2 Sheets--Sheet 1.

F. H. RICHARDS.

Machine for Forging Horseshoe-Nail Blank-Bars.

No. 164,102. Patented June 8, 1875.

Fig. 1.

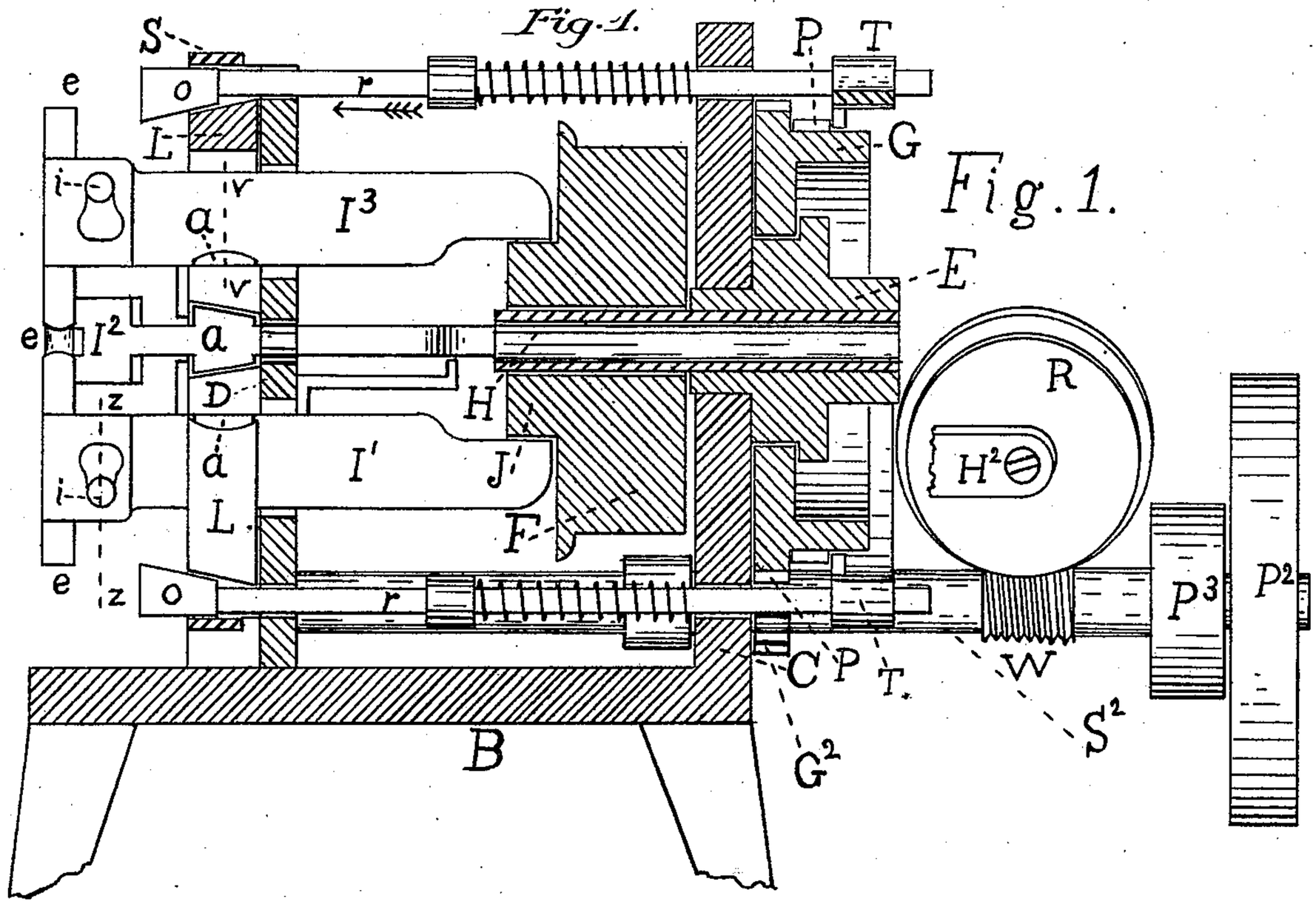

Fig. 2

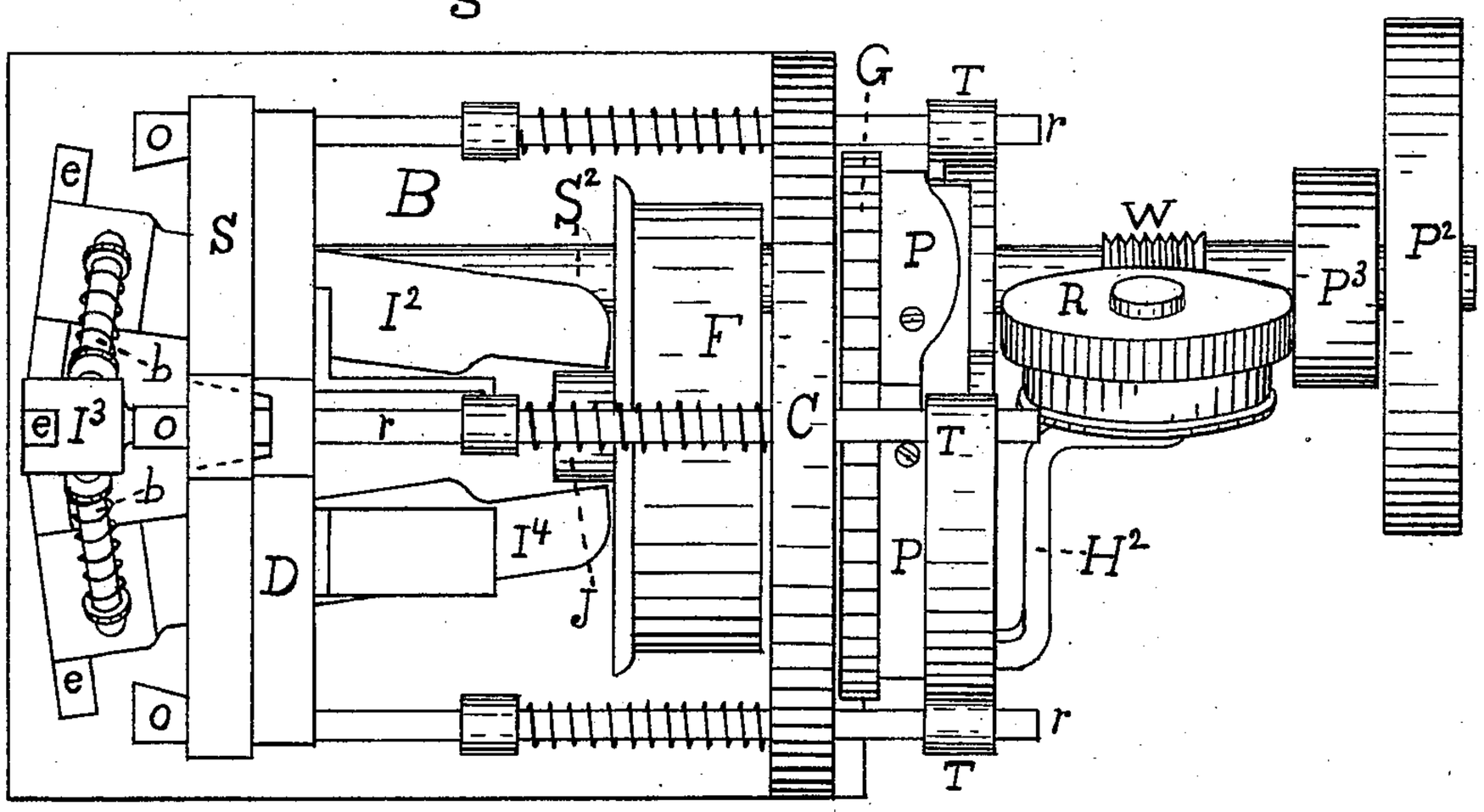

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Fig. 3.

