

George L. Hall,
Imp't in the Manufacture of Horse-Shoe Nails.

2 Sheets--Sheet 1.
 No. 121,511.
 Patented Dec. 5, 1871,

Fig. 1.

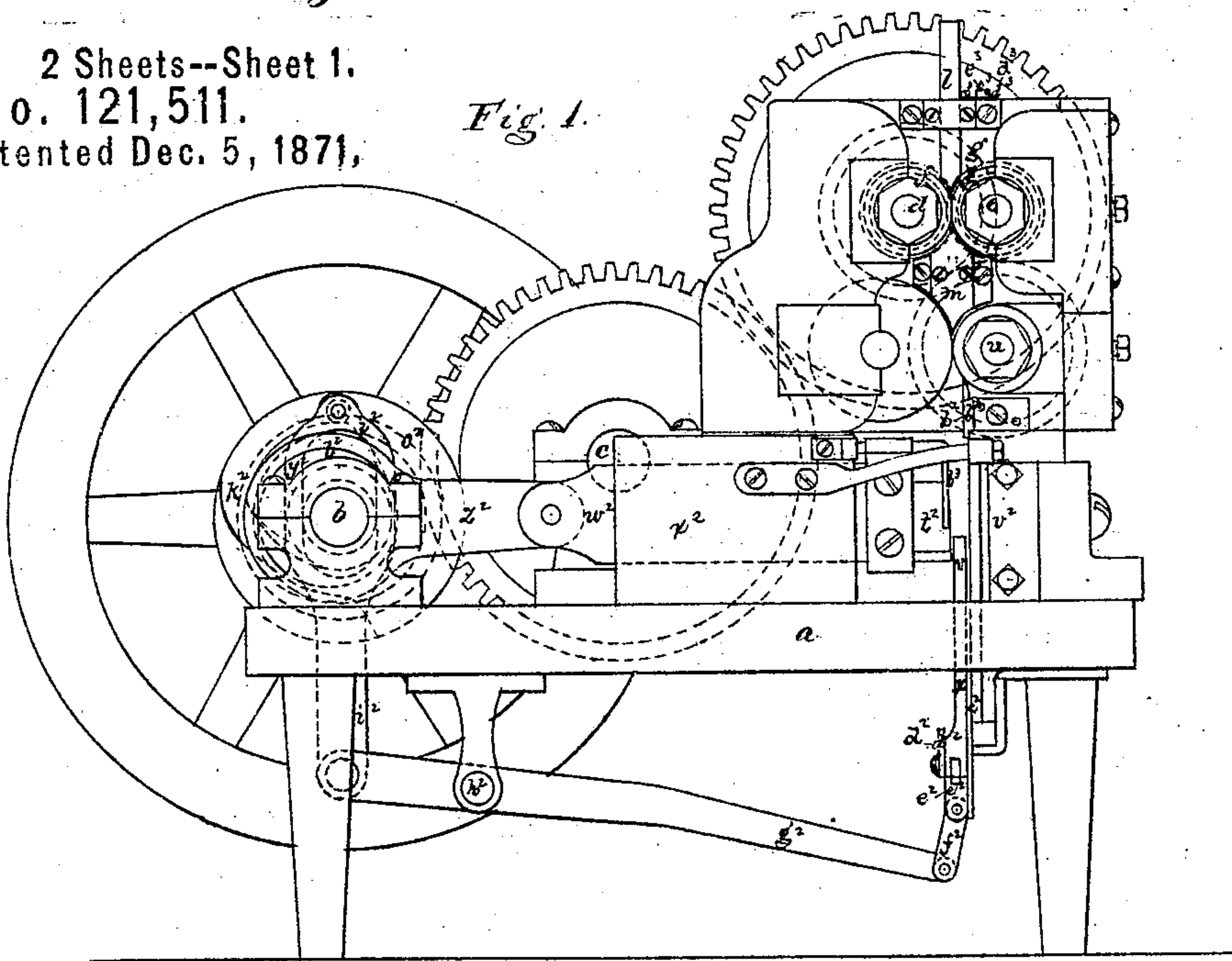
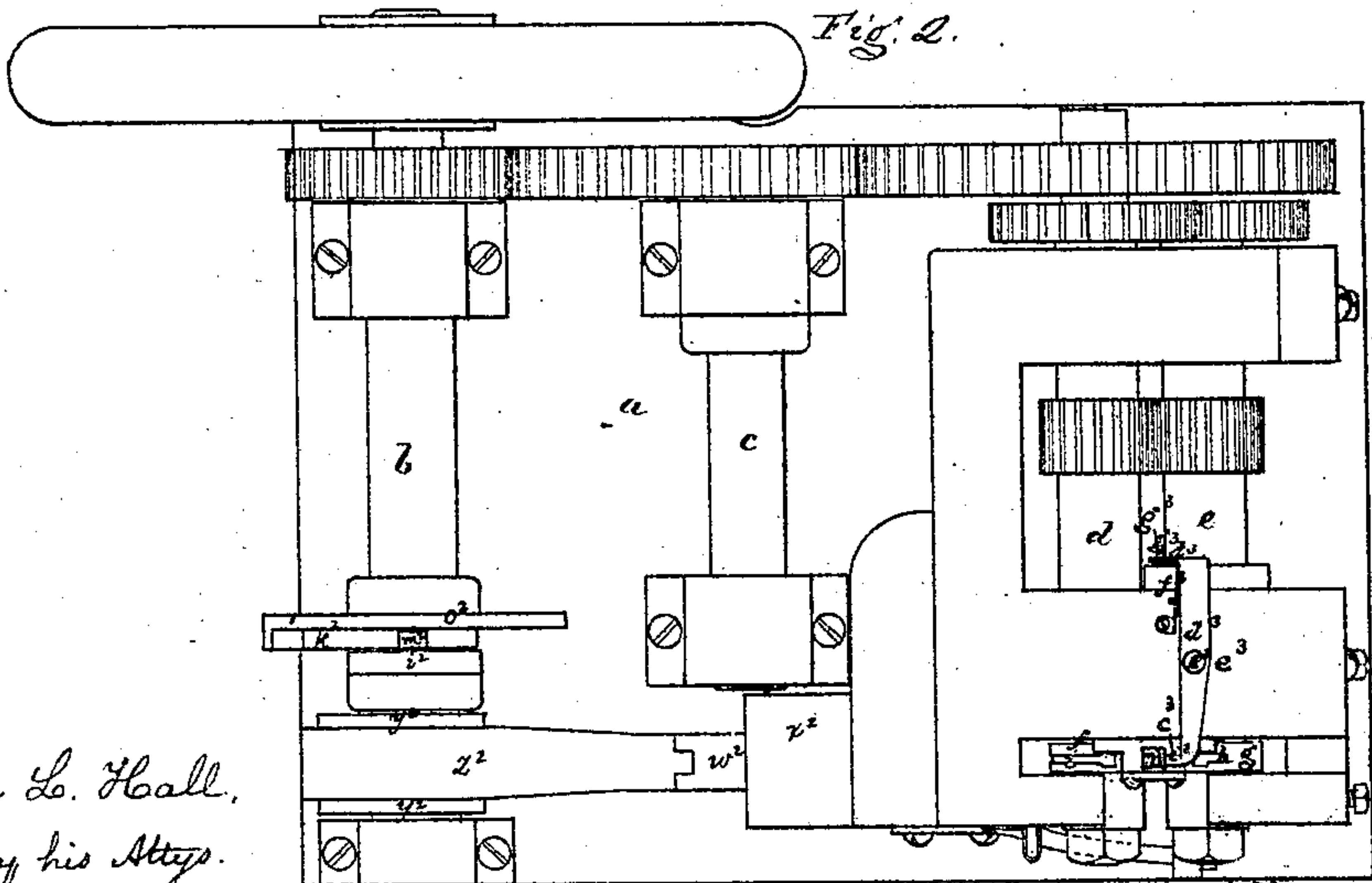


