No. 615,377. Patented Dec. 6, 1898.

H. A. WILLIAMS.

MACHINE FOR FINISHING FORGED HORSESHOE NAILS.

(Application filed Oct. 4, 1897.)

(No Model.) 9 Sheets—Sheet 1.

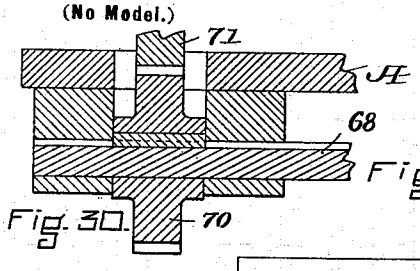


Fig. 30.

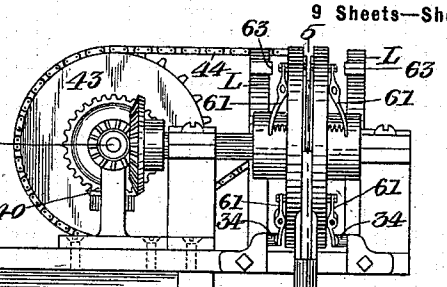


Fig. 1.

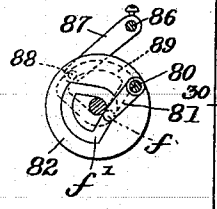


Fig. 28.

WITNESSES.

A. D. Prout.

B. L. Marden.

INVENTOR.

Henry A. Williams.

by A. E. Teschemacher Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 615,377. Patented Dec. 6, 1898.

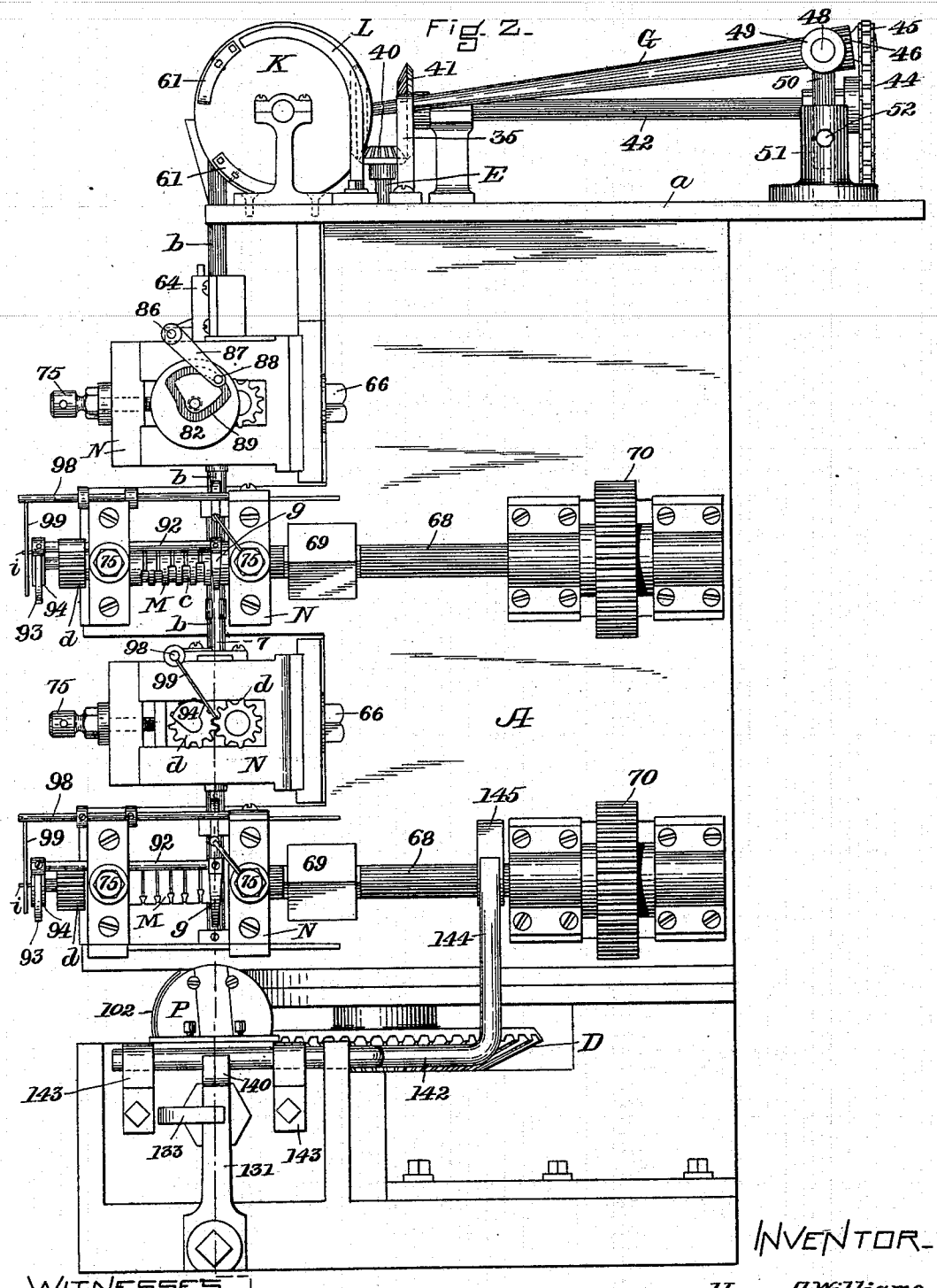
H. A. WILLIAMS.

MACHINE FOR FINISHING FORGED HORSESHOE NAILS.

(Application filed Oct. 4, 1897.)

(No Model.) 9 Sheets—Sheet 2.

Fig. 2.



WITNESSES.

A. D. Smith.

B. L. Marden

INVENTOR.

Henry A. Williams.

by S. G. Teschemacher Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 615,377. Patented Dec. 6, 1898.

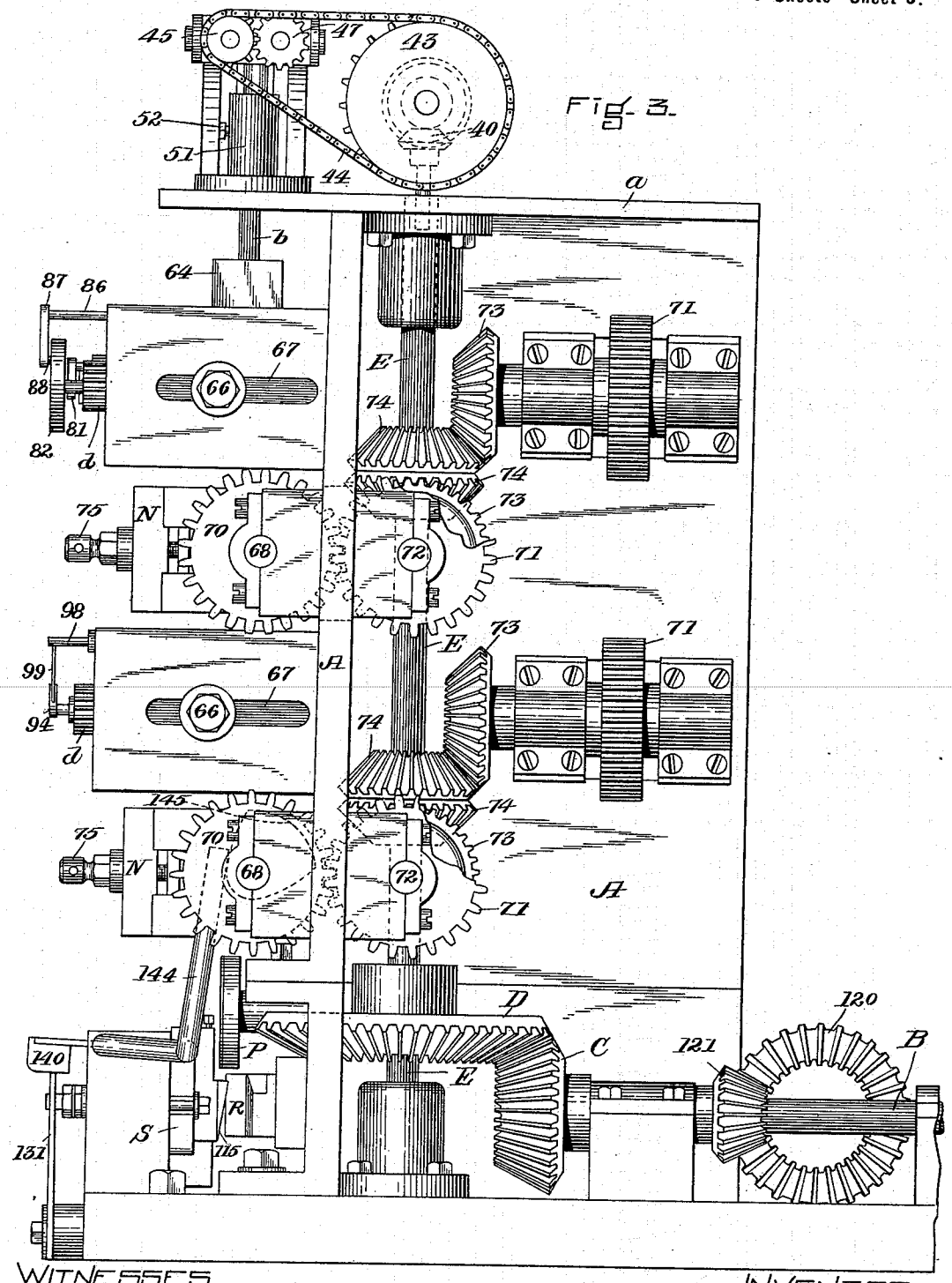
H. A. WILLIAMS.

