W. H. HART & J. E. DOBSON.

NAIL MAKING MACHINE.

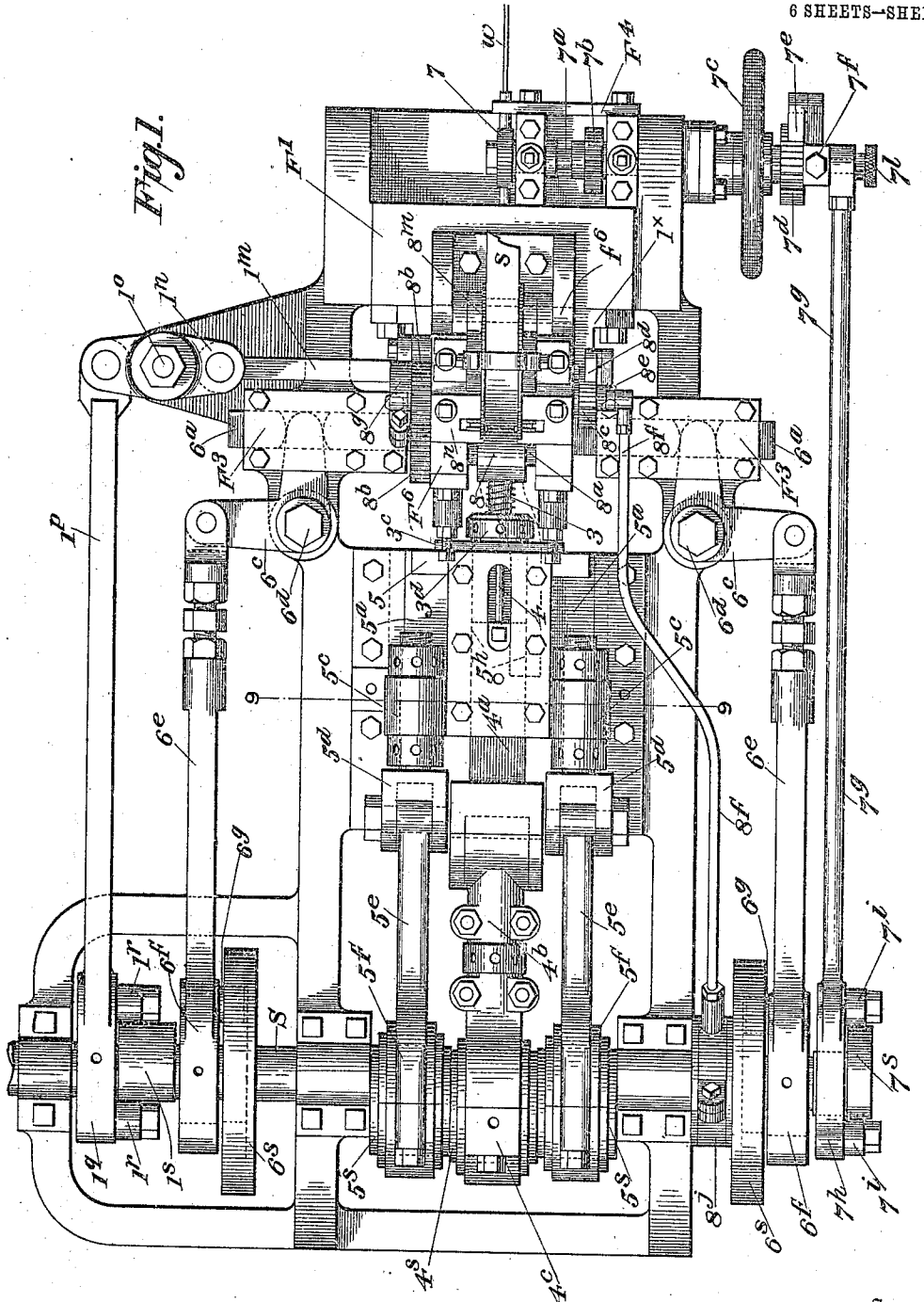
APPLICATION FILED JAN. 14, 1908.

948,879.

Patented Feb. 8, 1910.

