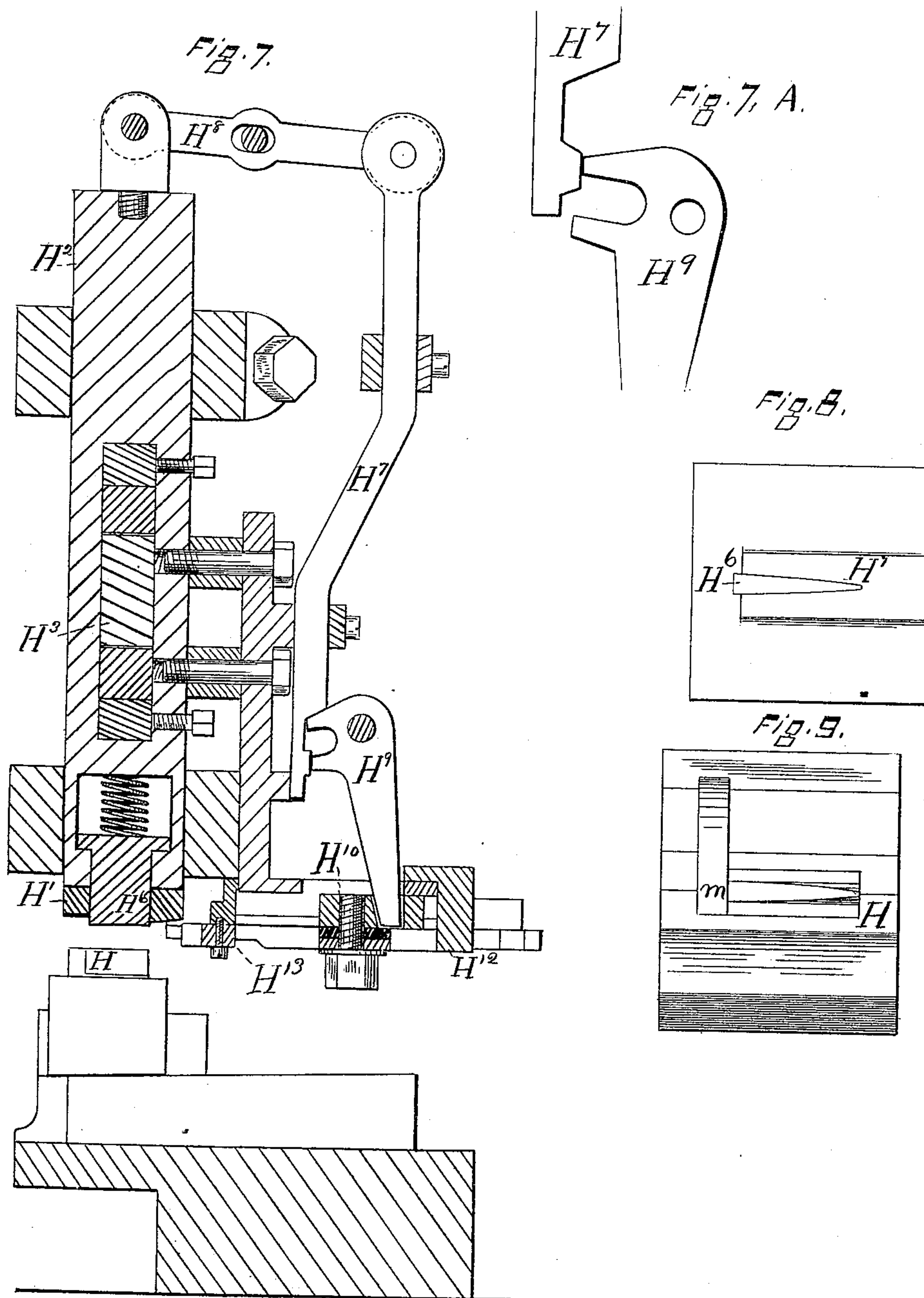
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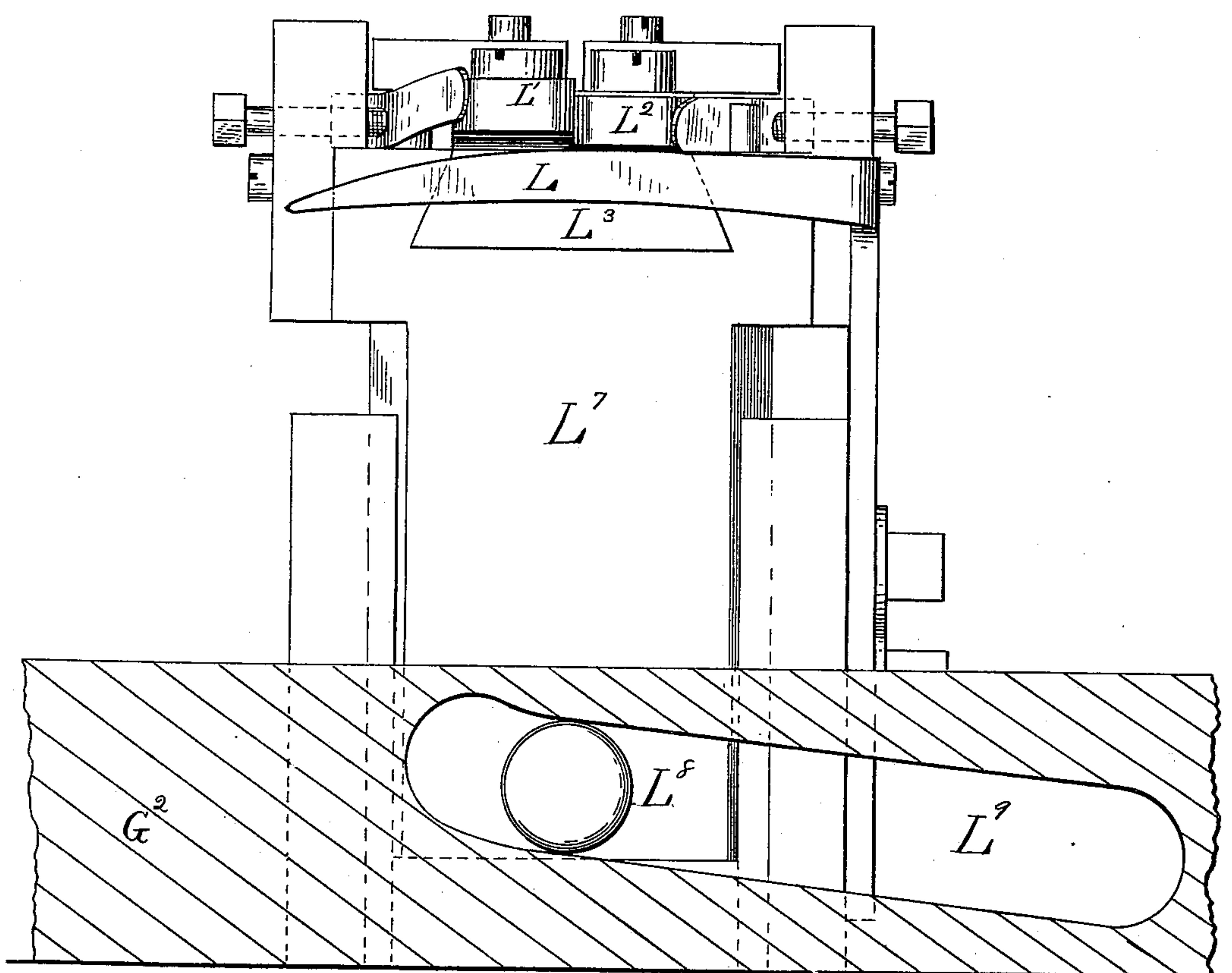
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Fig. 10.



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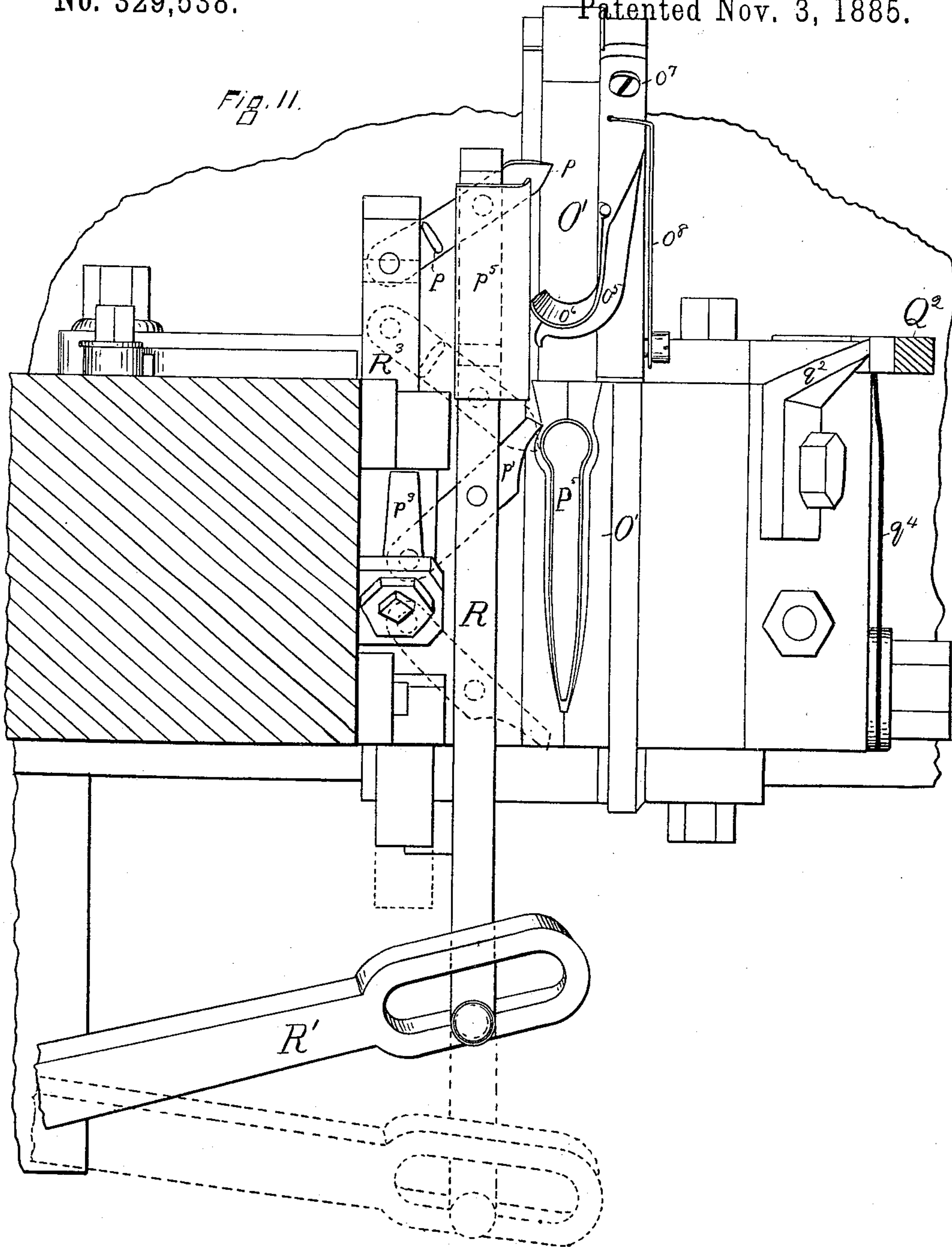
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Fig. 11.