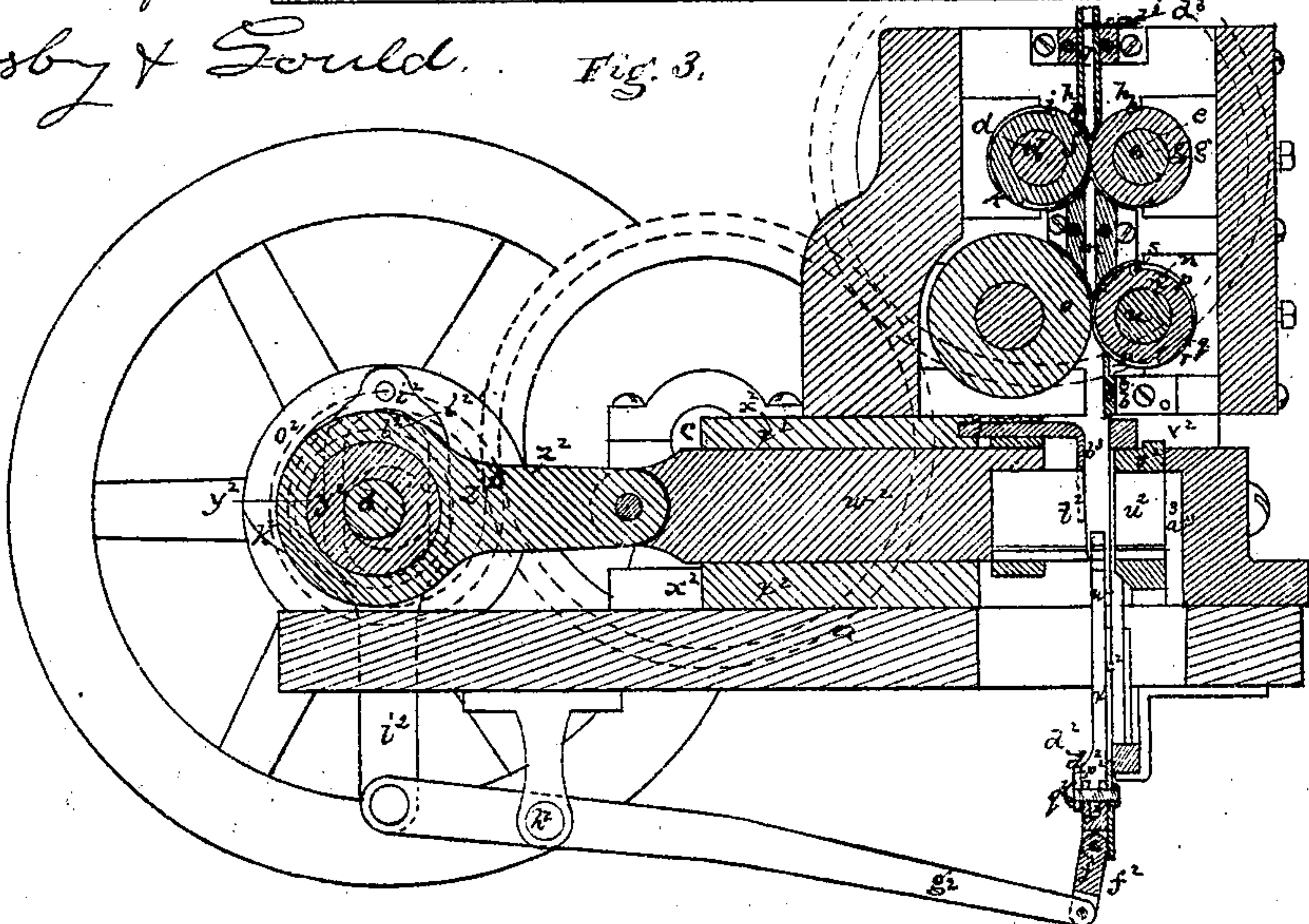
Fig. 2.



