(No Model.)

2 Sheets—Sheet 1.

H. NICOL & G. LJUNG.

HORSESHOE MACHINE.

No. 474,918. Patented May 17, 1892.

Fig. 2.

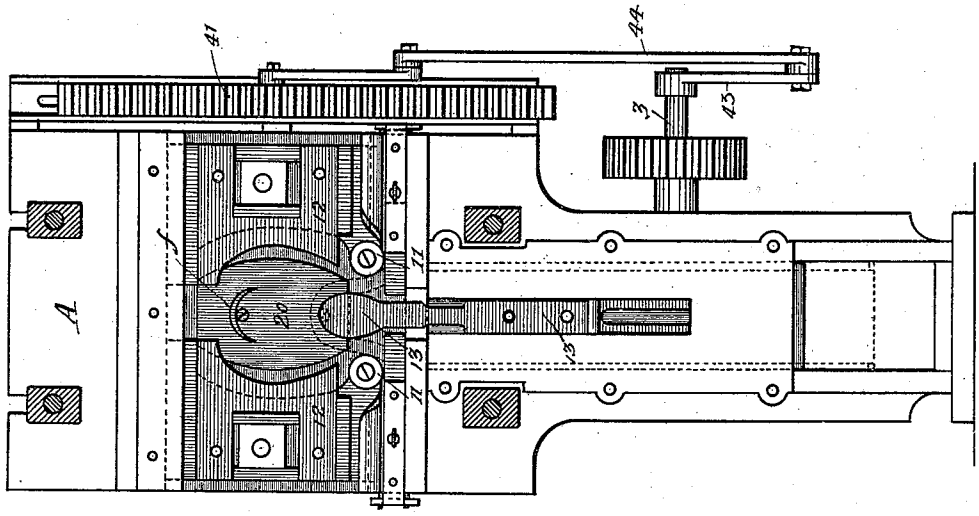


Fig. 1.

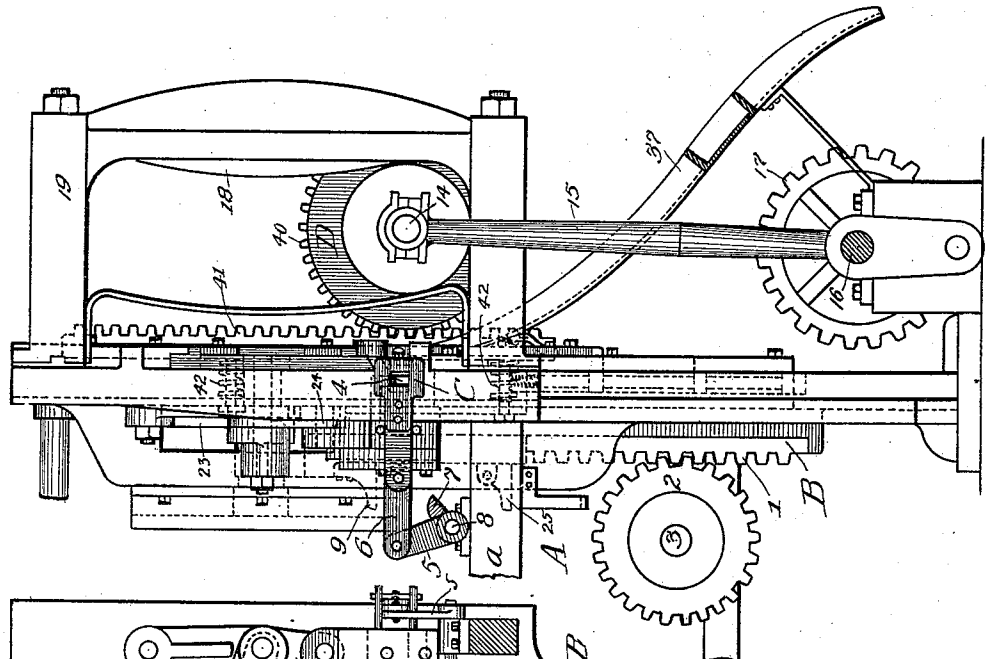
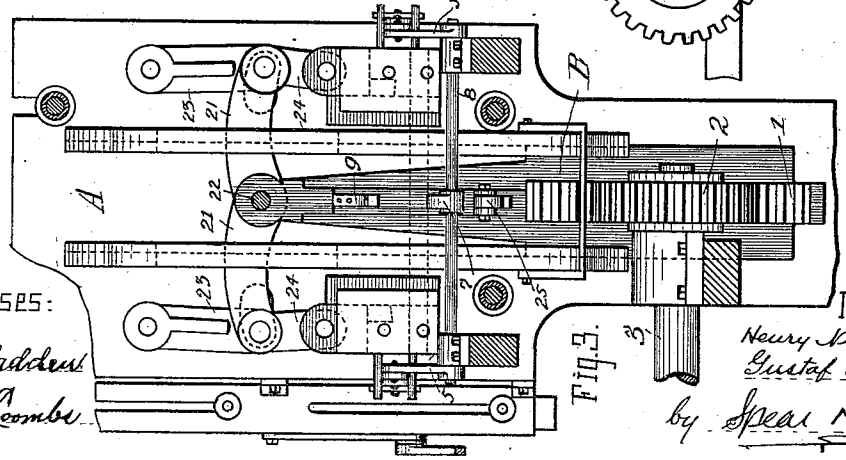