MACHINE FOR FINISHING FORGED HORSESHOE NAILS.

(Application filed Oct. 4, 1897.)

(No Model.) 9 Sheets—Sheet 3.

Fig. 3.



WITNESSES.

A. D. Brown.

B. L. Marden.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 615,377. Patented Dec. 6, 1898.

H. A. WILLIAMS.

MACHINE FOR FINISHING FORGED HORSESHOE NAILS.

(Application filed Oct. 4, 1897.)

(No Model.) 9 Sheets—Sheet 4.

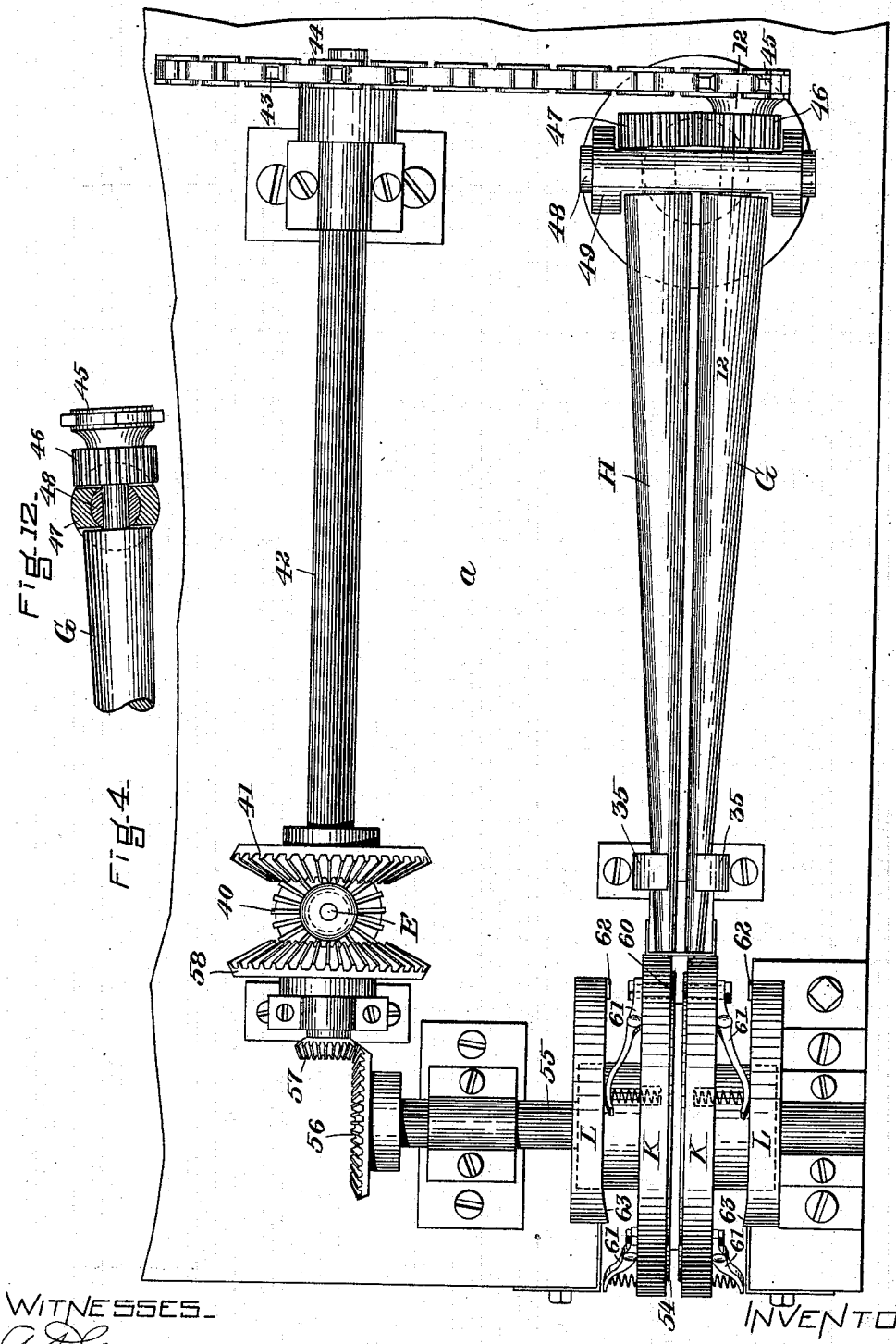


Fig. 12.

Fig. 4.

WITNESSES.
A. D. Front.
B. L. Marden.

INVENTOR.
Henry A. Williams.
by A. D. Deschumacher
Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