George L. Hall,
 By his Atty.

Crosby & Gould.

Fig. 3.



Witness.
 M. W. Frothingham,
 J. H. Atwater,

George L. Hall.
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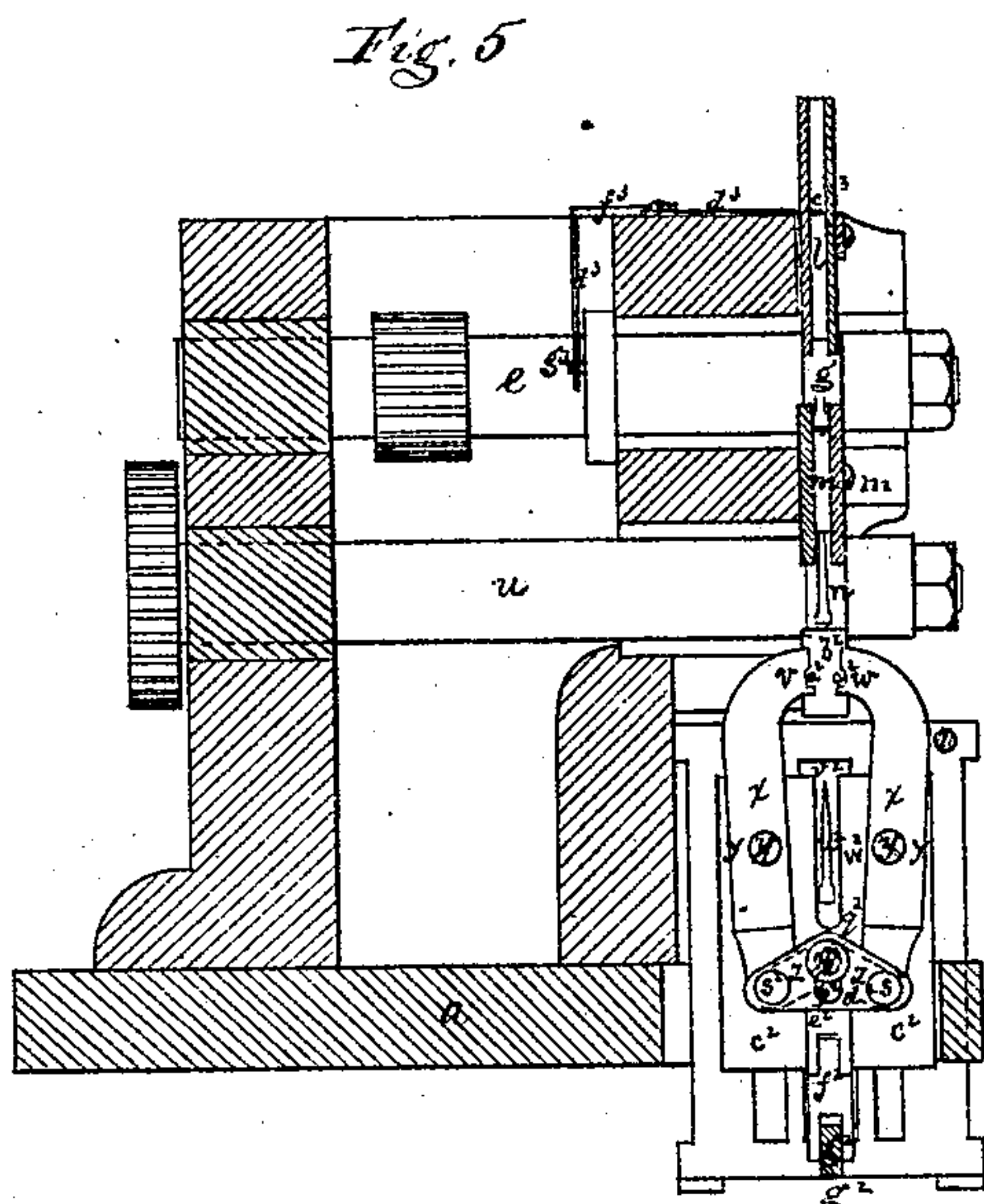