Fig. 3.



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(No Model.) 2 Sheets—Sheet 2.

H. NICOL & G. LJUNG.

HORSESHOE MACHINE.

No. 474,918. Patented May 17, 1892.

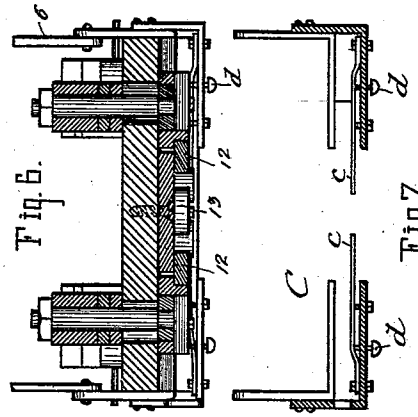

Fig. 6.

Fig. 7.

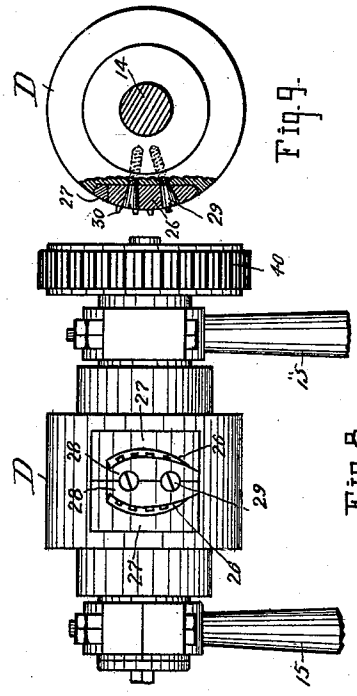

Fig. 8.

Fig. 9.

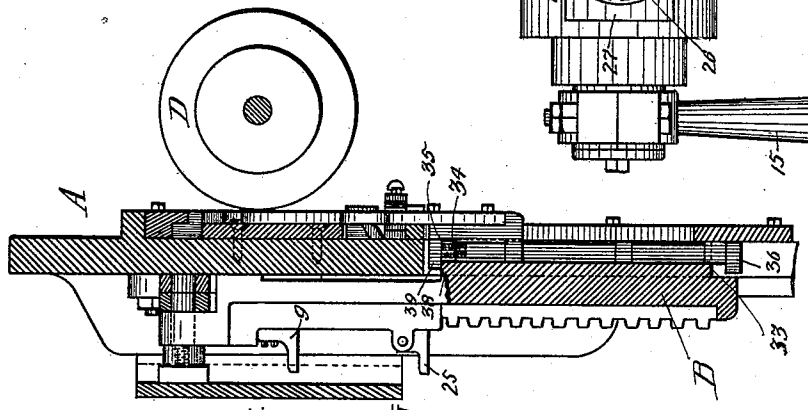

Fig. 5.

