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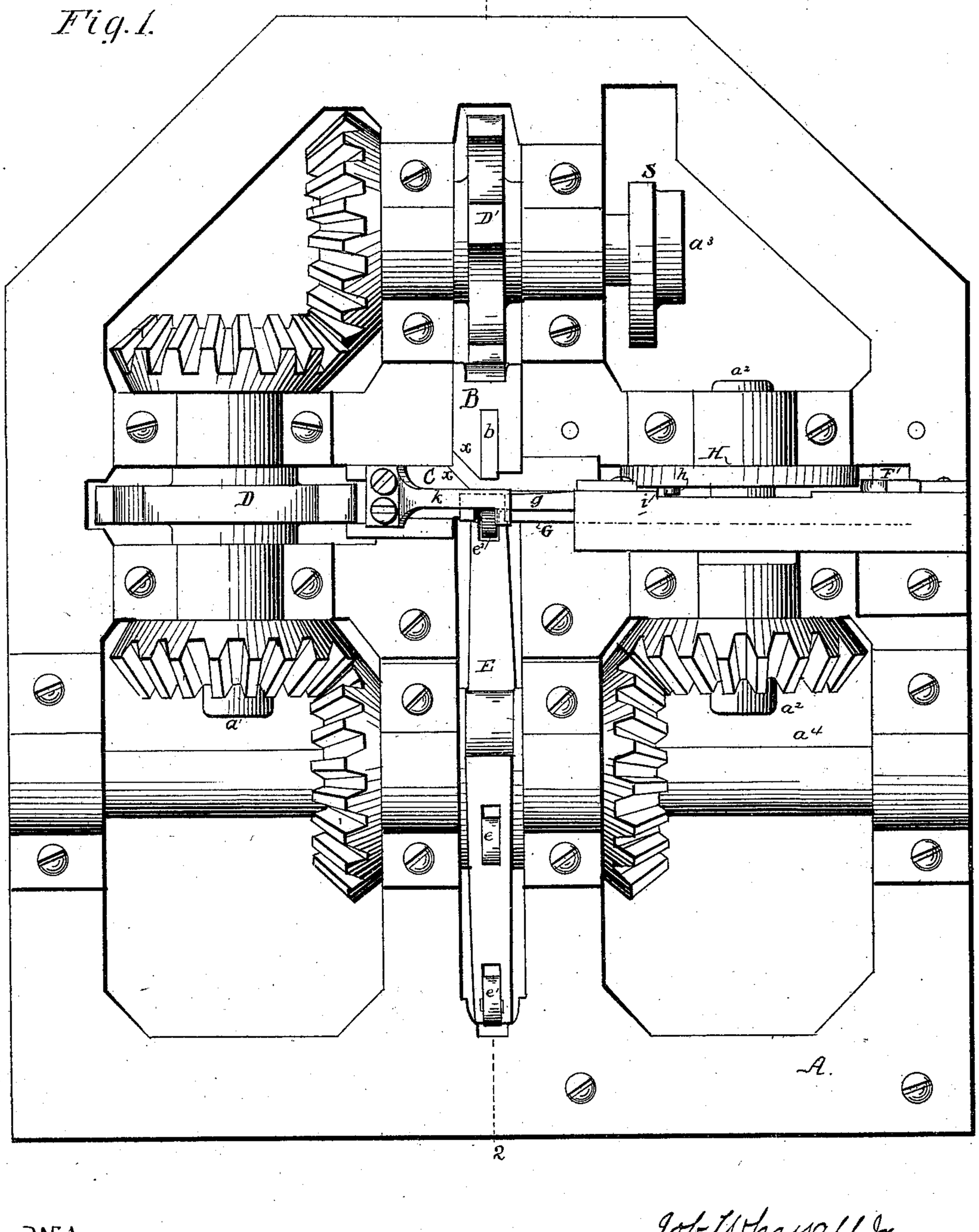
J. WHYSALL, Jr. & C. M. MERRICK.

MACHINES FOR FORGING HORSESHOE NAILS.