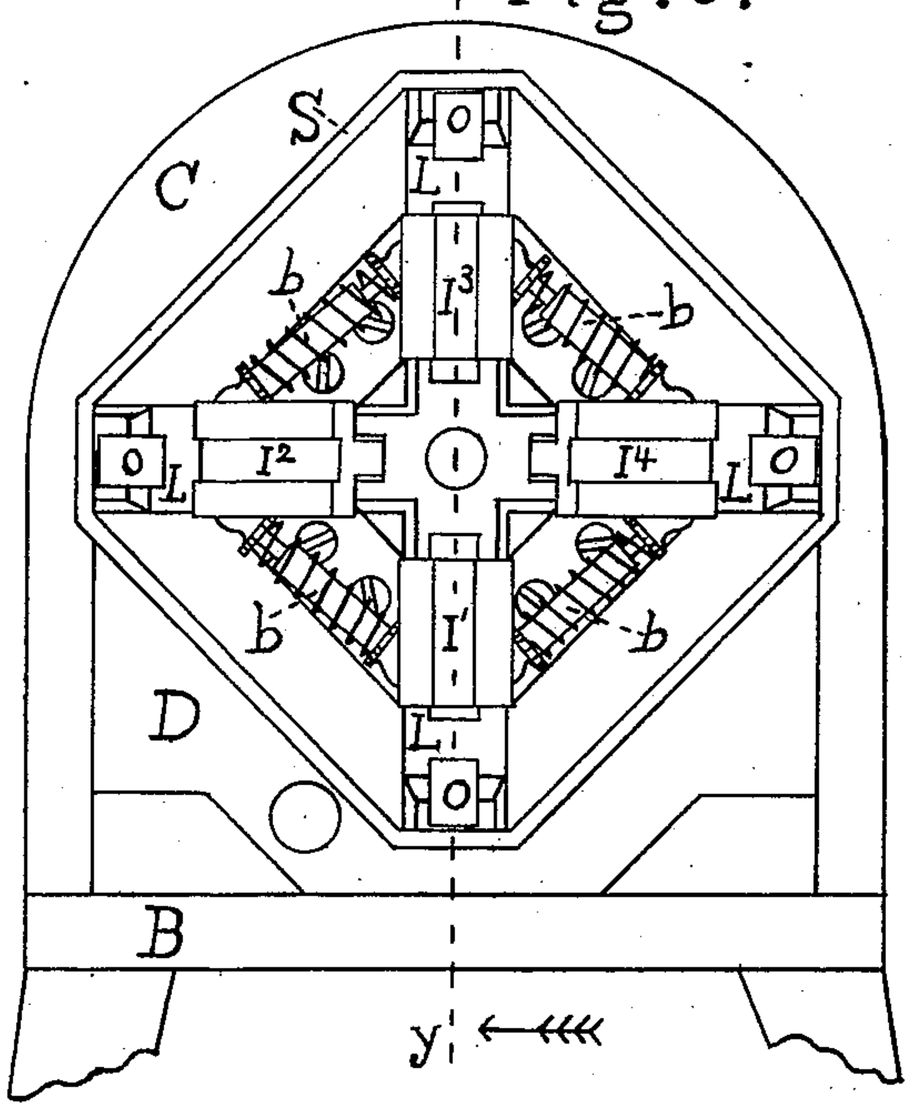


Fig. 4.

