2 Sheets—Sheet 1.

R. WARD.

Nail Machine.

No. 54,981. Patented May 22, 1866.

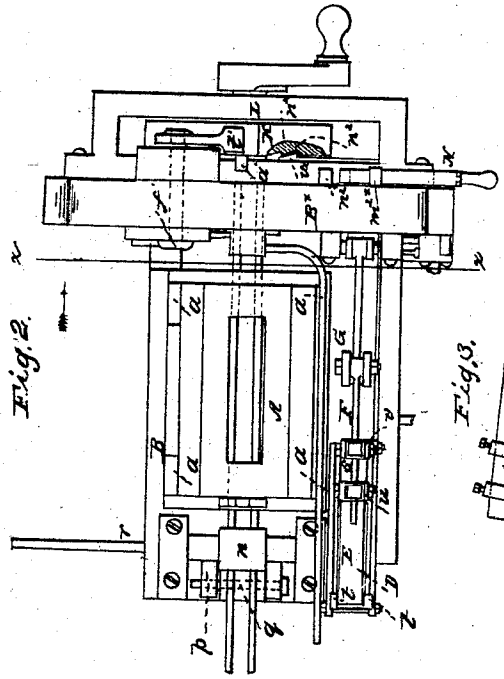

Fig. 2.

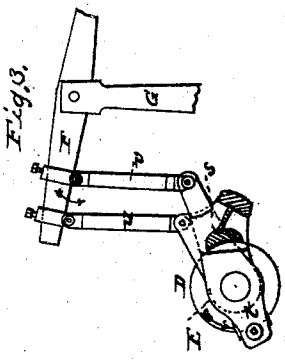

Fig. 3.

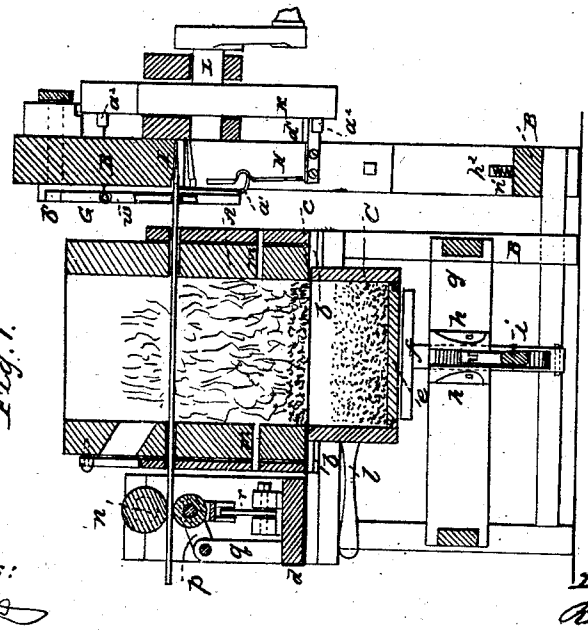

Fig. 1.

Witnesses:

Inventor:

54,981.

2 Sheets—Sheet 2.

R. WARD.

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Fig. 4.

