2 Sheets—Sheet 1.

R. ROSS.

MACHINE FOR FINISHING HORSESHOE NAILS.

No. 172,660. Patented Jan. 25, 1876

Fig. 1.

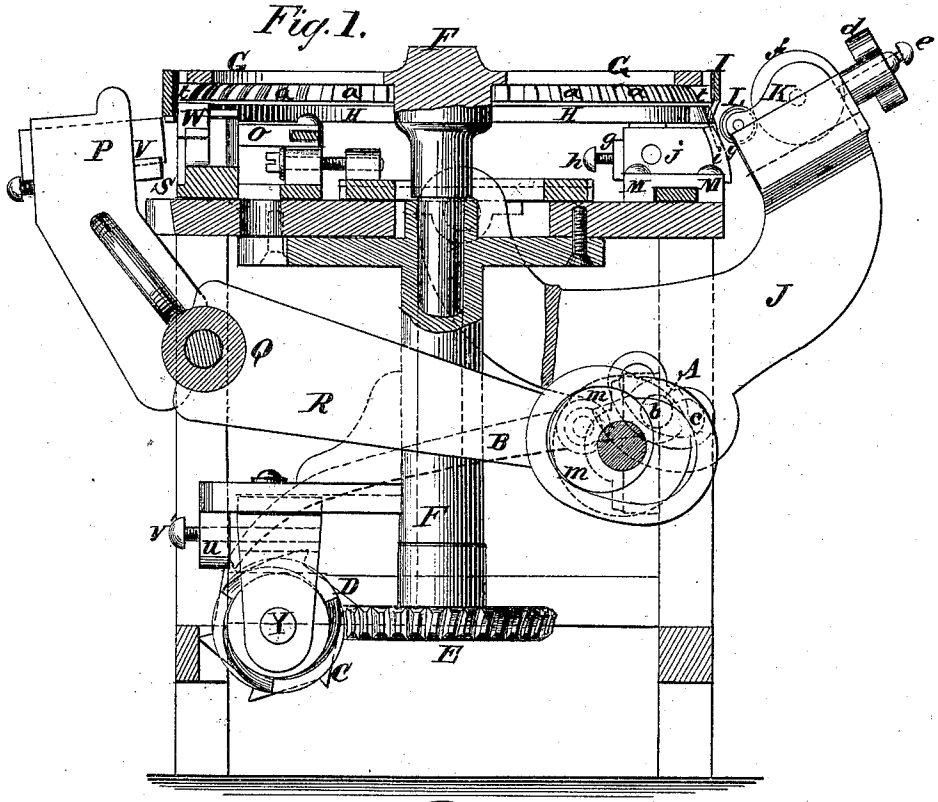
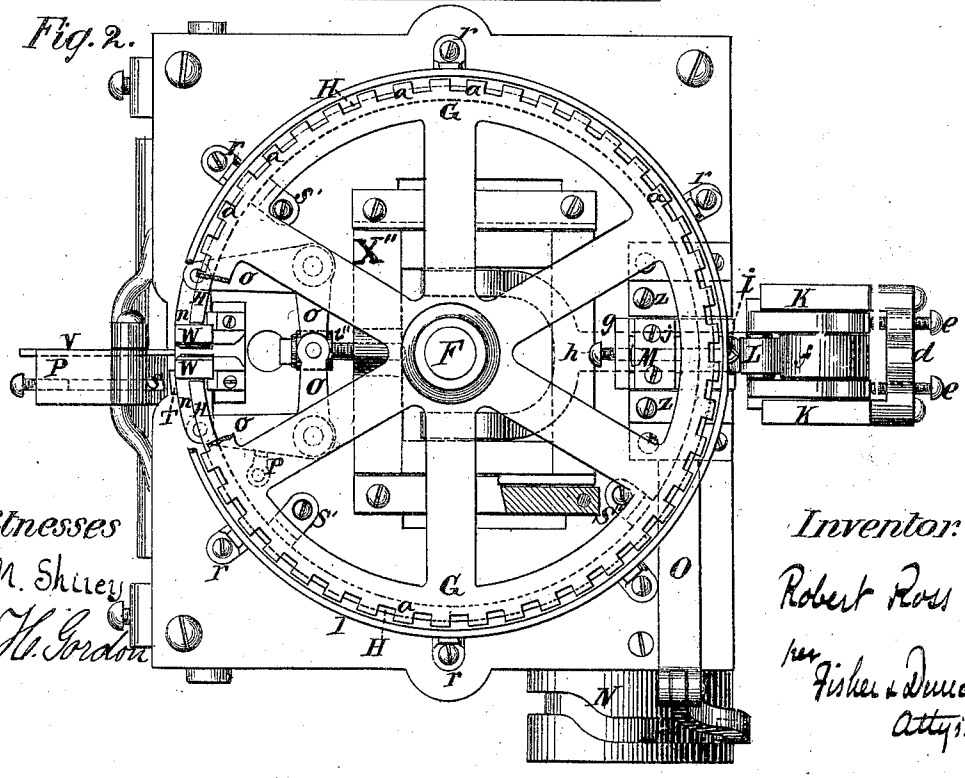