No. 176,912. Patented May 2, 1876.

Fig. 1.



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George Thom.

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Charles M Merrick
By their atty
Charles E. Foster

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J. WHYSALL, Jr. & C. M. MERRICK.

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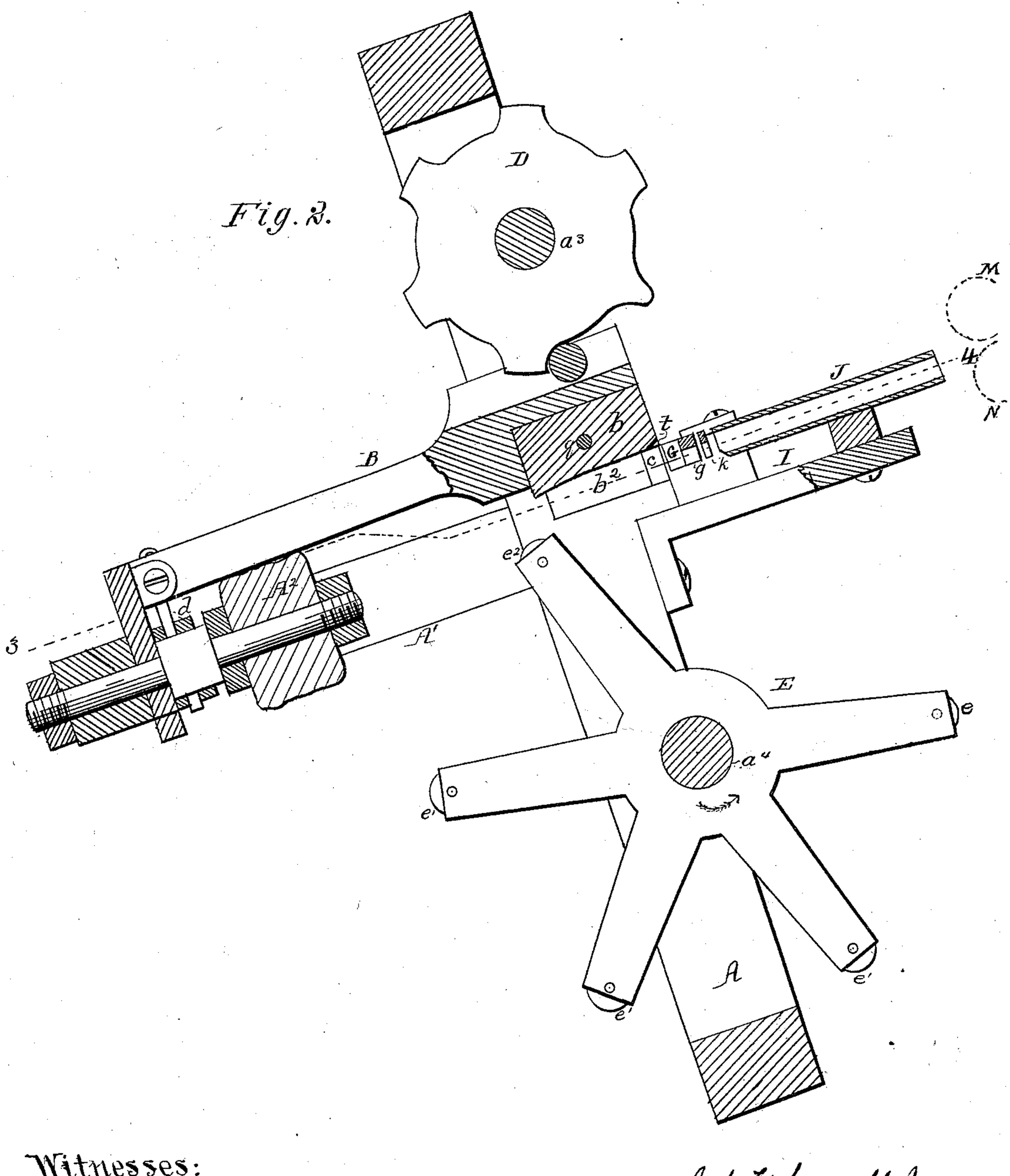
Fig. 2.



