

(No Model.)

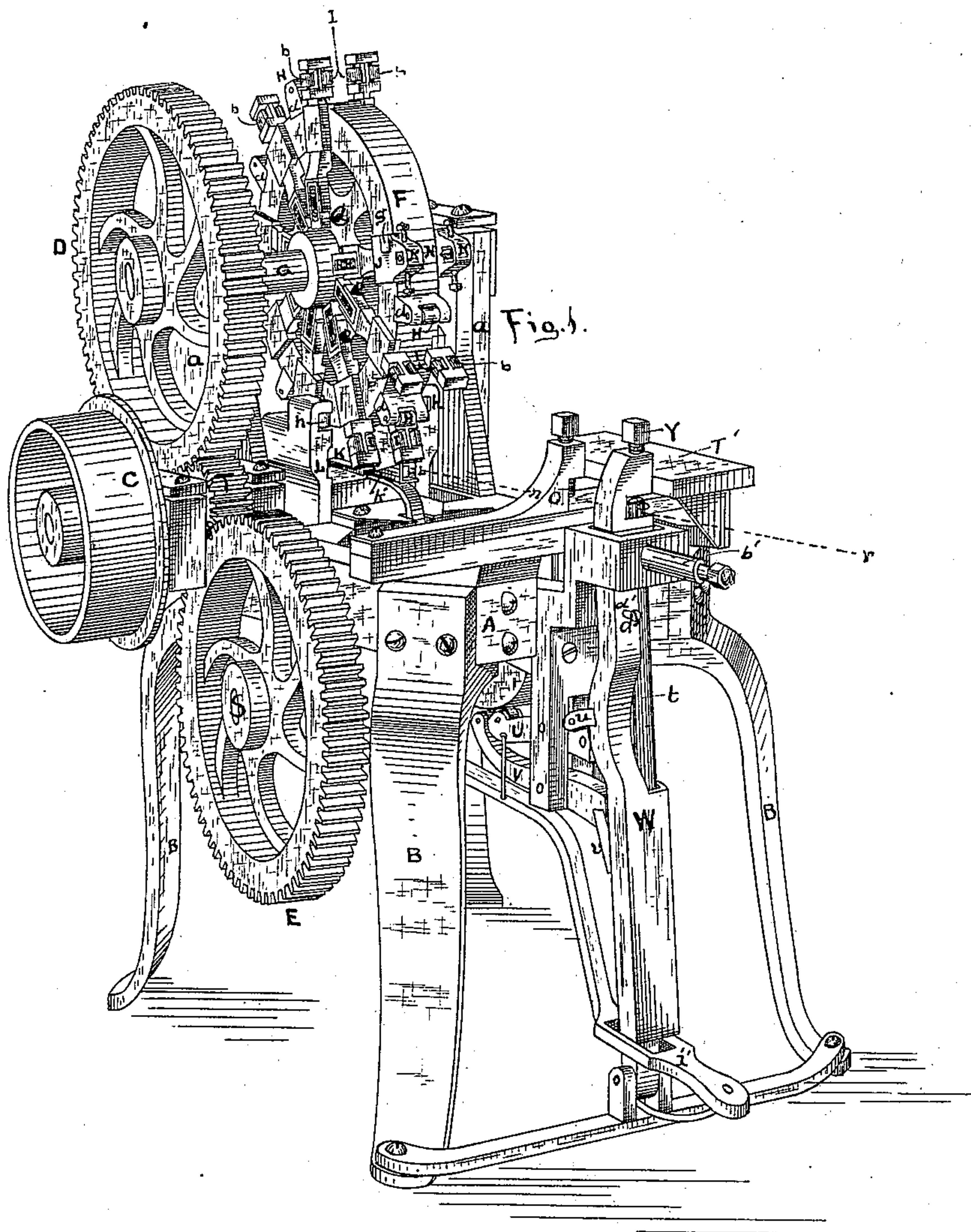
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D. F. WILLIAMS.

MACHINE FOR FORGING HORSESHOE NAILS.

No. 333,984.

Patented Jan. 5, 1886.