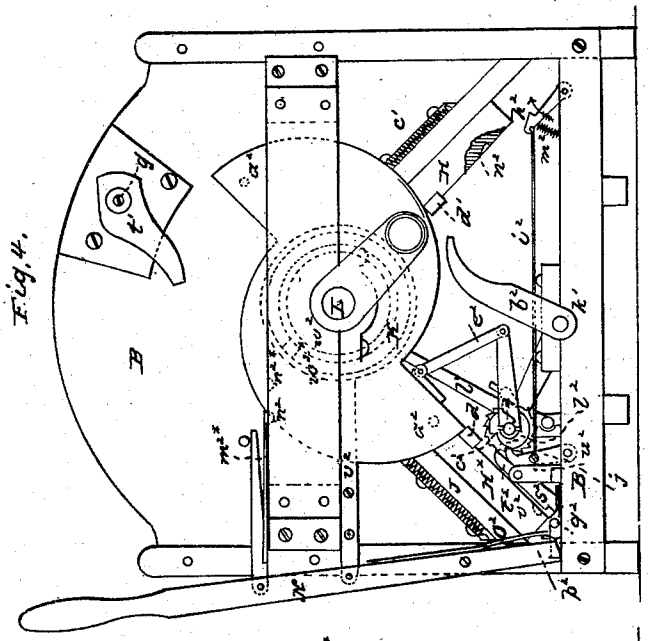
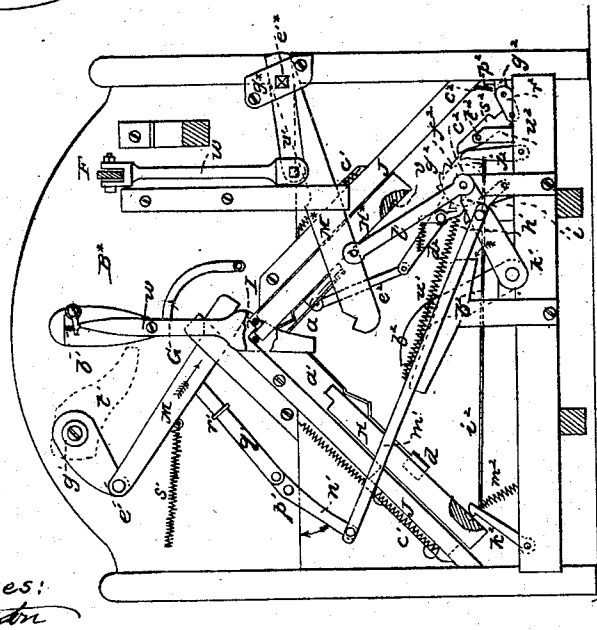


Fig. 3.



Witnesses:

Inventor:

R. Ward

By Munn & Co atty.

UNITED STATES PATENT OFFICE.

RIVERA WARD, OF ALDER CREEK, NEW YORK.

IMPROVEMENT IN NAIL-MACHINES.

Specification forming part of Letters Patent No. **54,981**, dated May 22, 1866.

To all whom it may concern:

Be it known that I, RIVERA WARD, of Alder Creek, in the county of Oneida and State of New York, have invented a new and useful Improvement in Nail-Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a longitudinal vertical section of this invention. Fig. 2 is a plan or top view of the same. Fig. 2* is a detached side elevation of the double clutch which serves to impart to the feed-rollers the desired motion. Fig. 3 is a transverse vertical section of the same, the line *x x*, Fig. 2, indicating the plane of section. Fig. 4 is a front view of the same.

Similar letters of reference indicate like parts.

This invention relates to a machine intended particularly for the manufacture of horseshoe-nails. The rods from which the nails are to be forged are passed, two at a time, through a furnace the fire-box of which is furnished with an adjustable bottom, so that the fuel can be gradually fed up from below and an even heat can be maintained in the furnace. When fresh fuel is to be introduced a piece of sheet metal is inserted between the bottom of the furnace and the top of the fire-box, and the incandescent fuel already in the furnace is sustained until the bottom of the fire-box has been lowered and the box refilled with fuel. The rods, after having been heated in the furnace, are exposed to the action of two hammers, which operate in planes at right angles to each other, and the faces of which are made in the form of two steps, which operate in combination with an M-shaped anvil in such a manner that each hammer operates simultaneously on two rods, one to produce the flat sides and the other the edges of the nails to be made. If the nails are to be made with heads the faces of the hammer and of the anvil have to be cut out accordingly. An oscillating guide, which operates in combination with the hammers, adjusts the rods in the proper position on the anvil after the stroke of each hammer, and in order to prevent this guide from heating a current of cold water or air is passed through it. One of the hammers is retained for a short time at certain intervals to give time to the shears to act, a spring-catch being allowed to drop into a cavity in the hammer whenever a certain cam has accomplished a whole or partial revolution, and at that moment the other hammer may also be stopped by a spring-catch the position of which is governed by a hand-lever. The shears are operated by suitable cams, and an arm connecting with one arm of said shears extends to a lever, from which two rods are suspended for the purpose of imparting to the feed-rollers the desired motion, one of the rods being connected to a clutch which turns the feed-rollers slightly back to bring the finished nails in the proper position for cutting off, and the other being connected to a clutch which imparts to the feed-rollers the requisite motion to feed in a sufficient length of the rods for the subsequent operation of the hammer.