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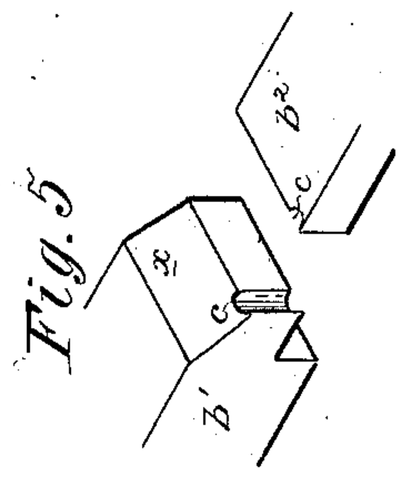

Fig. 5

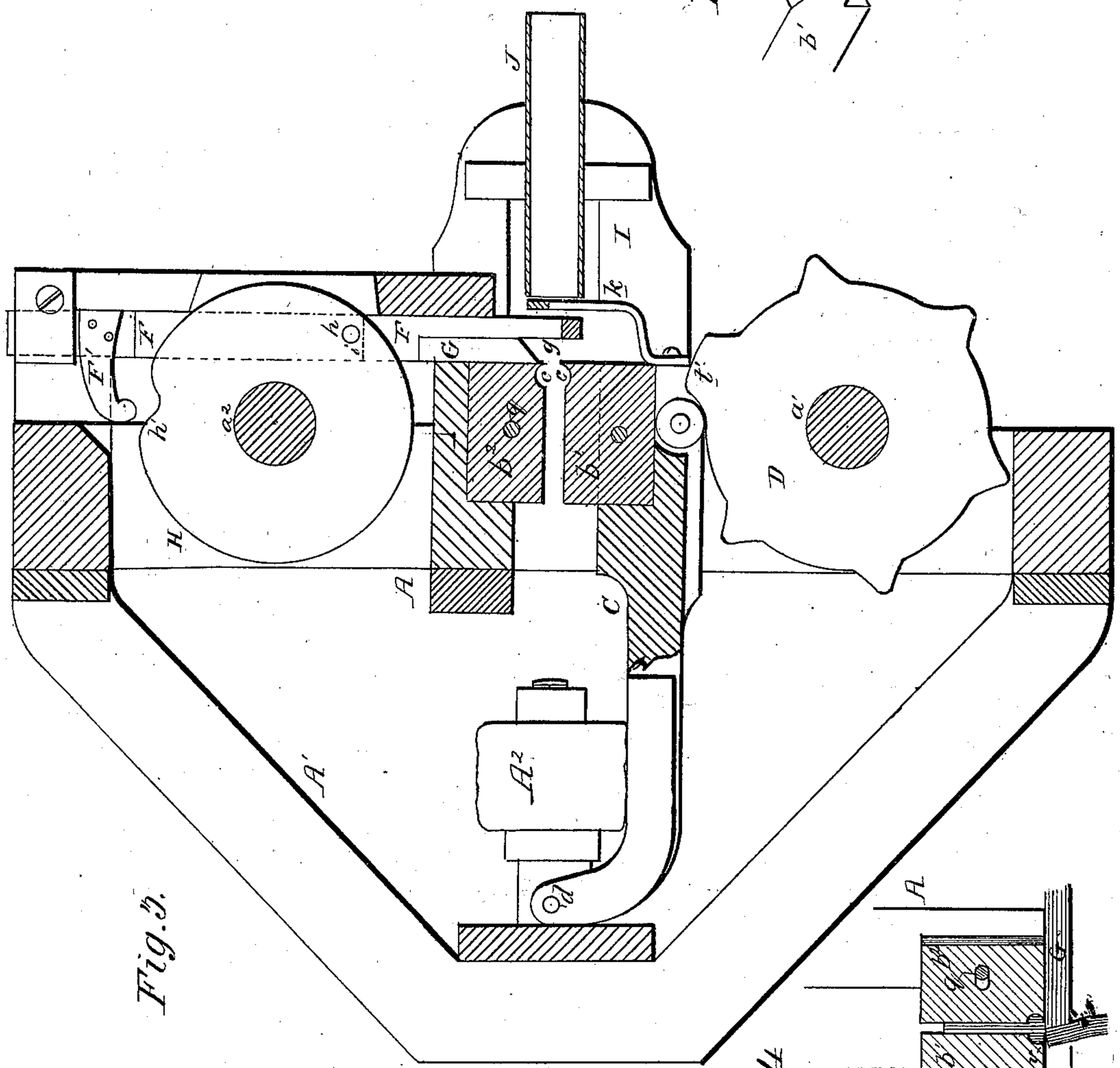