Attest.
A. B. Smith
E. C. Ford

Inventor:
D. F. Williams
By his atty
R. D. Smith

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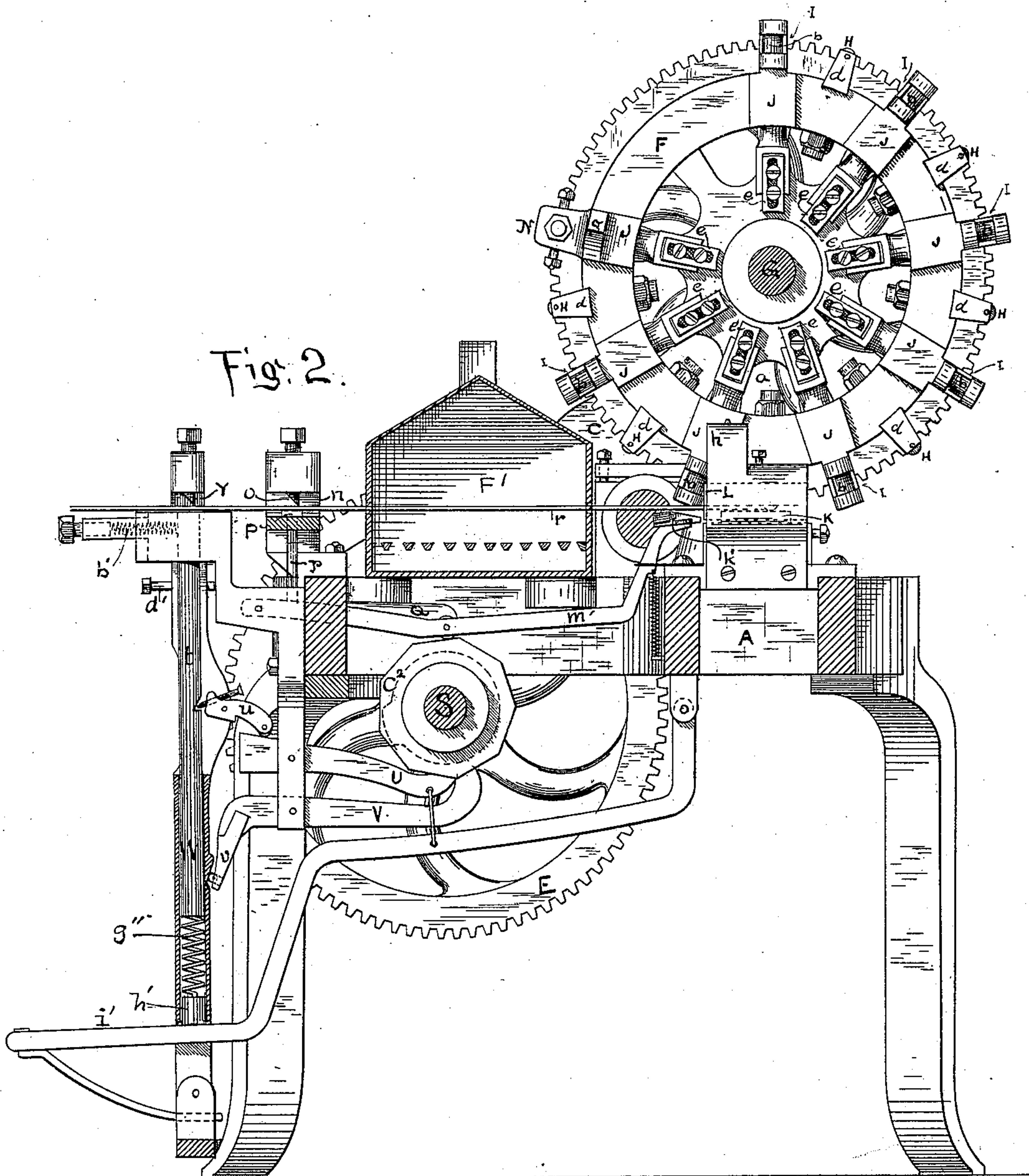
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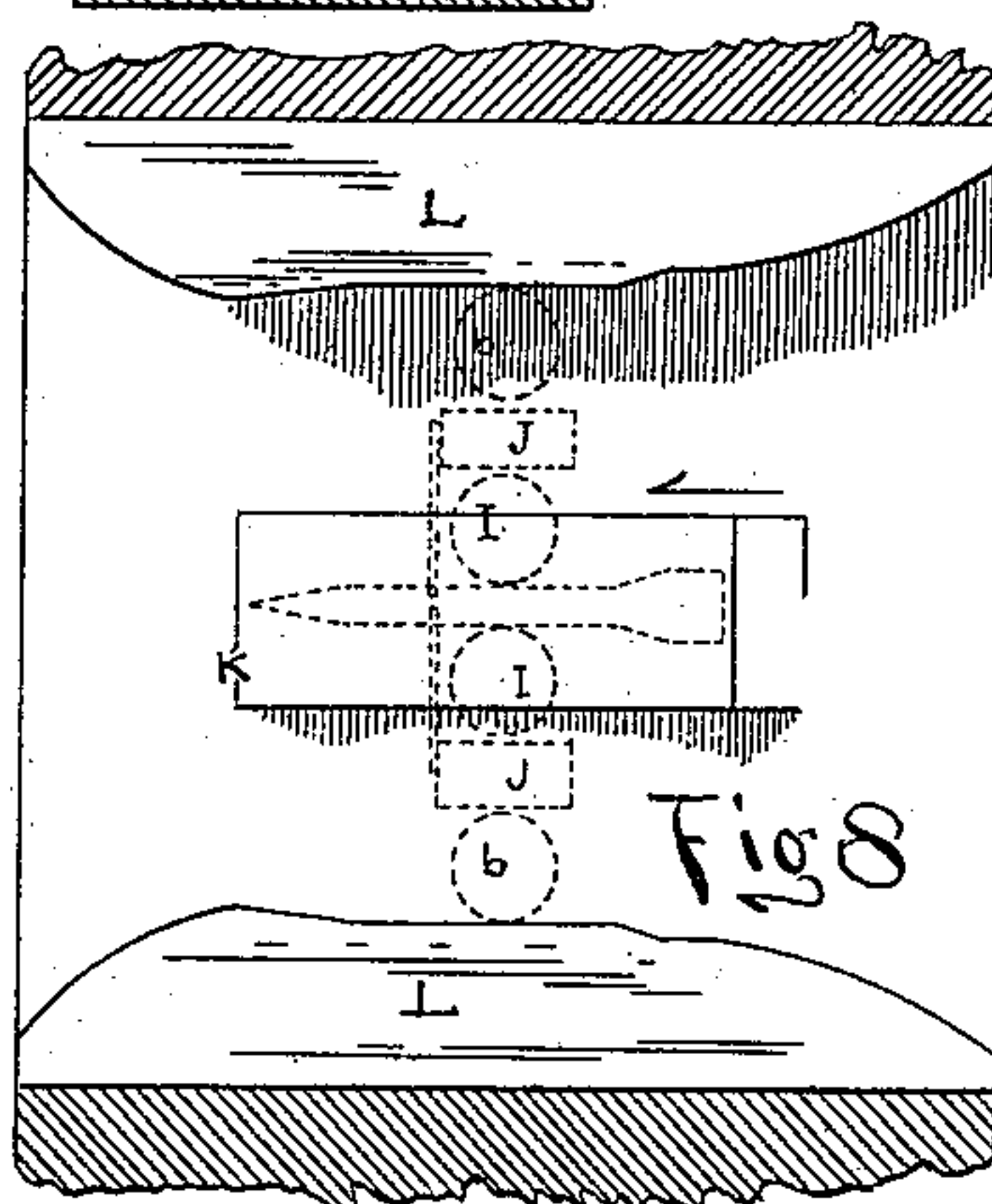