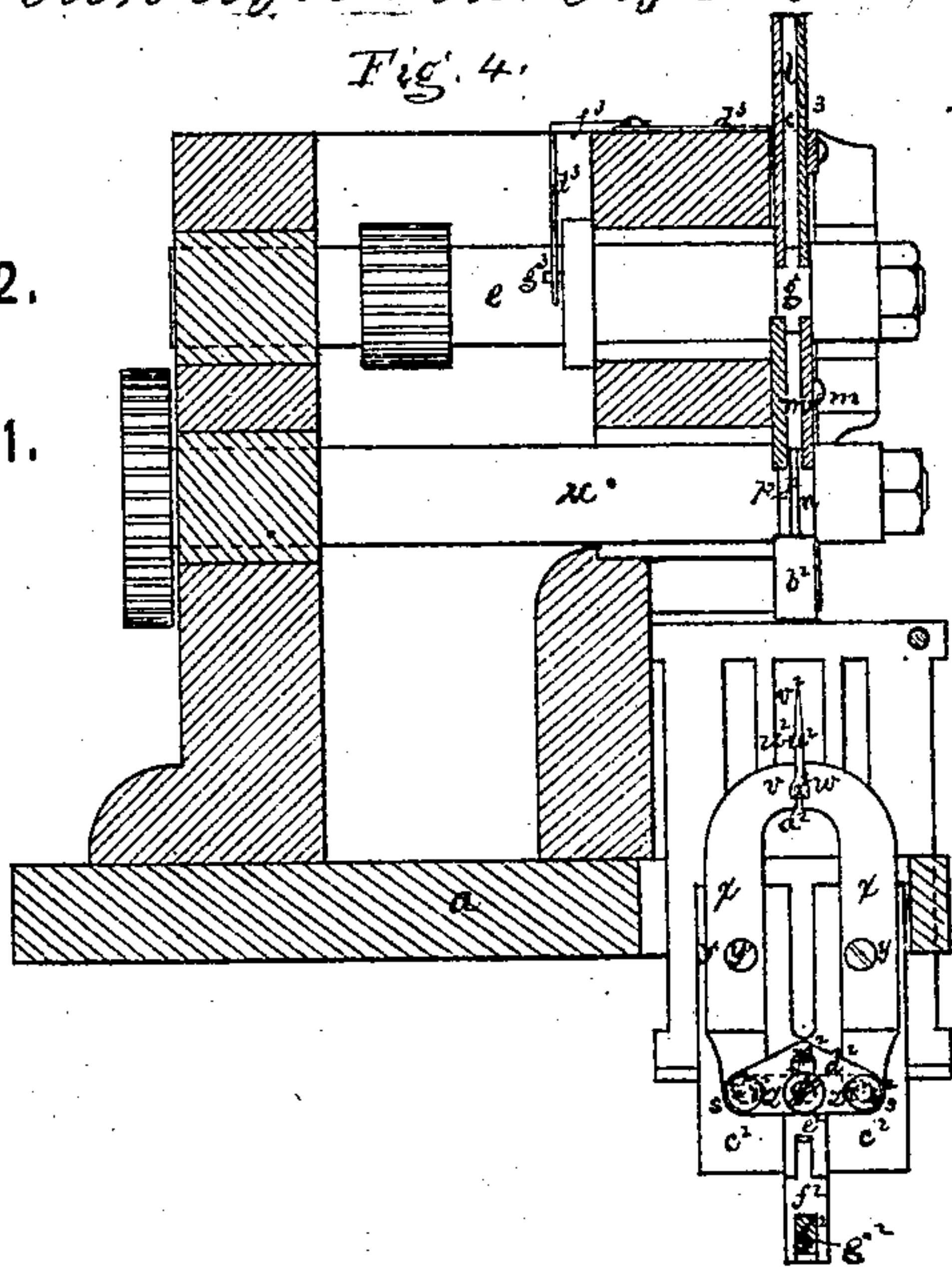
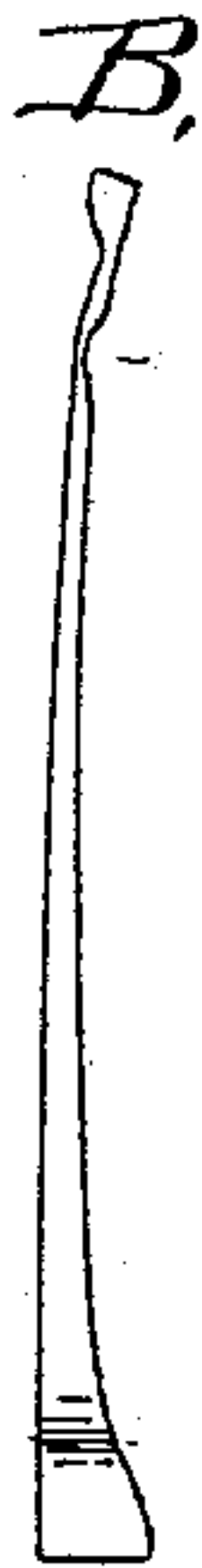
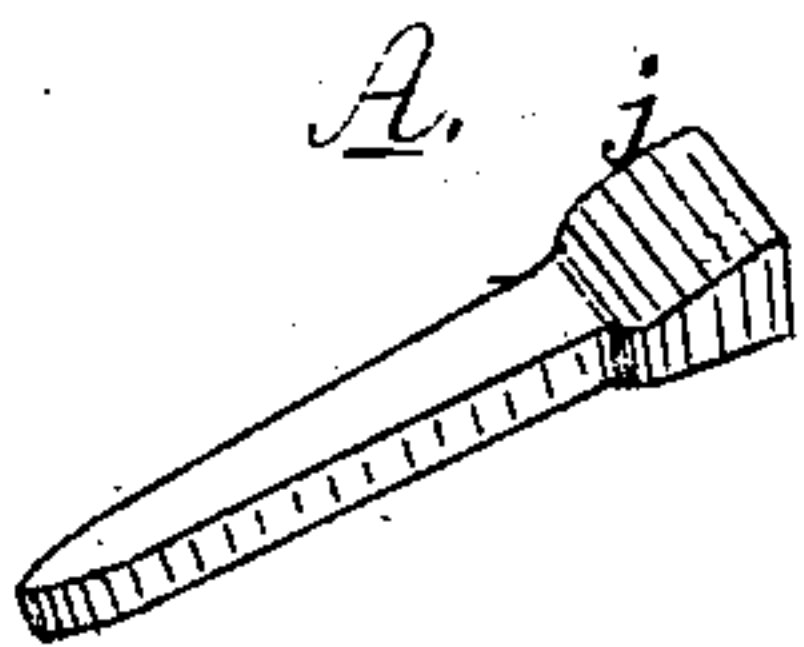