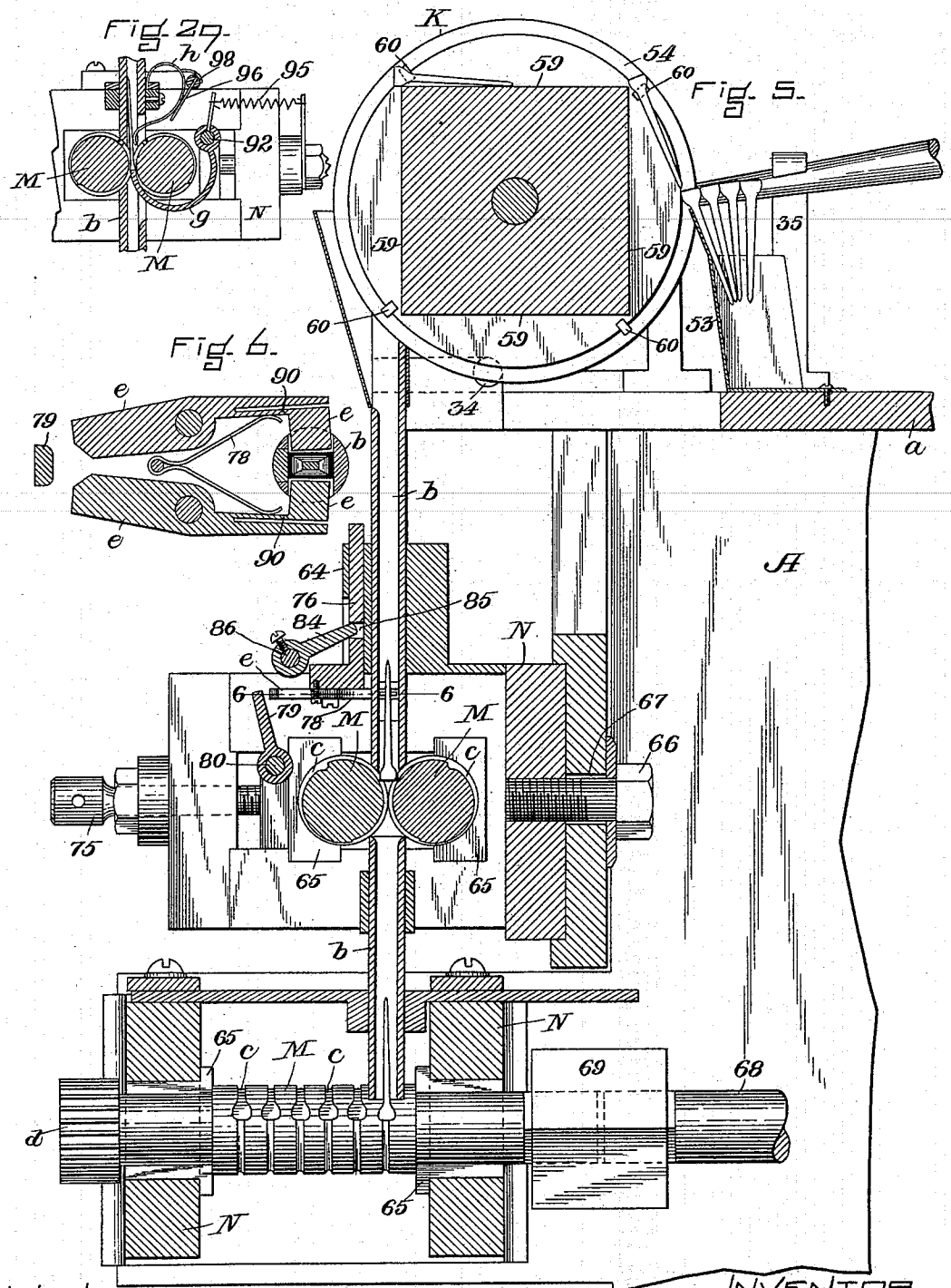
No. 615,377. Patented Dec. 6, 1898.

H. A. WILLIAMS.

MACHINE FOR FINISHING FORGED HORSESHOE NAILS.

(Application filed Oct. 4, 1897.)

(No Model.) 9 Sheets—Sheet 5.



WITNESSES.

A. D. Stowell.

B. L. Marden.

INVENTOR.

Henry A. Williams.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 615,377. Patented Dec. 6, 1898.

H. A. WILLIAMS.

MACHINE FOR FINISHING FORGED HORSESHOE NAILS.

(Application filed Oct. 4, 1897.)

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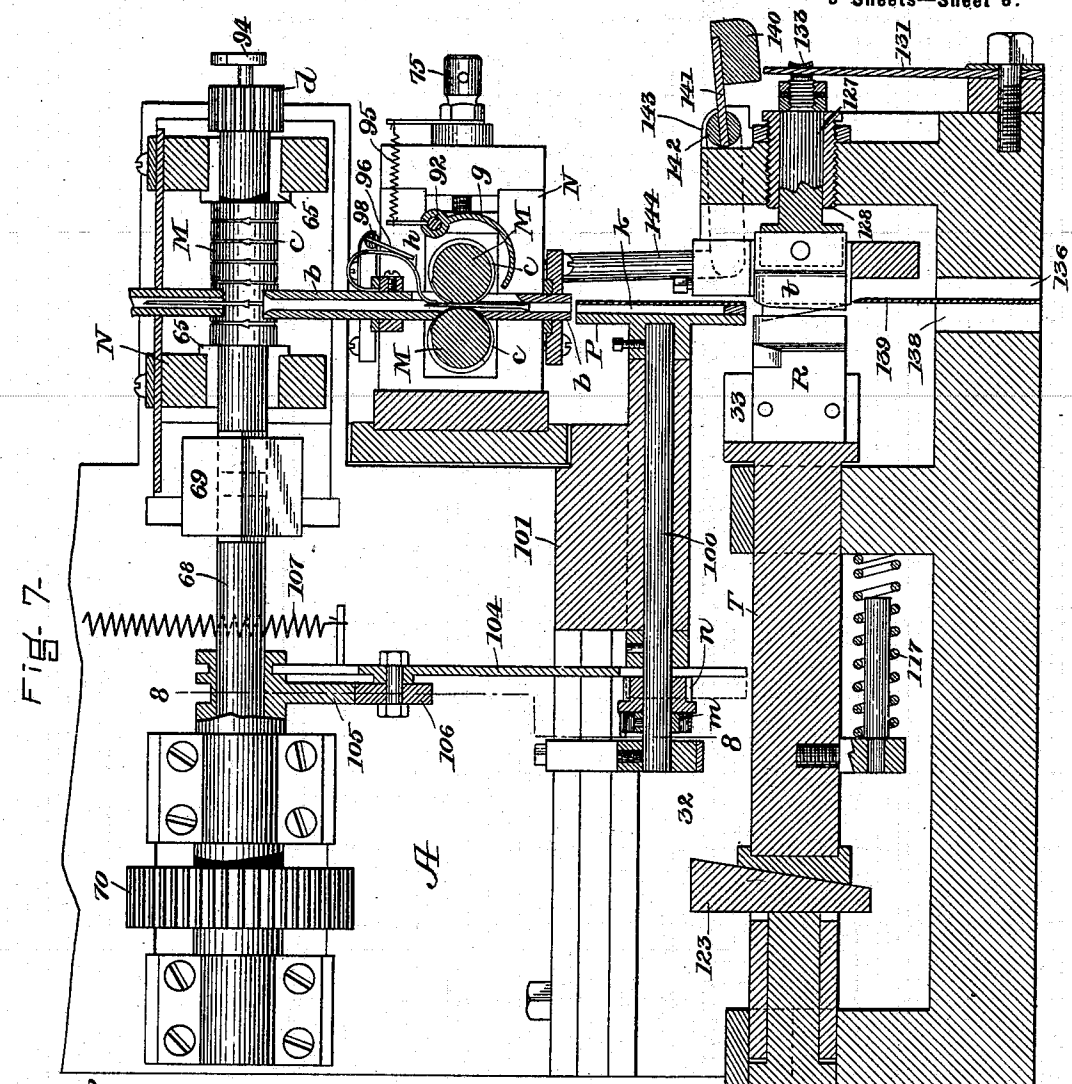


Fig. 7.



Fig. 9.

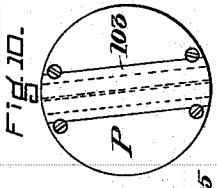


Fig. 10.

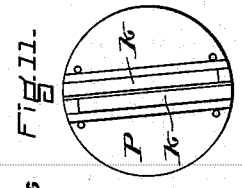


Fig. 11.

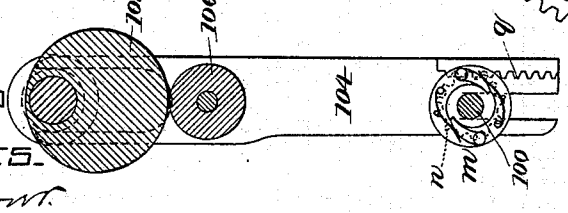


Fig. 8.

WITNESSES.

A. D. Grant.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 615,377. Patented Dec. 6, 1898.

H. A. WILLIAMS.

MACHINE FOR FINISHING FORGED HORSESHOE NAILS.

(Application filed Oct. 4, 1897.)

(No Model.) 9 Sheets—Sheet 7.

Fig. 13.