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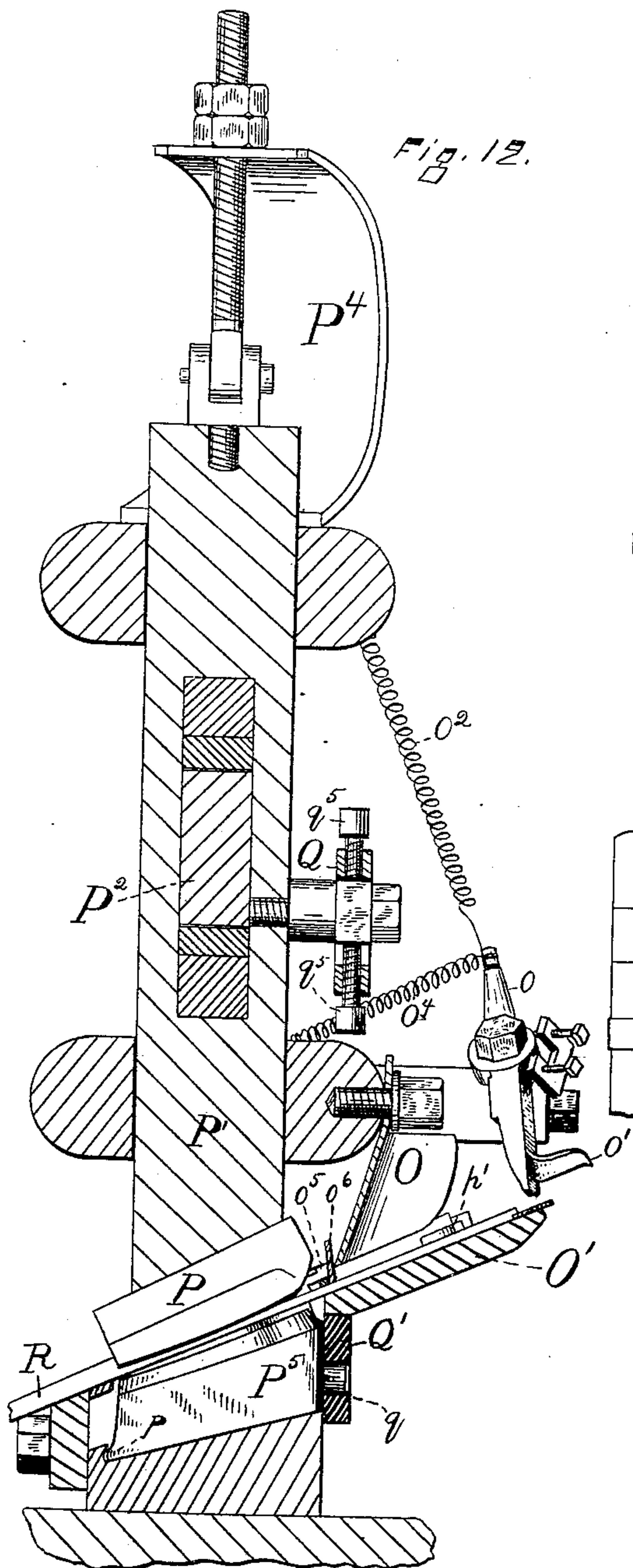


Fig. 12.

Fig. 13.

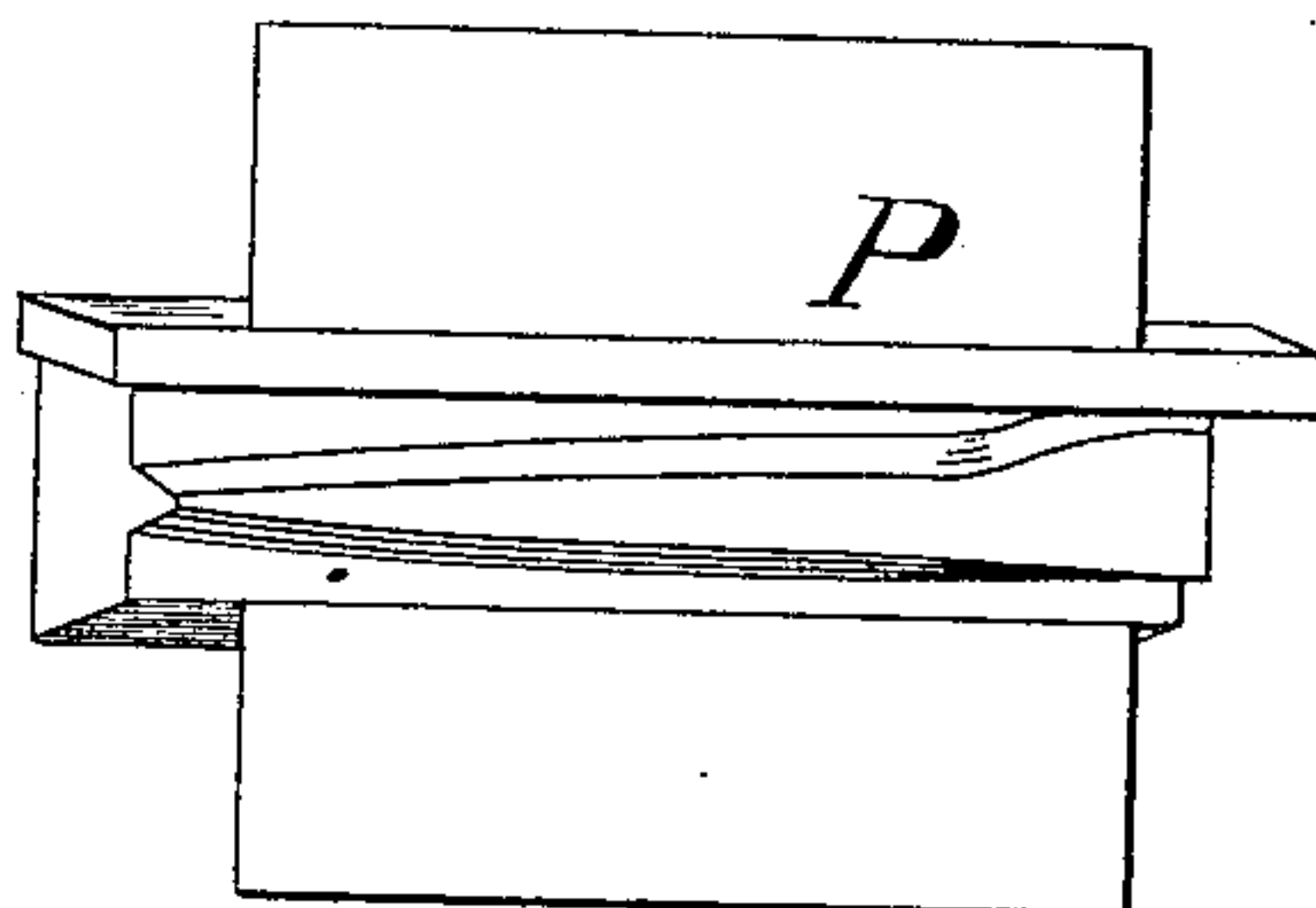


Fig. 14.