6 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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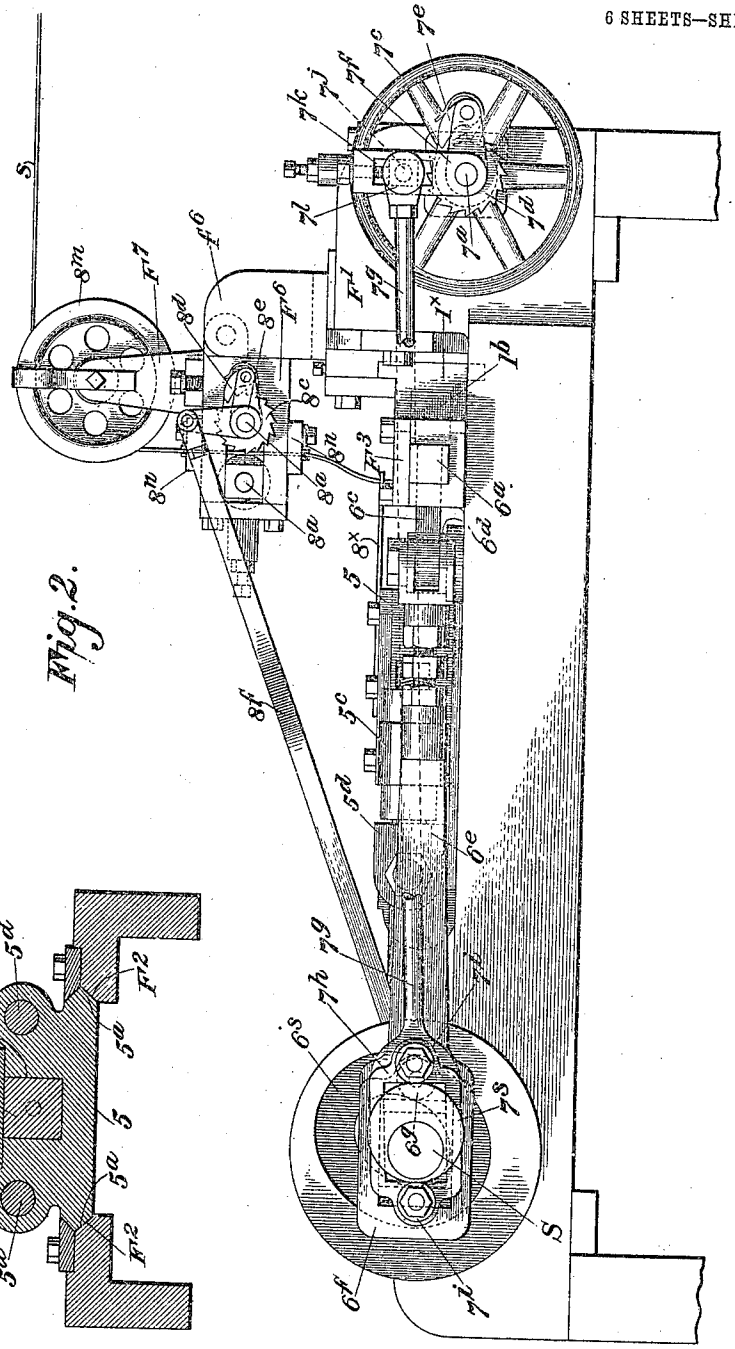

Fig. 2.

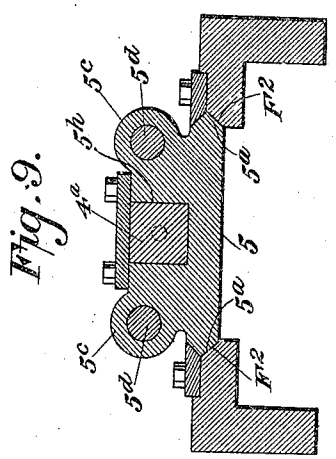

Fig. 9.

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6 SHEETS—SHEET 3.

Fig. 10.

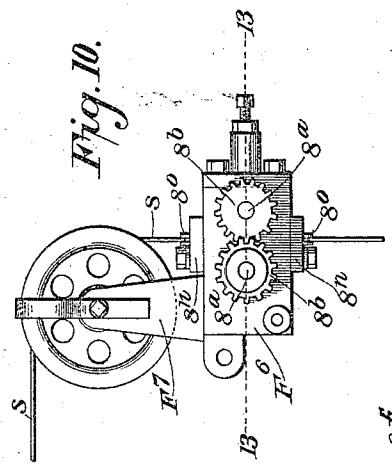


Fig. 11.