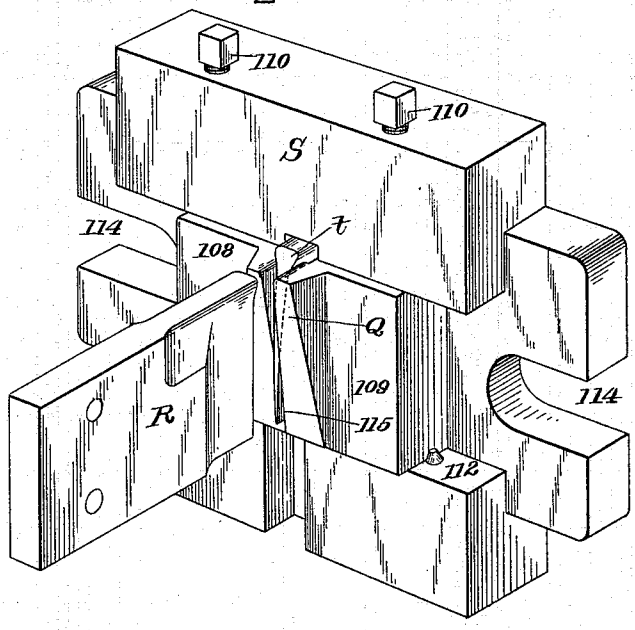


Fig. 14.

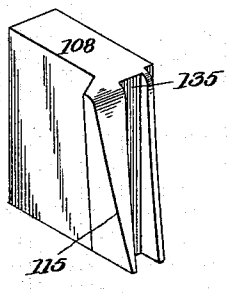
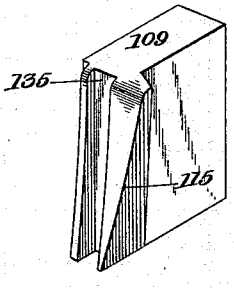


Fig. 15.



WITNESSES.

A. D. Grant

B. L. Marden.

INVENTOR.

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by F. O. Lechemacher

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No. 615,377. Patented Dec. 6, 1898.

H. A. WILLIAMS.

MACHINE FOR FINISHING FORGED HORSESHOE NAILS.

(Application filed Oct. 4, 1897.)

(No Model.) 9 Sheets—Sheet 8.

Fig. 16.

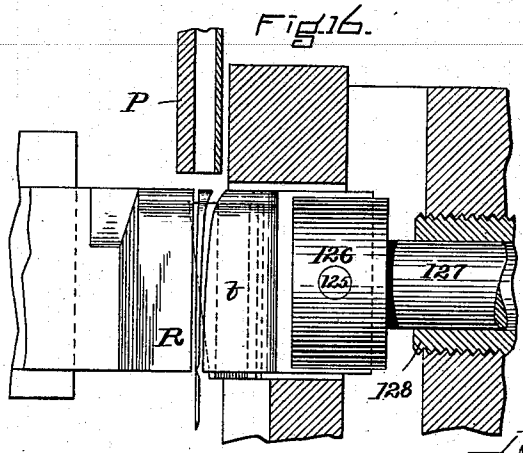


Fig. 17.

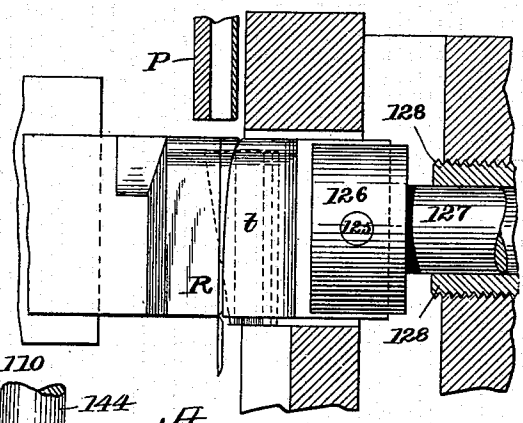


Fig. 18.

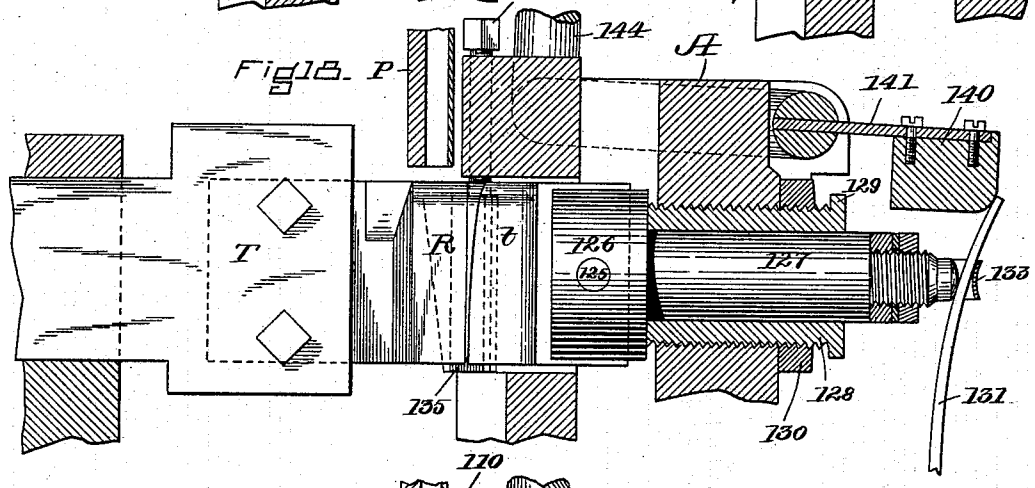
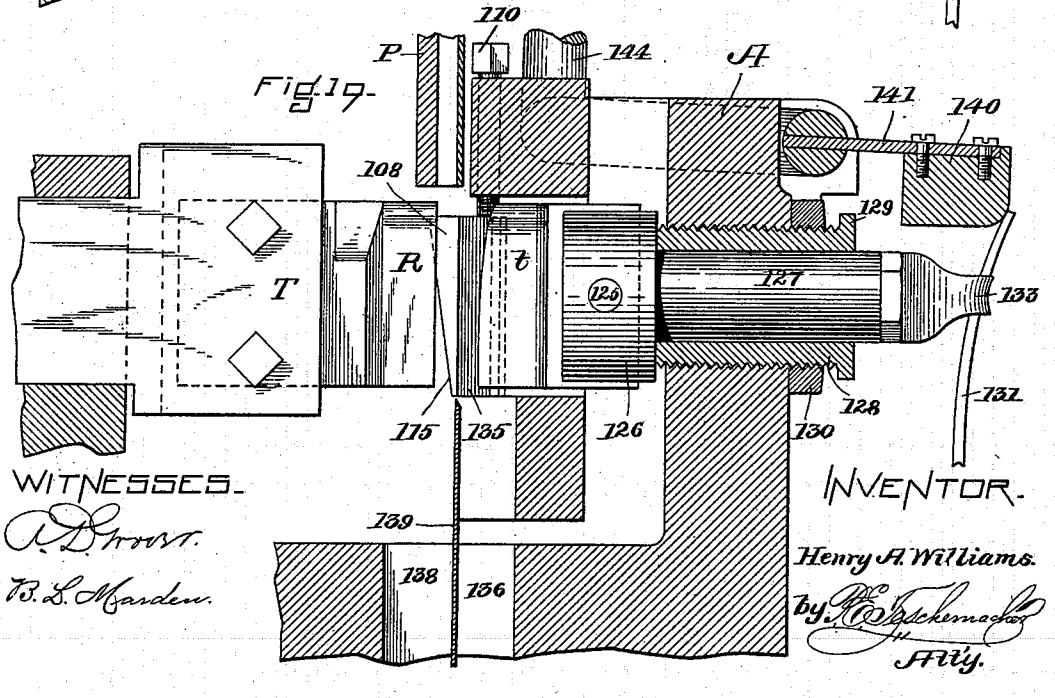


Fig. 19.



WITNESSES.

A. D. Stuart.

B. L. Marden.

INVENTOR.

Henry A. Williams.

by P. C. Pitchmacker

Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 615,377. Patented Dec. 6, 1898.

H. A. WILLIAMS.

MACHINE FOR FINISHING FORGED HORSESHOE NAILS.

(Application filed Oct. 4, 1897.)

(No Model.) 9 Sheets—Sheet 9.