Fig. 2.



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2 Sheets—Sheet 2.

R. ROSS.

MACHINE FOR FINISHING HORSESHOE NAILS.

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Fig. 3.

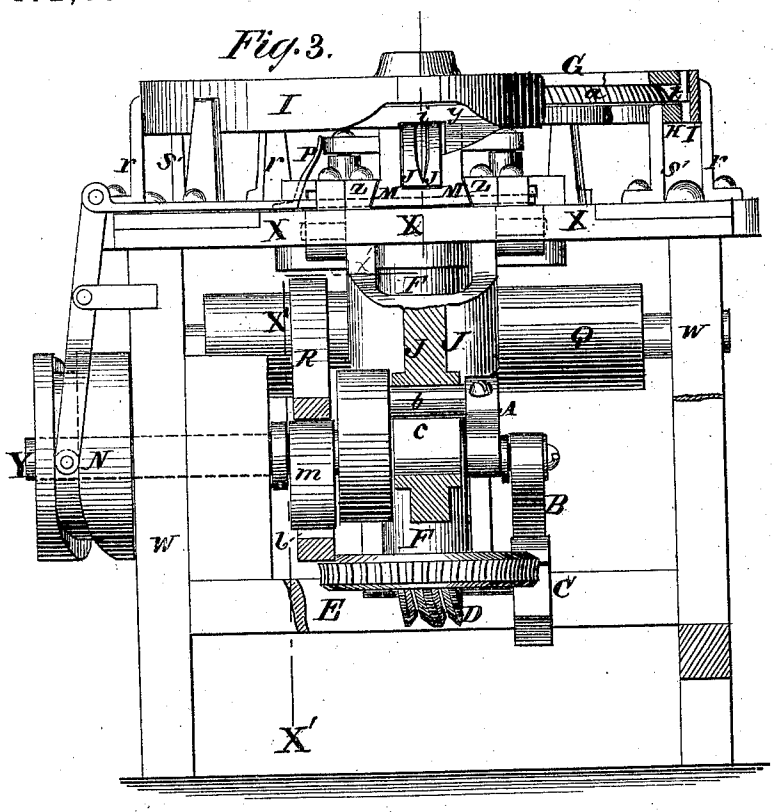


Fig. 4.

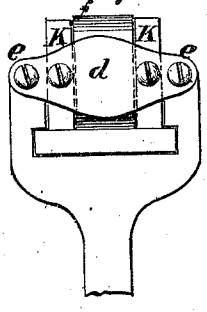


Fig. 5.

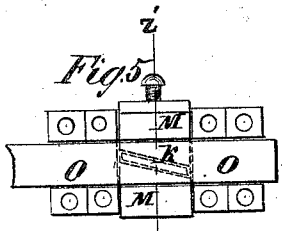


Fig. 6.

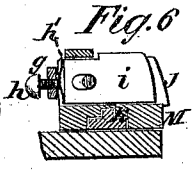


Fig. 7.