A represents a furnace, which is built up of cast-iron or sheet-metal plates lined with brick, and which is supported by the frame B, which may be made of iron or any other suitable material of sufficient height for the occasion, and which is provided with suitable guide-strips *a* to keep the furnace in position. The bottom edge of said furnace is provided with guide-grooves *b*, to receive and retain the fuel-box C, and with other guide-grooves, *c*, to receive the metal slide *d*. The bottom *e* of the fuel-box is movable, and it is supported by a platform with a square shank, *f*, which is provided with ratchet-teeth on both sides, and which moves up and down in a suitable socket in the longitudinal bar *g* of the frame B, and from this socket extend lugs or ears *h*, on one side, to form the bearing for the fulcrum-pin of the lever-pawl *i*, and similar lugs on the other side to form the bearings for a stop-pawl. By the action of the lever-pawl on the ratchet-teeth in the side of the shank *f*, which supports the movable bottom of the fuel-box, said bottom can be fed up gradually, the stop-pawl being arranged to retain the same and prevent it from dropping back while a fresh hold is taken with the lever-pawl, and the fuel which is placed in the fuel-box can thus be fed up as the same is consumed, and an even and uniform heat can be entertained in the furnace. If the movable bottom has been fed clear up to the top of the fuel-box the slide *d* is inserted, and the incandescent fuel contained in the furnace is sustained while the bottom of the fuel-box is

lowered and the fuel-box withdrawn in order to receive a fresh charge.

When the fuel-box is in its place it is retained by a spring-catch, *l*, which prevents the same from being displaced accidentally, and which is provided with a suitable handle for the purpose of releasing it whenever it may be desirable.

The furnace is provided with suitable loop-holes in its sides, through which the state of the fire and of the nail-bars can be ascertained, and two holes, *m*, in each of its ends, give access to the metal bars from which the nails are to be forged. These bars may be round, square, or oblong, or of any suitable form or shape, and they are fed through the furnace automatically by means of feed-rollers *n o*, the lower one of which is provided with grooves that are intended to guide the bars and keep them in proper position. This lower roller, *o*, has its bearings in a gate, *p*, which swings on a pivot secured in a standard, *q*, rising from the frame A, and a spring-lever, *r*, which acts on said gate, has a tendency to force the roller *o* up against the roller *n*, thus causing said rollers to take a firm hold of the nail-bars. By raising the outer end of the lever *r* the roller *o* is permitted to drop and the nail-bars are relieved.

The feed-motion is produced by a double-acting clutch, D, on a disk, E, which is mounted on the end of the shaft which bears the upper feed-roller, *n*, and the feed-motion is so arranged that the nail-rods (after having been heated) are fed in far enough to produce the desired nails, and when the nails are finished said bars are drawn back so as to cause the shears to take action at the proper spot. It will be observed that this backward motion is short as compared with the forward motion, and in order to obtain these motions two clutches or dogs, *s t*, are applied to the disk E on opposite sides thereof, the dog *s* to produce the forward motion and the dog *t* to produce the backward motion.