Fig. 20.

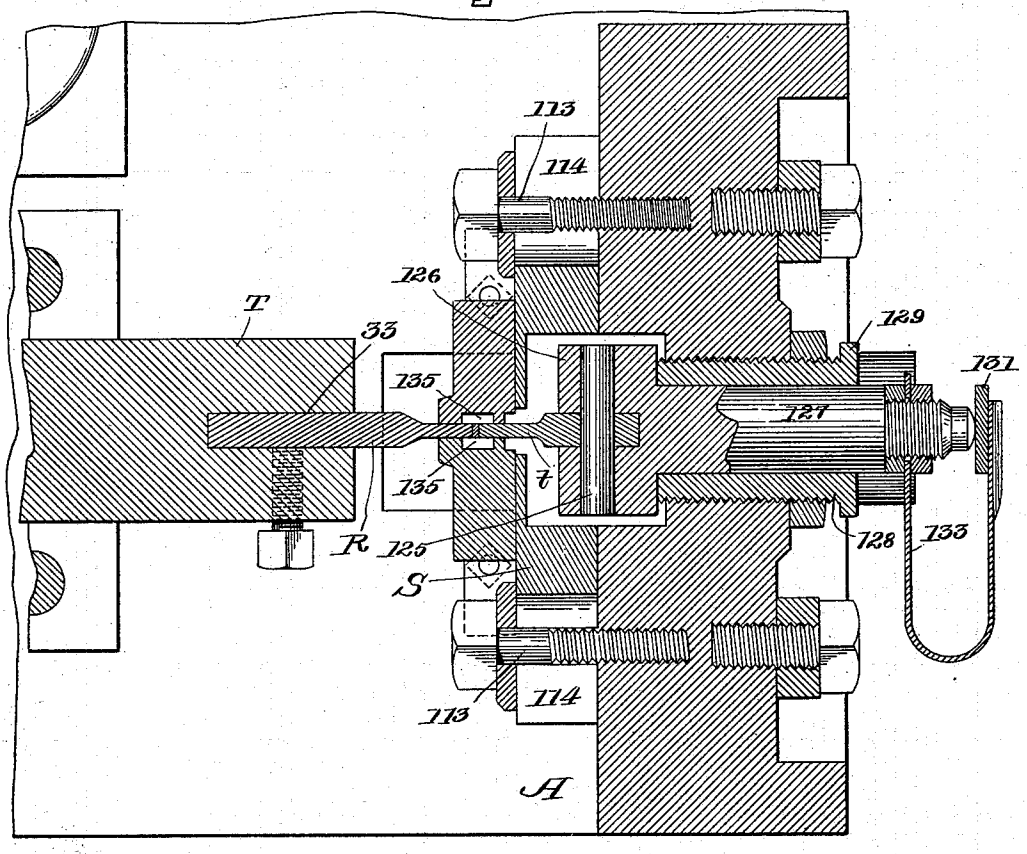


Fig. 21. Fig. 22. Fig. 23. Fig. 24. Fig. 25. Fig. 26.

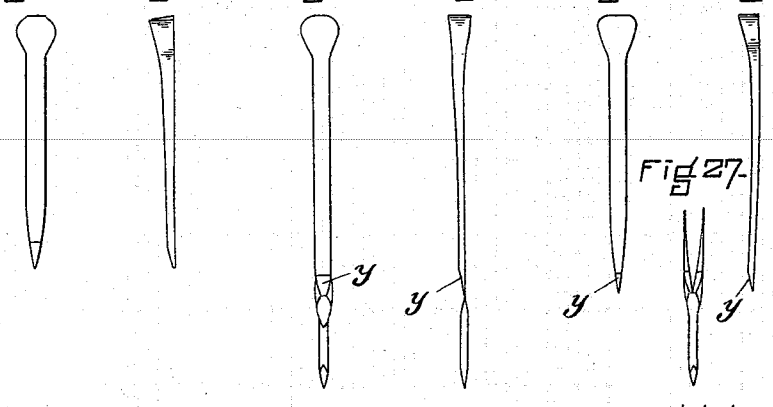


Fig. 27.

WITNESSES.

A. D. Groot.

B. L. Marden

INVENTOR.

Henry A. Williams.

by P. C. Tschumacher

Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HENRY ALEXIS WILLIAMS, OF QUINCY, MASSACHUSETTS, ASSIGNOR TO THE PUTNAM NAIL COMPANY, OF BOSTON, MASSACHUSETTS.

MACHINE FOR FINISHING FORGED HORSESHOE-NAILS.

SPECIFICATION forming part of Letters Patent No. 615,377, dated December 6, 1898.

Application filed October 4, 1897. Serial No. 654,074. (No model.)

To all whom it may concern:

Be it known that I, HENRY ALEXIS WILLIAMS, a citizen of the United States, residing at Quincy, in the county of Norfolk and State of Massachusetts, have invented certain Improvements in Machines for Finishing Forged Horseshoe-Nails, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a front elevation of my improved nail-finishing machine. Fig. 2 is a side elevation of the same. Fig. 3 is a rear elevation of the same. Fig. 4 is an enlarged plan view of the top of the machine. Fig. 5 is an enlarged vertical section on the line 5 5 of Fig. 1. Fig. 6 is a horizontal section on the line 6 6 of Fig. 5. Fig. 7 is an enlarged vertical section on the line 7 7 of Fig. 2. Fig. 8 is a vertical section on the line 8 8 of Fig. 7. Fig. 9 is a plan of the intermittingly-rotating carrier-wheel for inverting the nails after passing through the lowermost pair of rolls. Fig. 10 is a face view of the same. Fig. 11 is a face view of the same with the covering-plate removed. Fig. 12 is a vertical section on the line 12 12 of Fig. 4. Fig. 13 is a perspective view of the combined cutting and compressing die and the adjustable housing for the same. Figs. 14 and 15 are perspective views of the two portions of the cutting-die. Fig. 16 is a sectional detail of the combined cutting and compressing die. Fig. 17 is a sectional detail of the same, showing the parts in the position which they occupy when the nail is being held between the punch and the yielding back of the die. Fig. 18 is a sectional detail of the same, showing the position of the parts when the nail is being compressed after being cut off. Fig. 19 is a sectional detail of the same, showing the position of the parts after the nail has dropped out of the machine and the punch has been drawn back. Fig. 20 is an enlarged horizontal section on the line 20 20 of Fig. 1. Fig. 21 is a front view of an imperfectly-formed nail. Fig. 22 is a side view of the same. Fig. 23 is a front view of an imperfectly-formed nail after passing through the die-grooved rolls and before being acted upon by the cutting and compressing die. Fig. 24 is a side view of the nail shown in Fig. 23. Fig. 25 is a front view of the finished nail. Fig. 26 is a side view of the same. Fig. 27 is a view of the surplus portion of the nail sheared off by the cutting-die in the operation of finishing the nail. Fig. 28 is a vertical section on the line 28 28 of Fig. 1. Fig. 29 is a sectional detail to be referred to. Fig. 30 is a sectional detail on the line 30 30 of Fig. 1.

In the manufacture of forged horseshoe-nails a considerable number are always found having imperfections of various kinds—such as variations in the length, width, or thickness of the shank or blade—which imperfections, although not sufficient to unfit all of these nails for use, still render the best of them unsalable as nails of the first grade, such nails being usually sold at a reduced price as "seconds." My invention has for its object to provide a machine by means of which these inferior or imperfect nails may be, at a trifling cost, given the perfect symmetrical shape and size required for first-class nails; and to this end my invention consists in a machine of novel construction in which the nails while cold are acted upon by a series of pairs of die-grooved rolls to give them a uniform shape and subsequently subjected to a heavy pressure in cutting and shaping dies, which trim or shear off the surplus metal to produce a perfect point and finish the nail, as hereinafter fully described.

In the said drawings, A represents the framework of the machine, of proper shape to support the working parts.