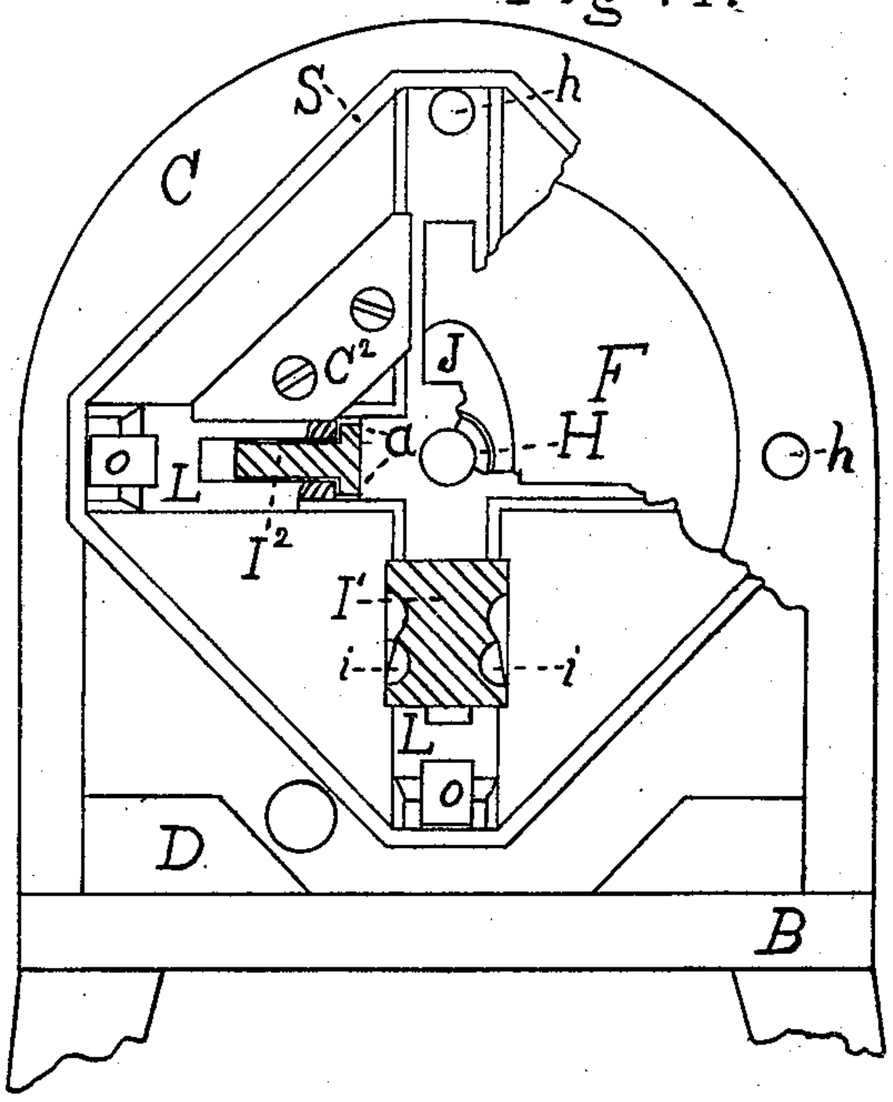


Fig. 5.