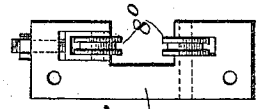
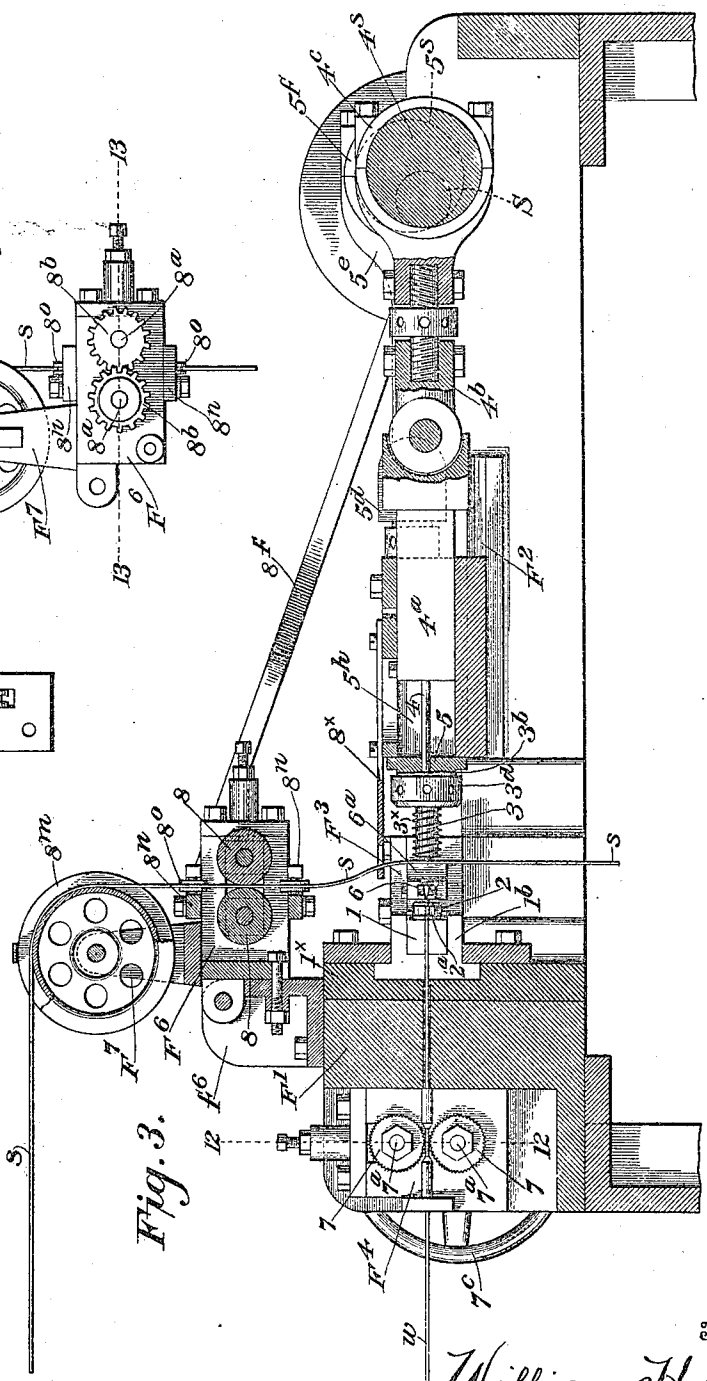


Fig. 3.



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6 SHEETS—SHEET 4.

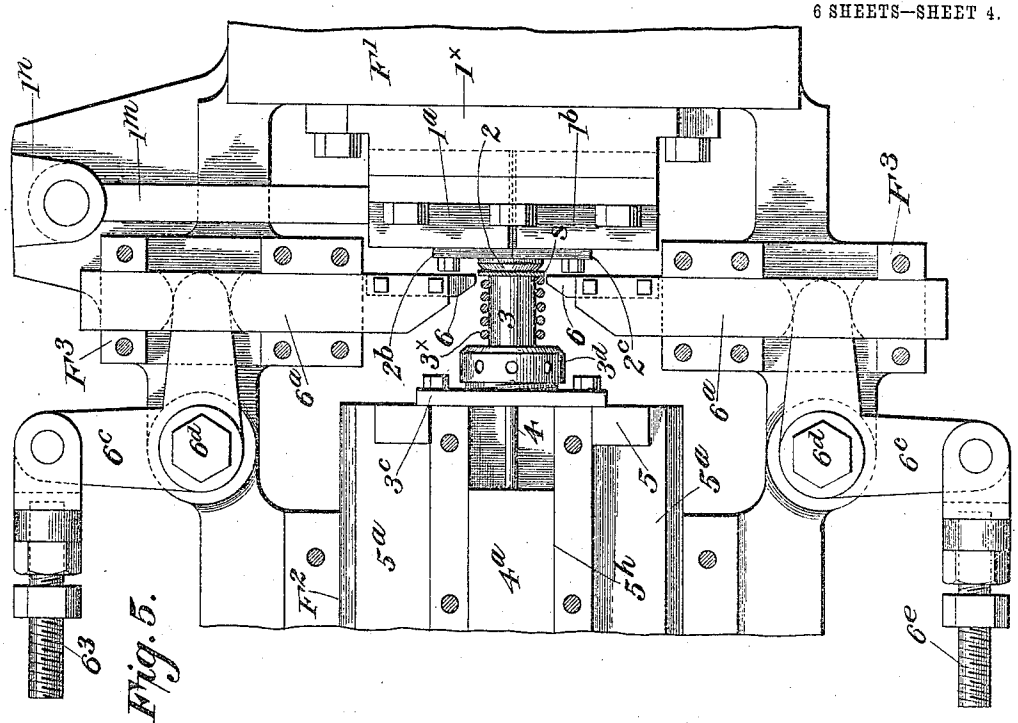

Fig. 5.