B, Fig. 3, is the driving-shaft, on which is fixed a bevel-gear C, meshing with and driving a horizontal bevel-gear D on a vertical shaft E, supported in bearings at the top and bottom of the framework and carrying at its upper smaller end a small bevel-pinion 40, which meshes with a bevel-gear 41 on a horizontal shaft 42, supported in bearings rising from the top plate *a* of the framework. This shaft 42 carries at its outer end a sprocket-wheel 43, which transmits motion through a chain 44 to a sprocket-wheel 45, fixed to the end of one of a pair of long tapering feed-rolls G H, which are connected to rotate together by gears 46 47 and form a raceway for the reception of the nails, these rolls being arranged

in an inclined position and at such distance apart as to leave a narrow space between them a little more than sufficient to accommodate the shanks of the nails when turned with their wider flat sides parallel with the rolls, the nails when between these rolls being supported by their heads and being fed forward in a pendent position by the rotation of said rolls, the direction of which is upward and outward from each other. These rolls are journaled at their larger ends in a rocking support 48, pivoted at its opposite ends to a yoke 49, provided with a short shank or bar 50, which is adjustable vertically within a hollow post 51, provided with a clamping-screw 52, whereby the support 48 may be raised or lowered to vary the inclination of the raceway. The lower ends of the rolls G H are supported in journal-boxes 35, open on the inner side, thereby preventing any interruption of the space between said rolls which forms the passage for the nails.

Each nail as it arrives at the lower end of the raceway comes into contact with a stop-plate 53, by which it is caused to assume the inclined position shown in Fig. 5, its head entering a deep shouldered groove 54, formed in the periphery of a carrier-wheel K, the shaft 55 of which is mounted in bearings rising from the top plate *a*. This shaft 55 carries at one end a bevel-wheel 56, which meshes with and is driven by a bevel-gear 57 on a short shaft carrying a bevel-wheel 58, which in turn meshes with and is driven by the horizontal bevel-pinion 40 at the upper end of the vertical shaft E, from which motion is thus transmitted to the carrier-wheel K. The bottom of the groove 54, instead of being concentric with the periphery of the wheel K, is made polygonal, having in the present case four flat surfaces 59 for the shanks of the nails to lie against, as shown in Fig. 5. Close to each angle or corner formed by the junction of two of the flat surfaces 59 is a pair of gripping-jaws 60, pressed inwardly by spring-actuated levers 61, connected therewith, the outer ends of which bear against two stationary curved cam-plates L L, provided with projections or cams 62, which serve by contact with the levers 61 to momentarily open the jaws 60 to allow the head of the nail to pass between them and be grasped thereby as soon as the levers pass out of contact with the cams, the opening of these jaws taking place at the instant that the head of the nail arrives at the bottom of the raceway and enters the groove 54. The nail is then carried upward by the jaws 60 in the position shown in Fig. 5 until the levers 61 are brought into contact with cams 63, when the jaws are momentarily relaxed or opened, allowing the shank of the nail to fall onto the flat horizontal portion of the bottom of the groove, as shown at the left-hand side of Fig. 5. As the wheel K continues to revolve this flat horizontal side of the bottom of the groove is brought into a vertical position, the jaws still holding the nail and preventing its shank from tipping outwardly, and at this moment the levers 61 are brought into contact with two cams or projections 34, (shown in Figs. 1 and 5,) which open the jaws 60 and permit the nail to drop head foremost into a conductor *b*, through which it falls directly into contact with the first of a series of pairs of rolls M, provided with dies *c*, which act on the nails to render them of uniform shape and give the head and shank the proper width and thickness, as hereinafter more fully described.

The rolls M are arranged in pairs beneath each other, the two rolls of a pair being connected to revolve together by gears *d*, and each pair is placed at right angles to the pair immediately above it, as shown. The rolls are supported in boxes 65, mounted in housings N, each of which is adjustably secured to the adjacent vertical wall of the framework by a heavy screw-bolt 66, passing through a horizontal slot 67, whereby the rolls M may be moved horizontally in the direction of their length to bring the desired dies into position beneath the conductors *b*, through which the nails pass from one pair of rolls to the next, each roll being provided with a number of dies *c*, arranged side by side and adapted for nails of different sizes or all of the same size, one set of dies to be used when another set is worn out, any one of these dies being brought beneath the conductor by properly adjusting the housing N. The journal of one roll of each pair is elongated and connected with a shaft 68, in line therewith, by means of a coupling 69, Figs. 1, 2, 5, and 7, which permits the housing N to be adjusted, as described, and each of said shafts 68 is provided with a gear 70, through the hub of which it slides with a spline, as shown in Fig. 30, to permit of the adjustment of the housing N with the die-rolls to bring the desired die into operative position beneath the nail-conductor *b*. Each gear 70 meshes with and is driven by a gear 71, secured to a short shaft 72, supported in boxes on the opposite side of the wall of the framework, as shown in full and dotted lines in Fig. 3, said short shafts 72 each carrying a bevel-gear 73, which meshes with and is driven by a bevel-gear 74 on the vertical shaft E, which is connected with the driving-shaft, as previously described, motion being in this manner transmitted from the driving-shaft to each pair of die-grooved rolls M. Suitable openings are cut through the walls of the framework to allow the gears 70 and 71 to engage each other. The boxes 65, which support the journals of each pair of rolls M, slide in suitable guideways in the housings N and are held in place by a screw 75, bearing against the outer box.

The nail comes into contact with the first or upper pair of rolls in an edgewise position, as shown in Fig. 5, the dies acting on the edges of the nail. The second pair of rolls,

owing to their position at right angles to the pair above, act on the flat sides of the nail. The third pair act on the edges of the nail, and the fourth pair again on the flat sides of the same, and in case the number of pairs of rolls should be increased they would be arranged to act alternately on the edges and flat sides of the nail in the same manner. As soon as the nail has dropped onto the first pair of rolls it is seized near the point by a pair of grippers *e*, (shown enlarged in Fig. 6,) the two members of which are pivoted to the under side of a slide 76, moving vertically in a guide 64, secured to the top of the upper housing N. The grippers are closed against the resistance of a spring 78 to seize the nail by means of a reciprocating wedge 79, Figs. 5 and 6, swinging in the arc of a circle and acting to separate the outer ends of the grippers *e*, said wedge being secured to a horizontal rock-shaft 80, provided at its front end with an arm 81, a pin *f* at the lower end of which is engaged by a cam-groove *f'* in a wheel 82, Figs. 1 and 28, secured to the end of the journal of one of the die-grooved rolls M, the cam being timed to cause the grippers to seize the nail at the proper moment. As the rolls revolve the head of the nail is carried by the grippers *e* into the recesses in the dies made for its reception, the grippers *e* then descending and carrying down the nail positively with a speed corresponding to the surface velocity of the dies, which insures the nail passing properly through the same. If it were not for this device, the rolls, if revolving at a high speed, might fail to take the nail at the right moment, and it would consequently be crushed out of shape and spoiled.

The slide 76 is actuated to depress and raise the grippers *e* by an arm 84, entering an opening 85 in the slide and secured at its opposite end to a shaft 86, to the outer end of which is secured an arm 87, carrying a pin 88, which is engaged by a cam-groove 89, Fig. 2, in the outer side of the wheel 82, previously described.

The above-described device whereby the nail is placed in the right position and given a positive downward movement corresponding to the feed of the die-grooved rolls to insure their acting upon the nail properly and at the right moment as they revolve is essential for the first pair of rolls, for the reason that the imperfect nail in its rough shape is not always presented to these rolls exactly in the right position. This device may be dispensed with for the other pairs of rolls, if desired, and in the machine herein described I have shown it as applied to the upper pair of rolls only; but I prefer to apply it to each pair of rolls, as it insures more perfect results. The jaws of the grippers *e* are each provided with a spring 90, formed integral therewith, as shown in Fig. 6, whereby they are enabled to yield in case an extra thick nail should be encountered, thereby avoiding injury to the mechanism.