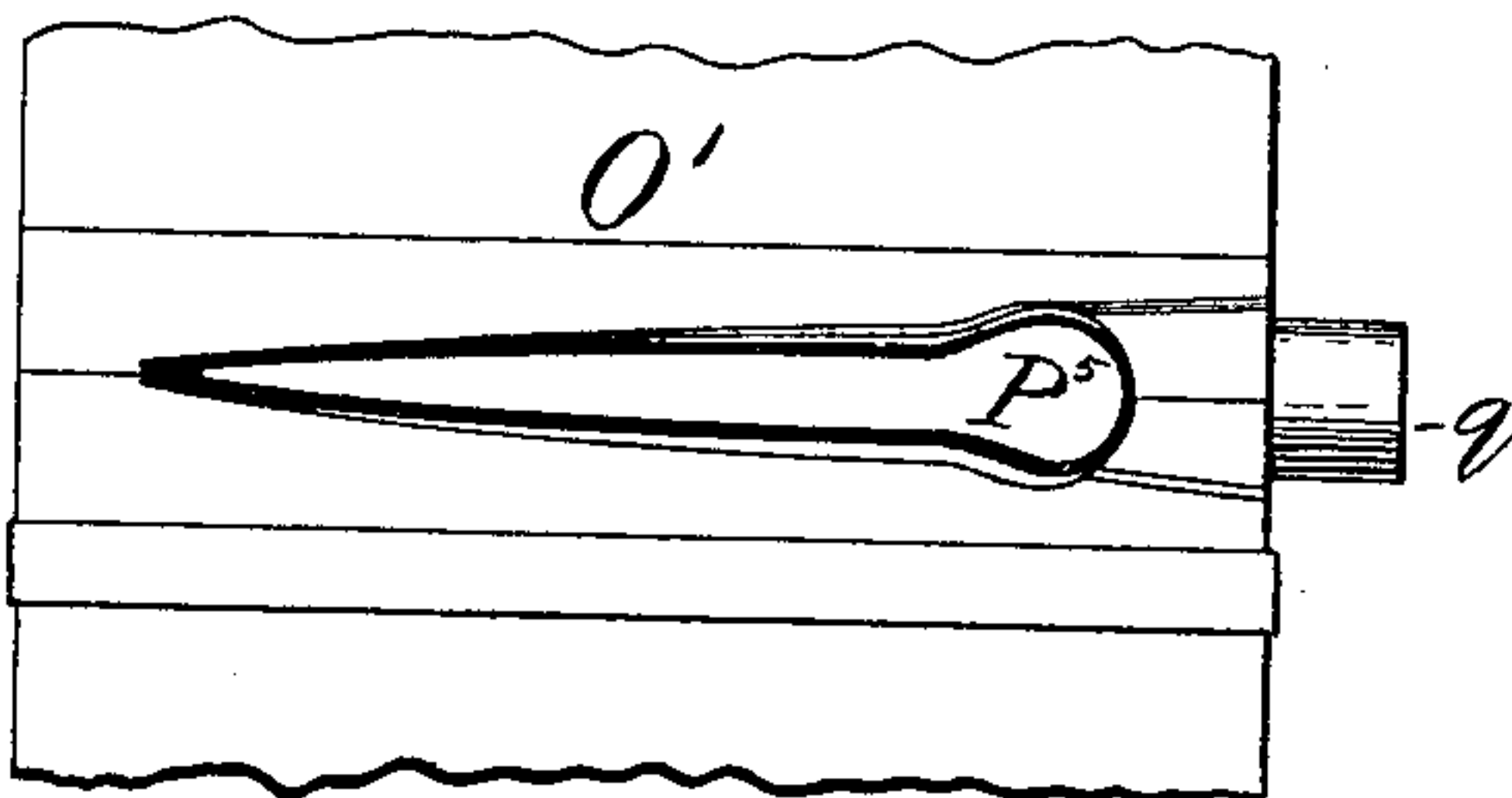
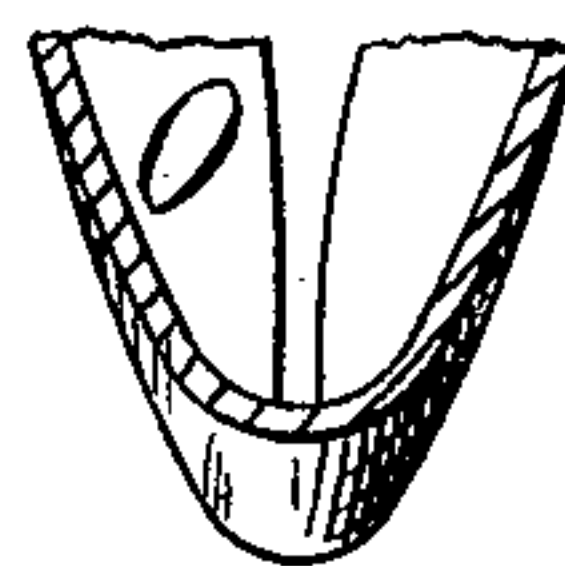


Fig. 14, A.



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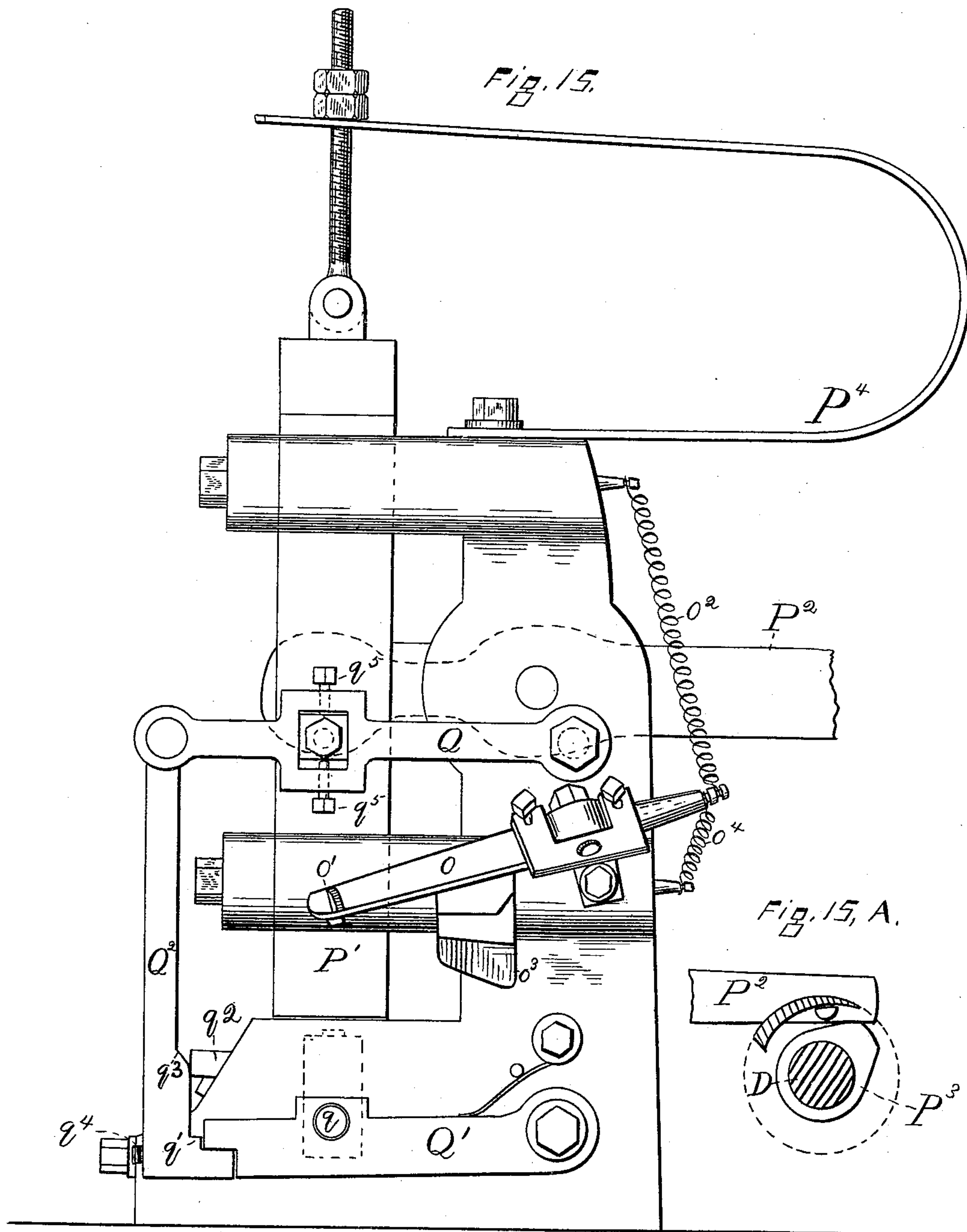
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Fig. 16.

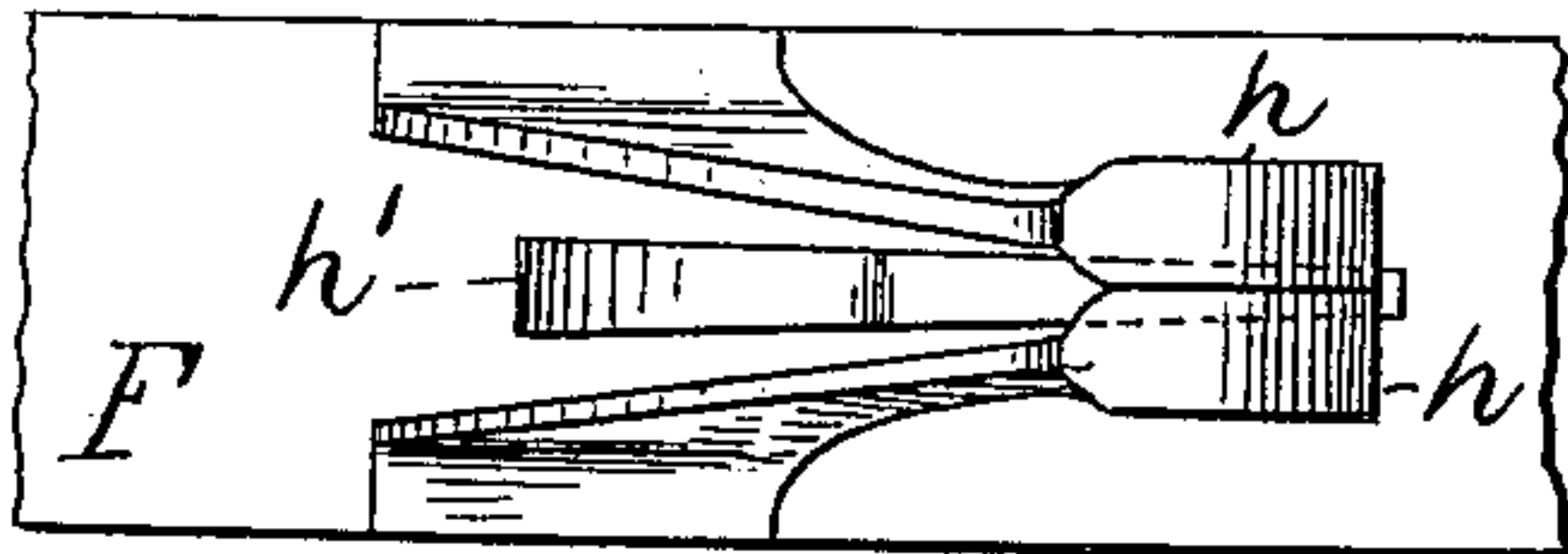


Fig. 17.