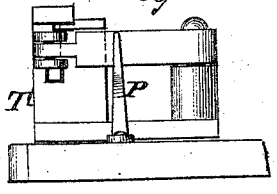
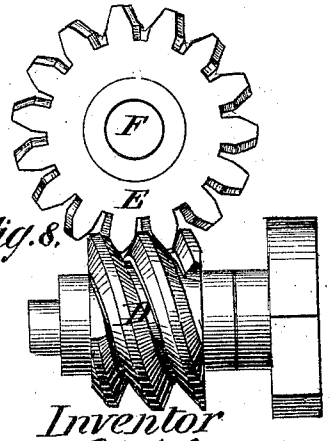


Fig. 8.



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UNITED STATES PATENT OFFICE

ROBERT ROSS, OF VERGENNES, VERMONT.

IMPROVEMENT IN MACHINES FOR FINISHING HORSESHOE-NAILS.

Specification forming part of Letters Patent No. **172,660**, dated January 25, 1876; application filed November 16, 1872.

To all whom it may concern:

Be it known that I, ROBERT ROSS, of Vergennes, in the county of Addison and State of Vermont, have invented an Improved Machine for the Manufacture of Horse-Nails, of which the following is a specification:

The machine to which my improvements relate has for its object the rolling, pointing, and finishing of horse-nails which have been approximately shaped by other means; and the various features of improvement range themselves in three groups, as follows: First, the feeding mechanism, by which the nail-blanks, when received into the machine, are carried forward successively to the rolling and to the pointing and trimming devices; second, the rolling mechanism, by which the faces of the nail are rendered smooth, a symmetrical taper is secured, and the body of the nail is compacted, and its fibers thereby strengthened and made more tenacious; third, the pointing and trimming devices, by means of which the requisite bevel for horse-nails is introduced upon one surface of the point, and all surplus metal finally trimmed off from the point and sides of the nail.

In the accompanying drawings, composed of two plates, Figure 1 is a vertical indirect cross-section through the planes indicated by lines *x'* of Fig. 3, the plan below being projected to show the arrangement of the levers and cams for operating the rolling and trimming dies. Fig. 2 is a plan view of the machine. Fig. 3 presents a view of the side of the rolling mechanism with the curved-roll lever removed to show the interior working parts. Fig. 4 is an enlarged view of the roll-block. Fig. 5 is a plan of the sliding bar for operating the die-carriage. Fig. 6 is a vertical section of the rolling die and carriage on the line *z' z'*, Fig. 5. Fig. 7 is a side view of the bell-crank lever for operating the jaws on the trimming-dies; and Fig. 8 is an enlarged view of the worm-wheel and endless screw for transmitting motion from the main shaft to the feeding mechanism.

The feeding mechanism comprises the following parts, as designated by the respective letters upon the drawings: The crank A, the pawl B, the ratchet-wheel C, the endless screw D, the worm-wheel E, the vertical shaft F, the feed-wheel G, and the inner and outer concentric guide-rings H I. *a a* represent the teeth upon the rim of the feed-wheel, so shaped in plan that the spaces between them will be approximately rectangular.

The principal parts composing the rolling mechanism are as follows: The bent lever J, with its crank-pin *b* and curved slot *c;* the roll-block K, with its bridge *d* and adjusting-screws *e e;* the nail-roll L, with its friction-roll *f;* the die-carriage M, provided with the bridge *g*, adjusting-screw *h*, and spring *h'*, and carrying the roll-die composed of the central part *i* and the two side pieces *j j;* the grooved cam N; and the sliding bar O, fitted with the diagonal projection *k*.

The various parts of the pointing and trimming mechanism are designated as follows: The punch-stock P; the rock-shaft Q; the lever R, with its slot *l* and eccentric *m;* the beveling-punch S; the beveling-die T; the trimming-punch V; the trimming-dies W; and the centering devices, consisting of the arms *n n*, the bell-crank levers *o' o'*, and spring *p*.

The uprights *w w w w* and the table X constitute the frame of the machine, upon which the operative parts are supported; and Y is the main shaft. The main shaft rests in bearings suitably attached to any of the uprights adjacent to each other. It receives motion in any convenient manner from the driving-power, and transmits it in turn, by means of its eccentrics, cams, and crank, to the working parts of the machine.