Fig. 5.

Fig. 4

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Fig. 6.

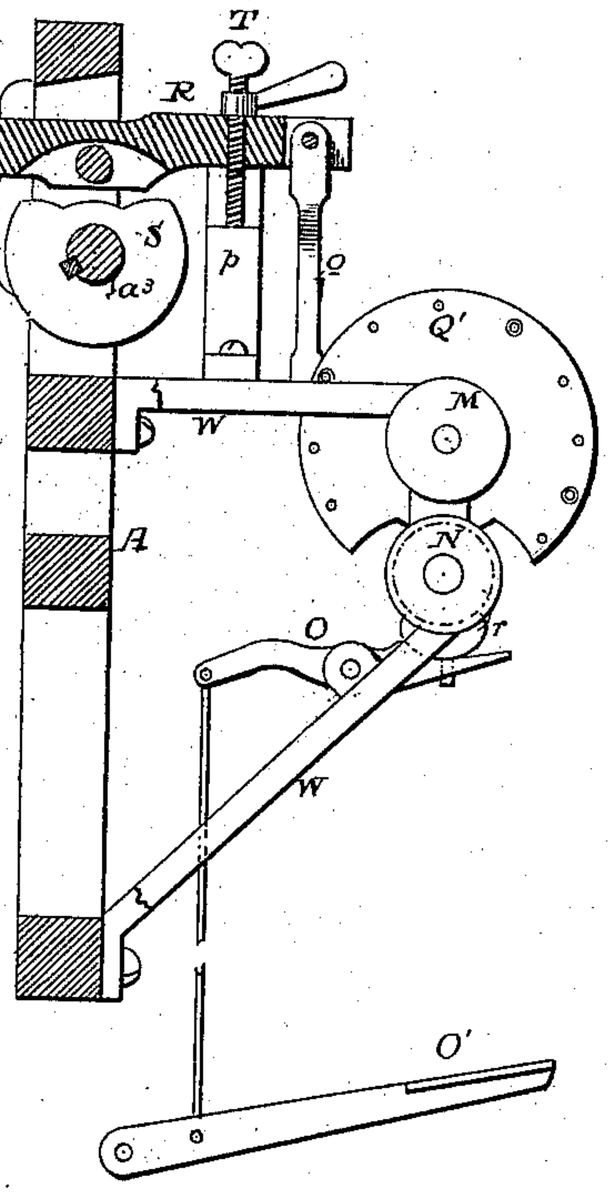


Fig. 7.