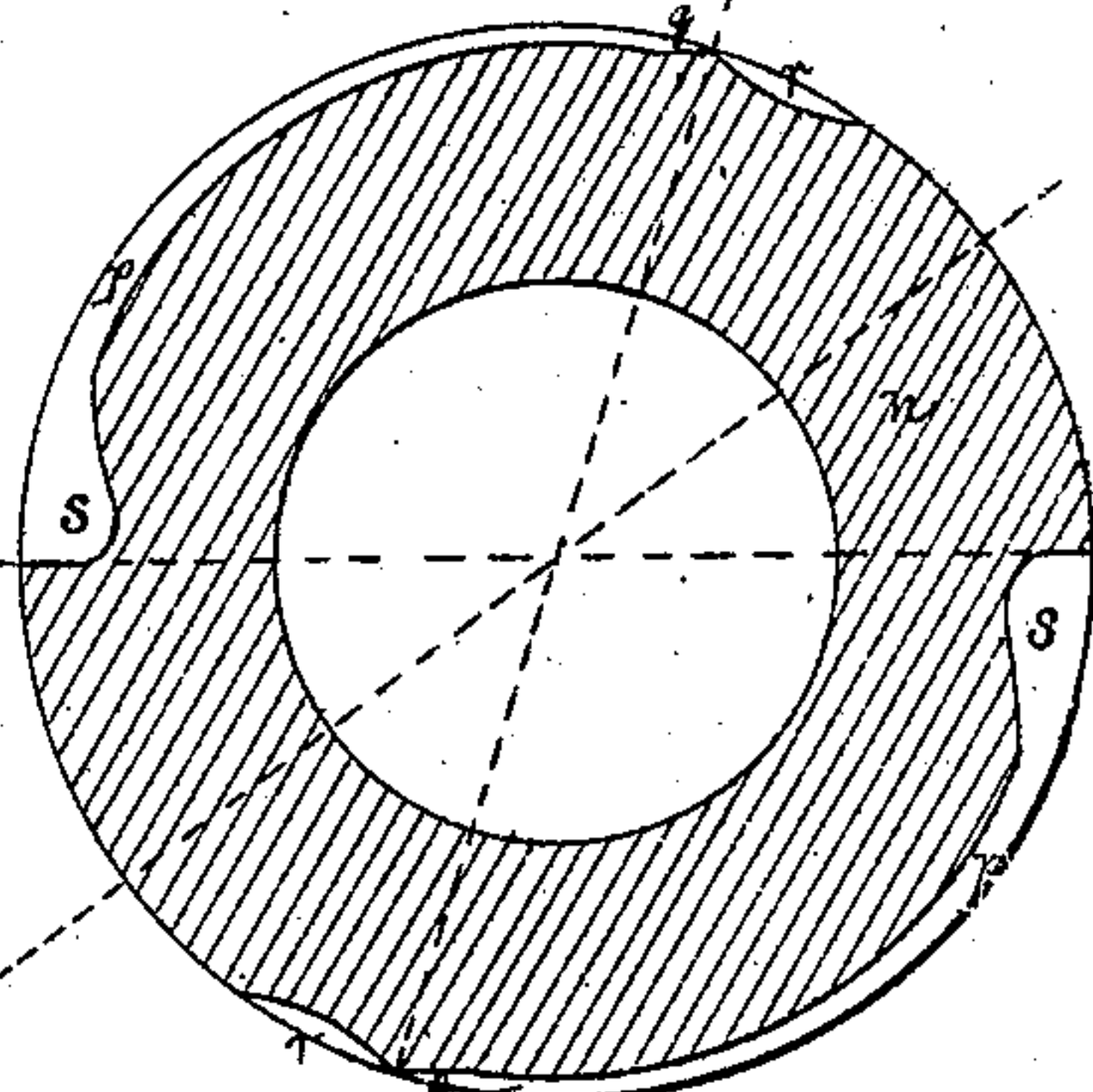
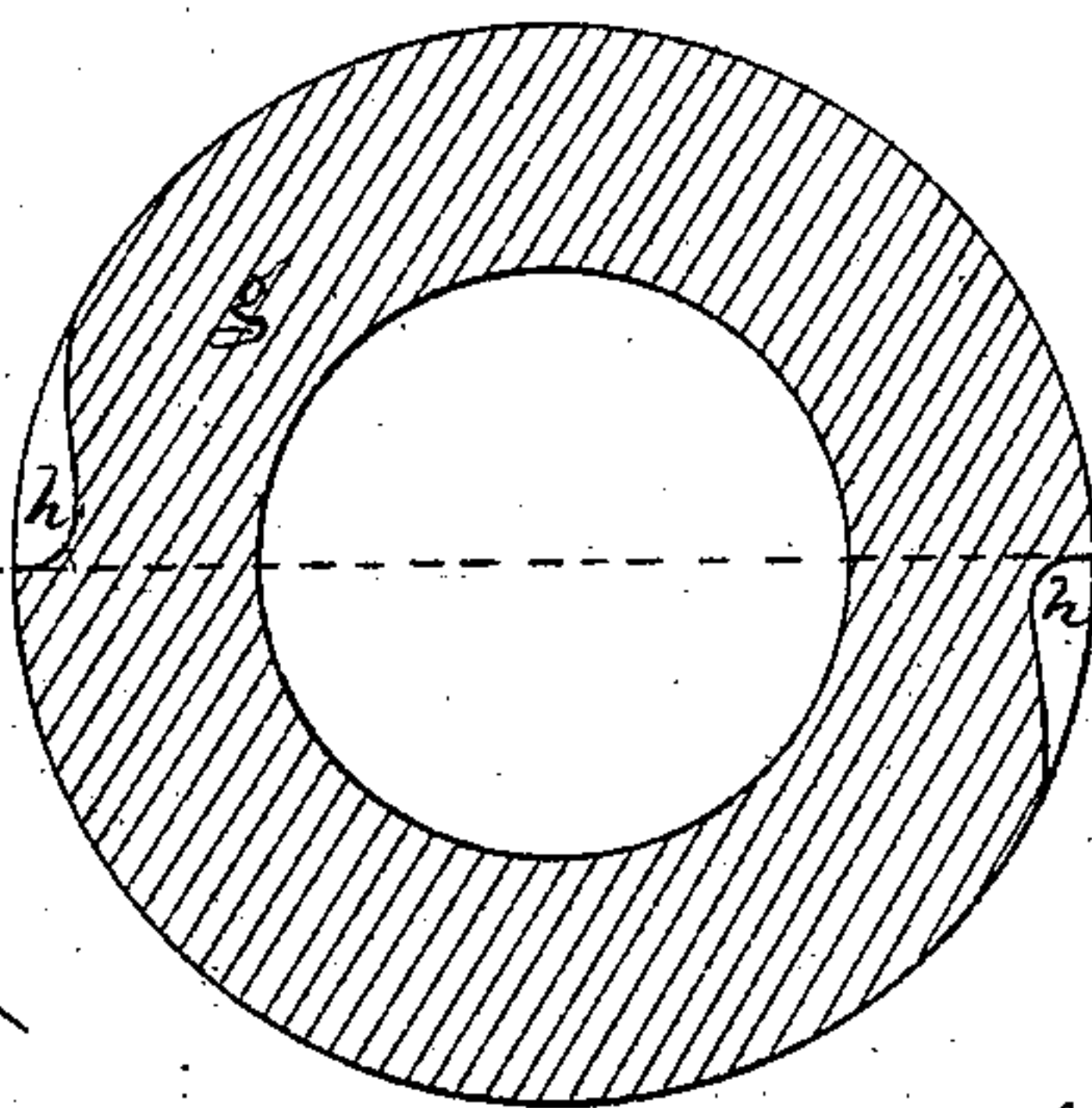
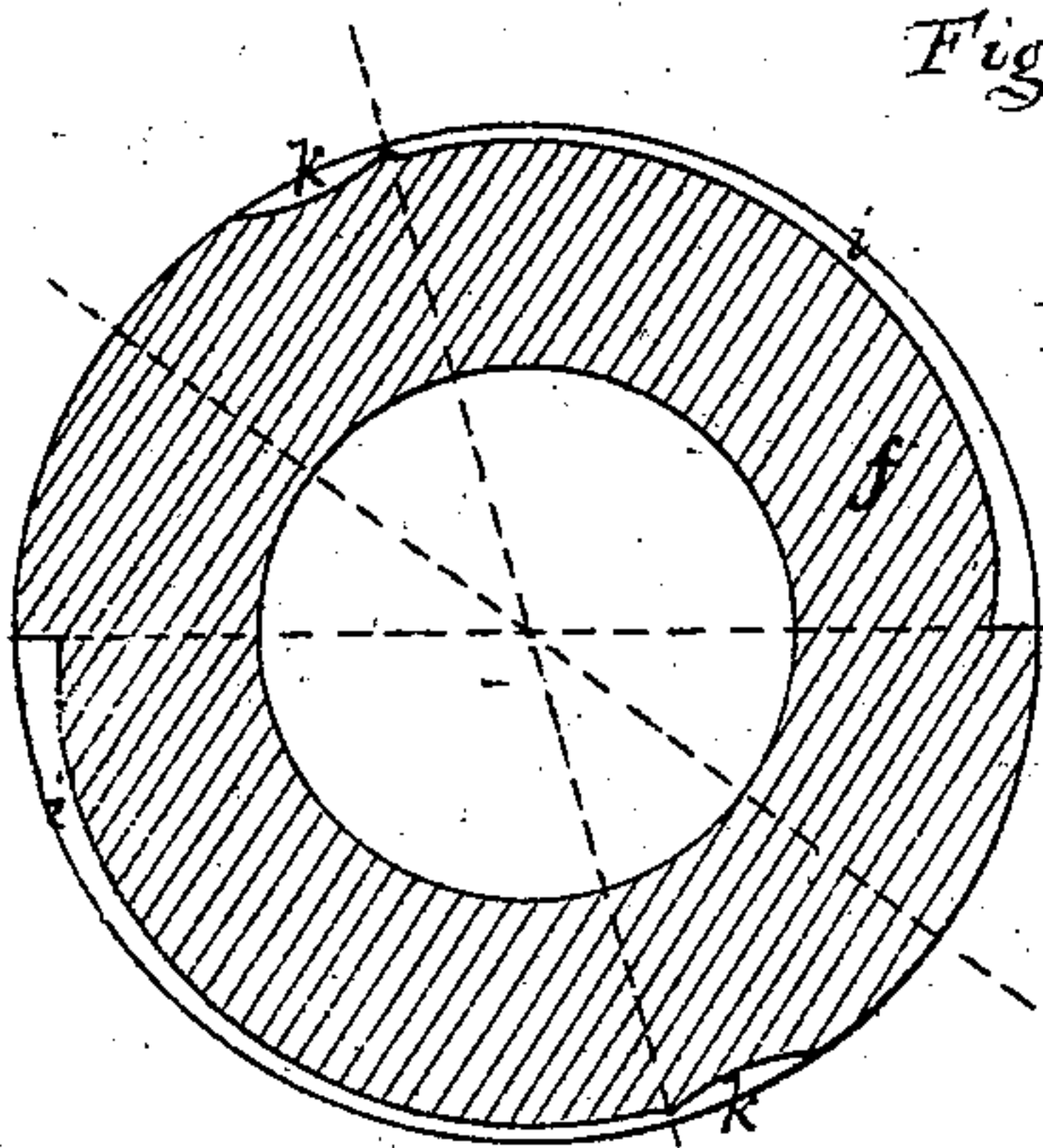


