

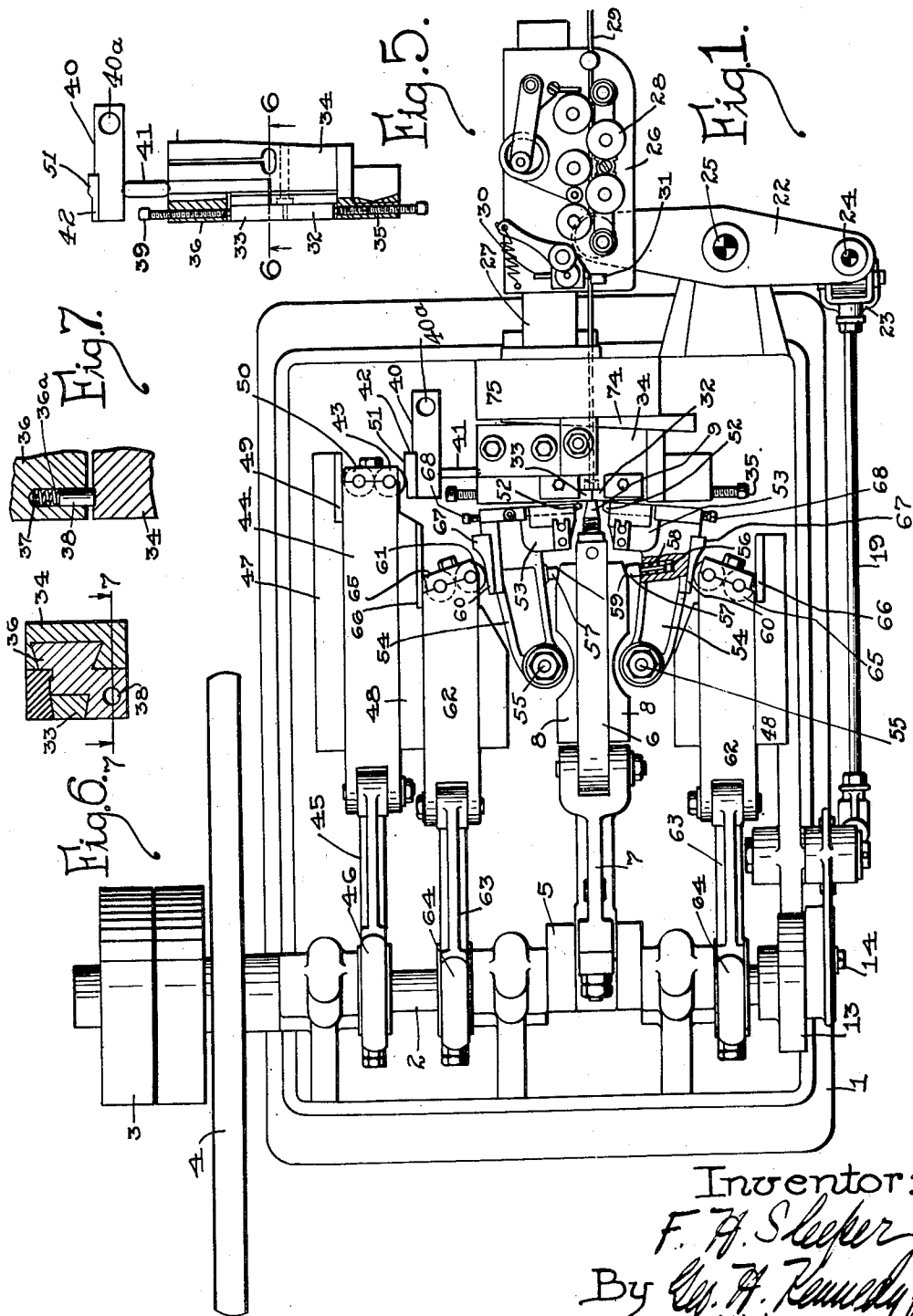
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NAIL MAKING MACHINE