The principal parts of the feeding mechanism are the horizontal ratchet feed-wheel, which is caused to revolve with an intermittent motion, and the two concentric guide-rings. These guide-rings are elevated the required height above the table, being supported upon independent series of standards *r r r* and *s' s' s'*. The outer one of these rings is made of such diameter as exactly to inclose the feed-wheel, with only play enough between the two to permit the easy movement of the wheel. The spaces between the teeth upon the periphery of the feed-wheel are large enough to permit the head of the nail-blank to drop through them, while the annular space between the two guide-rings is wide enough to receive the shank of the nail, but not wide

enough to permit the head of the nail to pass. The inner guide-ring, moreover, is placed at a distance below the rim of the feed-wheel somewhat more than equal to the height of the head of the nail, so that when the nail is driven rearward into the trimming-die its movement shall not be impeded by the head striking against the lower part of the notches in the rim of the wheel. For the purpose of carrying the nails around in the annular space between the guide-rings, the teeth on the feed-wheel are prolonged downward below the general plane of the under side of the wheel, as shown at *t t*, these prolongations striking against the heads of the nails as the wheel revolves.

The inner guide-ring is broken away at a point opposite to the trimming-die, to permit the nails to be discharged rearward into and through this die.

It is necessary that the feed-wheel should revolve with an intermittent motion, since the nail must be brought to a state of rest before both the rolling and the pointing mechanisms, and so remain long enough for these devices to perform their respective functions. This intermittent motion is secured by mounting the wheel upon a vertical shaft, which carries a worm-wheel upon its lower end, the teeth of this worm-wheel meshing with the threads of an endless screw upon the horizontal shaft which carries the ratchet-wheel, actuated by a pawl receiving its motion from a crank, or other equivalent device, upon the main shaft.

At each revolution of the main shaft the ratchet-wheel will be advanced one tooth, this wheel, and, of course, the feed-wheel also, remaining at rest during the time occupied by the crank in withdrawing the pawl from one tooth and engaging it with the next; and the pitch of the thread of the endless screw must be so adjusted with reference to the number of teeth upon the ratchet-wheel, as well as the number upon the worm-wheel and upon the feed-wheel, that at each revolution of the main shaft the feed-wheel will be advanced through a space equal to the distance from the middle of any one of the notches on its periphery to the middle of the notch next adjacent. Furthermore, the arrangement of parts must be such as that when the feed-wheel is brought to a state of rest, the middle of one of the notches in its periphery will be found immediately above and in front of the middle of the rolling-die, the middle of the corresponding notch on the opposite side of the feed-wheel being at the same moment brought opposite to the trimming-die, and the middle of the notch next preceding this being left in front of the beveling-die.

To compensate for any loss of motion by the wearing of the thread of the endless screw and of the teeth of the worm-wheel, the shaft which supports the endless screw has its bearing in an adjustable frame, *u*, and grooves are cut in the worm-wheel at the base of the teeth, and corresponding spiral grooves formed between the threads of the endless screw. The adjusting-screw V′ will at any time carry the endless screw into more intimate contact with the worm-wheel, the edge of the thread of the screw entering the above-described grooves between the teeth of the wheel, and the points of these teeth entering the spiral groove cut at the base of the thread which forms the endless screw. As shown in the drawings, the frame which supports the endless screw is held to its support by means of a screw-bolt passing up through a slot, this slot permitting any requisite degree of adjustment of frame.

The rolling devices consist, in the main, of a bent lever pivoted to an adjustable frame, X″, and carrying the roll upon its free end, and of a compound die, which, through the medium of the carriage upon which it rests, has a reciprocating motion imparted to it by connection with the grooved cam upon the main shaft. The roll-lever is pivoted to the adjustable frame by means of pins passing through the two lugs, into which its pivoted end is divided, and is operated by means of a crank-pin upon the main shaft, working in the curved slot formed in the body of the lever, this slot being so shaped (substantially as shown in the drawings) that during a portion of the revolution of the shaft the lever will remain at rest. The crank-pin, furthermore, which operates this lever, is so adjusted with reference to the grooved cam from which the reciprocating movements of the die-carriage are derived, as well as the position of the crank from which the feed-wheel derives its intermittent motion, that the die-carriage is not advanced until, at each revolution of the main shaft, the feed-wheel has been brought to a state of rest, and the nail-roll does not begin its work until the die has been advanced against the nail to be rolled. After the roll has passed over the face of the nail, pressing it into the die, and thus shaping it and smoothing its surfaces, the die is retracted from contact with the nail before the feed-wheel receives another forward impulse from the main shaft, thus leaving the feed-wheel free from any obstruction that would otherwise arise from the confinement of the nail between the roll and the die.