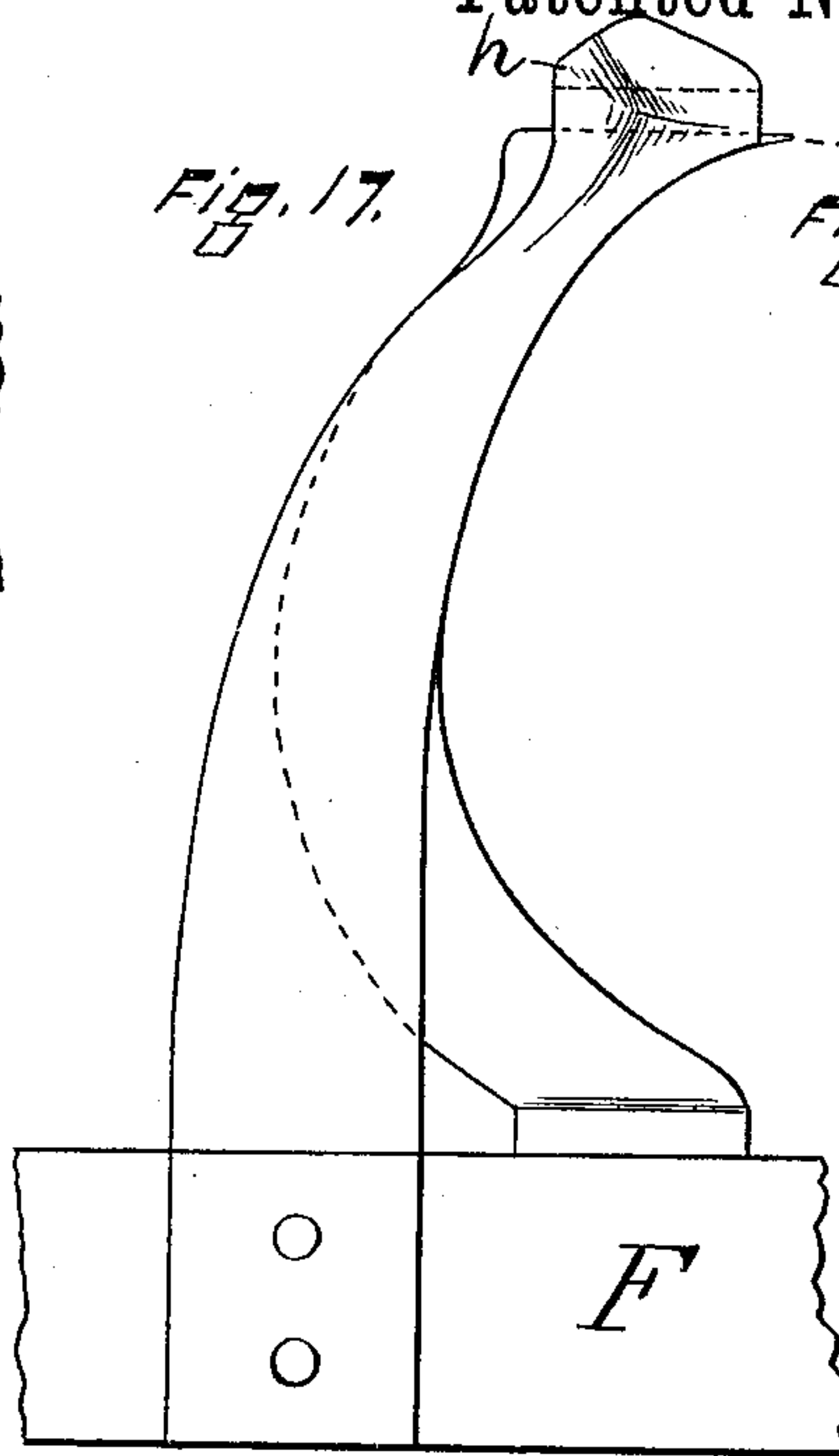


Fig. 18.

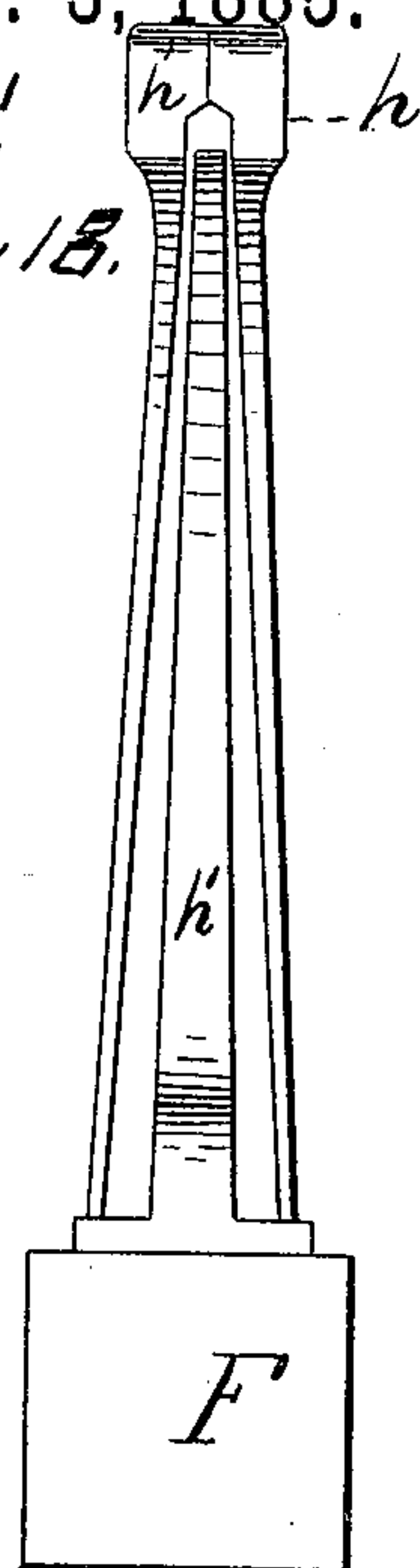


Fig. 19.

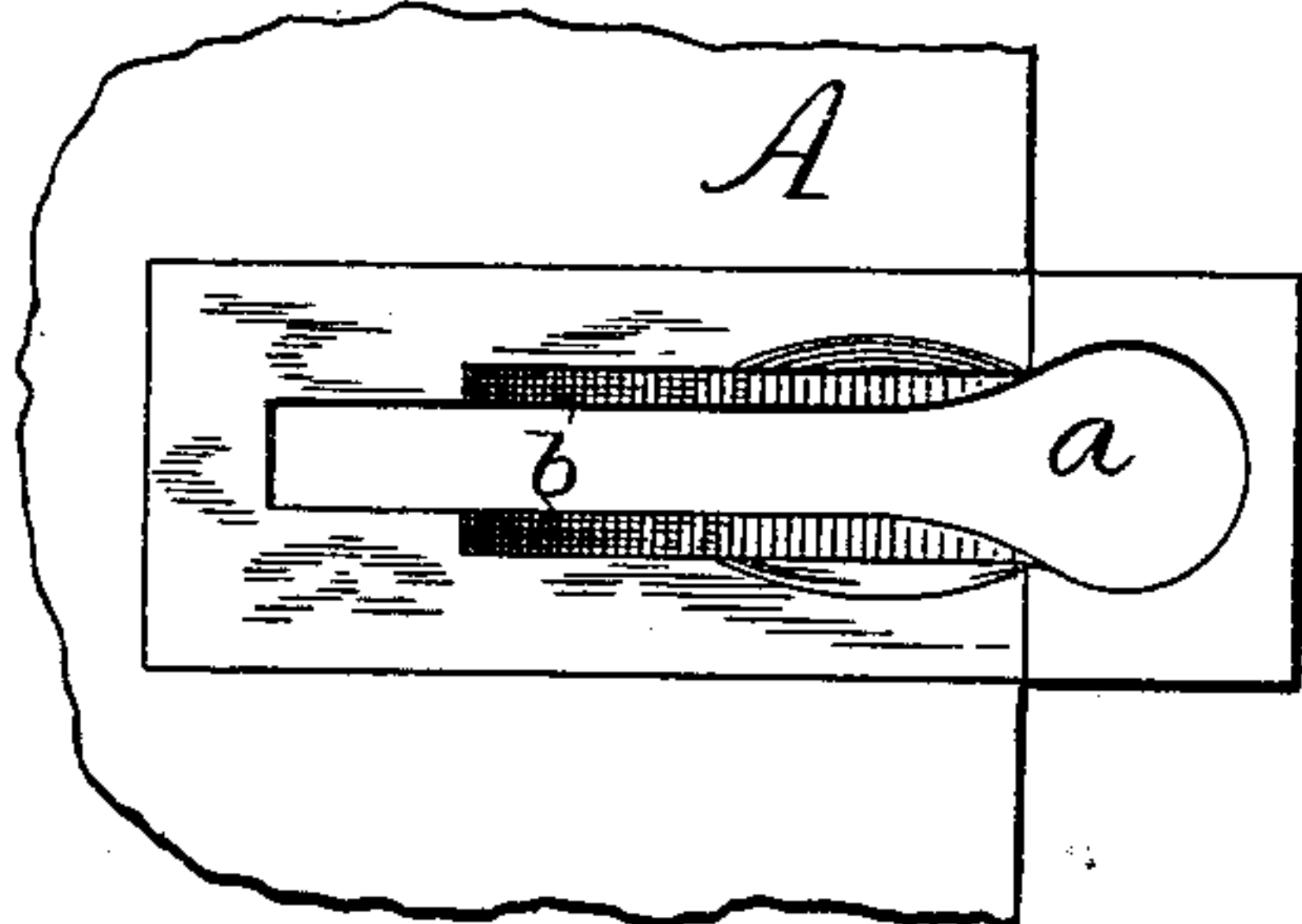


Fig. 20.