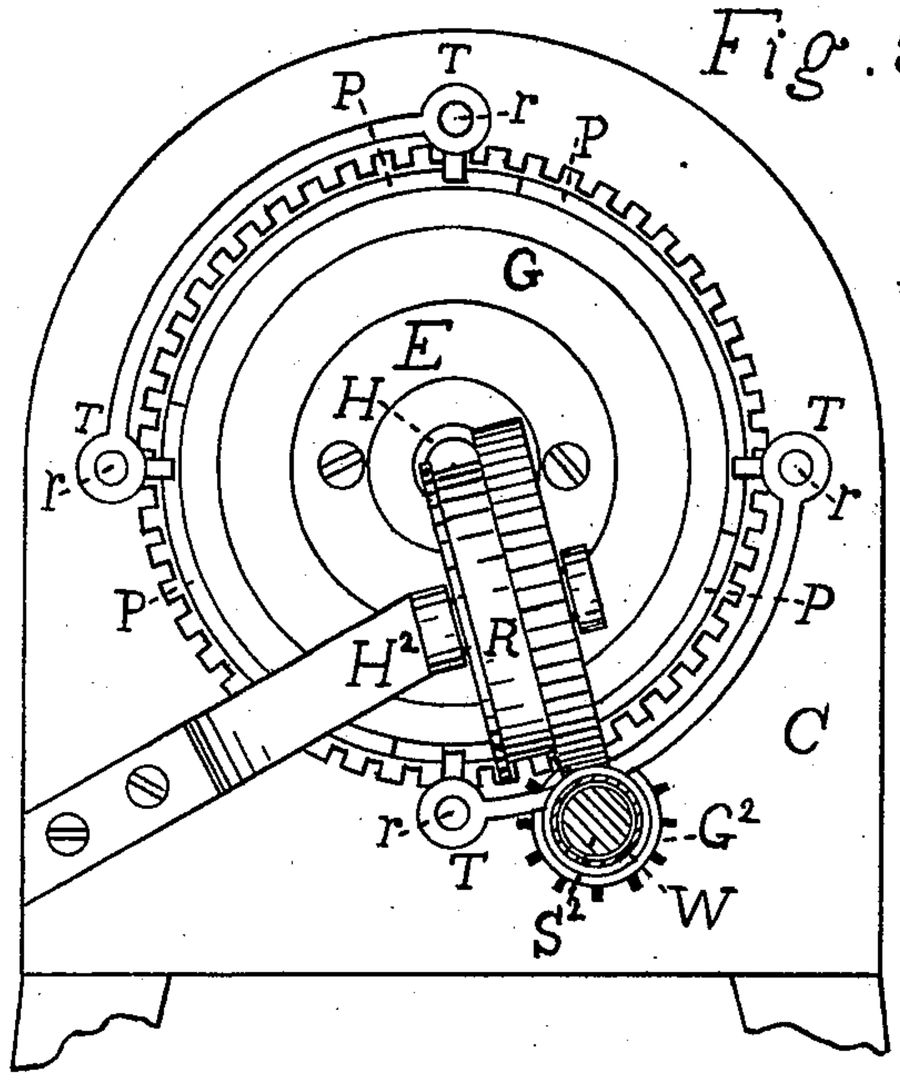
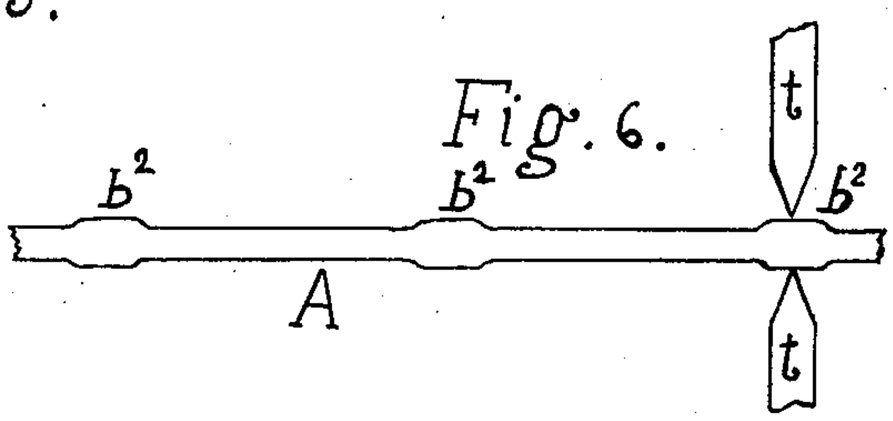
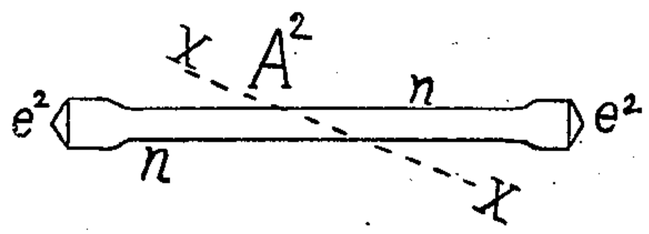


Fig. 6.