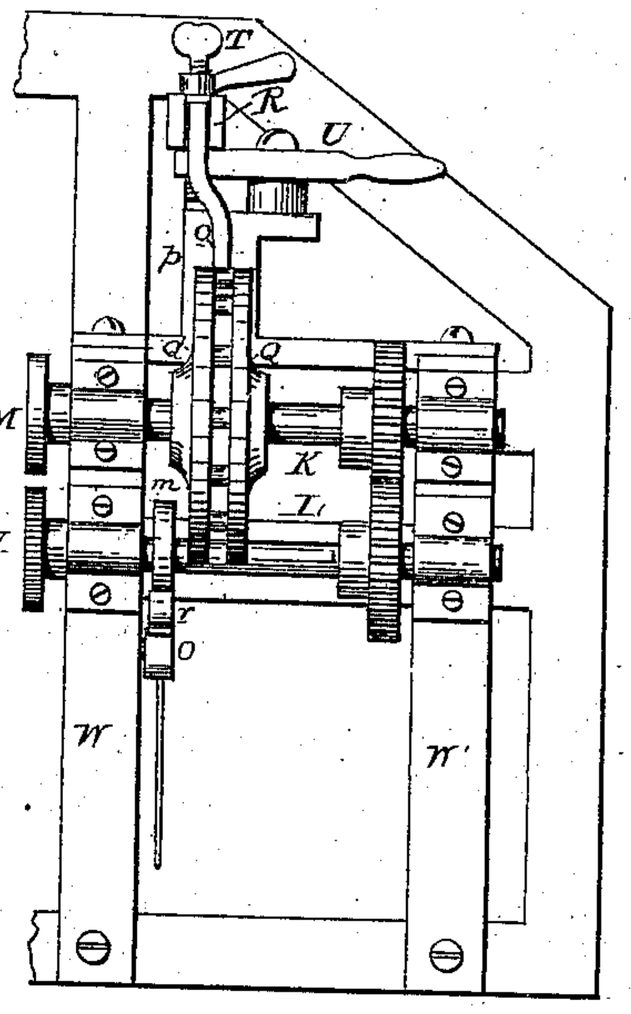
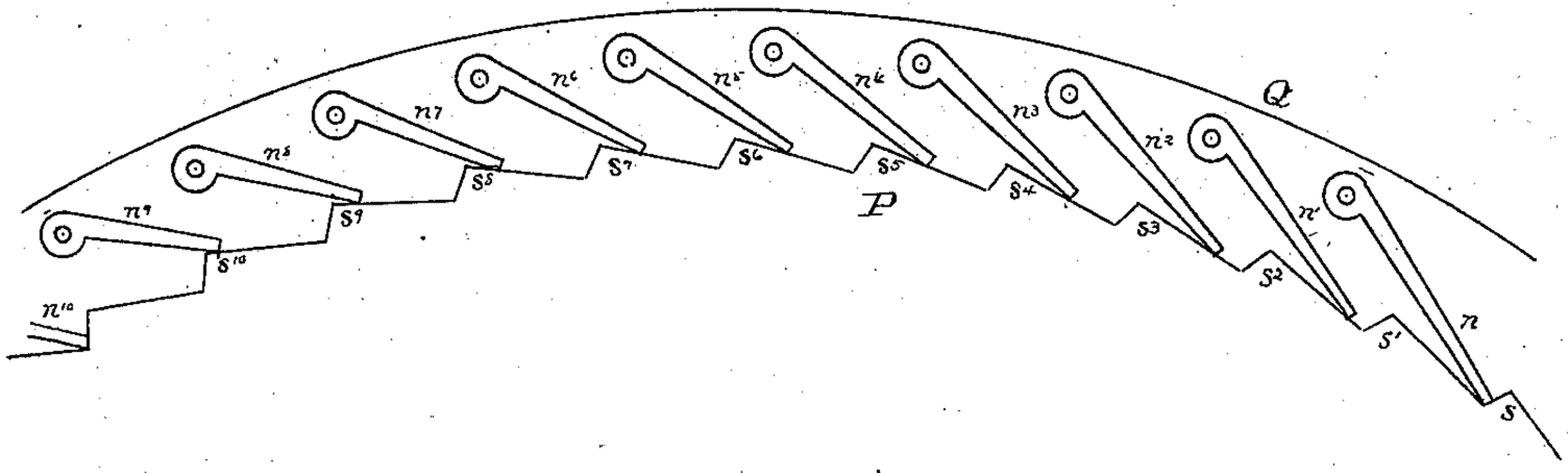


Fig. 8.



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UNITED STATES PATENT OFFICE.

JOB WHYSALL, JR., AND CHARLES M. MERRICK, OF NEW BRIGHTON, PA.