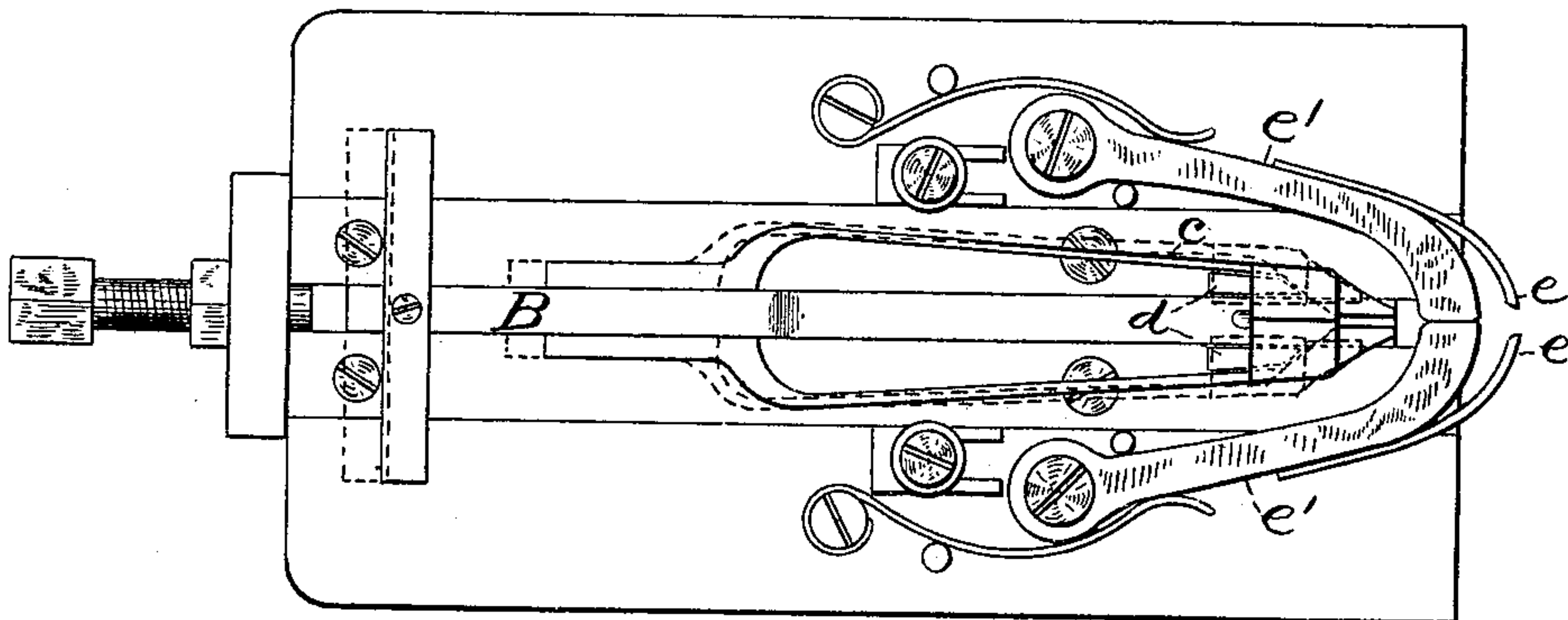
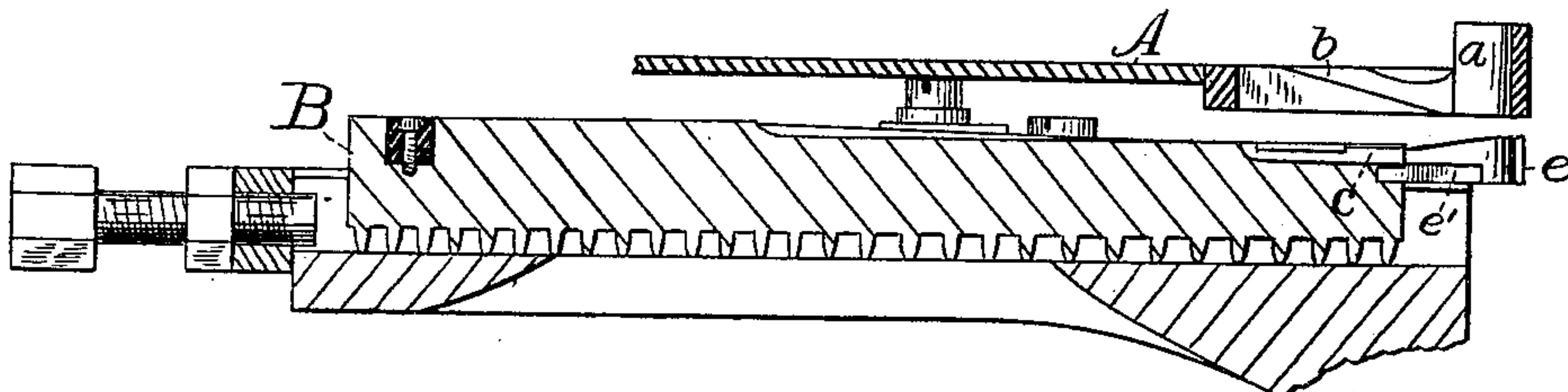


Fig. 21.



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(No Model.)

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Fig. 22.

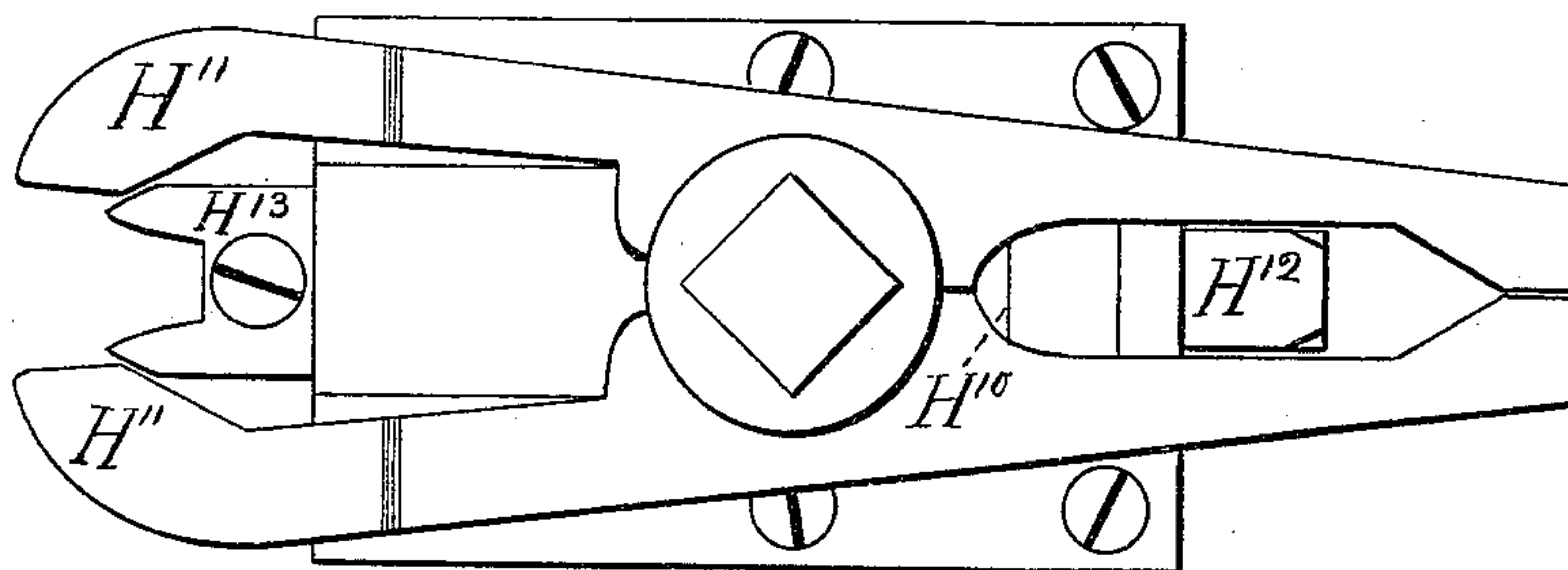


Fig. 23.

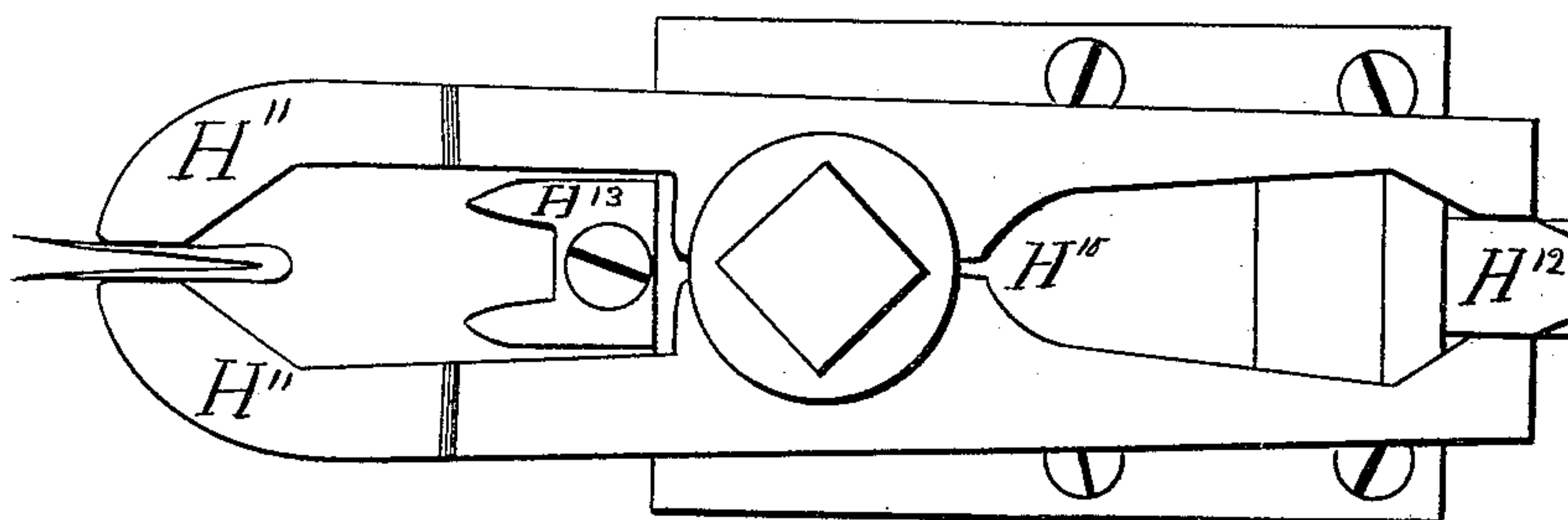
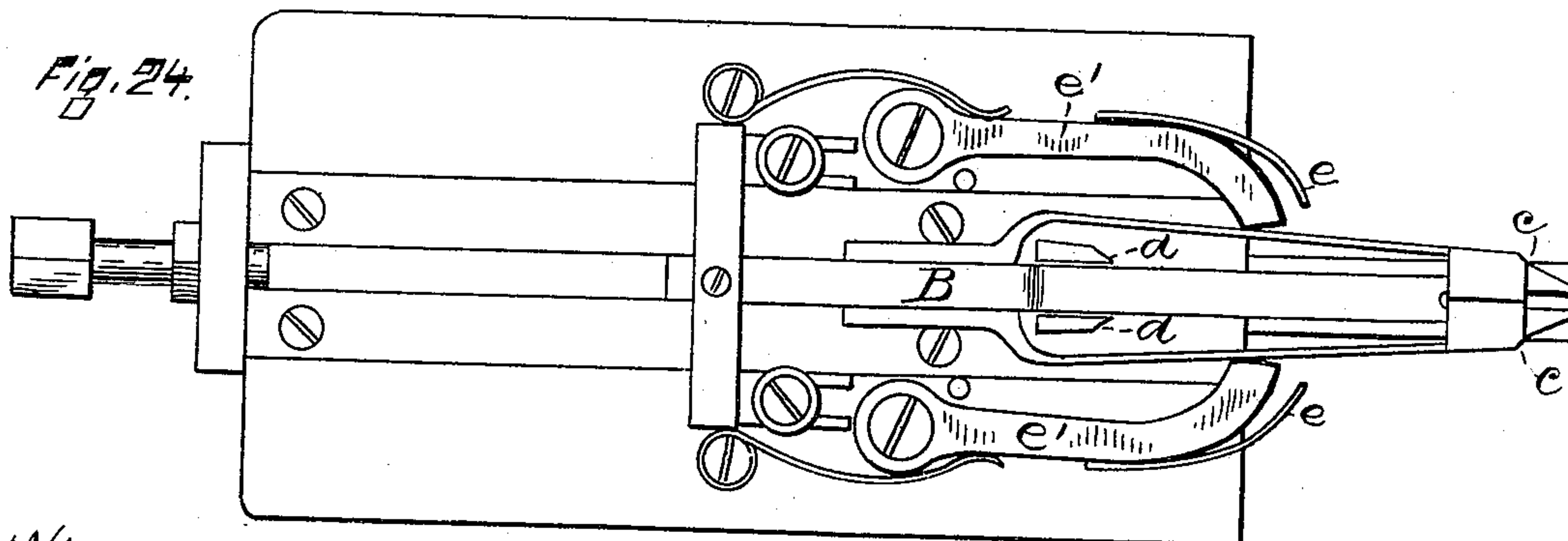


Fig. 24.