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UNITED STATES PATENT OFFICE

FRANCIS HENRY RICHARDS, OF NEW BRITAIN, CONNECTICUT.

IMPROVEMENT IN MACHINES FOR FORGING HORSESHOE-NAIL-BLANK BARS.

Specification forming part of Letters Patent No. **164,102**, dated June 8, 1875; application filed March 3, 1874.

To all whom it may concern:

Be it known that I, FRANCIS HENRY RICHARDS, of New Britain, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Forging-Machines; and that the following is a full, clear, and exact description of the same, reference being had to the accompanying plates of drawings.

The present improvements in forging-machines are more especially designed for the manufacture of blanked rods that, by other and supplementary processes, are to be converted into finished horseshoe-nails or other articles, as the case may be. Although by the use in this machine of tools constructed as shown in Fig. 6, Plate 3, of my Patent No. 142,044, horseshoe-nails or other articles may be forged and finished by the process therein described, in the present invention they may likewise be finished in the same machine by the process herein described, but other tools and different manipulation of the bar during the action of the tools upon it will be required.

Before entering upon a detailed description of the construction and operation of this invention, I will give a brief account of the method of manufacturing horseshoe-nails from the blanked rods, to produce which, as before stated, this invention is more especially designed.

In Fig. 6, Plate 2, A is a blanked rod used in the process to be described for making horseshoe-nails, having a formation in all its parts consistent with the required form of the finished article. The rod A having been produced is next subjected to the action of tools *t*, formed as shown in Fig. 6, operated by suitable mechanism, which may be substantially the same as the machine hereinafter described; and by the proper movement being imparted to the fulcrums, the center of the enlarged portion b^2 of the rod A being in the common center of the said tools *t*, they are caused to approach at each revolution of the operating mechanism nearer to their common center until the rod is severed in the center of said enlarged portion, the ends being left pyramidal. So the center e^2, Fig. 6, of the head of the nail *n*, upon which, when being driven, the hammer shall strike, is the highest, thereby greatly lessening the liability of its being driven out of its course sidewise, as when the head is highest on one side. Cutting the rod A at the places and in the manner above described leaves it in sections A^2, which, being cut at line *x x*, are divided into separate horseshoe-nails ready for pointing.

In Plate 1, Fig. 2 is a plan view of a machine constructed according to the present improvements; Fig. 1, a vertical section in plane of line *y y*, Fig. 3, Plate 2, deviating, however, in some points from such plane.

In Plate 2, Fig. 3 is a view in elevation of the front of the machine, where the forging occurs and the metal bar or rod is received. Fig. 5 is a view, also in elevation, of the back of the machine, showing the feeding mechanism, the pulleys P^2 and P^3, Plate 1, being removed. Fig. 4 is a view the same as Fig. 3, showing portions removed, the better to exhibit the construction and operation of the several parts. Fig. 6 shows two diagrams illustrative of the method hereinbefore explained of converting the blanked rods before mentioned into finished horseshoe-nails.

In the drawings, B is a rectangular bed-plate, to which a back plate, C, and a front plate, D, are securely fastened. These three parts constitute the frame-work of the machine, and are supported by legs, one under each corner of the bed-plate B. The front plate D supports the forging mechanism proper, consisting of levers I, (in the present instance four in number, duplicates of each other, and arranged in pairs, one pair in a vertical plane, and the other in a horizontal plane,) with their fulcrum-blocks L and wedges O. The back plate C supports the cam J, which actuates the levers I, the feeding-roll R, and the pattern mechanism, which, by means of rods *r* and wedges O, regulates the movable fulcrum-blocks L, and thereby gives the required form to the rod as it is drawn through between the tools *e*. (Shown only in Plate 1.) E is a hub, within which the hollow shaft H is closely fitted, and which serves as a bearing for the pattern-wheel G. It is secured to back plate C by screws. The pattern-wheel G is provided with a rim, upon which four patterns, P, (duplicates of each other,) are se-