IMPROVEMENT IN MACHINES FOR FORGING HORSESHOE-NAILS.

Specification forming part of Letters Patent No. **176,912**, dated May 2, 1876; application filed February 25, 1876.

To all whom it may concern:

Be it known that we, JOB WHYSALL, Jr., and CHARLES M. MERRICK, of New Brighton, Beaver county, Pennsylvania, have invented certain Improvements in Machines for Making Nails, of which the following is the specification:

Our invention relates to that class of machines for making nails and other articles in which a series of dies operate upon a bar inserted between them, as in the machine for which Letters Patent of the United States were granted to us on the 10th day of February, 1874; and our invention consists in constructing the parts, as described hereinafter, to simplify the operation of the machine, increase its efficiency, and insure a better product.

In the accompanying drawings, Figure 1 is an elevation showing the face of the machine, the feed mechanism being detached; Fig. 2, a sectional elevation on the line 1 2, Fig. 1; Fig. 3, a sectional plan on the line 3 4, Fig. 2; Figs. 4 and 5, detached views, showing parts of the machine; Fig. 6, a side view, partly in section, of the feed mechanism; Fig. 7, a front elevation of Fig. 6, and Fig. 8 a diagram.

The frame A of the machine is constructed in any suitable manner to support the bearings of four shafts, a^1 a^2 a^3 a^4, the latter being the driving-shaft. The shaft a^3 is parallel to the driving-shaft, and the shafts a^1 a^2 are parallel to each other, being at right angles to the driving-shaft, all the shafts being geared to turn together. To a yoke, A^1, at the rear of the frame, are pivoted the rear ends of two hammers, B C, vibrating at right angles to each other in slots in the frame, on lines intersecting at the center of the machine, the adjacent sides x x of the heads of the two hammers being beveled, as shown in Fig. 1, for a purpose described hereafter. A rubber block or spring, A^2, bearing upon the shafts of the hammers B C, tends to throw both the latter outward, and to the shafts a^1 a^3 are secured wheels or disks D D′, having at their peripheries cam-projections, which, by contact with the hammers, throw them inward, the hammers having friction-rollers at the points of contact with the cams. Each hammer carries a die, the under face of the die b in the hammer B being slightly curved and beveled at the end t to form the taper front face of the nail-head, and the die b^1 of the hammer C having near the outer end a recess, c, and corresponding with a similar stationary die, b^2, secured in the frame of the machine. The hammer C is pivoted at a point, d, on a line with the center of the machine, or arranged at that side of said line nearest the die b^2, the inner face of the latter being on the same side of said line.

To the driving-shaft a^4 is secured a wheel, segment, or series of arms, E, carrying a series of hardened rollers, e e^1 e^1 e^1 e^2, the peripheries of the rollers e^1 being farther from the center of the shaft than those of the rollers e e^2, the roller e being nearest the center. The wheel E is so arranged that when the dies b^1 b^2 are separated, as shown in Fig. 1, the rollers of the wheel will be carried between them, with their peripheries above the lower edges of the dies. A bar, F, sliding in bearings on the frame, carries a cutter, G, the inner side of which is in contact with the end of the die b^2, and from the end of the cutter projects a hooker-bar, g. A disk, H, secured to the shaft a^2, carries a pin, h, which, by its contact with the edge of a shoulder, i, on the slide F, forces forward the cutter, an inclined edge, h', of the disk thereafter striking against an arm, F′, of the slide, and moving the latter to its first position. A table, I, at the front of the frame, supports a tube, J, the inner end of which is opposite the center of the machine, between the faces of the dies, and a short distance from the latter; and to the end of the hammer C is secured a hooked arm, k, which extends between the end of the tube J and the arm g, and overlaps the latter. To the front of the frame are bolted brackets W W′, to which are secured the bearings of two shafts, K L, carrying feed-rolls M N, the latter being serrated, both rolls being arranged so as to grasp and feed forward the nail-rod through the tube J. The shafts K L are geared together near their outer ends, the inner end of the shaft L having a limited vertical sliding movement in its bearing, regulated by a lever, O, hung to the bracket W, and provided with a loose brake-shoe, r, bear-