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By James Shepard atty.

UNITED STATES PATENT OFFICE.

EDWARD CROFT, OF WATERBURY, CONN.; MARGARET CROFT (ADMINISTRATRIX OF SAID EDWARD CROFT, DECEASED) ASSIGNOR TO JAMES SHEPARD, OF NEW BRITAIN, CONN.

MACHINE FOR FINISHING HORSESHOE-NAILS.

SPECIFICATION forming part of Letters Patent No. 329,538, dated November 3, 1885.

Application filed January 5, 1885. Serial No. 151,983. (No model.)

To all whom it may concern:

Be it known that I, EDWARD CROFT, a citizen of the United States, residing at Waterbury, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Machines for Finishing Horseshoe-Nails, of which the following is a specification.

My invention relates to improvements in machines for finishing horseshoe-nails. In my machine the nails, after forging, are passed one by one through a hole in a table, and then, by means of a series of fingers, passed through a series of rolls for cold-rolling and delivered to jaws with-
in an intermittently-revolving head. Then they are presented to punching mechanism, which trims the point, then to an emery or grinding wheel, which grinds the upper side of the nail at the point, then to a reciprocating burr or file, which smooths off the edges, then over another polishing or grinding wheel to remove any burr and smooth the under side of the nail-point, and, finally, they are driven into a die to straighten them edgewise and curve them flatwise, and then they are discharged from the machine.

The objects of my invention are to thus finish nails automatically and to finish them well; and the invention consists in the mechanism and mechanisms which I employ for this purpose, either for all of the several operations named or for any number less than the whole.

In the accompanying drawings, Figure 1 is a partial horizontal section on line *xx* of Fig. 2, together with a plan view of the main parts of my machine. Fig. 2 is a side elevation of the same. Fig. 3 is a rear elevation, but with a rear driving-shaft removed in order to more clearly represent the other parts. Fig. 4 is a vertical section through the series of roller-dies, the plane of section being indicated by line *yy* in Fig. 1, said figure being represented upon twice as large a scale as the preceding figures. Fig. 5 is a vertical section, partly in elevation, of the rear part of the machine, taken upon the same line *yy* of Fig. 1, and represented upon a scale twice the size of Fig. 1. Fig. 6 is a partial horizontal section and plan view of one pair of jaws, the intermittently-revolving head, oscillating plate, and

mechanism for driving the same, the parts being represented upon the same scale as in Figs. 4 and 5. Fig. 7 is a central vertical section, partly in elevation, on the same scale as Fig. 6, of the mechanism for trimming the points of the nails. Fig. 7^A is a detached side elevation of the slide *H*⁷ and angle-lever *H*⁹, the same being represented with the slide at the upper end of its stroke and upon a scale four times as large as that employed in Fig. 1. Fig. 8 is a reversed plan view of the trimming-die. Fig. 9 is a plan view of the punch belonging thereto, said figures being represented upon a scale four times the size of Fig. 1. Fig. 10 is a front elevation or end view of the jaws for filing the edge of the nail, and a vertical section of the oscillating cam-plate for raising and lowering said jaws, the parts being represented upon the same scale as in Figs. 8 and 9. Fig. 11 is a partial section and plan view, upon the same scale, of the die for straightening and curving the nail. Fig. 12 is a vertical section, partly in elevation, of said die and its punch, said parts being represented on a scale twice that of Fig. 1. Fig. 13 is a reversed plan view of the punching and swaging tool. Fig. 14 is a plan view of the die belonging thereto, said parts being represented upon a scale four times as large as that of Fig. 1. Fig. 14^A is a horizontal section, upon the same scale, of one of the guides belonging to said die. Fig. 15 is a side elevation showing mainly the mechanism for lifting the swaging-die follower, the parts being represented upon the same scale as in Fig. 12. Fig. 15^A is a side view of the end of the operating-lever and its cams, represented upon the same scale as the parts in Fig. 1. Fig. 16 is a plan view of one pair of conveying-fingers which operate in connection with the roller-dies. Fig. 17 is a side elevation of the same. Fig. 18 is a front elevation of the same. Fig. 19 is a plan view of the table and the orifice through which the nails are inserted into the machine, said Figs. 16, 17, 18, and 19 being represented upon a scale four times as large as that of Fig. 1. Fig. 20 is a plan view of the conveyer which first receives the nails from the table, Fig. 19. Fig. 21 is a central vertical section of the same, partly in elevation, together with the table, Fig. 19, in proper

position over the same, the parts in these Figs. 20 and 21 being represented upon a scale twice the size of that of Fig. 1. Fig. 22 is a reversed plan view of the mechanism which gages the points of the nails for trimming and which carries the punchings away from the die. Fig. 23 is a like view of the same parts represented as at the other end of their stroke, said parts being represented upon a scale four times the size of that employed in Fig. 1; and Fig. 24 is a plan view of the parts represented in Fig. 20, upon the same scale, but in another position of their movement.

The nails, after having been forged previously by any suitable machine, are placed promiscuously upon the table A, and are dropped one by one through the orifice *a* by slipping them head first down upon the inclines *b*, Figs. 19 and 21, whereby they cannot fall through the table until their heads slip off the lower ends of the inclines *b*, at which time the point of the nail will be carried so far forward as to be brought over the space between said inclines, whereby the nail falls flatwise through the table. A pair of spring-jaws, *c*, Figs. 20, 21, and 24, are secured to a reciprocating rack, B, and when drawn back into the position represented by the broken lines in Fig. 20, the jaws are forced open by means of the inclined lugs *d*. The nail falls with its body between these jaws, and with its head just inside of the gages *e*, with the flat side of the head resting upon the pivoted jaws *e'*. These gages *e* prevent the nail from jumping forward too far as it drops through the table. As the rack moves forward, the jaws *c* slip off the inclines *d* and grasp the nail. Their tapering noses then come in contact with the pivoted jaws *e'* and force them open, so as to carry the gages *e* out of the path of the nail-head and to carry the parts into the position represented in Fig. 24, thereby presenting the nail-head first to a series of roller-dies, C, arranged in pairs upon shafts D at right angles to each other. Each of these roller-dies has die grooves or recesses in it to correspond to the form of the nail. The conveyer, Fig. 20, moves toward these dies, so as to present the head of the nail in place for the die-recess for the head, sometime before the pair of recesses which are to receive the head come together, and the motion of the rack carrying the conveyer is fast enough to keep the nail-head pressed firmly into the largest part of the die-recess and to follow it up until the die-roller takes a firm hold upon the nail. The rollers then pull the nail from the conveyer and the conveyer retreats. Gages *f* may be placed upon the front side of the roller-dies, and upon each side thereof to guide the head of the nail properly into the die-recess. The vertical shaft E is connected by gearing to the driving-shaft, or with gears upon the vertical shafts carrying die-rollers. Upon the upper end of this shaft is a revolving plate, E', having upon its under side the cam-groove, as indicated by the broken line

in Fig. 1, which groove receives the pin upon the sliding arm *g* to reciprocate it back and forth, said arm having secured to it the lever *g'*, whose inner end is adjustable and is secured to a post, *g*². The outer or swinging end of this lever *g'* is slotted and connected to the reciprocating finger-bar F, so as to reciprocate it back and forth at every revolution of the cam-plate E'. The outer end of the finger-bar F is secured to the vibrating arm F', having a circular rack upon its end, which meshes into the rack B. The lower end of this oscillating arm F' is pivoted to a bracket, F², upon the framing of the machine, so that as the finger-bar F reciprocates an oscillating movement is imparted to the arm F', whereby the rack B, which carries the conveyer, Fig. 20, is driven. The finger-bar F carries a series of spring-fingers, *h*, the same being mounted upon two sides of a stationary support or rest, *h'*, said fingers being shown as connected with the bar in Fig. 4, arranged in proper relative position to each other, while a single pair of fingers detached from the rest are represented in Figs. 16, 17, and 18. At the rear side of each roll is an oscillating arm, *h*³, the same being pivoted to the framing of the machine and pressed continually into the position in which they are represented in Fig. 4 by means of a spring, which spring is not shown, said arms being provided with a suitable stop of any kind to limit their motion toward the front of the machine to the position shown, while they are free to swing in the opposite direction whenever they are pressed upon sufficiently to overcome the power of their springs. When the finger-bar and fingers move inward, the spring-fingers strike the swinging arms *h*³ and swing them inward until the fingers have passed by them, after which they immediately snap into the position represented in Fig. 4, but with the several fingers upon the opposite side of their ends from that represented in said figure. Upon the return of the finger-bar and the fingers the lower ends of the swinging pieces *h*³ come in between the fingers *h*, and as said pieces cannot swing backward any farther the jaws are forced open by being drawn past said pieces *h*³. The fingers are so related to the recesses in the die-rollers that a nail-head emerges from the die-rollers at a time when the swinging pieces *h*³ are spreading the fingers *h* open, and thereby permit the head of the nail to pass through them. Just after the nail-head has passed through these fingers they have moved far enough to slip off from the pieces *h*³, and the fingers snap upon the nail to hold it firmly. At the next forward movement of the finger-bar the first pair of fingers carries the nail to the succeeding pair of rollers, from which it is received by the second pair of fingers, and so on through the entire series.