The roll-die consists of a central piece inclosed between two side pieces, the central piece being made tapering in its transverse vertical section to correspond with the taper of the two sides of a finished nail, and being set back from the face of the side pieces a trifle less than the thickness of the nail. The three pieces are confined, by suitable means, in a block or carriage, which, in turn, is held to its seat by means of two beveled blocks, *z z*, which are fastened to the table in such a way that their beveled faces rest upon and in contact with the inclined planes formed upon the sides of the die-carriage. This block or carriage is cut away transversely upon its under side to permit the movement beneath it

of the sliding bar O, by means of which its alternate advance and retrograde movement are effected, this reciprocating movement being attained by means of a pin or diagonal tongue upon the upper side of the sliding bar, moving in a corresponding diagonal groove formed on the under side of the die carriage. This sliding bar is attached to one end of a lever, which is pivoted upon one side of the frame of the machine, the other end of the lever entering the groove in the cam N upon the main shaft.

In order to facilitate the disengagement of the nail from the die after it has been pressed into it by the roll, it may be necessary that the central piece should not move back so far as the two side pieces. This differential movement may be accomplished in various ways. The method which I prefer, and have illustrated in the drawings, is to form a slot in the central piece *i*, through which a pin shall pass, having its ends resting in the side pieces, or, more conveniently, the sides of the carriage. A strong spring also, as represented by *h'*, is to be placed at the rear of the central piece, between it and the adjusting-screw *h;* then, as the die-block with the two side pieces begins to move back, the central piece will be held stationary by the force of the spring, and thus the hold of the nail will become so loosened that it will offer no impediment to the further movement of the die. When the pin strikes against the end of the slot in the central piece, that piece also is thereby made to partake of the rearward movement of the carriage.

As the rolling of the nail has a tendency to bend it, it becomes necessary to curve the face of the die away from the roll. In practice it is curved upon a radius of about eight inches, both the central and side pieces having the same curvatures. This, under the pressure that would ordinarily be put upon the roll, will leave the nails practically straight. As this curvature of the face of the die causes the lower part of it to project farther forward than the upper part, the point of the nail may be prevented from striking against the side of the more advanced part by the use upon the face of the inner guide-ring of a guide-shield, *y*, so arranged, as shown in the drawings, as to throw the point of the nail forward from its vertical position as it approaches the die.

The amount of pressure to be applied in rolling the nail may be regulated by means of the sliding frame X″, to which the roll-lever is pivoted. This frame, as shown in the drawings, is located upon the table of the machine, being secured against lateral displacement by the two bars between which it is confined, while its position, and consequently the position of the roll, with reference to the face of the dies, is made adjustable by means of an adjusting-screw, *z″*, which is seated in a permanent standard rising from the table, and which enters the frame. The nail-roll is of small diameter, it being found in practice that such a roll is necessary in order that the nail may not be so stiffened that it will not readily clinch.

To aid the revolution of this small roll a friction-roll of much larger diameter is used, the latter bearing against the periphery of the former, and turning with it. The two are mounted in a common frame, K, which is supported in the outer free end of the roll-lever. This frame is made adjustable toward and from the center of motion of the roll-lever by means of the two screws *e* seated in the bridge *d*, which passes in the rear of the roll-block. By thus varying the distance between the center of motion and the operative face of the roll the latter is made to travel on a curve of longer or shorter radius, and thus the pressure against any part of the nail may be regulated at pleasure. The nail, after being rolled, is carried forward by the feed-wheel in succession to the beveling and the trimming devices.

The stock to which the beveling-punch is attached is borne upon a rock-shaft, Q, which is supported in bearings upon the side of the machine opposite to the main shaft, and is operated by a slotted lever, R, embracing an eccentric upon the main shaft. The descent of this lever causes the beveling-punch to compress the tip of the nail between it and a die, T, which has the form of an inclined plane projecting from the face of a stationary die-block seated on the table.