cured, and with teeth or cogs meshing with pinion G^2 upon shaft S^2, which shaft is also provided with a pulley, P^2. Upon the back plate C a support, H^2, is fastened for the feed-roll R, said roll being provided with teeth meshing with worm W. This worm revolves loosely about shaft S^2, and is provided with a pulley, P^3. Above, below, and on each side of pattern-wheel G are rods *r*, (in the present instance four in number,) extending through both the front plate D and back plate C, parallel with and equally distant from shaft H. At the back end, which is at the right hand in Plate 1, these rods *r* are provided with pins which rest against the back edge of patterns P, said pins being held in position by collars T, constructed in pairs, as best shown in Fig. 5, Plate 2, for the purpose of preventing the pressure of the patterns P against the pins from turning the rods *r*. Between front plate D and back plate C each rod *r* is provided with a collar and spiral spring, so arranged as to move the said rods *r* in the direction of the arrow, Fig. 1, Plate 1. At the front end, which is at the left hand in Plate 1, each rod *r* is provided with a wedge, O, resting on the outside against a stout strain-band, S, and on the inside against the fulcrum-blocks L, which are arranged to slide freely in grooves formed in front plate D, inward toward and outward from their common center, and retained within said grooves by caps C^2, Fig. 4, Plate 2. Between the sides of the fulcrum-blocks L, which are of a U shape, the levers I are fitted to vibrate, being supported by segmental fulcrums *a* against the concave ends of said fulcrum-blocks L. The levers I are provided at their front ends with forging-tools *e* and spring-braces *b*. These spring-braces *b* are constructed in two parts, one part sliding freely within the other, held apart by spiral springs, and rest in cavities *i*, Figs. 1 and 4, in levers I. They keep the front ends of levers *i* and fulcrum-blocks L as widely apart as possible, and thereby keep the back ends of said levers against the surface of driving-cam J, which is driven by pulley F revolving loosely about shaft H.

In Fig. 4, Plate 2, the lever I^1 is shown in section in plane of line Z Z, Fig. 1, Plate 1; and lever I^2 is shown in section in plane of line V V, Fig. 1, Plate 1, where it is drawn across lever I^3 instead of I^2.

Having thus described in detail the construction and arrangement of the several parts of the machine, before proceeding to explain their particular operation one with another to forge a blanked rod, for which, as before stated, the present machine was more especially designed, the general operation of the parts one with another will be referred to.

With power applied to pulley F, causing it and cam J to revolve about the hollow shaft H, and if the fulcrum-blocks L be not moved, it is obvious, from the description, that the tools one pair after the other will be moved toward and away from each other, their levers I swinging upon their respective fulcrums *a*, and that the tools of each pair will approach or move away from each other simultaneously and equally, and that the tools of one pair are always moving in a direction opposite to the tools of the other pair, and that while the tools of one pair are made to approach each other by the cam J the tools of the other pair are made to move away from each other by the spring-braces *b*, which, by virtue of their peculiar situation with respect to the two levers, against which each brace rests, perform their function with little or no variation in the length of their springs, by which means the breakage and wear of the springs are very materially lessened. During this movement of the tools, and according to the shape of the patterns P provided to move the fulcrum-blocks L, such blocks are either stationary or more or less being moved in either one or the other direction, and, if in motion, according to the direction of such motion, automatically changing the fulcrums of the tools, causing the tools in their operation through the revolution of the cam J to have a greater or lesser amount of swing outward from or inward toward each other, as the case may be.