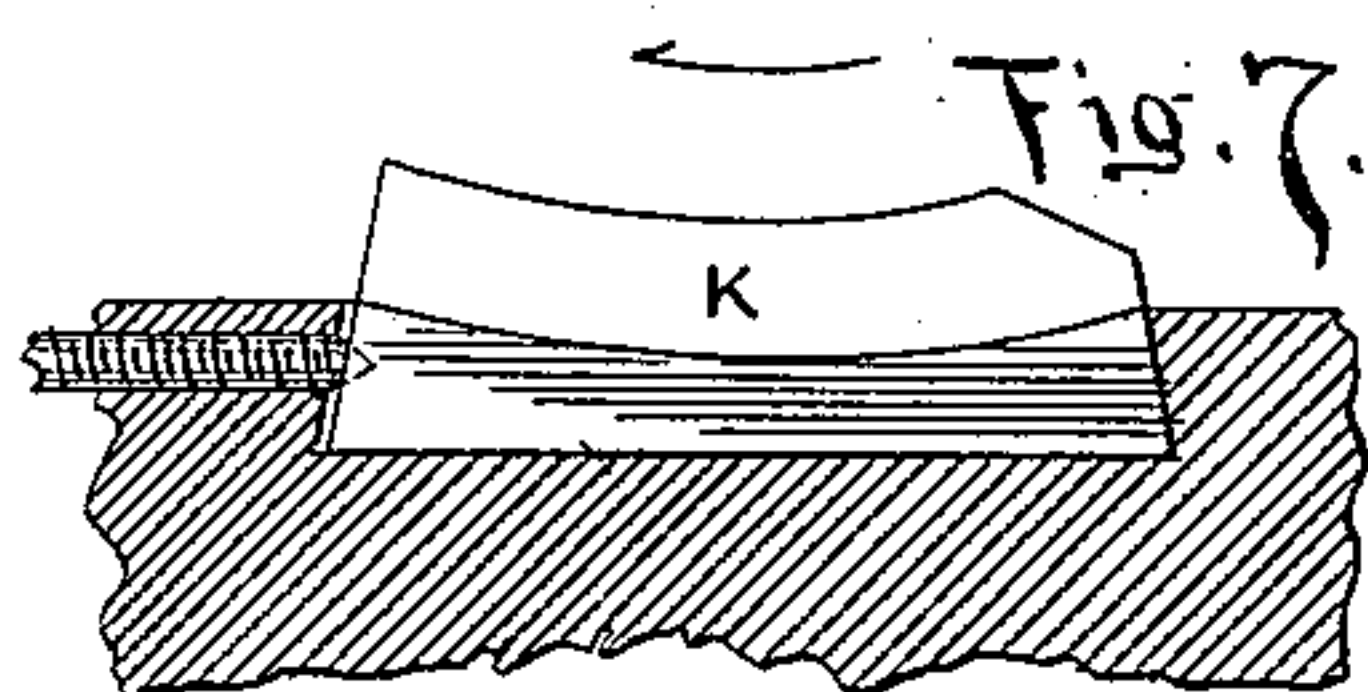
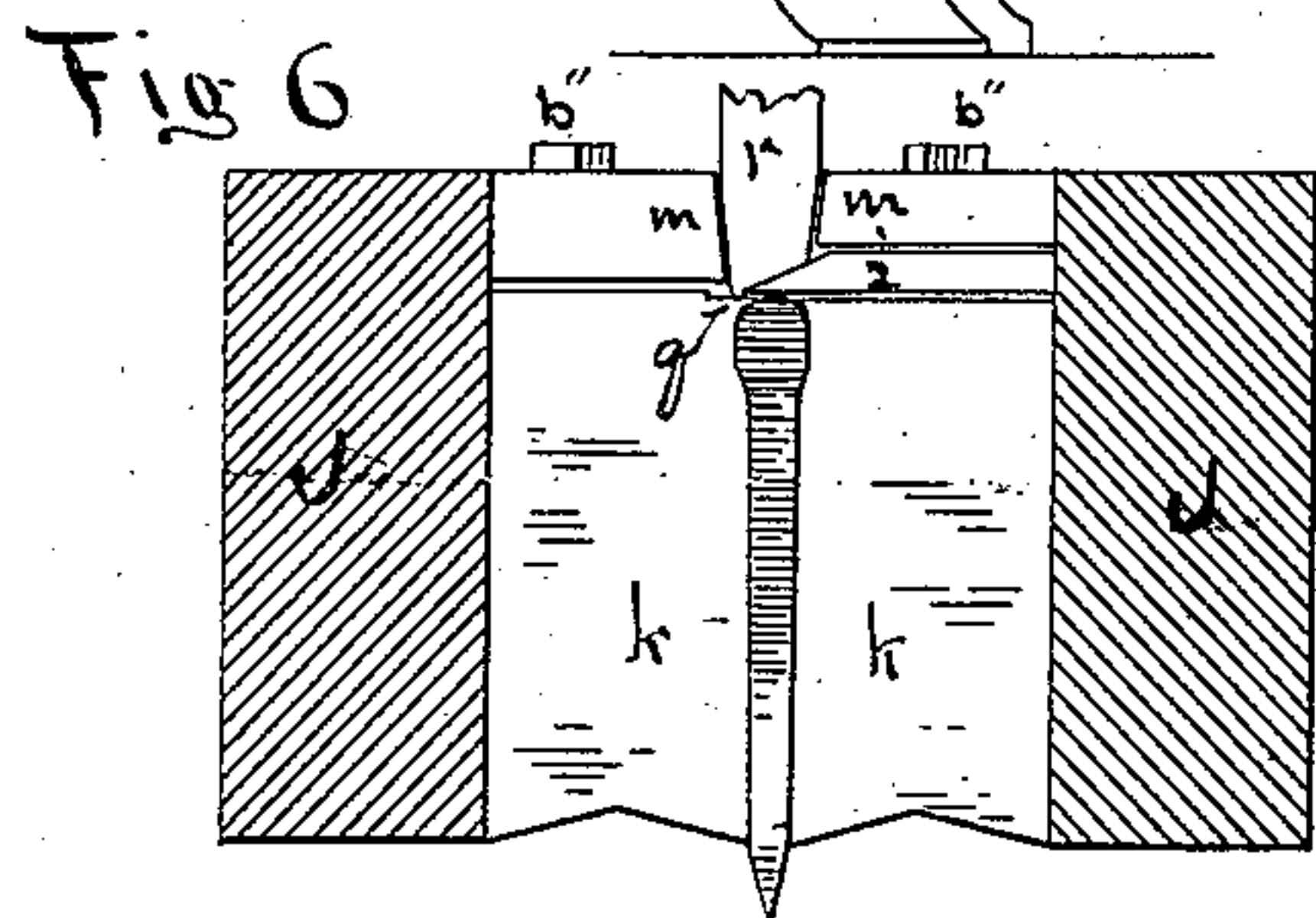
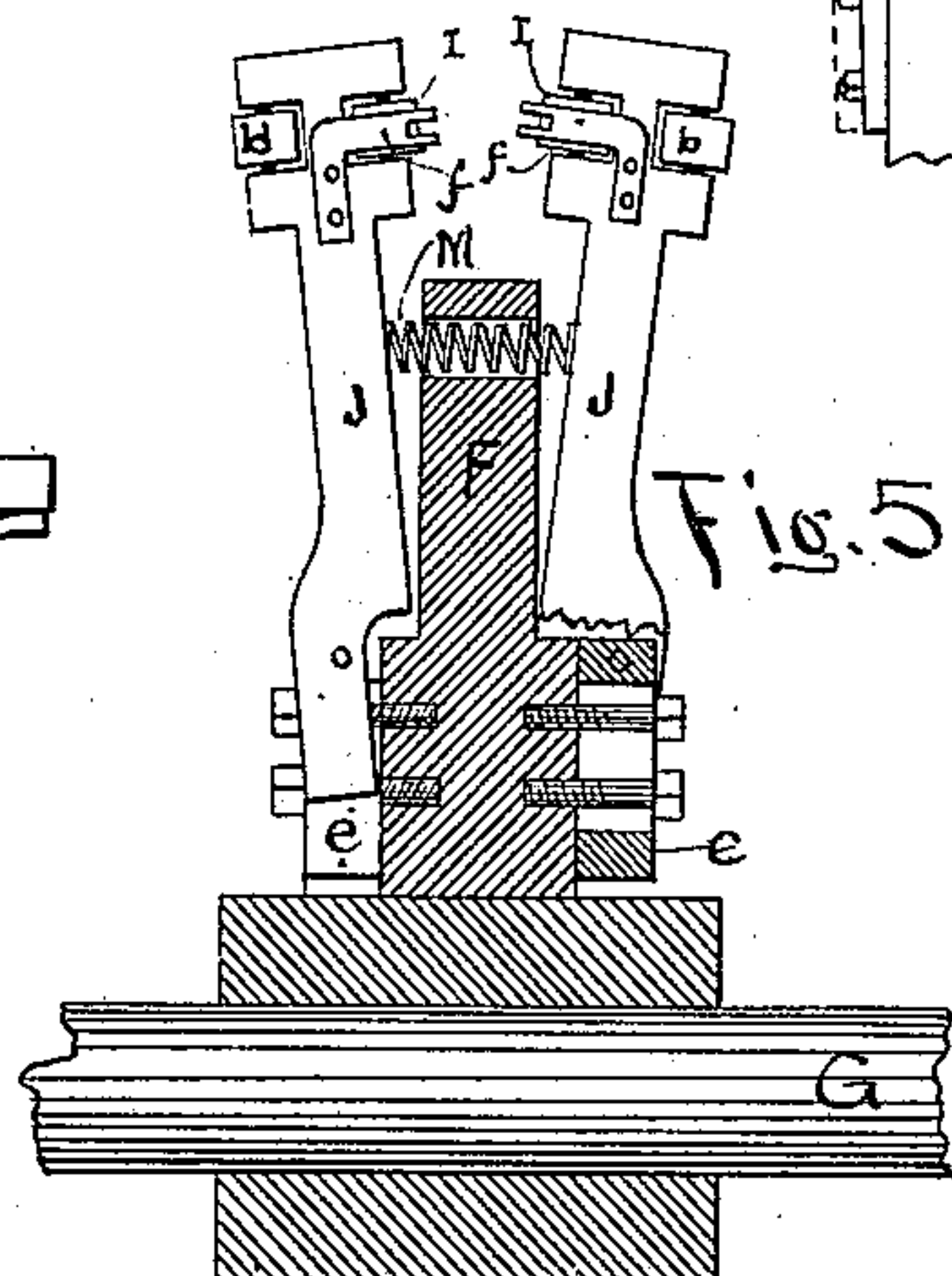
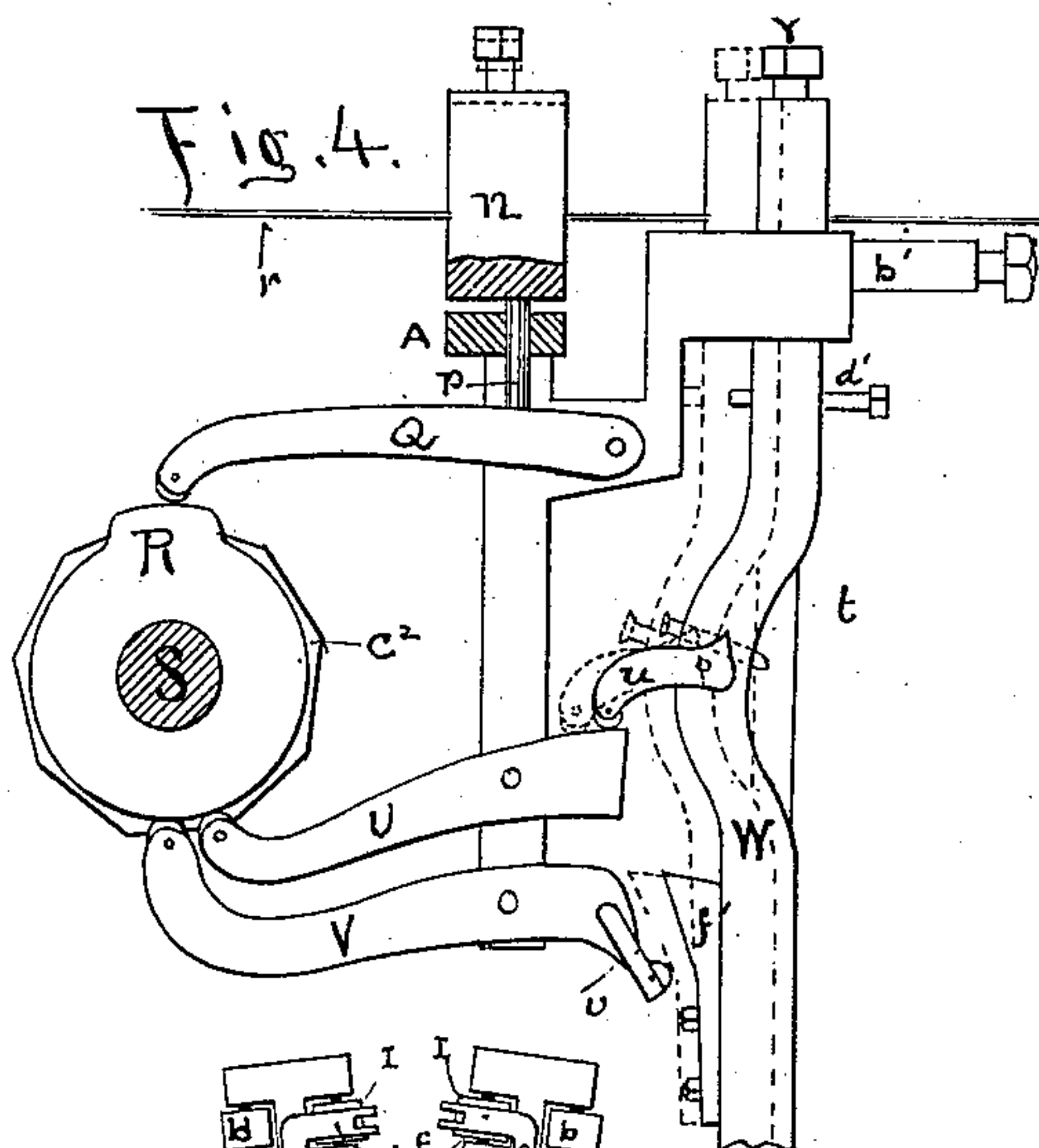