By referring to Fig. 2* it will be seen that the dogs *s t* are mounted in arms which swing on the arbor of the disk E, the arms of the dog *t* being made longer than those of the dog *s*, and arranged so that they extend beyond the center of the disk. Both arms—those of the dog *s* and those of the dog *t*—connect with a lever, F, which has its fulcrum in a standard, G, rising from the frame A, the connections of the former being effected by a rod, *u*, and that of the latter by a rod, *v*, and it will be noticed that the connection of the rod *u* with the lever is farther from the fulcrum of the lever than that of the rod *v*, so that when an oscillating motion is imparted to said lever on the downstroke of the rods *u v* the dog *s* glides over the surface of the disk E, which is turned a short distance in the direction of arrow 1 by the action of the dog *t*, and on the upstroke of the rods *u v* the dog *t* slides, and the dog *s* catches hold of the disk and turns the same in the direction of arrow 2, and the amount of motion produced by the dog *s* is much larger than that produced by the dog *t*, just in proportion as the arms of the dog *s* are shorter than those of the dog *t*, and the point of connection between the rod *u* and lever F is farther from the fulcrum of said lever than the connecting-point of the rod *v*.

The means by which motion is imparted to the lever F, and through it to the feed-rollers, will be hereinafter explained.

By the action of the feed-rollers the nail-bars are fed in through a guide, G, which is provided with two holes, each to receive one rod, and which is suspended from a pivot, *w*, secured in the front plate, B*, of the frame B, as shown particularly in Fig. 3 of the drawing. To this guide an oscillating motion is imparted by the action of the hammers H H* on tappets *a'*, projecting from its edges, and it is held in the desired position by a spring-dog, *b'*, which catches over its upper end. The object of this oscillating motion is to bring the ends of the nail-rods opposite the centers of the faces of the hammers and to prevent the formation of pins on the edges of the nails. This guide is hollow, and a current of cold water or air is passed through it to prevent it from heating.

The anvil J is M-shaped, and the hammers operate in a direction at right angles to each other, each being provided with a stair-like face, as clearly shown in Fig. 3, which operates in combination with the M-shaped anvil, in such a manner that it acts on both nail-rods simultaneously, one hammer being made to strike the flat surfaces of the nails and the other their edges. By this arrangement two nails are finished simultaneously, the faces of the hammers being so shaped that the nails and their heads are brought to the desired shape.

The hammers are guided in inclined slotted ways J, under the front plate, B*, of the frame B, and they are subjected to the action of springs *c'*, which have a tendency to force the same up against the anvil I. A double cam, K, mounted on the main shaft L of the machine, acts on tappets *d'*, extending from the edges of the hammers, and depress the same against the force of the springs, and on being relieved from said cam the hammers fly up against the anvil with considerable force, and the desired effect on the nail-rods is obtained.

If a couple of nails are finished they are cut off by the action of shears M M*, the two jaws of which are secured to pivots *e' e'**, the pivot *e'* being fastened in an arm, *f'*, mounted on the inner end of a rock-shaft, *g'*, whereas the pivot *e'** has its bearings in the plate B* and in a bridge-piece, *g'**, secured to the inner surface of said plate. During the time the hammers act on the nail-rods the two jaws M M* are kept out of the way, as shown in Fig. 3, a spring-catch, *h'*, (see Fig. 3,) being provided, which catches over a pin, *i*, secured in the outer side of an arm, *j'*. This arm is mounted on a rock-shaft, *k'*, and its end connects by a link, *l'*, with the jaw M*. From said arm ex-

tends also a rod, m', to the end of the long arm of a lever, n', which has its fulcrum on a pivot, p', and the short arm of which is pivoted to a bolt, q', that is guided in a staple, r', and the loose end of which bears against the jaw M, a spring, s', being provided which keeps said jaw in contact with the bolt. By the action of the bolt against the jaw M the rock-shaft g' is kept in such a position that the cam K will not come in contact with a tappet, t', mounted on the outer end of said rock-shaft, as shown in Fig. 3 in dotted, and in Fig. 4 in full, lines.