In practice one nail will be fed into the machine for every reciprocating movement of the finger-bar F, so that when properly supplied, and after the machine is under way, all of the

fingers will be simultaneously operating upon a nail, and so with the various other parts of the machine; but for convenience of description I will only follow the movement of one nail as it passes through the machine. After passing the series of roller-dies, the nail is received by the last pair of fingers of the finger-bar F, and by them it is presented to one of the pairs of jaws k upon the intermittently-revolving head G, the head always being stopped with one pair of jaws in longitudinal alignment with the movement of the fingers and opened ready to receive the nail. These jaws k are hinged together at their inner ends, and are mounted upon a reciprocating slide, k' . The pin k^2 projects upward from the slide between the jaws, and is pressed upon by means of a spring, k^3 , having a constant tendency to force the slide and the jaws inward. Another spring, k^4 , is connected with each pair of jaws to press on them with a constant tendency for forcing them open. The outer ends of these jaws are beveled, as clearly shown more particularly in Fig. 6, and they pass through an opening in the flange of the head G, the sides of which are correspondingly beveled. The pin k^5 , Fig. 5, extends downward from the bottom of the slide k' , and is acted upon by the cams k^6 and k^7 , to reciprocate the slide k' and its jaws. These cams k^6 and k^7 are located upon the central hub of the oscillating plate G^2 , which is immediately under the head G, and their contour is indicated by broken lines in Fig. 6. The mechanism for operating this head and plate is most clearly shown in Fig. 6. The pitman l is connected, by means of a bolt or crank-pin, to the upper side of the revolving disk or plate E' upon shaft E, and also to the reciprocating slide l' , which it drives. At the end of the slide l' another pitman, l^2 , is secured, the opposite end of which pitman is connected to an arm, l^3 , which is rigidly secured to and moves with the oscillating plate G^2 , whereby said plate receives a reciprocating and oscillating movement for every revolution of the shaft E. The edge of the head G is toothed like a ratchet-wheel, as shown by the partial section in Fig. 6, and a spring-actuated hook, l^4 , engages this toothed portion of the head G, and imparts to it one-eighth of a revolution for every revolution of the shaft E. A spring-actuated dog, l^5 , snaps into a hole in the edge of the head G, and locks the head against a rotary movement at the end of each intermittent movement. In order to make this locking doubly sure and to have the dog l^5 act quickly, the spring l^6 upon the oscillating arm l^3 is so arranged as to strike the heel of the dog l^5 during the last part of the stroke of the slide l' . The movement of the oscillating plate G^2 is such as to bring the point of the cam k^7 back of the pin k^5 , and to force the slide k' outward, as shown in Fig. 6, and as indicated by the broken lines therein. This movement takes place at the end of the backward stroke of the slide l' , and at a time when the jaws are

one-eighth of a revolution to the left of the position represented in Fig. 6. The return of the slide l' carries the oscillating plate and the head G together into the position represented in said Fig. 6, when the movement of the head ceases, leaving the jaws forced outward, so as to allow their springs to throw them open into position ready to receive the head of the nail as it comes from the last pair of fingers upon the finger-bar F. The head of the nail passes between the jaws and up against the gage-pin k^8 , so that the nail, when grasped, will be seized by its body underneath the head. When the nail is thus locked within the jaws, the return movement of oscillating plate G^2 begins and carries cam k^7 away from the back of the pin k^5 , and allows the jaws k to close upon the nail and grip it firmly. When the oscillating plate moves forward again, the head G makes one-eighth of a revolution and stops, at which point no operation is performed upon the nail. At the next intermittent movement of the head the nail is brought around to the mechanism for trimming the points. In coming to this position the nail rides up the incline m to carry it to the top of the punch H under the die H' , as shown in Figs. 7, 8, and 9. This die H' is mounted in a slide, H^2 , which is reciprocated by means of the lever H^3 , whose motion is imparted to it by means of a crank and pitman, H^4 , upon the end H^5 of one of the shafts of the die-rollers, as shown in Fig. 1. The die H' has within it a spring-pressed follower, H^6 , Fig. 7, for the purpose of forcing the point of the nail out of the die after trimming. Upon the back side of the slide H^2 is a secondary slide, H^7 , the same being connected by means of a lever, H^8 , to the slide H^2 , so that while one slide is moving upward the other is moving downward, and vice versa. The lower end of this slide H^7 acts upon the angle-lever H^9 to throw it from the position represented in Fig. 7 into that represented in Fig. 7^A, whereby an oscillating front-to-rear movement is imparted to the lower end of the angle-lever H^9 . Said angle-lever enters the slot in a horizontally-moving slide, H^{10} , whereby said slide is reciprocated for every movement of the slides H^2 H^7 and the angle-lever H^9 . This slide H^{10} has pivoted to it the pair of jaws H^{11} . Just as the die descends to trim the point of the nail the slide H^7 rises and the inclines thereon strike the points of the angle-lever H^9 and throw the lower end thereof forward into the position represented in Fig. 7^A, thereby carrying the slide H^{10} and its jaws H^{11} forward into the position represented in Fig. 23, so that the jaws come upon each side of the point of the nail and properly center it over the die. In coming into this position the rear ends of the jaws engage the stationary incline H^{12} , which forces their outer ends together. When the punch ascends, the slide H^{10} is moved in the opposite direction and carries the metal which has been trimmed off from the nail backward out of the way, and in moving back the

outer ends of the jaws will come in contact with the stationary posts H^{13} and force the jaws open, as shown in Fig. 22, when the punching will fall out of the jaws. The punching, or the piece of metal trimmed from the nail-point, is represented as within the jaws in Fig. 23. These jaws are put together in such a manner as to cause sufficient friction to make the jaws stay in whatever position they are placed, whereby the jaws retain their hold upon the punching and carry it backward until the jaws are opened. At the next intermittent movement of the head G the nail is presented to the under side of the polishing-wheel K , said wheel being mounted to reciprocate back and forth upon any suitable carriage, and being revolved by a belt extending over the driving-pulleys K' , the belt being arranged in a well-known manner by passing over friction-rollers, some of which are made yielding by a weight or spring to take up the slack of the belt caused by the reciprocating movement of the carriage. The carriage upon which the grinding or emery wheel K is mounted is reciprocated by means of the pin K^2 , which enters the cam-slot K^3 , formed in the edge of the oscillating plate G^2 . At the next intermittent movement of the head G the nail is carried up over the inclined gage or rest L under the jaw L' , and against the jaw L^2 , the jaw L' being placed a little higher than jaw L^2 , as clearly shown in Fig. 10, so that the nail may be passed under the end of the jaw L' in coming into position between the jaws, and out over the jaw L^2 in leaving them. These jaws are toothed or roughened upon their flattened faces to act as a burr-rasp or file, and they are pivoted upon a slide, L^3 , upon which they reciprocate horizontally. They are also pressed upon by springs, with a constant tendency to force them together. The slide L^3 is reciprocated by means of an eccentric, L^4 , mounted upon the shaft L^5 , which is sustained upon brackets L^6 at the rear of the machine. This same shaft also carries the driving-pulleys for the grinding and polishing wheels. This slide L^2 and its jaws are mounted upon the vertically-reciprocating carriage L^7 . The movement is imparted to said carriage by means of the pin L^8 , entering an oblique slot, L^9 , made in the edge of the oscillating plate G^2 . As the nail comes up against the jaw L^2 and under the jaw L' , (said jaws continually reciprocating horizontally,) the oscillating movement of the plate G^2 drives the carriage L^7 downward, and thereby brings the nail gradually in between the jaws L^2 and L' , when they file or rasp the edges of the nail until the jaws descend so far as to bring the jaws L^2 below the edge of the nail. When in this position, the nail is ready to pass on again over the jaw L^2 at the next intermittent movement of the head G , at the end of which it is stopped in front of the grinding or polishing wheel M , the same being mounted upon a horizontally-reciprocating carriage, M' , and driven by the pulley M^2 . This carriage M' has its reciprocating movement imparted to it by

means of the pin M^3 in the cam-slot M^4 , formed on the edge of the oscillating plate G^2 . The next intermittent movement of the head G brings the nail into position directly opposite the dies for straightening the nail edgewise and curving it flatwise. Just about the time that it reaches said position the cam k^6 upon the oscillating plate comes in contact with the pin k^5 of the slide k' and the jaws k , and acts to open the jaws. The cam l' (see Fig. 6) upon the hook l^4 comes in contact with the arm o^3 upon the under side of the oscillating knockout-lever o , thereby lifting the knockout-finger o' , so that it clears the jaws and rides up to a point directly over the space between them. The spring o^2 upon the opposite end of said lever causes the hooked finger o' to pass down between the jaws with the point of its hook in the rear of the nail-head. As the hook l^4 continues its stroke, the cam l^8 upon said hook comes in contact with the arm o^3 on the knockout-lever and forces said arm and lever in a direction to withdraw the nail from the jaws. This knocking-out lever o is hung upon a compound joint, so that it may oscillate both vertically and laterally, and the springs o^2 and o^4 have a tendency to hold said lever in its normal position when it is not acted upon by cams l^7 or l^8 . The spring l^9 constitutes in effect an extension of the cam l^8 , and makes an elastic cam. When the nail is thus pulled out of the jaws, its point enters the guide O and falls upon the inclined table O' . Just in front of the guide O is another guide, o^5 , carrying the shield o^6 , said guide being mounted upon a hinge by means of the screw or rivet o^7 , and actuated by a spring, o^8 , to hold it in the position in which it is represented in Fig. 11. This guide o^5 is sufficiently elevated above the table o' as to allow the nail-point to pass under it, while at the same time it is close enough to said table to prevent the nail-head from passing under said guide. The swaging-tool P is mounted upon the lower end of the slide P' . It is actuated by the lever P^2 and cam P^3 upon the upper one of the shafts D of the roller-die nearest the intermittently-revolving head. The slide P' is assisted in its return by means of the spring P^4 . A swaging-die, P^5 , is mounted in a beveled-mouthed orifice in the inclined table O' , and has its upper surface curved to conform to the desired curvature to be given to the nail, and it is so mounted within its block as to swing upon the point p as a fulcrum. By the side of this die is the slide R , connected to a slotted lever, R' , which is actuated by cam R^2 upon one of the roller-shafts. (See Fig. 2.) This slide R is connected by means of two links or swinging arms, p and p' , to another slide, R^3 . This latter slide R^3 is bound in place by means of the friction-spring p^3 so firmly that it will not move in either direction, except when considerable force is applied to bear upon it. The stop p^4 upon the link p^2 coming in contact with the slide R^3 limits the swinging movement of