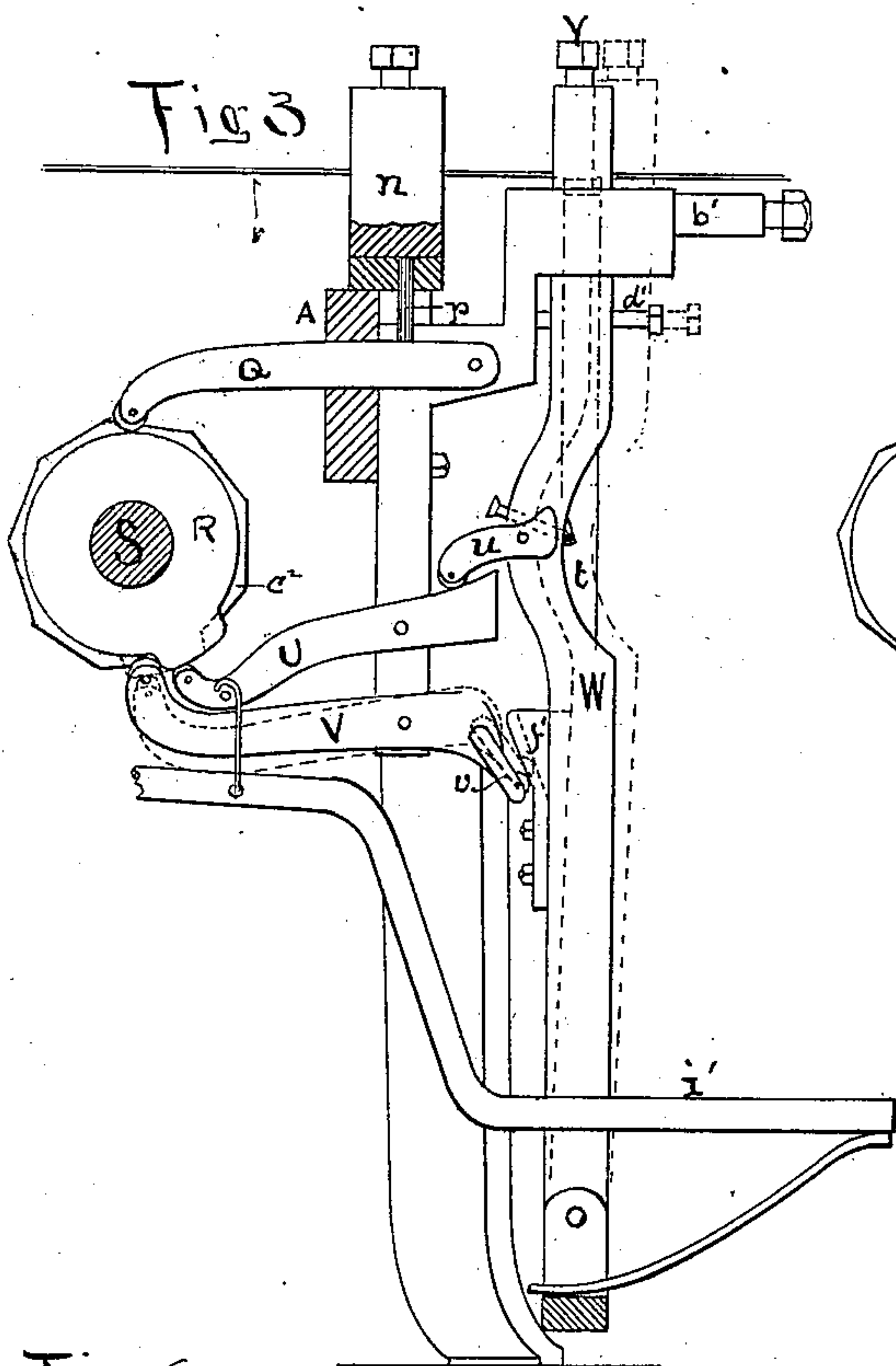
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UNITED STATES PATENT OFFICE.