The die-grooves of the several pairs of rolls decrease in width and depth and increase in length as the pairs of rolls succeed each other in a downward direction, whereby the nail is compressed and drawn out until it is given the elongated shape shown in Figs. 23 and 24, the last pair of rolls forming the scarf *y* at the point of the nail, which in a finished nail is always on the same side as the flat inclined face of the head.

Beneath the second and fourth pairs of die-grooved rolls, which act on the flat side of the nail, is placed a curved stop-finger *g*, which when in the position shown in Fig. 29 forms a stop for the head of the nail, thus preventing the nail from slipping down between the rolls and also serving as a gage to determine its position with respect to the dies, and thereby insure the entrance of the head of the nail at the proper time into the recesses made to receive it in the dies as the latter are rotated. The stop-finger *g* is brought into a position to catch the nail just before the latter drops from the rolls above, and at the instant of its contact with the stop-finger a flat spring-finger *h*, Figs. 7 and 29, is caused to bear upon the shank of the nail to hold the same by its friction thereon, immediately after which the stop-finger *g* is withdrawn, leaving the nail supported by the spring *h* and free to be drawn down by the revolution of the die-grooved rolls as soon as the head has entered the recesses therein adapted to receive it, the nail passing into the conductor *b* and thence to the mechanism beneath. Each of the fingers *g* is secured to a rock-shaft 92, carrying at its outer end an arm 93, which is acted upon by a cam 94 to withdraw the finger *g* against the resistance of a light retracting-spring 95, which when permitted by the cam 94 throws the finger up into the position shown in Fig. 29 to catch the nail. The flat spring-finger *h* is forced forward into contact with the shank of the nail by an arm 96 on a rock-shaft 98, which carries at its outer end an arm 99, Figs. 1 and 2, which is acted upon to move the shaft by a pin *i* on the outer face of the cam 94, which operates the stop-finger *g*. The third pair of rolls M is not provided with a stop-finger *g*, as it is not required, on account of the nail being presented to the rolls edgewise, but said third pair of rolls is provided with a spring-finger *h*, having the same construction and mode of operation as that applied to the second and fourth pairs of rolls.

After passing through the last pair of die-rolls the nail drops head foremost into one of two pockets *k*, extending diametrically through a rotary inverting carrier-wheel P, which is then turned one-half a revolution to deliver the nail point foremost to the combined cutting and compressing die, to be hereinafter described. The wheel P is secured to the end of a horizontal shaft 100, supported in a long stationary bearing 101, to the outer end of which is secured a curved guard-plate

102, partially encircling the periphery of the wheel P and serving to prevent the nail from dropping out of the pocket before the wheel has completed its half-revolution. The two pockets *k* for the nails are placed side by side with their open ends on opposite sides of the periphery of the wheel, as shown in Fig. 11, said pockets having a removable cover 103, whereby access may be gained thereto.

The wheel P is rotated intermittingly in one direction one half-revolution at a time by means of a ratchet-and-pawl mechanism *m*, connected with a pinion *n* on the shaft 100, which meshes with a rack *q* on one side of a flat bar or pitman 104, Figs. 7 and 8, the upper end of which is forked and embraces the shaft 68, the latter being provided with a cam 105, which acts upon a cam-roll 106 on the bar 104, thus depressing the same against the resistance of a retracting-spring 107, Fig. 7, a vertically-reciprocating movement being thus given to the bar 104 to produce through the connections described the desired movement of the carrier-wheel P, each half-revolution of which brings the open end or mouth of one of the pockets *k* into a position to receive a nail from the die-rolls above and the open end of the other pocket into a position to discharge the nail previously dropped therein into the cutting and compressing die beneath. The shaft of the carrier-wheel P is provided with a friction-brake 32, Fig. 7, which prevents the wheel from being carried by its own momentum beyond the distance required to bring the mouth of each pocket *k* directly beneath the conductor *b*.

Q represents the stationary cutting-die, and R is a reciprocating punch which coöperates therewith, said punch having the shape or outline of the flat side of a finished nail. The cutting-die is composed of two portions 108 109, (shown particularly in Figs. 13, 14, and 15,) which are adjustably secured in position opposite to each other by means of screws 110 within a horizontal groove 112 in a housing S, the latter being secured to the framework near the bed of the machine by means of screw-bolts 113, passing through slots 114, whereby said housing is made adjustable, as may be required. The two cutting edges 115 of the die Q are inclined downward and inward, as shown in Figs. 13, 14, and 15, thereby producing, with the punch R, a shearing cut to trim off the surplus metal from the nail after the latter has been acted upon by the die-grooved rolls previously described, the piece of metal cut off from the lower portion of the shank being shown in Fig. 27, leaving the shank of the exact shape required for a nail of the first quality, as shown in Figs. 25 and 26. The punch R is secured within a vertical slot or groove 33 in the head of a horizontal reciprocating bar or spindle T, which slides in suitable bearings in the framework, as shown in Fig. 7, its outer end being acted upon by a cam 116, whereby it is moved in the direction of its length against the resistance of a retracting-spring 117 to advance the punch to shear or trim the nail. The cam 116 is secured to a horizontal shaft 118, carrying a bevel-gear 120, which meshes with and is driven by a bevel-pinion 121 on the driving-shaft B, as shown in Fig. 3.

The end 122 of the punch-carrying spindle T, which is acted upon by the cam 116, is made separate from the main portion and is arranged to slide telescopically within it, as shown in Fig. 7, a wedge or key 123, passing through a slot in said bar T, acting upon the inner end of the portion 122 to push the same outward, whereby the effective length of the bar T may be changed to vary the limit of the forward movement of the punch R, and thereby subject the nail to more or less pressure, as hereinafter described. Between the two side pieces 108 109 of the cutting-die Q is placed a slide *t*, which has the same shape or outline in cross-section as the punch R; but instead of having a straight vertical face it is inclined or curved backward and upward, as shown in Figs. 13, 16, 17, 18, and 19, to conform exactly to the shape of the inclined side of a horseshoe-nail. This slide *t* is secured by a bolt 125 within a slot in the head 126 of a spindle 127, which slides horizontally within a tubular support or bushing 128, provided with a polygonal head 129 and screwed into the framework A, whereby it may be caused to project more or less on the side next to the head 126 of the spindle 127, said bushing, which forms a bearing for the spindle 127, being provided with a check-nut 130 for locking it in position when adjusted. Against the outer end of the spindle 127 bears a stiff flat spring 131, secured at its lower end to the bed of the machine, said spring being connected with the spindle 127 by means of a U-shaped coupling 133, for a purpose to be hereinafter explained.

Each of the side pieces 108 109 of the cutting-die Q is provided with a straight vertical groove 135, Figs. 14, 15, 19, and 20, forming when placed together a straight vertical passage, as shown in Fig. 20, through which the finished nail drops when released into an opening 136, Figs. 7 and 19, and thence out of the machine, the waste pieces cut from the nails falling through an opening 138, separated from the opening 136 by a partition-plate 139. As the nail drops from the inverting carrier-wheel P it is caught by the head in a pendent position, as shown in Fig. 16, between the two side pieces 108 109 of the cutting-die, with one of its flat sides close to the rearwardly-yielding slide *t*, which forms the back of the compressing-die. The punch R now advances and carries the nail against the back *t*, between which and the punch it is then tightly squeezed as the punch continues to move forward, as shown in Fig. 17, the back *t* yielding against the resistance of the spring 131, previously referred to, which by its stiffness causes a considerable pressure to be exerted on the nail to hold it firmly and

securely in place and prevent any possibility of its turning or getting out of position while being cut. The punch R as it continues to advance now brings the lower portion of the shank of the nail against the inclined cutting edges of the portions 108 109, whereby the piece of surplus metal shown in Figs. 16, 17, and 27 is sheared off, the sliding back *t* still yielding against the resistance of the stiff spring 131 until the head of the spindle 127 is brought into contact with the inner end of the bushing 128, Fig. 18, which acts as a stop therefor, when the further advance of the punch to the termination of its forward movement causes the nail to be subjected to a heavy pressure between the punch R and the now stationary slide *t*, whereby the operation of straightening it to give it the proper shape for driving is completed, and at the same time by reason of the backwardly-inclined shape of the upper end of the face of the slide *t* the head of the nail is set or bent over to conform thereto in case the inclined face of said nail should happen to be on the side next to the punch R, which is liable to occur owing to the position of the head when the nail is dropped onto the first pair of die-grooved rolls, this device thus insuring the inclined flat side of the nail being, as required, always on the same side as the scarf *y* at the point of the shank, which scarf is formed by the dies of the lowermost pair of rolls M.