Fig. 6.

Fig. 7.



Witnesses.
 M. W. Frothingham.
 J. H. Latimer

George L. Hall,
 By his Atty.
 Crosby & Gould.

UNITED STATES PATENT OFFICE.

GEORGE L. HALL, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO GLOBE NAIL COMPANY, OF SAME PLACE.

IMPROVEMENT IN MACHINES FOR MANUFACTURING HORSESHOE-NAILS.

Specification forming part of Letters Patent No. 121,511, dated December 5, 1871.

To all whom it may concern:

Be it known that I, GEORGE L. HALL, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in the Manufacture of Horseshoe-Nails; and I do hereby declare that the following, taken in connection with the drawing which accompanies and forms part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it.

My invention relates particularly to the manufacture of that class of horseshoe-nails in which the blanks are punched from a rolled plate, having upon it head-forming ribs or projections, the shanks of such blanks being elongated by rolling and finally pointed and finished.

In my invention I combine the rolling and pointing operations and a punching operation, by which the nail-shank at or near the point is reduced to the proper width and finish and the edges of the nail are shorn of any excess of metal. In these operations I use first a pair of shaping-die rolls, which elongate the blank very nearly to the required length. From the dies of these rolls the nail-blank passes directly and automatically to the action of a surfacing and pointing roll, the movement of which roll is graduated from the movement of the shaping-rolls, so that the head of the blank passes directly into the head-receiving recess of the lower roll. With this lower roll is combined a friction-roll of larger diameter, and the negative action of this roll, in connection with the positive movement of the other roll, causes the nail-head to be bent over toward the die-roll and against a vertical guide, by which guide the nail is directed so that as it emerges from the lower roll it is straightened. The friction-roll has a smooth periphery, and the acting surface of the die-roll is smooth also, and the blank is straight and very smooth when it leaves the surfacing-rolls. On the die-roll is a taper surface, the action of which is to bevel-point the nail. As the head emerges from the lower rolls it is seized between two nipper-jaws, which close upon it, and these jaws draw the blank down until it comes directly in line with the end of a punch, which is of the exact form of a finished nail, this punch being directly opposite a die in a die-plate, which die is of the exact form of the punch. When the blank is thus presented between the punch and die the punch

moves forward and carries the nail-blank with it, forcing it through the die-plate and cutting from it all redundant metal, bringing the nail-shank to its ultimate form—finished and ready to be driven.

My invention consists in certain combinations of mechanism hereinafter more particularly set forth.

The drawing represents a machine embodying my improvements.

Figure 1 shows the machine in side elevation. Fig. 2 is a plan of it. Fig. 3 is a sectional elevation on the line *x x*. Fig. 4 is a sectional elevation on the line *y y*. Fig. 5 is a similar section, showing the nail-grasping nippers as open. Fig. 6 shows, in section, the upper pair of die-rolls. Fig. 7 is a section of the lower die-rolls.

a denotes the frame; *b*, a driving and cam-shaft; *c*, an intermediate shaft geared to the driving-shaft and to a roll-shaft, *d*, said shaft *d* being geared to another roll-shaft, *e*, these two shafts carrying at their front ends two die-rolls or shaping or drawing rolls, *f g*, the roll *g* having a peripheral head-receiving recess, *h*, but being otherwise smooth or concentric, while the roll *f* has a peripheral die-groove, *i*. The rolls *f g* run at the same speed, and the shape of the recess *h* and the corresponding or opposite portion of the die-recess or groove *i* is such that the head of the blank (seen at *A*) is not changed by the action of the rolls, such head-receiving recesses being merely the guides or gauges, by or in which the head of the blank is grasped in such manner as to cause the die-groove *i*, in passing its length upon the nail, to draw down the shank to or nearly to the length and thickness required in the finished nail, and to make all the nails or shanks rolled therein uniform in length, size, and shape. The groove *i* contracts or lessens in depth at its end, as seen in Fig. 6, and just beyond this point is a recess, *k*, into which any superfluous metal upon the end of the shank can enter. Over the rolls is a vertical guide-tube, *l*, through which the blank is dropped (head down) for presentation to the upper rolls, the passage corresponding in shape to the largest part of the head, but so as to let the blank pass freely down, and the head being so introduced as to present its front side *j* to the recess *h* as the rolls in their rotation bring the said recesses into position to receive the blank. As the rolls rotate with the

blank the head emerges from the recesses below as soon as the dies open sufficiently, and passes into another vertical guide-tube, m , which connects the peripheries of the upper rolls with the peripheries of two rolls, $n o$, forming the lower and surface-finishing and pointing rolls. The roll n is a die-roll having a peripheral die-groove, p , and the other roll is a friction-roll with a smooth periphery, and the acting surfaces of the two rolls $n o$ are kept very smooth, so that they condense the metal on the opposite faces of the nail and impart a smoothness and finish thereto. At the point end of the groove p it is made with a taper, as seen at q , so as to form a bevel at the point of the shank, as seen at B, which is an edge view of the blank as it emerges from the lower rolls, there being also a recess, r , beyond the space q to receive the redundance or excess of metal. The roll n travels at the same speed as the rolls $f g$, and its groove has a head-receiving recess, s , and a die-groove, p , the recess s being of the full size and shape of the head of the blank, and the groove being of the size and shape of the shank as left by the upper rolls, except at the end or point where it is shaped to form the bevel on the end of the shank. The roll n is on the end of a shaft, u , geared to and driven from the shaft d , and the gudgeons of the friction-roll o turn in suitable bearings. The connecting-tube m receives the blank from the upper roll and guides the head to the recess s of the lower roll, the rolls being preferably so timed that the lower rolls take the blank as soon as it leaves the upper rolls, or, in other words, so that the blank continues to move without stopping after passing into the upper rolls until it emerges from the lower rolls, from which lower rolls it is automatically removed and carried to the action of a punching mechanism, which shears off the excess of metal at the opposite edges and point of the blank and completes or finishes the nail, the nail-blank when it emerges from the lower rolls having the shape seen at C, and when it emerges from the punching mechanism having the shape seen at D.