DAVID F. WILLIAMS, OF PLATTSBURG, NEW YORK.

MACHINE FOR FORGING HORSESHOE-NAILS.

SPECIFICATION forming part of Letters Patent No. 333,984, dated January 5, 1886.

Application filed August 14, 1885. Serial No. 174,363. (No model.)

To all whom it may concern:

Be it known that I, DAVID F. WILLIAMS, of Plattsburg, in Clinton county, in the State of New York, have invented new and useful improvements in machines for forging nails, especially adapted to the manufacture of horseshoe-nails; and I do hereby declare that the following is a full and accurate description of the same, reference being had to the accompanying drawings, wherein—

Figure 1 is a perspective view of my invention. Fig. 2 is a longitudinal section of my machine. Fig. 3 is an elevation showing the feeding device. Fig. 4 is an elevation of the same, showing change in position. Fig. 5 is a vertical section of the carrier, showing structure of edge-roller. Fig. 6 shows a modification of the cutter. Figs. 7 and 8 show details.

The manufacture of horseshoe-nails by machines requires a higher degree of certainty and perfection of operation than most other mechanical operations, because the horseshoe-nail has essential peculiarities which are not required in other nails. An imperfect nail driven in a horse's hoof may injure or ruin a valuable animal, and any mechanical process which is uncertain in its results will therefore fail to produce marketable nails. Hand-forging is the most perfect process, and those machines which most nearly imitate the methods of the hand-hammer will most closely approach the perfect results of the hand process. At the present time machine-made nails so closely approximate the qualities of the hand-made nails, while they excel them in uniformity, that they are almost exclusively used by farmers.

The forging-machines heretofore used may be separated into three classes: first, those which fashion the nail between dies, commonly rolling-dies; second, those which fashion the nail between impacting dies or hammers, and, third, those which fashion the nail by successive blows from a roller of small diameter carried on a revolving shaft. I do not deem it necessary to describe the differences in effect which these modes exert upon the metal under treatment. It will be sufficient to point out that my invention belongs to the third class, and that the blow of the small roller carried upon the revolving shaft over a stationary anvil closely simulates in its method and effect the

blow of the hand-hammer upon metal resting upon a stationary anvil, because its first impact is against the nail-rod at a distance from its end, and its action is upon the iron in a direction from the place of impact forward toward said end. The iron is thereby drawn out in front of the advancing roller just as the iron is drawn out in front of the hand-hammer, the blows of which are delivered successively advancing toward the point. The extremity is therefore the last to be drawn down to size. In this way the metal is prevented from splitting at the end of the nail.

The small roller upon the revolving shaft and the stationary anvil having been used heretofore, I do not propose to claim the same, but to confine myself to the device whereby the nail is gradually formed by a succession of roller-blows moving at a less speed, and therefore with less wear and tear upon the machine.

For convenience of description, I will separate the devices of my machine into separate groups, which are all supported on a frame, A, common to all of them. Said frame is preferably made of cast metal, cast in a single piece, with proper bearings for the working parts. The frame A is provided with suitable legs, B. Motive power is received on a pulley, C, which I prefer to place on a counter-shaft provided with a pinion, T, and to transmit motion therefrom by gearing D E in mesh with said pinion to the moving parts of the machine, whereby the speed of the machine may be to any desired degree less than that of the main shaft.