ing upward against the edge of a disk, *m*, on the shaft, the said lever being operated by a treadle, O′. The shaft K carries a ratchet, P, (shown in the enlarged diagram, Fig. 8,) with the teeth of which engage a series of pawls, *n* n^1, &c., (ten, in the present instance,) hung to pins projecting from the face of a disk, Q, supported by but turning freely on the shaft K. The disk Q is covered by a cap-plate, Q′, and is connected by an arm, *o*, to a lever, R, hung to a bracket at the rear of the frame, and raised by a cam, S, on the shaft a^3, a spring imparting the downward movement, which is regulated by a screw, T, passing through the lever R and striking a post or bearing, *p*, on the frame. A lever, U, supported by said post, serves to retain the lever R in an elevated position, when the feed is to be suspended.

The pawls *n* n^1, &c., are of such varying lengths, or are so pivoted, that their points shall be at regularly-increasing distances from the shoulders of the series of teeth *s* s^1, &c., of the ratchet-wheel, with which they are in contact. Thus, if there are ten pawls, the first, *n*, will be in contact with the shoulder of the tooth *s*, the second a slight distance from the shoulder of the tooth s^1, the third farther from the shoulder of the tooth s^2, and so on until the ninth is nearly at the point of the tooth s^{10}.

It will be seen that a very slight oscillation of the disk Q—equal to one-tenth of the space between the points of any two of the teeth—will be sufficient to drop the pawl n^9 behind the shoulder of the tooth s^{10}, and a second oscillation of like extent will drop the pawl n^8, and so on, thus insuring the regular movement of the shaft K, and the uniform feed of the nail-bar, with a possible lost motion of less than one-tenth the length of a tooth. It will be apparent that by reducing the size of the teeth, or increasing the number of pawls, increased nicety of adjustment may be obtained.

The operation is as follows: The feed having been adjusted to move the rod forward intermittingly, and to the desired extent, and the nail-rod having been inserted through the tube J, the treadle O′ is depressed, bringing the brake-shoe *r* against and elevating the shaft L, and clamping the rod firmly between the feed-wheels, by which it is held immovably until it is moved forward upon the rotation of the wheels. After the hammer B has been thrown downward by one of the projections on the cam-wheel D′, the roller *e*, striking the lower side of the nail-rod, draws it longitudinally against the lower curved face of the die *b*, increasing its length, reducing it in thickness gradually toward the end, and forcing it into the recess *t* in the die *b*, which forms the face of the nail-head. As the roller *e* passes from the bar, the hammer C is thrown forward by one of the projections of the cam D, and bends the bar latterly, carrying the partly-shaped end against the face of the die b^2, and reducing the bar in width, except opposite the recesses *c c*, in which and in the recess *t* is formed the enlargement constituting the head of the nail. As the hammer C recedes, the hook *k*, catching the opposite side of the bar, bends it back to a position directly beneath the die *b*, between which and the roller e^1 it is further reduced, owing to the increased distance of the roller e^1 from the center of the shaft a^4, and so on, the rolling and beating operations alternating until the roller e^2 passes from contact with the bar, when a projection, *t*′, of increased length on the cam D will throw the hammer C inward, and will hold it, griping the bar between the dies b^1 b^2, until the cutter G forces the bar laterally in the direction of the arrow Fig. 4, against the sharp edge *v* of the die b^1, whereby it is sheared off, leaving the blank between the dies, from which it is forced by the extended downward movement of the hammer B, permitted by the absence of any support beneath the detached nail.

As the cutter recedes the hook *g* bends back the end of the bar to a position central or thereabout with the space between the dies b^1 b^2, when the feed will move it forward the length of a nail and the operation will be repeated. Should the spring A^2 fail to throw back either hammer B C in time, the proper movement is insured by the beveled edge *x* of the other hammer acting as a cam or wedge to force the forward hammer to its place, preventing the breakage which otherwise would occur.