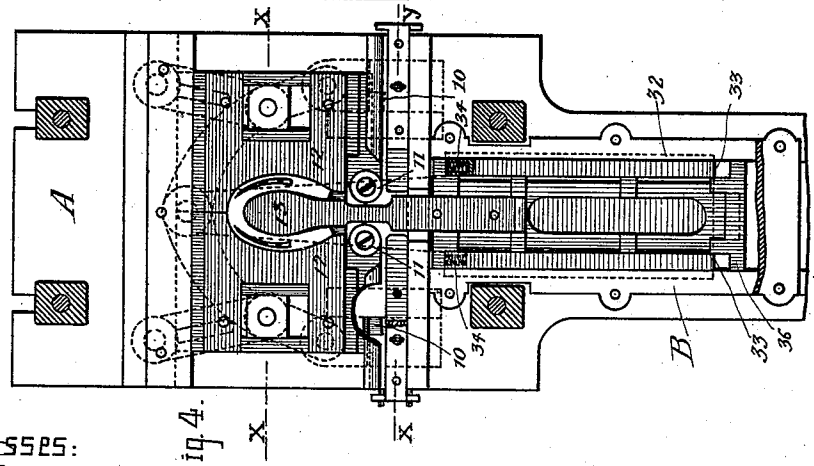

Fig. 4.

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UNITED STATES PATENT OFFICE.

HENRY NICOL AND GUSTAF LJUNG, OF SAN FRANCISCO, CALIFORNIA.

HORSESHOE-MACHINE.

SPECIFICATION forming part of Letters Patent No. 474,918, dated May 17, 1892.

Application filed September 26, 1891. Serial No. 406,917. (No model.)

To all whom it may concern:

Be it known that we, HENRY NICOL, a subject of the Queen of Great Britain, and GUSTAF LJUNG, a citizen of the United States, both residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Horseshoe-Machines; and we do hereby declare that the following is a full, clear, and exact description thereof.

This invention relates to improvements in automatic machines for making horseshoes from a straight bar or blank of metal. Its object is to furnish a machine which shall be continuously automatic in its action and which in operation will require no attention beyond the feeding of the blanks, the operation, of moving the blanks to proper position, bending them, shaping them, grooving them, and discharging them being thereafter automatically performed.

The invention consists in certain novel features in the construction and operation of the various dies for forming the shoes, as well as in various peculiar details. All these are fully hereinafter described and claimed and are illustrated in drawings accompanying this specification, to which reference is made for a full comprehension of the invention.

In the drawings, Figure 1 is a side elevation; Fig. 2, a front elevation; Fig. 3, a rear view; Fig. 4, a front view with dies closed; Fig. 5, a central vertical section; Fig. 6, a horizontal section on line *x x* of Fig. 4; Fig. 7, a horizontal section of the feeding mechanism on line *x y* of Fig. 4; Fig. 8, an elevation of the roller; and Fig. 9, a side view of the same, partly broken away.

The machine illustrated in the drawings is, when constructed for practical operation, intended to make horseshoes from single blanks alternately at both ends; but as the operation of the mechanisms which form the shoes at both ends, as well as the construction thereof, are similar we have illustrated in the drawings only one end of the machine and have shown mechanism for making the horseshoes at that end only. A description, therefore, of the mechanism shown in the drawings will be understood to be that of similar mechanism duplicated at the other end, the two mechanisms working alternately.

A represents the frame of the machine shown at *a* as broken away, in order, in accordance with the statement just made, to indicate that the frame is continued far enough to duplicate the construction at the other end.

The blank from which the horseshoe is formed is a straight bar of metal of substantially the same width and thickness throughout, adapted when bent and shaped into proper form to make a complete horseshoe.

B is a vertically-sliding frame moving in guides in the main frame of the machine and provided with a rack 1, with which engages a pinion 2, Figs. 1 and 5. This pinion is mounted on a transverse shaft 3, journaled in bearings on the main frame and connected to the driving-shaft of the machine by any suitable kind of reversing-gearing. The latter is not shown, as its operation is well understood, and it forms no part of the invention set forth in this case. Its object, however, is to move the rack and frame vertically in the guides up and down at the proper times.