The forging devices comprise a carrier-wheel mounted on a shaft, G, which turns in bearings at the top of the standards *a*. The carrier F is provided with a series of forging-rollers, H, set upon the exterior periphery of said carrier. In the machine which I have constructed this series comprises eight rollers, and they are set progressively farther from the center from one end of said series to the other, so that the hot iron nail-rod *r* is gradually reduced and drawn out. Intermediate as to said rollers H, I provide other forging-rollers to act upon the edges of the nail, so that it is alternately subjected to forging upon the side and edge. The rollers I are mounted upon arms J, which are pivoted to the sides

of the carrier F, so as to be capable of movement toward or away from the periphery of the wheel, and arranged in pairs opposing each other in their action. An anvil, K, is mounted upon the frame A, in the plane of revolution of the carrier, so that the several forging-rollers pass directly in front of it, each succeeding one of the series approaching nearer to said anvil than its predecessor. At each side of the anvil there is a stationary former or guide, L, which causes the rollers I to approach each other as desired while passing the anvil to impart to the nail edgewise the required configuration. When the arms J have passed the anvil, they are retracted, most conveniently by springs M, set in cavities provided in the rim of the carrier. Each of the arms J is provided with a friction-roller, *b*, to traverse the face of the former L and reduce friction therewith. Thus at each revolution of the carrier F the nail-blank is subjected to the successive and progressive action of the series of forging-rollers upon its face and both edges, gradually reducing and drawing it out, and completing the operation during one revolution of said carrier. These are essential devices to accomplish the purpose in view.

The details of structure may of course be varied without in any way changing their operation as set forth; but the construction which I prefer I will now more minutely describe. Each roller H is mounted in the fork of a clip, *d*, the shank of which passes down through the periphery of the carrier F, and is secured by a nut. The adjustment of the roller as to its radial distance from the axis of the carrier may be accomplished by means of adjusting screws, wedges, or shims; but I prefer the latter, because it is sufficiently delicate and much cheaper and easier to handle. The arms J are each jointed to a plate, *e*, which is bolted fast to the side of the carrier, and the endwise adjustment required to properly locate the edge-roller is secured by slotting said plate *e* and placing the holding-bolts through said slot, so that the plate *e* may be moved endwise on said bolts. The point of the nail having been reduced by the action of the forging-rolls, is sometimes liable to twist under the action of the edge-rolls toward the rear end of the series, and to prevent this undesirable effect I place a guard, *f*, upon the arms J, so that it will precede the roller in the engagement with the nail, and will guide the nail and prevent it from turning or twisting. I prefer to make the guard *f* from spring-steel and forked at the end, the latter to embrace and engage the nail. The last member of the series attached to the carrier F is the pair of cutters N, said cutters being mounted on a pair of arms, J; but as it is required that the cutters shall close quickly to sever the nail without jerking the rod forward the arms which carry said cutters are not actuated to close by contact with the former, L, but each of said arms is provided

with an inclined projection or stud, *g*, which at the proper moment engages a friction-roller, *h*, mounted on a stationary part of the frame. The cutters are thereby closed quickly to sever the nail, and to remain closed sufficiently long to push the severed nail forward and discharge it from the machine. The cutters N may be simply nipping-cutters, as shown in Fig. 1, or they may constitute a shearing-die, one part, as at *i*, being made to slide over and shear against the edge *q* of the opposite member, *k*, as in Fig. 6. In this case the cam projection *g* would necessarily be more prominent on the side carrying the shear-cutter *i*. The anvil K is a block of chilled steel ground to proper shape under an emery-wheel. Several of these blocks may be bolted to the same bed and face-ground at the same time. They will therefore be exactly alike in configuration, and if it becomes necessary to remove one anvil it may immediately be replaced by another which is an exact duplicate. The anvil K is firmly seated in a solid portion of the bed of the machine, and is held in place by suitable clamping-screws.

In addition to the cutters described, I have employed a pair of dies, *k k*, having the configuration of the edge of the nail to compress and straighten it. The dies *k k* are attached to and carried by the arms J J, which carry the cutters, so that they move coincidentally with the cutters. In Fig. 6 the cutter *i* is shown shearing against the edge *q* of the opposite die *k*; but it is evident this is merely a convenience, and that a separate shear-plate could be employed, and might form a part of the die *k* on that side. By this means the nail is simultaneously sheared off and squeezed on its edge to straighten it. The act of shearing off the nail mutilates and spreads the end of the rod from which the next nail is to be formed, and I have therefore also attached to the outer side of the cutters a pair of die or compression shoulders, *m m*, which advance upon the rod outside the cut and squeeze the same to a blunt point, as shown in Fig. 6.

The die *k*, cutter *i*, and die *m* on one side are all solidly united, say, by bolts *b''*, and carried by one arm J, while the die *k*, having the shearing-edge *q*, and the die *m* on the other side, are similarly united together, and carried by the other arm J.