This bevels one face of the point of the nail, and at the next revolution of the main shaft the feed-wheel carries the nail into position between the trimming-die W and the trimming-punch V, which latter is secured upon the same stock with the beveling-punch. By means of an adjusting-screw, which enters the punch-stock from the rear, the position of the beveling-punch may be regulated at pleasure, so that the point of the nails may be compressed with a greater or less force.

The trimming-die, the function of which is to trim from the sides of the nail, and more particularly from its point, any surplus metal, is placed directly opposite the break in the inner guide-ring, and as the punch-stock again advances the trimming-punch drives the nail rearward, and forces it into and through the dies, when it drops through a hole in the table, and is discharged.

In this operation it is necessary that the nails, notwithstanding any variation that may occur in their width, should be accurately centered in front of the trimming-dies.

To effect this the bell-crank levers *o'* are used, pivoted upon suitable standards rising from the table, the inner ends of the levers being so fastened together that each may partake of the movements of the other.

To the outer ends of these levers, and above and a little in front of the trimming-die, arms *n* are pivoted, which move in suitable ways in the upper surface of the block which carries the die, the length of the arms being such that when the levers are in their normal po-

sition the ends of the arms will be a somewhat less distance apart than the width of a nail, the opening between them being at the same time directly in front of the opening between the dies. In order that the nail may readily enter between these centering-arms, the ends are slightly beveled outwardly, and they are made to gripe the nail with the requisite firmness by means of one or more springs pressing against the levers at any convenient point. These springs also cause the ends of the centering-arms to approach each other when the nail has been driven through by the punch.

It is evident that many of the elements in this machine may be varied without in any way effecting the characteristic features of my invention. For instance, if preferred, an eccentric may be substituted for the crank, as a means of operating the pawl that actuates the ratchet-wheel and communicates the intermittent motion to the feed-wheel Beveled gears may be used instead of the endless screw and worm-wheel, as a means of communicating to the vertical shaft of the feed-wheel the motion derived from the main shaft through the pawl and ratchet-wheel. A pin projecting from the upper surface of the sliding bar may be used in lieu of the diagonal tongue shown in the drawings. In place of a crank-pin working in a slot in the lever that actuates the roll-stock, this lever may be lifted by a cam on the main shaft, and allowed to fall by its own weight. And for various other of the secondary elements of the machine it is evident that mechanical equivalents may be used.

I do not propose, therefore, to limit myself in the practice of my invention to the precise construction herein shown in all its details, but I desire and hereby intend to reserve the right to substitute for any of the devices hereinbefore described any equivalent devices, provided I do not thereby depart from the principles of the invention.

What I claim as new in this machine and desire to have protected by Letters Patent of the United States, is—

1. The improved nail-carrying devise composed of the two concentric guide-rings and the notched feed-wheel provided with teeth projecting downward and operating to carry the nails around between the rings.

2. The combination of the feed-wheel, the crank, the pawl and ratchet-wheel, and the endless screw and worm-wheel, or their equivalents, substantially as described.

3. The combination of the endless screw, mounted in adjustable bearings and having a spiral groove cut between the threads, with the worm-wheel provided with grooves between the teeth, substantially as and for the purpose set forth.

4. The combination of the roll-lever and the adjustable frame, or its equivalent, to which it is pivoted, as a means of regulating the degree of pressure on the nail.

5. The combination of the grooved cam, the connecting-lever, the sliding bar and the roll-die carriage, or their equivalents, in the manner substantially as described, as a means of carrying the roll-die to and from its work.

6. The roll-die constructed substantially as hereinbefore described, so that the central part may have a different range of movement from the side pieces, for the purpose of more readily freeing the nail from the die.

7. The combination in a horse-nail machine of a feed-wheel, a roll-die, and a nail-roll, together with their respective connections with the main shaft, substantially as hereinbefore described, so that the nail may be brought into position in front of the die, before the die is advanced, and the die be advanced before the roll begins its work.

8. The arrangement in a nail-machine of the feeding mechanism, the rolling devices, and the pointing and trimming devices, substantially as hereinbefore described, so that when the nail-carriage is full, a nail shall be brought into position before the trimming-die and another before the beveling-die at the same moment that one is brought into position for the action of the rolling mechanism.

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