As soon as a couple of nails are finished the spring-catch h' is made to release the pin i', and a spring, w', acting on the arm j', causes the same to fly up in the direction of the arrow marked thereon in Fig. 3, and the jaw M* rises until the link l' comes in line with the arm j', and forms a firm support for said jaw. At the same time the lever n' is caused to turn in the direction of the arrow marked on it in Fig. 3, the bolt q' is drawn in, and the jaw M is allowed to follow the action of the spring s' and to descend until its cutting-edge is opposite the cutting-edge of the jaw M*, said cutting-edges being in such a position that the nail-rods to be cut are situated between them. Before the cutting takes place, however, it is necessary to draw the nail-rods back a short distance, which is effected by the action of a lever, v', which is firmly connected to the jaw M*, and connects, by a rod, w, with the feed-lever F, so that when the jaw M* flies up the feed-lever is turned in the direction of the arrow marked on it in Fig. 2*, and the feed-rollers are turned back a short distance.

By the downward motion of the jaw M the rock-shaft g' is turned and the tappet t' is brought in such a position that the cam K comes in contact therewith, and imparts to the rock-shaft a partial revolution, causing the jaw M to move down in the direction of the arrow marked thereon in Fig. 3 and to effect the cutting.

Immediately after the cutting is effected the jaws M M* are carried back to their original position (shown in Fig. 3) by the action of one of the pins a^2 on a tappet, b^2, which is mounted on the outer end of the rock-shaft k', as seen in Fig. 4. The pins a^2 project from the inner surface of the cam K, and by their action on the tappet b^2 the cam j' is turned down in a direction opposite the arrow marked on it in Fig. 3 until the spring-catch h' drops over the pin i' and retains the shears in their position of rest. By this motion the tappet b^2 comes in such a position that it does not interfere with the revolving motion of the cam K, and at the same time the arm v', which connects with the jaw M*, imparts to the feed-lever F a motion in a direction opposite the arrow marked thereon in Fig. 2*, and the nail-bars are fed in a sufficient distance for the next operation.

In order to release the spring-catch h' automatically at certain stated intervals a ratchet-wheel, c^2, is provided with a number of teeth equal to the number of blows of each hammer required to finish a nail, and a lever-pawl, d^2, which connects by a rod, e^2, with the hammer H*, causes said ratchet-wheel to revolve one tooth for each blow of the hammer. The ratchet-wheel c^2 is mounted on a shaft, f^3, which has its bearings in suitable standards in the lower part of the frame A, and from its inner surface projects a pin, g^2, Fig. 3, which is so situated that the same, as it is carried round by the action of the lever-pawl on the ratchet-wheel c^2, is brought in contact with the spring-catch h', and throws the same off from the pin i'.

During the time the cutting is effected, and after the nail-bars have been moved back for the purpose of cutting off the finished nails, it is necessary that the action of the hammers shall cease. This object is effected by a self-acting spring-catch, h^2, which is best seen in Figs. 3 and 4 of the drawing. This catch connects by a rod, i^2, with a dog, j^2, the point of which bears on the circumference of a disk, k^2, that is mounted on the shaft f^3 of the ratchet-wheel, and revolves with the same. This disk is provided with a cavity, l^2, which is so situated that when the pin g^2 in the ratchet-wheel releases the catch h' the dog j^2 is permitted simultaneously to drop into said cavity, thereby allowing the dog h^2 to follow the action of the spring m^2 and to swing in the direction of the arrow marked near it in Fig. 4. On the next downstroke of the hammer H the catch h^2 is thus permitted to drop into a notch, n^2, in the hammer H, and to retain the same until the shears have performed the cutting, and until, by the subsequent motion of the ratchet-wheel c^2 and disk k^2, the dog j^2 is thrown out of the cavity l^2 and the catch h^2 is forced back to the position shown in Fig. 4.