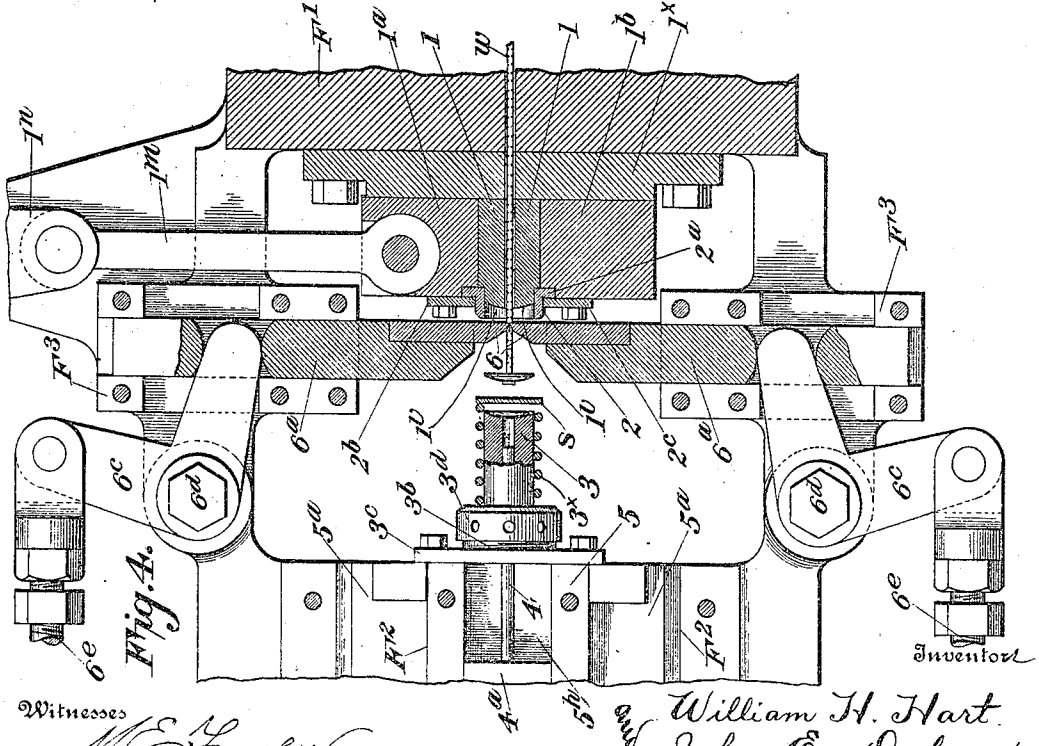

Fig. 4.

Witnesses

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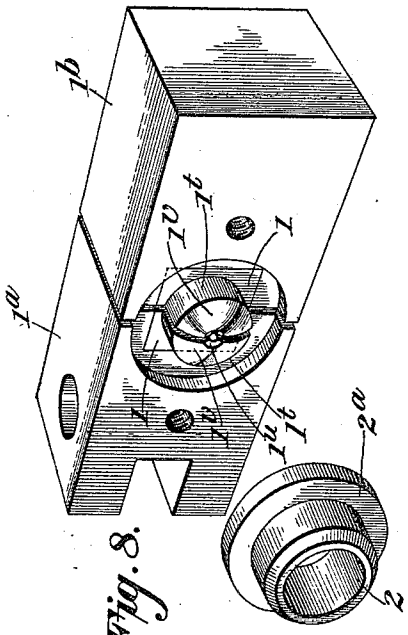

Fig. 8.

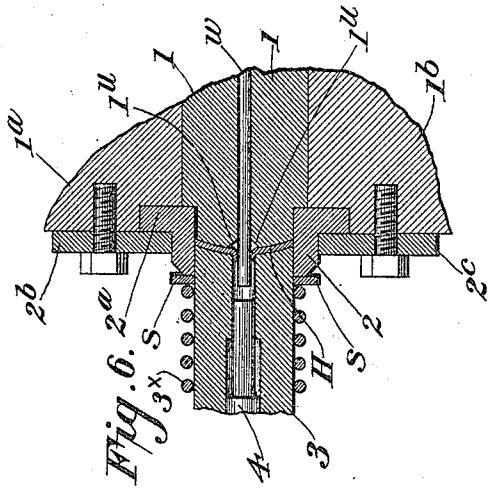

Fig. 6.