Feeding devices consist, primarily, of a moving grip and a stationary grip having alternate periods of action, so that the latter may firmly hold the rod while it is being forged and release it while being fed forward. The stationary grip consists of an adjustable chisel-edged grip, O, mounted on a spring, *n*, one end of which is fastened to the frame A. Opposed to said grip O there is a serrated plate, P, and the nail-rod is firmly gripped and held between O and P. The spring *n* is periodically lifted to release the nail-rod *r* by a pin, *p*, resting on a lever, Q, pivoted at one end to the frame A, and having its free end engaged with a cam, R, on the shaft S, which is driven by power

transmitted from the shaft-pulley C by means of the spur-gear T, in mesh with the wheels D E, and less in diameter than said wheels, so that they are revolved with less speed than said pinion. The levers U and V, pivoted to the frame, also rest upon and are actuated by said cam R, to transmit to the feed-arm W and the grip Y, carried thereon, the required movements to grip, feed the rod *r* forward, release said rod, and return for another hold. The levers U V lie close together, one above the other, and are actuated simultaneously, except that the action of the lever U begins and ends slightly in advance of the beginning and ending of the lever V. At the top of the feed-arm W there is a chisel-edged grip, Y, and acting against it there is a spring-impelled bolt or rod, *t*, also carried in guides by said arm. Said bolt *t* is dominated by a lever, *u*, pivoted to said feed-arm, and in engagement with the lever U, so that when said lever U is moved by the cam R said rod will be drawn downward and the grip Y relaxed. Immediately after this action of the lever U said cam R will engage the lever V, and that will be similarly depressed, causing its toe to engage said bed-bar and push it backward. The action of said cam causes it to be retained in its backward position until after said cam has passed by the lever U and the grip Y has come into action again. The lever V will then be released also, and the arm W will be free again to impel the rod *r* forward to feed another nail. The toe *v* is, by preference, armed with a friction-roller, and acts against an inclined plane, *f'*, which, if made adjustable, can be caused by its adjustment to regulate the backward throw of the feed-arm W. The spring *g''* is put in its guide from below, and its tension may be varied by raising or lowering the plug *h'*, on which it rests. The foot-lever *i'* is employed to depress the lever U at will, to release the nail-rod *r* when it is necessary to take the same out of the machine. It is desirable to raise the nail from the face of the anvil while being acted on by the edge-rollers, and a nose-guide, *k'*, is therefore placed on the end of the lever *m'*, and located immediately at the front end of the anvil K, and said lever *m'* rests upon a cam, *C'*, whereby it is caused to rise immediately after the departure of the forging-roller H and the arrival of the edge-rollers I, and to sink again immediately after the departure of said edge-rollers. A spring causes said nose-guide to sink promptly on the passage of the cam *C'*.

The furnace F' may be of any suitable construction, and it may be heated by gas, charcoal, coke, or other proper fuel.

The table T' is employed, when needed, as an anvil on which the nail-rods may be straightened.

The forward motion of the feed-arm is produced by the spring *b'*, and its range of motion is determined by the stop-screw *d'*.

Having described my invention, I claim—

1. In a horseshoe-nail-forging machine, the

combination, with the anvil, of a revolving wheel-carrier provided with a series of forging-rollers on its periphery, and a series of edge-rollers attached to said carrier intermediate as to said forging-rollers, substantially as set forth.

2. In a horseshoe-nail-forging machine, the combination, with the anvil, of a revolving wheel-carrier provided on its periphery with a series of adjustable forging-rollers and an intermediate series of movable edge-rollers, and stationary guides for said edge-rollers, whereby at the proper point in the revolution the edge-rollers will be caused to approach each other and roll the edge of the nail approximately in the shape desired.

3. In a horseshoe-nail-forging machine, the combination, with the anvil, of a revolving wheel-carrier provided with a series of radially-adjustable forging-rollers and intermediate therewith a series of radially adjustable and movable edge-rollers, and movable cutters also carried by said carrier to separate the forged nail from the nail-rod, substantially as set forth.

4. In a horseshoe-nail machine, the combination, with the anvil, of a revolving wheel-carrier provided with a series of forging-rollers intermediately a series of edge-rollers, a cutter to detach the nail from the nail-rod, and the die-pieces *m m*, carried with the cutters to deliver a blow to the end of said rod as the nail is severed therefrom, as set forth.

5. In a horseshoe-nail-forging machine, the combination, with the anvil and forging-rollers, of the edge-rollers and the lifting-guide arranged to lift the nail immediately after the action of each forging-roller, substantially as set forth.

6. In a horseshoe-nail-forging machine, the combination, with the anvil and forging-rollers, of the edge-rollers and the forked guide to hold the nail from twisting between the edge-rollers, substantially as set forth.

7. In a horseshoe-nail-forging machine, the combination, with the anvil and forging-rollers, of the edge-rollers mounted on arms pivoted to adjustably-connecting plates, whereby said rollers may be adjusted radially, substantially as set forth.

8. In a horseshoe-nail-forging machine, the combination, with the anvil and the forging-rollers, of the automatic holding-grip and the automatic vibrating feeding-grip and the cam, substantially as set forth.

9. In a horseshoe-nail-forging machine, the cam combined with the levers U V, both pivoted to the frame and arranged to engage the said cam close together, but one slightly in advance of the other in the order named, and the grip-bolt whereby the feeding-grip is released and then retracted to catch a new hold on the nail-rod, as set forth.

10. In a horseshoe-nail-forging machine, the combination, with the anvil and the edge-rollers, of the nose-guide, the lever whereon it is mounted, and the cam adjusted to raise said

guide and the nail-rod from the anvil just in advance of the arrival of said edge-rollers, substantially as set forth.

11. In a horseshoe-nail machine, in combination, a revolving carrier provided with a series of forging-rollers mounted on one shaft provided with a gear-wheel, D, and an automatic reciprocating feed device actuated by a set of levers, and a cam or cams on another shaft provided with a gear-wheel, E, and an

intermediate shaft provided with a band-pulley, C, and pinion T in mesh with and less in diameter than the wheels D E, whereby the driving-belt may run at a high speed and the operative devices at a lower speed, as set forth. 15

DAVID F. WILLIAMS.

Witnesses:

JAS. SHAW, Jr.,

R. A. REID.