If it is desired to stop the action of both hammers the hand-lever N is thrown in the direction of the arrow marked near it in Fig. 4 until the spring-catch m^2, which is connected to said hand-lever, passes from the cavity n^2 into the cavity n^{2*}. By this motion a spring, o^2, which is connected to the hand-lever and bears on a pin, p^2, projecting from the upper surface of a slide, q^2, is strained, causing said slide to move in the direction of the arrow marked on it in Fig. 4 as soon as the proper moment arrives. Said slide connects, by a link, r^2, with a catch, s^2, which swings on a pivot, t^2, in suitable standards u^2, rising from the frame B. The upper end of this catch is in such a position that it bears on the back of the dog j^2, and is prevented from following the action of the spring o^2 until said dog drops into the cavity l^2 of the disk k^2. At that moment the slide q^2 moves in the direction of the arrow marked on it in Fig. 4, and the catch s^2 assumes such a position that the same on the next downward stroke of the hammer H* catches in a cavity, v^2, in said hammer, and retains the same in such a position that the cam K clears its tappet, and any further motion thereof is prevented. All this takes place when the dog

j^2 drops in the cavity l^2, whereby the catch h^2 is made to retain the hammer H, and consequently both hammers are arrested.

When the machine is to be started the hand-lever N has to be moved in a direction opposite the arrow marked thereon in Fig. 4, and it is necessary to do this at such a time when the lowest part of the cam K is opposite the tappet of the hammer H*, so that this hammer will be moved first, and by its motion the ratchet-wheel c^2 and disk k^2 are turned, and the catch h^2 is compelled to release the hammer H.

In order to start the machine at the proper moment a spring-dog, v^2, is connected to the hand-lever N, and the point of this spring-dog is made to catch into a circular groove, w^2, when the machine stops, and into another concentric groove, w^{2*}, when the machine is in motion. The ridge between the two grooves forms a square shoulder on its inner side, but its outer side is inclined so that the dog can readily pass from the groove w^{2*} to the groove w^2, but when an attempt is made to draw it back from the groove w^2 to the groove w^{2*} the square shoulder of the ridge retains it. At one point only the ridge is cut away, and if this point comes opposite the dog v^2 the hand-lever can be moved out and the machine is started at the proper time.

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

1. The arrangement of a movable fuel-box, C, with adjustable bottom *e*, in combination with the furnace A, feed-rollers *n o*, hammers H H*, and shears M M*, substantially as and for the purpose set forth.

2. Imparting to the nail-rods a retrograde motion before cutting and a forward motion after cutting by means substantially such as herein described, or any other equivalent means, for the purposes specified.

3. The oscillating guide G, in combination with the M-shaped anvil I, constructed and operating substantially as and for the purpose set forth.

4. The hammers H H*, in combination with the M-shaped anvil I, constructed and operating substantially as and for the purpose described.

5. The oscillating jaw M*, in combination with the feed-lever F, clamps *s* and *t*, disk E, and feed-rollers *n o*, constructed and operating substantially as and for the purpose described.

6. The dog h' and pin i', in combination with the arms j' l', rod m', lever n', bolt q', and jaws M M*, constructed and operating substantially as and for the purpose set forth.

7. The rock-shaft g' and tappet t', in combination with the jaws M M* and cam K, constructed and operated substantially as and for the purpose described.

8. The tappet b^2, in combination with studs a^2 on the cam K, and with the arms j' l', jaws M M*, and rock-shaft g', substantially as and for the purpose set forth.

9. The ratchet-wheel c^2 and stud g^2, in combination with the catch h', spring w', arm j', and with the rods connecting said arms with the jaws M M*, substantially as and for the purpose set forth.

10. The disk k', with its cavity l^2, in combination with the dog j^2, catch h^2, and hammer H, substantially as and for the purpose described.

11. The hand-lever N, with spring o^2, in combination with the catch s^2 and hammer H*, constructed and operating substantially as and for the purpose described.

12. The combination of the catch s^2, dog j^2, disk k^2, and catch h^2 with the hammers H H*, substantially as and for the purpose described.

13. The spring-catch v^2, in combination with the annular grooves w^2 w^{2*} in the cam K, and with the hand-lever N, constructed and operating substantially as and for the purpose set forth.

The above specification of my invention signed by me this 1st day of September, 1865.

RIVERA WARD.

Witnesses:

M. M. LIVINGSTON,

C. L. E. TOPLIFF.