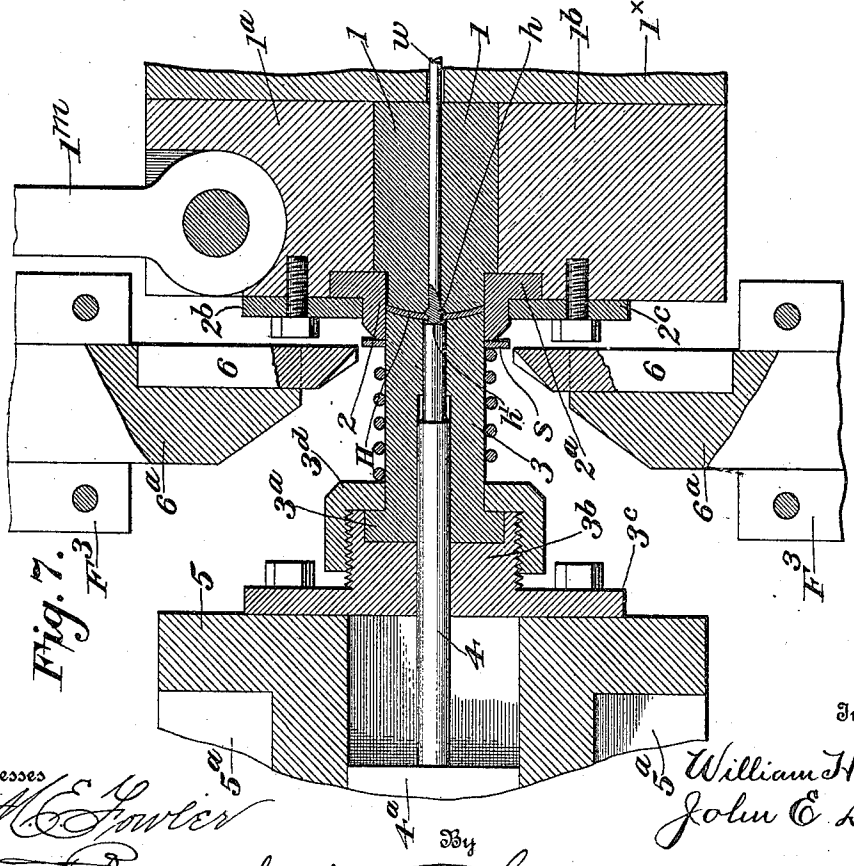

Fig. 7.

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6 SHEETS—SHEET 6.

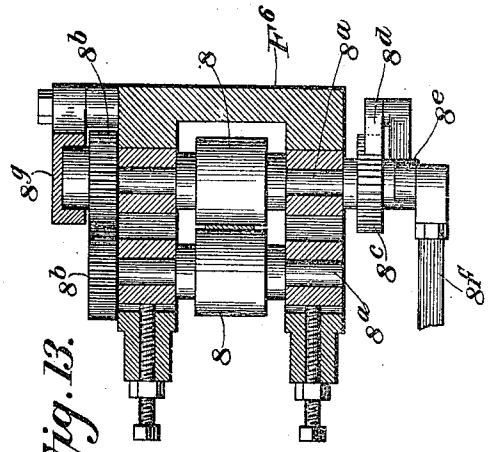

Fig. 13.

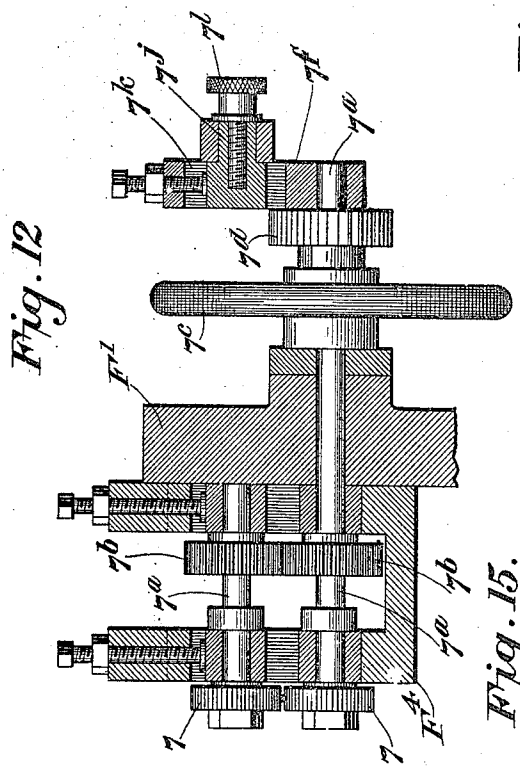

Fig. 12

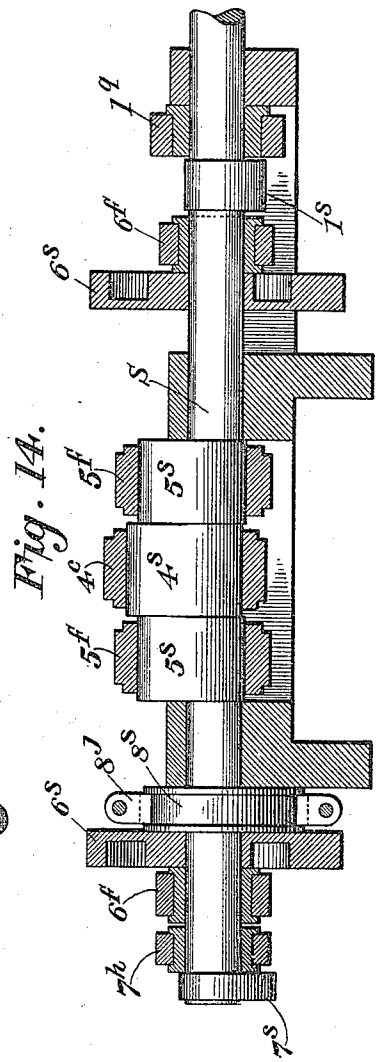

Fig. 14.