The first step in the process of making the shoe is the insertion of the blank previously heated into the horizontally-moving holder C through the slot 4. At this time the vertically-sliding frame B is supposed to be at its highest point or commencing to descend. Pivoted arms 5, Figs. 1 and 3, are connected by links 6 to the holder C on opposite sides of the machine, and a cam 7 on the pivot-pin 8 is struck in the descent of the frame B by a projection 9, attached to the frame, and through the arms 5 and links 6 pushes the holder C forward. The construction of the holder is illustrated in detail in Fig. 7, *c c* being springs regulated by screws *d d*, which bear on the blank, and *e* a stop which limits the movement of the blank when being inserted. Just before this movement takes place, however, the ends of the blank are slightly tapered by dies 10 10, secured to the frame and moving with it, the effect being to give the ends of the shoe the slightly-tapered appearance shown in Fig. 4. The frame continues to descend and the arms 5 and links 6 now throw the holder and blank forward, so that the latter is in position for being bent. At this time the blank lies in the holder, with its ends beneath the two rollers 11 11, Fig. 2,

the latter being carried by the laterally-moving forward dies 12 12. The first bend is given the blank by the vertically-moving bending-die 13, Fig. 2, which slides on the front of the machine, but is secured to and operated by the frame B. When the latter has reached the limit of its downward movement, the reversing-gearing before alluded to is put in operation and the frame begins to ascend, carrying with it the bending-die 13. This pushes the blank out of the holder and from beneath the rollers 11 11, gives it the shape shown in dotted lines in Fig. 2, and carries it up between the forming-dies 12 12, which are at this time separated, as shown in that figure. The blank is held in position and prevented from falling forward by the roller D, Figs. 1, 8, and 9. This roller is journaled loosely on the pin or shaft 14 between two collars *e e* and is operated by connecting-rods 15 15, connected to the crank-shaft 16. The latter is operated intermittently at proper times by a gear-wheel 17, connected by any well-known form of automatic clutch mechanism with the driving-shaft. Such mechanism is well understood by all skilled in mechanics, and we have considered it unnecessary to illustrate it in this case. It is sufficient to say that the gear-wheel 17 is thrown into engagement with the driving-shaft at about the time that the frame B and its bending-die commence to rise. The roller is consequently raised and is pressed inward toward the blank by the cam-surface 18, forming part of a bracket 19, bolted to the main frame.

The roller D carries a die for forming the grooves or creases in the shoe; but such die is not brought into operation until after the roller commences to descend and after the blank has been completely shaped. Such operation will be described in its proper place. During the ascent of the roller it performs two functions. In the first place, it keeps the blank in position while the bending-die is operating upon it, and, in the second, its inward pressure upon the blank forms the depression or "concave" upon the upper inside edge of the shoe. This will be understood by reference to Fig. 2, in which *f* is a crescent-shaped projection upon the back plate, so situated that when the bending-die has raised the blank to its farthest extent the inner upper edge of the shoe will be pressed against this projection by the ascending roller, thus forming the concave.

The laterally-moving dies 12 12 move in guides 19 on the main frame and slide across the face of the back plate 20. Their shape is best illustrated in Figs. 2 and 4 and their operation in Figs. 3 and 4. By reference to Figs. 3, 4, and 6 it will be seen that to the upper end of sliding frame B is connected a system of toggle-levers—six in number—which operate both dies 12 12 simultaneously. The system is composed of arms 21 21, pivoted upon a pin 22, pivoted arms 23 23, and links 24 24, the latter being pivoted to the respective dies. As the frame B ascends the toggles bring the sliding dies toward one another into the position shown in Fig. 4, thus completing the external shape of the horseshoe and leaving it in readiness to be grooved or creased. A projection 25 on the frame B (see Figs. 1 and 3) has in the meantime thrown the holder C back into position to receive another blank. The roller D, operated by the crank-shaft, commences to descend before the frame B. This roller is provided with dies 26 26, Figs. 8 and 9. The roller is recessed and the dies 26, of curved shape, are inserted and clamped rigidly by blocks 27 28, secured by screws or bolts 29. The dies project beyond the face of the roller and are provided with steel pins or bits 30 for forming the depressions for nail-holes at the bottom of the crease. In its descent the roller is forced inwardly by the cam 18 and the dies 26 are pressed up against the blank, registering exactly with it, and thus forming the creases and marking the positions of the nail-holes. Since the roller in its upward movement simply exerts a pressure upon the blank, because its plain face opposite the die 26 is alone brought in contact with such blank, it is evident that means must be provided for giving the roller a partial turn at the limit of its movement in order that the dies 26 will be brought into position to register with the blank upon the downward movement. Keyed upon the pin or shaft upon which the roller is mounted is a spur-gear 40, which engages with a vertically-sliding rack 41, mounted upon the main frame and adapted to be pressed constantly outward by springs 42 42. The yielding of the rack is of course necessary, because without it the cam 18 could not force the roller inward. When the roller has reached its highest point, the rack 41 is moved by the rotation of the shaft 3, transmitted by means of a crank 43 and a connecting-rod 44, or by any other suitable means. The vertical movement of the rack gives the spur-gear 40 and roller D a partial turn for the purpose above described. At the lowest point to which the roller moves it receives another partial turn, transmitted by the opposite movement of the rack, so that the dies 26 will not come into contact with the blank during the upward movement of the roller.