Filed May 23, 1921

2 Sheets-Sheet 1



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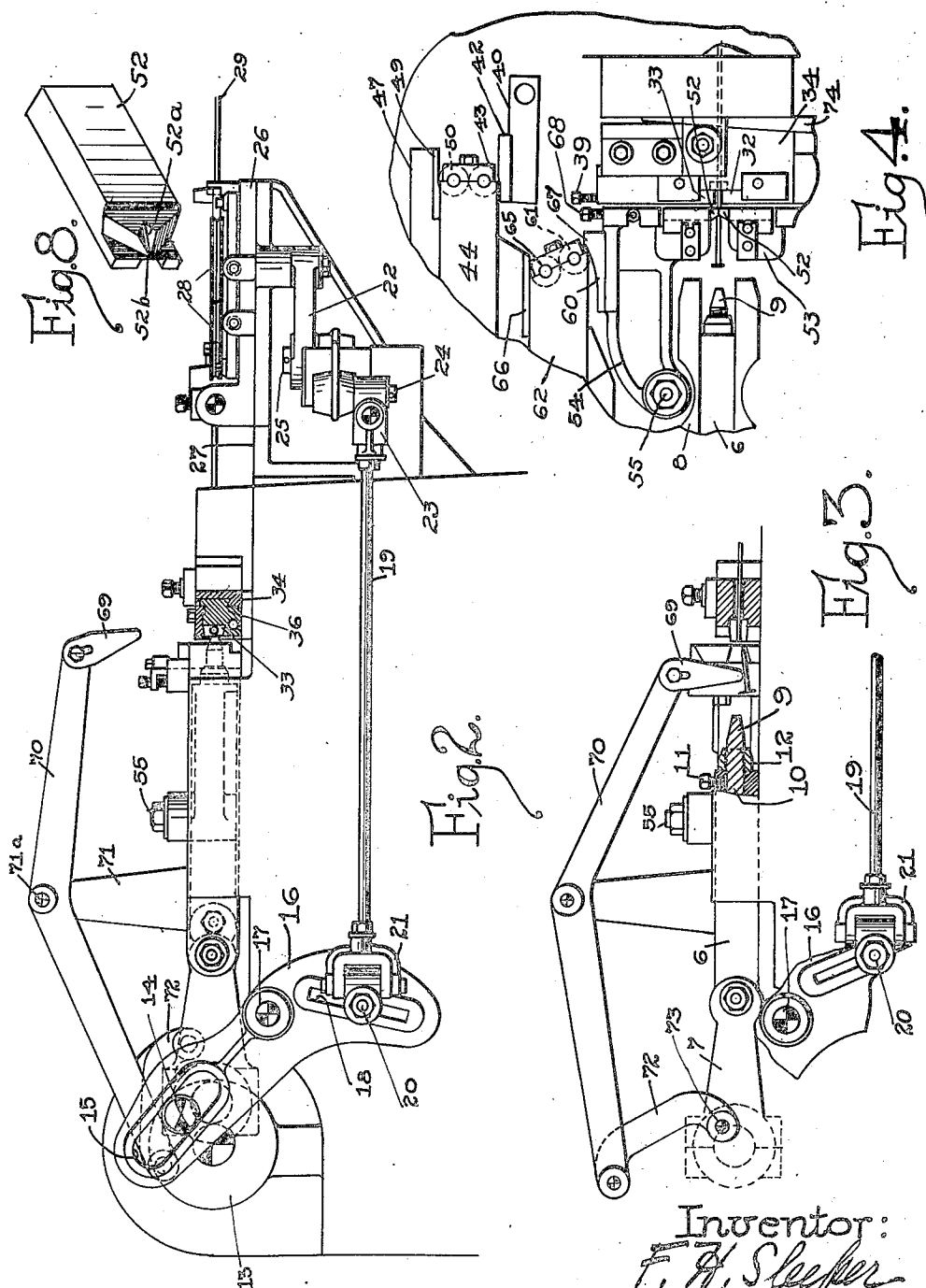
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2 Sheets-Sheet 2



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NAIL-MAKING MACHINE.

Application filed May 23, 1921. Serial No. 471,819.

To all whom it may concern:

Be it known that I, FRANK H. SLEEPER, a citizen of the Dominion of Canada, residing at Worcester, in the county of Worcester and Commonwealth of Massachusetts, United States of America, have invented a new and useful Improvement in a Nail-Making Machine, of which the following, together with the accompanying drawings, is a specification.

My invention relates to machines for forming nails from a continuous strip of wire or other suitable material, and has for its object to provide an improved machine of the class described that is characterized by its simplicity, compactness and high rate of production.