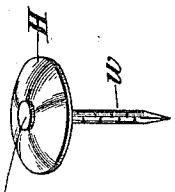

Fig. 15.

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UNITED STATES PATENT OFFICE.

WILLIAM H. HART, OF BATTLE CREEK, AND JOHN E. DOBSON, OF DETROIT, MICHIGAN, ASSIGNORS TO H. B. SHERMAN MANUFACTURING COMPANY, OF BATTLE CREEK, MICHIGAN, A CORPORATION OF MICHIGAN.

NAIL-MAKING MACHINE.

948,879. Specification of Letters Patent. Patented Feb. 8, 1910.

Application filed January 14, 1908. Serial No. 410,840.

To all whom it may concern:

Be it known that we, WILLIAM H. HART, of Battle Creek, Calhoun county, Michigan, and JOHN E. DOBSON, of Detroit, Wayne county, Michigan, have invented certain new and useful Improvements in Nail-Making Machines; and we hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

This invention is an improvement in nail making machines and is particularly designed for making roofing nails having wire shanks and large disk-like sheet metal heads.

The machine comprises mechanism for feeding the wire; dies for clamping the wire after a nail length has been advanced; means for feeding a metal strap across the line of wire feed and in front of the end of the wire; means for punching a nail head from the strap, and driving it onto the end of the wire, (the wire punching its way through the head); and also if desired, concavo-convexing the head; means for swaging the end of the wire to the head, and means for severing a nail length, with the attached head, from the wire and for pointing the nail. Preferably the wire is fed forward after the head is attached thereto, and the wire is then severed; and the same dies which cut the wire also point the same.

The invention will be clearly understood from the following description of the machine illustrated in the accompanying drawings, which represent the present preferred practical embodiment of the invention, such machine being adapted to turn out nails having cylindrical concavo-convex sheet or strap metal heads and barbed, or roughened, and pointed wire shanks.

In said drawings—Figure 1 is a top plan view of the complete machine. Fig. 2 is a side elevation thereof. Fig. 3 is a central longitudinal vertical section thereof, some of the parts being shown in elevation. Fig. 4 is an enlarged sectional plan view of the die portion of the machine, showing parts in position just prior to the severance of the completed nail. Fig. 5 is a plan view with the blanking dies and the wire clamping dies closed. Fig. 6 is an enlarged detail sectional view of the dies just prior to heading the nail. Fig. 7 is an enlarged horizontal sectional view showing the position of the dies and header rod after the completion of the heading operations. Fig. 8 is a detail perspective view of the wire clamping dies and the female blanking die separated. Fig. 9 is a detail transverse section on line 9—9, Fig. 1. Fig. 10 is a side elevation of the strap feeding device removed from the machine. Fig. 11 is a plan view of one of the strap guide plates. Fig. 12 is an enlarged sectional view of the wire feeding device on line 12—12, Fig. 3. Fig. 13 is a horizontal sectional view of the strap feeding device on line 13—13, Fig. 10. Fig. 14 is a detail transverse sectional view showing the drive shaft and its cams. Fig. 15 is a perspective view of one of the completed nails.

The wire *w* is fed in by means hereafter described through a wire clamping die composed of opposite similar parts 1, 1, (see Figs. 6, 7, 8,) mounted in blocks 1^a and 1^b. Block 1^b is fastened in a casting 1^x secured to an upstanding bracket F^1 on the main frame; and the block 1^a is slidably mounted in said casting and capable of movement to and from block 1^b so as to open or close the die 1. As shown, block 1^a is connected by a link 1^m to an oscillating lever 1^n pivoted at 1^o on the main frame and in turn connected by a link 1^p to a yoke 1^q loosely supported on shaft S and carrying rollers 1^r engaging opposite sides of an eccentric cam 1^s attached to the main shaft S (see Figs. 1 and 14). By means of these parts the wire clamping die is opened and closed at the proper time.