In the patent granted to us on the 10th day of February, 1874, two vibrating side dies were employed, which, owing to their rapid movements and the difficulty of insuring perfect accuracy, would sometimes strike the bar unevenly, producing irregular nails. By using one vibrating lateral die and a stationary lateral die this difficulty is obviated, and an extended bearing obtained for the cutter-bar F, which in our patented machine was carried by one of the hammers.

It will be apparent that greater accuracy is obtained in the cutting operation by the use of a cutter sliding in stationary bearings.

By pivoting the hammer C at a point on a line with the center of the machine, or on the side of said center opposite the hammer, the latter, when thrown back will recede from the end of the nail-rod after the nail is cut, instead of jamming against it, as in our former machine, where the hammer is hinged on the side of the center nearest the shaft a^1.

By operating the cutter by a disk and a pin acting on a straight edge, *i*, the forward motion begins slowly without any jerk, and increases in rapidity as the cutter advances, the cam-edge *h*′ of the disk insuring a rapid and positive backward motion.

Instead of securing the dies in the hammers, as in our former machine, they are secured by pins *q* passing transversely, as shown at Figs. 3 and 4, preventing the loosening of the dies, heretofore resulting from the wearing of the screw-threads.

In our former machine the rollers e e^1 and projections upon the cam-wheels operating the hammers were arranged so as to increase the movement of the hammers and the extent of the draw at each action in the formation of the nail. We have discovered that a much better and uniform result is obtained by increasing the movements only after the first blow, and having the others uniform, and, if any other change is made, reducing the extent of the last blow and drawing action, so that the greater number of actions are finishing rather than forming or reducing in their character.

It will be observed that the reduction of the nail may be effected by altering the throw of the hammer B at successive movements, instead of arranging the rollers e e^1 at different distances from the axis of the shaft.

Although we have referred to the hooks g k as being connected to and operated by the cutter and the hammer C, it will be apparent that they may be operated by special devices.

Heretofore in nail-machines cutters have been arranged to shear the bar from the face toward the back of the nail, or, vice versa, across the narrow width of the rod, the effect being to reduce the thickness of the nail-head from front to back, rendering it necessary to use a thicker rod than would otherwise be required.

In our machine the cutter is arranged to cut across the rod at its greatest width, as shown in Fig. 4, the effect being to condense and spread the metal in the only direction in which it can expand—that is, from back to front—thereby enabling us to use a smaller rod, and requiring less reduction in order to form the shank of the nail, the importance of which will be readily understood.

We claim—

1. The combination, with the stationary die b^2 and reciprocating hammer, carrying the die b^1, of the cutter G, arranged to slide in stationary bearings and shear the bar against the edge of the hammer-die, as set forth.

2. The combination of the fixed die b^2, reciprocating dies b b^1, and hook k, for carrying the bar from the die b^2 to a position directly beneath the die b, substantially as specified.

3. The combination of the stationary die b^2, reciprocating hammers, carrying dies b b^1, and roller-carrier E, all constructed and operating as described, whereby the lower support for the blank is withdrawn after the nail has been cut from the rod prior to the last movement of the upper hammer, as set forth.

4. The combination of the dies b^1 b^2, cutter G, and hook g, for drawing back the end of the bar after shearing the same, as set forth.

5. The combination of the die b^2 and hammer C, carrying the die b^1, vibrating at right angles to the face of the machine, and pivoted, as described, whereby the die is withdrawn from the cut end of the nail when the hammer is thrown back, as specified.

6. The combination of the lever R, regulating-screw T, and retaining-lever U, substantially as and for the purpose set forth.

7. The combination, in a nail-making machine, of feed-wheels, operated intermittingly from the machine, and a treadle and operating devices, whereby the wheels may be brought against the nail-rod with a pressure regulated by the operator, as set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

JOB WHYSALL, JR.
C. M. MERRICK.

Witnesses:
CHARLES E. FOSTER,
COURTNEY A. COOPER.