Now, suppose the tool-levers I each to be provided with a tool, *e*, having an oval face, as shown in Fig. 1, Plate 1, and said hammering-faces to be in the same vertical plane about the common center of the tools, and that the position of the fulcrum-blocks L is such that if the cam J be turned the hammering-face of any tool can only approach within one-fourth of an inch or other distance, as the case may be, of the opposite tool of the same pair. Now, suppose one end of a long metal bar or coiled rod one-fourth of an inch square, or of other size, as the case may be, be heated by passing through a suitable furnace, then passed through between the hammering-faces of tools *e*, back through hollow shaft H, one or more times around feed-roll R, and then wound upon a reel, or otherwise properly disposed of. Now, if power be applied to pulley P^3, causing feed-roll R to revolve in the right direction, it is obvious that the bar will be drawn first through the fire, then between the tools *e*, and afterward will pass around feed-roll R, and pass on to be wound upon a reel or otherwise disposed of. And if, while the bar is being thus drawn along, the cam J be kept rapidly revolving, while the fulcrums are in the position hereinbefore described, which position is shown in Figs. 1 and 2, Plate 1, it is obvious the tools *e* will touch, but will not forge the said bar. Now if, while the tools and bar are in motion, as herein described, power be applied to pulley P^2, causing pattern-wheel G to slowly revolve, and, through rods *r* and wedges O, to bring fulcrum-blocks L nearer their common center, it is obvious that so long as said fulcrum-blocks continue thus to move, the tools *e* will approach at each revolution of cam J nearer their common center, and forge the bar smaller and smaller as it passes along be-

tween them until the fulcrums stop moving toward their common center, when the tools will forge the bar of a uniform size so long as the fulcrums remain stationary, and when the motion of patterns P allows the wedges to move forward and the fulcrums outward from their common center, the bar will be forged less and less until the fulcrums are in the position first described, when the bar is no longer acted upon by tools *e;* and if, with a machine constructed substantially as herein described, and provided with patterns P, having a formation suitable thereto, this operation be continuously repeated upon the same bar, it is obvious that a bar or blanked rod of indefinite length, such as shown at A, Fig. 6, Plate 2, having enlarged portions b^2 at regular intervals, may be produced, and that such bars or blanked rods will be consistent, according to the nature of the machine, with the formation of the patterns P, and that by employing suitable patterns any desired formation within the capacity of the machine may be given to said blanked rod A. Obviously, therefore, blanked rods may be produced by this invention, having the formation required in the manufacture of horseshoe-nails.

The strain-band S is made use of for economic and other reasons. By its use the front plate D is reduced in weight about one-half, and in width about four inches in machines of ordinary proportions. Much greater rigidity is also secured than with other arrangements, and the expense of construction is also reduced.

The feed-roll R acts to draw the bar upon the principle of a windlass, and in being placed back of the forging mechanism permits the fire for heating the bar to be much nearer the forging-tools than when placed in front. This is particularly advantageous, for the nearer the fire is to the tools the less the bar cools after it is heated and before it is forged, and therefore a better heat can be maintained. This arrangement also completely obviates the difficulty arising from the bending of the highly-heated bar, which, when sufficiently heated, will support but a few inches of its own weight.

The fulcrums *a* of the tool-levers I are constructed of the segmental form shown, in order to bring the center of oscillation of said levers nearly in line with the common center of tools *e*, by which means the tools are made to approach and move away from each other at very nearly right angles with the bar, which would not otherwise be the case.

For heating the bar before it is forged, I do not limit myself to any particular form of furnace.

Having thus described in detail the construction and operation of my invention, I shall state my claims as follows:

1. The levers I, fulcrum-blocks L, and wedges O, in combination with patterns P, arranged to operate said wedges O.

2. The levers I, fulcrum-blocks L, or their equivalent, wedges O, or their equivalent, and patterns P, arranged substantially as described, in combination with cam J.

3. The spring-braces *b*, constructed and arranged as described, in combination with levers I.

4. The combination, as herein described, of levers I, having segmental fulcrums *a* constructed to bring the center of their oscillation near the common center of tools *e*, with the fulcrum-blocks L, having concave bearings for said fulcrums *a*.

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