The inner ends of the parts 1 of the clamping die 1 are semi-cylindric, as shown at 1^t and the extremity of this cylindric portion is preferably convex as shown at 1^v. Around this cylindric portion 1^t of the clamping die is removably mounted an annular female blanking die 2, the opening in which corresponds in form to the contour of the head of the nail, being preferably circular. The blanking die 2 has an annular flange 2^a which fits into corresponding recesses in the inner faces of blocks 1^a and 1^b, and is secured thereto by means of plates 2^b and 2^c fastened to the blocks by suitable screws. A sufficient play is left between the blanking die 2 and part 1^t of the clamping die to allow the clamping die to be opened and closed, this movement of the clamping die being very slight.

Arranged opposite and in axial alinement with the dies 1 and 2 is a male blanking die 3, the end of which is adapted to enter the female blanking die 2, and such end is preferably concaved opposite the convex portion 1^t of die 1, so as to co-act therewith and impart a concavo-convex shape to the nail head, as indicated in Figs. 4, 6, 7. Die 3 is provided with an annular flange 3^a fitted into a corresponding recess in a threaded boss 3^b on a plate 3^c, which is secured to a cross head 5. The die 3 is detachably attached to plate 3^c by means of a cap-nut 3^d screwed onto the boss 3^b (see Figs. 4, 5, 7). The cross head 5 is provided with side base flanges 5^a engaging guides F^2 on the frame, and this cross head is reciprocated in the guides by means of pitmen 5^e pivotally connected to bolts 5^d, which are adjustably connected to ears 5^c on the cross head, and the pitmen 5^e are also connected with eccentric bands 5^f engaging cams 5^s on the main shaft S (see Figs. 1–14). In this manner the cross head and dies thereon are moved to and from the dies 1 and 2 at each revolution of the main shaft. Within the die 3 is a header rod 4 which operates axially of the die 3 and is connected to a bar 4^a which is guided in a box 5^h on cross head 5, and bar 4^a is connected at its rear end to a pitman 4^b, which is preferably made extensible, as shown, and is connected to an eccentric box 4^c engaging an eccentric 4^s on shaft S, so that the header rod is reciprocated in and like the cross head, but has a different time of movement, as hereinafter explained. A spring 3^x may be placed upon the die 3 and project beyond the end thereof sufficiently to clear the strap S from the die 3 after each punching operation.

Opposite the line of wire feed are cutting and pointing dies 6, which are removably attached to slides 6^a, as shown in Figs. 4, 5, said slides being mounted in boxes F^3 on the main frame and being reciprocated by suitable means. As shown, each slide is engaged by one arm of a crank lever 6^c pivoted at 6^d on the main frame, the other arm of said lever being connected by a rod 6^e to a yoke 6^f loosely embracing the shaft S, said yoke carrying a roller 6^g engaging a race cam groove in a cam 6^s fast on shaft S, as shown. These parts are so timed that at the proper moment the cutting and pointing dies are advanced and sever a nail length of wire.

The wire may be fed in any suitable manner. As shown, it is fed between rolls 7 mounted upon shafts 7^a journaled in a bracket F^4 attached to the main frame. The shafts 7^a are provided with intermeshing gears 7^b. One of the shafts 7^a is extended at one side, and to it is secured a hand wheel 7^c and a ratchet 7^d, which ratchet is engaged by a dog 7^e pivoted to one arm of a lever 7^f loosely mounted on the shaft adjacent ratchet 7^d, and the other arm of said lever is connected, as indicated in Figs. 1—2, to a rod 7^g which is in turn connected to a slide 7^h loosely resting on shaft S and provided with rollers 7^i, 7^i, engaging a cam 7^s attached to the shaft S (see Fig. 1–14). The rod 7^g may be adjustably connected to arm 7^f by means of a stud 7^j adjustably secured in a slot 7^k in lever 7^f by a bolt 7^l, and by adjusting the pin 7^j in slot 7^k the throw of lever 7^f can be changed so that any desired length of wire can be fed through the wire clamping dies 1 at the time desired.

The peripheries of rolls 7, 7, are serrated or deeply milled, as shown, so as to firmly bite the wire and also roughen the edges thereof, so that the shanks of the completed nails will be roughened or barbed, as shown in Fig. 15.

Strap feed.—The strap metal from which the nail heads are formed may be fed toward the line of wire feed by any suitable means. As shown the strap *s* is led in over a grooved guide wheel 8^m journaled on arms F^7 mounted on a casting F^6 attached to bracket F^1. From wheel 8^m the strap passes between feeding rolls 8 mounted upon shafts 8^a journaled in suitable bearings supported in castings F^6. These shafts 8^a have intermeshing gears 8^b and one of the shafts is extended at one side and carries a ratchet 8^c, which engages a dog 8^d pivoted on the lever 8^e hung upon shaft 8^a, and this lever is connected by a link 8^f to an eccentric strap 8^j inclosing an eccentric 8^s on shaft S. A friction brake 8^g may be applied to one of the shafts 8^a (see Figs. 1–13) to prevent any non-positive movement of the strap feeding rolls. Preferably the strap is fed down after the blanking dies have separated and before the nail is severed. The straps *s* after passing rolls 8 may be positioned relatively to the blanking die 3 by means of a slotted guide 8^x attached to the cross head 5. The strap may be directed to the rolls 8 by means of a guide plate 8^n (see Fig. 3–11) mounted on casting F^6 and provided with grooved rollers 8^o adapted to engage the edge of the straps, as shown in Fig. 11. A similar guide plate may be attached to the under side of the brackets F^6 to keep the strap in proper position. Preferably the casting F^6 carrying the strap feeding devices is pivoted to lugs f^6 on brackets F^1 as shown, so that the strap feeding devices may be thrown back out of the way when it is desired to get to the dies 1, 2, 3; and to facilitate the adjusting or repairing of the dies.