These and other advantageous features of my invention will hereinafter more fully appear, reference being had to the accompanying drawings, in which—

Fig. 1 is a plan view of a nail making machine embodying my invention.

Fig. 2 is a view in side elevation of the parts shown in Fig. 1, certain of the parts being shown in section.

Fig. 3 is a view, partially in transverse section and partially in side elevation, of a portion of the parts shown in Fig. 2, the nail ejector being shown in operation.

Fig. 4 is a fragmentary plan view of a portion of the parts shown in Fig. 1, with the heading ram withdrawn.

Fig. 5 is a view, partially in plan and partially in longitudinal section, showing the details of the gripping dies.

Fig. 6 is a vertical sectional view on the line 6—6, Fig. 5.

Fig. 7 is a horizontal sectional view on the line 7—7, Fig. 6.

Fig. 8 is a perspective view of one of the pointing dies.

Like reference characters refer to like parts in the different figures.

Referring to Fig. 1, the machine comprises a rectangular frame 1, at one end of which is mounted a driving shaft 2. A pulley 3 is mounted upon a projecting end of the shaft 2, by means of which it may be connected to a suitable source of power, not shown, and a flywheel 4 is also carried on the shaft 2, for a purpose which will be hereinafter described.

The shaft 2 is further provided with a

crank 5, which is connected to a crosshead 6 by a connecting rod 7. The cross-head 6 is adapted to reciprocate between suitable ways 8 and is provided at its end with a heading ram 9. As best shown in Fig. 3, the ram 9 is received in an opening 10 provided in the crosshead 6, and is secured therein by means of a set screw 11 and a lock nut 12. The shaft 2 is also provided with a crank disk 13, which carries a pin 14 in engagement with a slot 15 formed at one end of a rocker arm 16. The rocker arm 16 is pivotally mounted on a stud 17, and its other end is provided with a slot 18 which is connected to an operating rod 19 by means of a pin 20 and a universal joint 21. The other end of the rod 19 is connected to one end of a second rocker arm 22 through a universal joint 23 and a pin 24. The rocker arm 22 is pivotally mounted on a pin 25, and its other end is connected to a feed carriage 26.

The carriage 26 is adapted to reciprocate on a surface 27, which may be provided upon a part of the machine frame 1, or upon a separate bracket, as shown in the drawings. The carriage 26 is provided with a plurality of straightening rolls 28, between which a length of wire 29 is adapted to pass. The carriage 26 is further provided with a chisel 30, bevelled on its rear side and adapted to coact with a suitable block 31 to seize the wire 29 during the movement of the carriage toward the ram 9. The chisel 30 is adapted to slide on the wire on the reverse movement of the carriage. The angular relation between the crank 5 and the crank pin 14 is such that the cross-head 6 and the carriage 26 are always moved in the same direction on the frame 1 when the shaft 2 rotates. Consequently, when the ram 9 advances to form a head on the wire 29, the backward movement of the carriage 26 causes the wire to be released by the chisel 30 and allows the straightening rolls 28 to slide freely over the wire. When the ram 9 makes its withdrawal stroke, the movement of the carriage 26 causes the chisel 30 to seize the wire and feed it forward.

The wire feed carriage 26 is thus adapted to advance the wire and deliver it between a pair of gripping dies 32 and 33. The die 32 is mounted on a block 34 and, as best shown in Fig. 5, is adjustable thereon by means of a screw 35. As best shown in Figs. 6 and 7,

the die 33 is carried on a slide 36 having a tongue and slot connection with the stationary block 34. The dies 32 and 33 are normally held apart by means of a spring 37 located in an opening 36^a and coacting with a pin 38 which the former holds in engagement with the block 34. The position of the dies 32 and 33 with reference to the line of wire feed is adapted to be adjusted by means of a screw 39 carried by the slide 36.