In Fig. 4 is shown the completed shoe ready to be released. The frame B commences to descend and through the toggle mechanism opens out the dies 12 12. It will be noticed, however, that the bending-die 13 cannot descend until the dies 12 12 have become separated to some extent. It is therefore necessary that the frame B be permitted to move down a short distance independently of the bending-die. By reference to Figs. 4 and 5 it will be seen that the die 13, while it is set within and operated by the frame B, is not rigidly secured to it. Guides are formed in the frame for the die, as shown at 32, and the frame recessed, so as to form shoulders 33. Springs 34 in recesses 35 tend to throw the

die down, and the latter has at its bottom a flange or projection 36. The frame B may thus move downward independently of the die until the shoulders 33 strike the projection 36. By this time the dies 12 will have separated sufficiently to allow the die 13 to be pressed down, taking the shoe with it, the latter being struck by the holder C as it moves forward and falling into the chute 37. When the frame B rises, a shoulder 38 upon it strikes a projection 39 on the die and pushes the latter up against the pressure of the springs.

What we claim is—

1. In a horseshoe-machine, the combination of a vertically-sliding frame, a vertically-moving bending-die operated thereby, and transversely-sliding forming-dies connected to said vertically-moving frame, substantially as set forth.

2. In a horseshoe-machine, the combination of a vertically-sliding frame, a bending-die moving vertically therewith, shaping-dies having a transverse movement toward and from one another and connected to the vertically-moving frame, and a vertically-moving pressure-roller, substantially as set forth.

3. In a horseshoe-machine, the combination of a vertically-moving frame, a sliding holder for horseshoe-blanks, shaping and bending dies operated by the vertically-moving frame, and projections on said frame and said holder, whereby the descent of the frame moves the holder forward and its ascent retracts such holder, substantially as set forth.

4. In a horseshoe-machine, the combination of a vertically-moving frame, a pair of longitudinally-sliding dies connected to and operated thereby, and a bending-die carried by said sliding frame and connected thereto so as to permit said frame a slight vertical movement independently of said bending-die, substantially as set forth.

5. In a horseshoe-machine, the combination of a main frame, a vertically-moving frame operated by a rack and pinion, a pair of transversely-sliding dies connected to the vertically-moving frame by a system of toggle-arms, and a vertically-moving bending-die operated by the vertically-moving frame, substantially as set forth.

6. In a horseshoe-machine, the combination, with mechanism for bending a horseshoe-blank, of a vertically-moving pressure-roller, and a fixed die or projection for forming the concave, substantially as set forth.

7. In a horseshoe-machine, the combination, with bending and forming dies, of a vertically-moving pressure-roller mounted on a transverse shaft and carrying creasing-dies at one portion of its periphery and a plain pressing-surface for the remainder of its periphery, and a vertically-reciprocating rack for giving said roller a partial turn at the upper and lower limits of its vertical movement, substantially as set forth.

8. The combination, with the vertically-movable pressure-roller D, having creasing-dies 26, and a plain pressing-surface, of the cam 18, and the yielding rack 41, substantially as set forth.

9. In a horseshoe-machine, the combination, with the crescent-shaped die *f*, of the vertically-moving bending-die 13, and the vertically-moving pressure-roller D, substantially as and for the purposes set forth.

In testimony whereof we have affixed our signatures, in presence of two witnesses, this 12th day of September, 1891.

HENRY NICOL.
GUSTAF LJUNG.

Witnesses:
L. W. SEELY,
M. R. BRYAN.