The blank-receiving, holding, and punching mechanism is as follows: $v w$ denote two jaws or gripping ends of a pair of nippers or levers, $x x$, fulcrumed at $y y$ and connected at their lower ends to toggle-arms or links $z z$. The inner face of each jaw is formed with a notch, a^2 , which closes upon the corresponding projecting edge of the nail-head, and when the jaws close upon the blank the head enters the two notches a^2 , while the jaw-faces above the notches grasp or fit upon the adjacent portions of the edges of the nail-shank, the jaws being in a plane parallel with the axes of the die-rolls. At one side of the jaws they move against a vertical guide-wall or face, b^2 , extending from the periphery of the roll o , and against this wall the head and shank of the blank are thrown as the blank emerges from the rolls $n o$, the friction-roll o being made of larger diameter than the roll n , so that it tends to throw the blank over toward the roll n . This action straightens the shank, or leaves it slightly but uniformly bent, and insures the proper presenta-

tion of the head for the grasp of the jaws $v w$. The jaw-levers $x x$ are pivoted to a vertically-reciprocating slide, c^2 , and at their lower ends they are connected not only by the toggle-links $z z$, but by a cross-plate, d^2 , which, by means of links $e^2 f^2$, is jointed to one end of a lever, g^2 , fulcrumed at h^2 , and connected at its outer end by a link, i^2 , with a cam, k^2 , on the driving-shaft, the link i^2 having a slot, l^2 , through which the cam-shaft passes, and a pin, m^2 , upon which acts a cam, k^2 , on the side of a cam-wheel, o^2 , rotation of the cam effecting the upward movement of the tongs or gripping-jaws to receive the blank, and their downward movement to carry the blank down and present it to the action of the punch and die. The plate d^2 has a vertical slot, p^2 , through which extends the center link-pin q^2 and two horizontal slots, r^2 , through which extend the lever and link-pins s^2 , and, as the inner end of the lever g^2 starts up by the action of the cam, the center pin is carried up in the slot p^2 and the end pins move inward in the slots r^2 , thus opening the upper ends or jaws of the levers, friction preventing the levers and toggles from moving up until the pin rises to the top of the vertical slot p^2 , in which rise the opening of the jaws is effected. In like manner, when the inner end of the lever g^2 starts down, the pin q^2 first moves to the bottom of the slot and effects the close of the jaws upon the head of the blank, after which the gripping-levers move down with the lever g^2 . The movements of the jaws and the lower rolls are so timed, respectively, that as the head of the blank emerges from the lower rolls and comes between the jaw-notches a^2 , the lever-arm g^2 begins to move down, thereby closing the jaws upon the head and then descending with the nail-head between the jaws. When the jaw-levers reach their lowest position the lever g^2 stops and the nail-blank is held stationary between a punch, t^2 , and a die, u^2 , in a die-plate, v^2 , the die projecting from the front end of a follower, w^2 , to which it is fastened by suitable clamping mechanism, and corresponding in form to the shape to be imparted to the edges of the finished nail, and the die-opening being of the same shape. The die-plate is stationary, but the punch-block is on the end of the reciprocating follower w^2 , sliding in a horizontal guide, x^2 , and actuated by an eccentric, y^2 , on the shaft b , and a link and eccentric-strap, z^2 , connecting the follower with the eccentric.

As soon as the nippers or gripping-jaws stop their descent the punch t^2 begins to move forward, and the nail-blank head and the head of the punch being in exact line, as are also the shank portion of the punch and the shank of the blank, the punch presses the blank from the jaws, the stress of the jaws being released, and the passage of the blank into the die presses it against the die-plate and into the die, removing from it all excess of metal at the edges and bringing the shank to its ultimate and finished form. As soon as the punch has brought the blank-head to the die-plate the cam opens the jaws and the levers ascend for a new blank, the punch continuing its forward movement and

pressing the blank into the die-plate and then receding, so that the punch is ready for the next blank as soon as the jaws bring it down. The die-opening in the die-block leads into a space, a^3 , into which the finished nails are pressed, and through which they may fall into a suitable receptacle placed beneath the machine. The scraps removed by the punch and die, and which may, by the action of the mechanism, be left upon the punch, are stripped therefrom by a stripper, b^3 , which straddles the punch. Each set of rolls $f g$ and $n o$ is preferably made to operate upon two blanks at each rotation, there being two pairs of grooves and recesses in the upper rolls and two grooves in the lower rolls. To insure the dropping of the blank to the upper rolls at the proper time a stop, c^3 , may extend into the tube l , this stop being on the end of a lever, d^3 , pivoted at e^3 , and being kept in the tube by a spring, f^3 , until the proper time for the blank to drop to the rolls, when a pin, g^3 , on the shaft e , acts on the lever, throwing back the stop and letting the blank pass it.

It will be observed that by this organization punch-blanks, by one continuous operation, are automatically shank-rolled, surface-finished, or smoothed, pointed, and punched into their ultimate form.

I claim—

1. In combination with rolls for drawing out

and shaping horseshoe-nails, and a die and punch for trimming the edges of the nail as formed by the rolls, mechanism to transfer the nail from the rolls to the die and to hold it vertically in proper position in front of said die until the punch in its forward movement shall come in contact with the nail, and then release its hold that the punch may force said nail into the die, substantially as set forth.

2. The combination of the drawing or shaping mechanism, the seizing, carrying, and holding mechanism, and the punching mechanism automatically co-operating to roll the nail-shank and turn its edges, substantially as described.

3. Jointly, the two sets of rolls $f g$ and $n o$, each roll being constructed as described, the roll o being a plain frictional roll and larger than the roll n , as and for the purpose set forth.

4. The combination of the devices shown and described for successively drawing, pointing, surface-finishing, straightening, and edge-trimming a nail-blank.

5. The reciprocating griping-nippers or levers $x x$, stationary die-plate v^2 , and reciprocating punch t^2 , combined and operating substantially as described.

GEO. L. HALL.

Witnesses:

FRANCIS GOULD,
L. H. LATIMER.

(103)