A lever 40 is pivotally mounted on the frame 1 adjacent to the slide 36, by a pin 40^a, and a thrust rod 41 is held between the lever 40 and the slide 36 by the pressure of the spring 37. The lever 40 is provided with a race plate 42, which is adapted to be engaged by a roller 43 rotatably mounted at the end of a crosshead 44. The crosshead 44 is connected to the shaft 2 by means of a connecting rod 45 and eccentric 46 and is thereby adapted to be reciprocated between guides 47 and 48. The guide 47 is provided with a race plate 49 which is adapted to be engaged by a second roller 50, also rotatably mounted on the crosshead 44 and in peripheral engagement with the roller 43. The rollers 43 and 50 and their corresponding race plates 42 and 49, respectively, are preferably made of hardened steel which is highly polished, so that there are substantially no frictional losses between the rollers and the plates, and between the rollers themselves, as the cross head 44 reciprocates during the rotation of the shaft 2. The spring 37 tends to hold the race plate 42 in engagement with its roller 43, and the race plate 42 is provided with a raised portion 51, which when engaged by the roller 43, moves the lever 40 in the direction of the die 32. This movement of the lever 40 is transmitted to the slide 36 through the thrust pin 41, which causes the dies 32 and 33 to come together and grip the wire 29 therebetween.

The angular relation between the eccentric 46 and the crank 5 is such that the wire 29 will be gripped between the dies 32 and 33 before the ram 9 reaches the end of its stroke toward the wire, the length of the raised portion 51 of the race plate 42 insuring that the dies will still grip the wire while the head is being formed upon the projecting end of the wire by the impact of the ram 9. The parts are shown approximately in the above described position in Fig. 1, the ram being shown as having reached the end of its stroke so as to have formed the head while the wire is still gripped between the dies. It will be obvious that when the ram 9 starts on its return stroke, the gripping dies will be moved apart as the roller 43 moves off the raised portion 51 of its race plate, so that the wire will be free to be fed forward by the chisel 30 upon movement of the feed

carriage 26. Therefore, during the return stroke of the ram 9, the wire 29, with a head formed thereon, will be moved forward between the dies 32 and 33, the amount of such movement determining the length of nail which will be formed. Just as the carriage 26 reaches the end of its feeding stroke, the wire is adapted to be acted upon by the pointing and severing devices, which will now be described.

Referring again to Fig. 1, pointing dies 52 are arranged on opposite sides of the line of movement of the wire 29, each die being supported in a block 53 carried at the end of an arm 54. Each arm 54 is mounted on a pin 55 and is provided with an opening 56, within which is located a plunger 57. A spring 58 surrounds the plunger 57 and tends to hold it in engagement with a bevelled surface 59 provided on one of the ways 8. Each arm 54 is further provided with a race plate 60 which is adapted to be engaged by a roller 61 rotatably mounted at the end of a crosshead 62, the crosshead 62 being connected to the shaft 2 by means of a connecting rod 63 and eccentric 64. A second roller 65 is carried by the crosshead 62 and is in engagement with a race plate 66 carried by the guide 48. The rollers 61 and 65 and the race plates 60 and 66 are preferably formed of hardened steel, so that there are substantially no frictional losses between the engaging surfaces thereof when the rollers move with the crossheads 62.

The dies 52 are adapted to be held apart by the springs 58 which hold the race plates 60 in engagement with the rollers 61. Each race plate 60 is provided with a raised portion 67, so that movement of the crossheads 62 towards the dies will cause the arms to be moved against the pressure of the springs 58 and thereby bring the dies 52 together. The angular relation between the eccentrics 64 and the crank 5 on the shaft 2 is such that the dies 52 will engage the wire 29 just as the carriage 26 reaches the end of its feeding stroke, as shown in Fig. 4. The pointing dies 52 may be of any suitable form, a preferred form being shown in Fig. 8, from which it will be apparent that as these dies come together upon the wire, a point will be formed thereon by the edges 52^a and that the completed nail will be severed by the edges 52^b. The distance between the dies 52 is adapted to be adjusted by means of screws 68 carried by the blocks 53.

Referring to Figs. 2 and 3, an ejector finger 69 is carried at the end of a rocker arm 70 which is pivotally supported above the frame 1 by a bracket 71 and pin 71^a. The other end of the arm 70 is connected to the connecting rod 7 by means of a link 72 and pin 73. Reciprocation of the cross-

head 6 will cause the arm 70 to be oscillated on its pivot 71^a, so that the finger 69 will enter the space between the dies 52 and the ram 9 when the latter is withdrawn. This downward movement of the finger 69 will serve to positively eject the completed nail from between the pointing and severing dies 52 so that the nail is free to fall into a suitable delivery chute.