Operation.—The several mechanisms and parts thereof are so constructed, and the actuating cams and eccentrics so timed, that at each complete revolution of the main shaft a nail is made. The several steps in

this operation may be described as follows: Assuming that the wire *w* has been fed forward to the line of severance, the dies 1 are closed thereupon and clamp it. The die 3 is then advanced toward the blanking die 2 and the strap *s* is caught between said dies, and a disk or nail head H is blanked therefrom by dies 3 and 2 and forced into die 2 and against the end of the wire *w* clamped in die 1, the head H being forced onto the end of the wire, which punches its way through the center of the head. A further inward movement of the die 3 then pinches the head between the convex end 1^t of die 1 and the concave end of die 3, which impart a concavo-convex shape to the nail head. While the parts are in this position the header rod 4, which has been following up die 3, is moved farther forward and impinges upon the end of the wire projecting through the head H and swages the same down upon the head and firmly rivets the wire to the head. Preferably a slight annular recess 1^u is formed in the outer end of the part 1^t around the wire groove 1^a, so that when the header 4 compresses the wire a ridge *h* is formed on the shank under the head, as well as the nut h^1 outside of the head (see Figs. 6—7), thus making a very firm and tight joint between the wire and the head. The header rod 4 and the die 3 then move away from die 2, and about simultaneously the wire feed comes into operation and moves the headed end of the wire out toward the retreating die 3 until a length of wire equal to the desired length of a nail-shank has been projected through die 2. Thereupon, while the die 3 and the strap *s* are clear of the headed wire, the pointing and severing dies 6 are actuated so as to cut off the headed portion of the wire, which completes the nail; as the dies 6 point the nail simultaneously with the severance of the wire after the wire is severed, it remains at rest—and held by die 1—until another head H has been attached thereto. Meanwhile the strap feed may be operated so as to feed in enough of the strap *s* to bring a fresh portion thereof between the dies 2 and 3, so that at the next inward movement of the die 3 a new head can be blanked from the strap and fastened upon the end of the wire in the manner above described. The cutting and pointing dies 6 retreat out of the way as the die 3 advances toward die 2. The above described cycle of operations is performed with each rotation of the main shaft S and all of them occur in proper sequence. By shortening die 3 and elongating the part 1^t of dies 1 so as to fill die 2, the machine can be used for forming box strapping.

Having described our invention what we claim as new and desire to secure by Letters Patent is:

1. The combination in a nail making machine, of a wire clamping die, a female blanking die surrounding the end of the clamping die, and a male blanking die movable to and from the female die; means for opening and closing the wire clamping die, and means for operating the male blanking die.

2. The combination of a wire gripping die composed of opposite parts having reduced portions on their inner ends, a blanking die loosely fitted over the reduced portions of the clamping die, and a male blanking die movable to and from the female blanking die.

3. The combination of a wire gripping die composed of opposite parts having reduced parti-cylindric portions on their inner ends, an annular blanking die loosely fitted over the cylindric portions of the clamping die, and projecting beyond the same; and a male blanking die movable to and from the female blanking die.

4. In a nail making machine the combination of a wire clamping die, fixed and movable blanking dies, means for feeding a wire through the clamping die, means for feeding a strap between the blanking dies across the line of wire feed, and a strap guide movable with the male blanking die.

5. In a nail making machine the combination of a wire clamping die, fixed and movable blanking dies in axial alinement with the wire clamping die, means for feeding a wire through the clamping die, means for feeding a strap between the blanking dies across the line of wire feed, a strap guide movable with the male blanking die, a header rod, and means for disengaging the perforated strap from the male blanking die.

6. The combination of a female blanking die, a male blanking die, means for feeding a strap between the blanking dies, and a guide for the strap movable with the male blanking die.

7. In a nail making machine, the combination of a wire clamping die, means for feeding a wire through the clamping die, means for feeding a strap across the line of wire feed, a header rod and a strap guide movable with the header rod.

In testimony that we claim the foregoing as our own, we affix our signatures in presence of two witnesses.

WILLIAM H. HART.
JOHN E. DOBSON.

In presence of—
FRANK M. ANDRESS,
ARTHUR E. DOWELL.