the arms p and p' , so that when the slide R is pressed upward and the stop p^4 engages the slide R^3 the further movement of the slide R necessitates an upward movement of the slide-bar R^3 with the slide R , and carries them into the position shown in Fig. 11. When the slide R moves in the opposite direction, the pusher p^5 upon the slide R , engaging the shield o^6 as the slide swings laterally in moving backward, pushes the guide o^5 sidewise far enough to liberate the nail, (which had been deposited upon the inclined table O' above said guide, as before described,) and the end of the oscillating link p^2 comes in behind the nail-head to push the nail down over the die P^5 , the links p' and p^2 being then brought down into the position indicated by the broken lines in Fig. 11. The nail will generally slide down the inclined table faster than the links p p' , but if it is inclined to stick the link p will force it down. Whenever the nail moves faster in any part of its descent than the link p , its point passes under said link, and the nail is thereby held down over the swaging orifice and die P . The head of the nail then catches upon the side wall of the orifice O' at the head end of said orifice and stops the nail within the orifice and over the die P^5 . The walls of the orifice in the table O' , in which the die P^5 is located, are made slightly beveling, so that as the punch P descends it will force the nail down upon the upper surface of the die P^5 , and thereby straighten the nail edgewise and curve it flatwise. The slides R and R^3 again return under the influence of the cam R^2 back into the position shown by the full lines in Fig. 11. About the time that the slides reach this position a mechanism, which I will hereinafter describe, raises the die P^5 by swinging it upon its fulcrum p , bringing the surface of the die even with the surface of the inclined table O' , and thereby elevating the nail above it. The lever R' is then acted upon by means of the smallest recess in the cam R^2 to impart to the slide R a short downward and upward stroke, in doing which the end of the link p' comes behind the nail-head and strikes it a short quick blow, to discharge the nail from the machine in case it should not fall down the inclined table of its own accord.

The mechanism for lifting the die P^5 is more clearly shown in Fig. 15, and it consists of two swinging levers, Q and Q' , and the connecting-bar Q^2 . The bar Q^2 is jointed to the outer end of the bar Q , and this bar is actuated by being secured to the back side of the slide P' . The lower end of the bar Q^2 is connected with the lever Q' by means of steps or notches q' , as shown in Fig. 15, and the bar Q^2 is directly connected with the die P^5 by means of the pin q . When the slide P' begins to ascend, the end of the lever Q' rests upon the upper one of the steps q' . A stationary arm, q^2 , upon the side of the inclined table O' comes in contact with the incline q^3 on the bar Q^2 and swings said arm outward sufficiently to disengage the lever Q' from the upper step just so soon as

the die P^5 has been elevated to the desired position. A spring, q^4 , bears upon the lower end of the bar Q^2 with a tendency to keep the steps in constant engagement with the lever Q' . The lever Q^2 is adjustably connected to the slide P' by means of set-screws q^5 , and the arm q^2 is adjustably secured by means of a slot-and-bolt connection, so that the point where the upper step will be disconnected from the lever Q' may be readily adjusted as may be desired.

Many parts of my invention relate to the combination of mechanisms arranged successively and operated in the manner described, and when such combination of mechanism is new the particular details of the mechanism shown and described, or a part of them, may be changed for other mechanism accomplishing the same objects without materially changing said combinations.

Having thus described my invention, explained the principle thereof, and the best mode in which I contemplate applying that principle, I claim as my invention—

1. The combination of a series of roller-dies for cold-rolling the nail and an intermittently-revolving head containing jaws for receiving the nail from the roller-dies and presenting it successively for subsequent operations, substantially as described, and for the purpose specified.

2. The table A , provided with the nail-delivering orifice having inclines b upon two opposite sides, the distance between which is less than the width of the nail-head to be fed through said orifice, substantially as described, and for the purpose specified.

3. The combination of the reciprocating rack bearing spring-jaws, the stationary inclines d , and spring-actuated swinging jaws e' , bearing gages e , substantially as described, and for the purpose specified.

4. The combination of the slide or rack carrying spring-jaws c , mechanism for reciprocating said rack and opening the jaws to receive the nail, and a pair of roller-dies having nail-receiving recesses in their periphery, substantially as described, and for the purpose specified.

5. The combination of a table having a nail-delivering orifice, a suitable conveyer underneath the table carrying spring-jaws to receive and hold the nail, and roller-dies having die-recesses in their periphery, substantially as described, and for the purpose specified.

6. The combination of two or more roller-dies, the spring-fingers arranged between said dies, a spring-pressed oscillating arm, and mechanism for reciprocating the spring-fingers between the pair of rollers and past the spring-pressed oscillating arm, substantially as described, and for the purpose specified.

7. The combination of the rack bearing spring-jaws c , the stationary inclined lugs d , the swinging arms and gages e' and e , a series of roller-dies, the series of fingers and spring-

pressed oscillating arms between the roller-dies, and mechanism for reciprocating the fingers and rack, substantially as described, and for the purpose specified.

5 8. The combination of the roller-dies, the intermittently-revolving head, and the nail-holding fingers for conveying the nail from the roller-dies to the intermittently-revolving head, substantially as described, and for the purpose specified.

10 9. The combination of an intermittently-revolving head bearing a series of holding-jaws and an oscillating cam-plate concentrically mounted with said head for opening and closing the jaws, substantially as described, and for the purpose specified.

15 10. The combination of the jaws k , having inclines on their outer ends and passing through the rim of the head G , the slide k' , and springs k^3 and k^4 , substantially as described, and for the purpose specified.

20 11. The combination of the intermittently-revolving head, the pivoted jaws mounted upon the slide k' , the oscillating plate bearing cam for acting upon the slide k' , and mechanism for operating the cam-plate and head, substantially as described, and for the purpose specified.

25 12. The combination of a series of roller-dies and their transferring mechanism, the intermittently-revolving head bearing holding-jaws, and mechanism for trimming the point of the nail, substantially as described, and for the purpose specified.

30 13. The combination of the slide H^2 , lever H^8 , the slide-bar H^7 , angle-lever H^9 , and gaging and conveying jaws H^{11} , substantially as described, and for the purpose specified.

35 14. The combination of die and punch for trimming the point of the nail, the jaws H^{11} and H^{12} , for gaging the point of the nail, and mechanism for operating the jaws to carry away the trimming after the nail has been gaged and trimmed, substantially as described, and for the purpose specified.

40 15. The combination of the pivoted jaws H^{11} , the slide H^{10} , upon which they are mounted, the stationary inclines H^{13} and H^{12} , and mechanism for reciprocating the slide, substantially as described, and for the purpose specified.

45 16. The combination of the intermittently-revolving head bearing holding-jaws, the nail-point trimming die and punch, and the incline m , for guiding the nail into the proper position between the die and punch, substantially as described, and for the purpose specified.

50 17. The combination of a series of roller-dies, conveying-fingers, an intermittently-revolving head bearing holding-jaws, mechanism for trimming the point of the nail, and mechanism for grinding or polishing the nail-point upon one side, substantially as described, and for the purpose specified.

55 18. The combination of an intermittently-revolving head bearing holding-jaws, mechanism for trimming the points of the nail, a suitable abrading-wheel for grinding or polishing the point of the nail, and mechanism for reciprocating the abrading-wheel longitudinally over the nail-point, substantially as described, and for the purpose specified.

60 19. The combination of the intermittently-revolving head bearing holding-jaws, an abrading-wheel mounted upon a suitable carriage, the oscillating plate having cam-slot K^3 , for reciprocating the carriage upon which the abrading-wheel is mounted, substantially as described, and for the purpose specified.

65 20. The combination of an intermittently-revolving head bearing holding-jaws, mechanism for trimming the point of the nail, mechanism for polishing or grinding one side of the nail at the point, and mechanism for rasping or filing the edge of the nail, substantially as described, and for the purpose specified.

70 21. The combination of the intermittently-revolving head bearing holding-jaws, the reciprocating rasping or filing jaws L' and L^2 , the gage or rest L for the nail, and mechanism for reciprocating the rasping or filing jaws both horizontally and vertically, substantially as described, and for the purpose specified.

75 22. The combination of filing or rasping jaws L' and L^2 , mounted with the face of one jaw projecting downward below the face of the other, the guide or rest L for the nail-point, the vertical reciprocating carriage L' , an oscillating plate bearing cam-groove, L^3 , and the intermittently-revolving head bearing holding-jaws, substantially as described, and for the purpose specified.

80 23. The combination of an intermittently-revolving head, mechanism for trimming the point of the nail, mechanism for grinding or polishing one side thereof, mechanism for filing or rasping the edges of the point, and mechanism for polishing or grinding the opposite flat side of said nail-point, substantially as described, and for the purpose specified.

85 24. The combination of an intermittently-revolving head carrying holding-jaws, mechanism for trimming the point of the nail, for grinding or polishing the two sides thereof, mechanism for rasping its edges, the oscillating cam-plate for forcing open the jaws, and the knockout for removing the nail from the jaws, substantially as described, and for the purpose specified.

90 25. The combination of the intermittently-revolving head bearing holding-jaws, mechanism for trimming the point of the nail, for rasping or filing its two edges and polishing or grinding its two flat sides, mechanism for removing the nail from the jaws, and mechanism for swaging the nail, substantially as described, and for the purpose specified.

95 26. The combination of the knockout mechanism, the inclined table O' , and the swaging die and punch P and P^5 , substantially as described, and for the purpose specified.

100 27. The combination of nail-holding jaws,

knockout-lever o , hung upon a double joint for oscillating in two different directions, and mechanism for depressing the knockout into the jaws and then withdrawing it therefrom, 5 substantially as described, and for the purpose specified.

28. The combination of the swaging-die, the inclined table O' , the spring-pressed and pivoted guide o^5 , the slide R , links p' and p^2 , the 10 friction-slide R^3 , and mechanism for reciprocating said slides R and R^3 , substantially as described, and for the purpose specified.

29. The combination of the swaging-die P^5 , inclined table O' , the punch P , and mechanism

for lifting the same, substantially as described, 15 and for the purpose specified.

30. The combination of the swaging-die, the slides R and R^3 , connected by links p' and p^2 , the lever R' , and mechanism for imparting to said lever one long forward and backward 20 stroke, and then a shorter stroke for the purpose of knocking out the nail, substantially as described, and for the purpose specified.

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Witnesses:

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