Referring again to Fig. 1, in order to regulate the amount of material that comprises the head of each nail, as formed by the ram 9, a wedge 74 is provided between the die block 34 and an anvil 75 which may be a part of the frame 1. In this way the distance between the pointing dies 52 and the faces of the gripping dies 32 and 33 may be varied, it being obvious that the greater this distance, the longer will be the projecting end of wire, and consequently, the longer will be the head formed therefrom.

Having thus described the various parts entering into my invention, the operation thereof is as follows:—The wire 29 is manually fed between the rolls 28 of the carriage 26, the dies 32 and 33 having been selected to suit the diameter of the wire. The dies 52 can then be adjusted by means of the screws 68, so as to insure that the point will be formed exactly in the center of the wire. The wire 29 is next fed manually to a point where it projects just beyond the faces of the dies 32 and 33, the shaft 2 then being in such a position that the ram 9 is withdrawn. The shaft 2 is then connected to its source of power, whereupon the ram 9 will advance toward the end of the wire and form a head thereon. On the return stroke of the ram 9, the wire will be fed between the gripping dies by the movement of the slide 26, at the end of which movement the dies 52 will form the point on the nail, which is then ejected by the finger 69, as previously described. It is obvious that this cycle of operations will continue as long as the shaft 2 is rotated and that nails will be headed, pointed, severed and ejected with a rapidity dependent upon the rate of rotation of the shaft 2.

It is obvious that nails of different lengths may be formed by adjusting the end of the link 19 in the slot 18 until the carriage 26 has the proper amount of travel, and that the amount of material in the heads of nails can be varied to suit the diameters thereof by means of the adjustment afforded by the wedge 74.

My improved machine is particularly effective in operation, owing to the fact that the shaft 2 is balanced by the symmetrical arrangement of the cranks and eccentrics thereon, and also by the flywheel 4. The gripping and pointing dies are operated with great precision, and with a minimum

amount of wear and frictional losses, owing to the fact that the movement of the rollers between the race plates results in a noiseless and positive wedging action upon the movable members carrying the dies, which action could not be obtained were the dies to be acted upon by the usual cam or gear devices heretofore employed. Furthermore, the rollers are always held in close engagement with their race plates so that there is no possibility of shocks resulting from lost motion occurring in transmitting the motion of the crossheads to the dies. This motion is also transmitted substantially without frictional losses, as previously pointed out.

While I have shown my invention in its simplest and preferred form, it is not so limited, but is susceptible of various modifications within the scope of the appended claims.

I claim:

1. In a machine of the class described, the combination with a rotating element, a reciprocatory actuating member connected to said element, a die movable in a rectilinear path, and a pivotally mounted arm for operating said die, of an anti-friction device carried by said actuating member for transmitting the movement thereof to said arm.

2. In a machine of the class described, the combination with a rotating element, a reciprocatory actuating member connected to said element, a die, and a pivotally mounted arm for operating said die, of anti-friction rollers mounted on said actuating member and adapted to exert a wedging effect between surfaces presented by said arm and a fixed portion of the machine.

3. In a machine of the class described, the combination with a rotating element, reciprocatory actuating members connected to said element, a pair of pointing and severing dies, and pivotally mounted arms for operating said dies, of anti-friction rollers mounted on said actuating members and adapted to operate between surfaces presented by said arms and fixed portions of the machine, said surfaces being so formed as to cause pivotal movement of said arms during the reciprocatory movement of said actuating members.

4. In a machine of the class described, the combination with a rotating element, a reciprocatory actuating member connected to said element, a pivotally mounted arm, and a movable die operable by said arm, of an anti-friction device carried by said actuating member in engagement with said arm for translating the reciprocatory rectilinear movement of said member into movement of said die at right angles thereto.

5. In a machine of the class described, the combination with a rotating element,

a reciprocatory actuating member connected to said element, a pivotally mounted arm, and a pair of relatively movable dies operable by said arm, of anti-friction devices carried by said actuating member in engagement with said arm for translating the reciprocatory movement thereof into relative rectilinear movement between said dies.

6. In a machine of the class described, the combination with a rotating element, a reciprocatory actuating member connected to said element, a pivotally mounted arm, and a die movable in a rectilinear path, of an antifriction device carried by said actuating member in engagement with said arm for translating the reciprocatory movement of said member into pivotal movement of said arm, and a thrust pin extending between said arm and said die for translating the pivotal movement of said arm into rectilinear movement of said die.

Dated this 11th day of May, 1921.

FRANK H. SLEEPER.