I will now describe the locking device by means of which the spindle 127 is held back against the resistance of the spring 131 to prevent the slide *t* from following the punch R as the latter is withdrawn by its retracting-spring 117, which would close the nail-delivering passage formed by the grooves 135 of the cutting-die and prevent the escape of the nail after being released by the punch, and to prevent the possibility of the spindle 127 being carried forward by the jar caused by the operation of the machine, which would close the nail-passage, it is connected to the spring 131 by the horizontal U-shaped coupling 133, previously referred to, whereby the spindle is held back positively until the spring 131 is released to return the slide *t* to its normal position, which takes place as soon as the finished nail has dropped through the die. This locking device consists of a block or wedge 140, secured to the outer end of an arm 141, Figs. 1, 2, and 7, projecting from a horizontal rock-shaft 142, supported in brackets 143, said shaft having one end turned up at a right angle, forming an arm 144, which is acted upon by a cam 145 on the shaft 68, which drives the lower pair of die-rolls M, whereby as soon as the spindle 127 has been forced back by the punch R the wedge 140 is carried down against the inner side of the top of the spring 131, as shown in Figs. 18 and 19, thus preventing it from acting on the spindle to advance the same until the nail has dropped out of the cutting-die, at which time the cam 145 will be in the position shown dotted in Fig. 3, thus releasing the rock-shaft 142, when the spring 131, acting on the round corner of the wedge 140, will force the same upward into the position shown in Fig. 7 and at the same time return the spindle 127 and slide *t*, connected therewith, to their original position ready for the succeeding nail, which is then acted upon by the punch and die in the same manner as above described.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a horseshoe-nail-finishing machine, the combination with the nail-supporting raceway, of the rotary carrier-wheel provided with a peripheral groove for the reception of the nails, said groove having a polygonal bottom, a stop-plate for inclining the nails from a vertical position as they enter said groove, spring-pressed gripper-jaws located at or near the angles of the bottom of said groove, and cams for operating said gripper-jaws, whereby the nail is seized beneath the head as it enters the groove from the raceway, and momentarily released after being carried part way around to allow the nail to fall into a horizontal position upon the straight upper face of the bottom of the groove, and then released when it has assumed a vertical position over a guideway or conductor, substantially as described.

2. In a horseshoe-nail-finishing machine, the combination with a series of pairs of die-grooved rolls, a vertical conductor or guideway leading to the first pair of said rolls, and mechanism for conveying the nails to said conductor and dropping them one by one therein head foremost, of vertically-reciprocating grippers for seizing the nail within the conductor after it has dropped onto the die-rolls, said grippers being mounted on a slide, means for operating the grippers, and means for operating the slide to cause the grippers to descend and carry down the nail positively at a speed corresponding to the surface velocity of the dies in the rolls, substantially as described.

3. In a horseshoe-nail-finishing machine, the combination with the die-grooved rolls, the conductor or guideway leading thereto, and mechanism for conveying the nails to said conductor and dropping them one by one therein head foremost, of the grippers mounted upon a vertically-reciprocating slide and provided with yielding jaws normally held apart by a spring, a reciprocating wedge for closing said jaws upon the shank of the nail, and means for operating said wedge, and an arm operated by a cam for actuating the slide to carry the nail downward at a speed corresponding to the surface velocity of the dies in the rolls, substantially as described.

4. In a horseshoe-nail-finishing machine, the combination with a pair of die-grooved rolls and nail conductors or guideways placed above and beneath the same, of a stop-finger placed beneath said rolls to catch and support the nail, and forming a gage to determine its position and thereby insure the en-

trance of its head at the proper time within the recesses in the dies made to receive it, means for operating said finger, a spring-finger placed above the die-grooved rolls and adapted to be brought into contact with the shank of the nail after it has dropped, to support the same when the stop-finger is withdrawn, and means for actuating the spring-finger to bring it into contact with the nail, substantially as described.

5. In a horseshoe-nail-finishing machine, the combination with a series of pairs of die-grooved rolls arranged to act successively and alternately on opposite sides of an imperfect or unfinished nail to give the head and shank the proper width and thickness, of the combined cutting and shaping die consisting of a reciprocating punch member, a die or matrix having cutting edges for shearing the surplus metal from the nail, and provided with grooves forming a vertical passage for the discharge of the finished nail, and a yielding back placed between the two members of the cutting-die and coöperating with the punch to compress and straighten the nail and set over its head if necessary, said yielding back being secured to a horizontally-sliding spindle, a stiff spring bearing against said spindle and acting to force the same toward the punch, whereby the nail is held securely in place while being cut, and a stop for arresting the backward movement of the spindle before the punch has completed its forward movement, all operating substantially as described.

6. In a horseshoe-nail-finishing machine, the combination with the punch and the die having cutting edges for shearing the surplus metal from the nail, of a spring-pressed slide forming the back of the die and coöperating with the punch to straighten and shape the nail and hold the same while being cut, said slide being secured to a spindle provided with a head or shoulder and sliding within a tubular support or bearing, the inner end of which forms a solid stop for the shoulder of the spindle, said tubular support being made longitudinally adjustable to vary the position of the stop to produce more or less compression of the nail, substantially as described.

7. In a horseshoe-nail-finishing machine, the combination with the punch and the die having cutting edges for shearing the surplus metal from the nail, and provided with grooves forming a vertical passage for the discharge of the finished nail, of the yielding slide forming the back of the compressing-die and secured to a spindle supported by and sliding in a tubular bearing, the inner end of which forms a stop for arresting the rearward movement of the yielding back of the die, a stiff spring bearing against the end of the spindle, and a locking device for catching and holding back the spring at the end of the rearward movement of the spindle until the punch has receded to release the nail, whereby the latter is permitted to drop through the vertical passage of the die, substantially as described.

8. In a horseshoe-nail-finishing machine, the combination with the punch and die having cutting edges for shearing the surplus metal from the nail, and provided with grooves forming a vertical passage for the discharge of the finished nail, of the yielding slide forming the back of the compressing-die, and secured to a spindle supported by and sliding in a tubular bearing, the inner end of which forms a stop for arresting the rearward movement of the yielding back of the die, a stiff spring bearing against the end of the spindle, a rock-shaft carrying an arm provided with a wedge or block for engagement with the upper end of said stiff spring to lock the same when forced back by the spindle, and a cam for actuating said rock-shaft, substantially as described.

9. In a horseshoe-nail-finishing machine, the combination with the punch and the die having cutting edges for shearing the nail, of the spindle carrying the slide forming the yielding back of the compressing-die, and the spring bearing against the end of said spindle and positively connected therewith by a coupling, whereby the yielding back of the die is prevented from being moved forward by the jarring of the machine into a position to prevent the discharge of the finished nail before the release of the spring, substantially as described.

10. In a horseshoe-nail-finishing machine, an inverting nail-carrying wheel rotated intermittingly in one direction only, a half-revolution at a time, and being provided with two straight nail-pockets arranged side by side and extending diametrically through the wheel, and having their open ends on opposite sides of the periphery of the same, ratchet-and-pawl mechanism for intermittingly rotating the carrier-wheel, and a friction-brake for preventing said wheel being carried by its own momentum beyond the distance required to bring the mouth of each nail-pocket beneath the nail-conductor, substantially as described.

Witness my hand this 29th day of September, A. D. 1897.

HENRY ALEXIS WILLIAMS.

Witnesses:

P. E. TESCHEMACHER,

CLARA M. HARRIS.