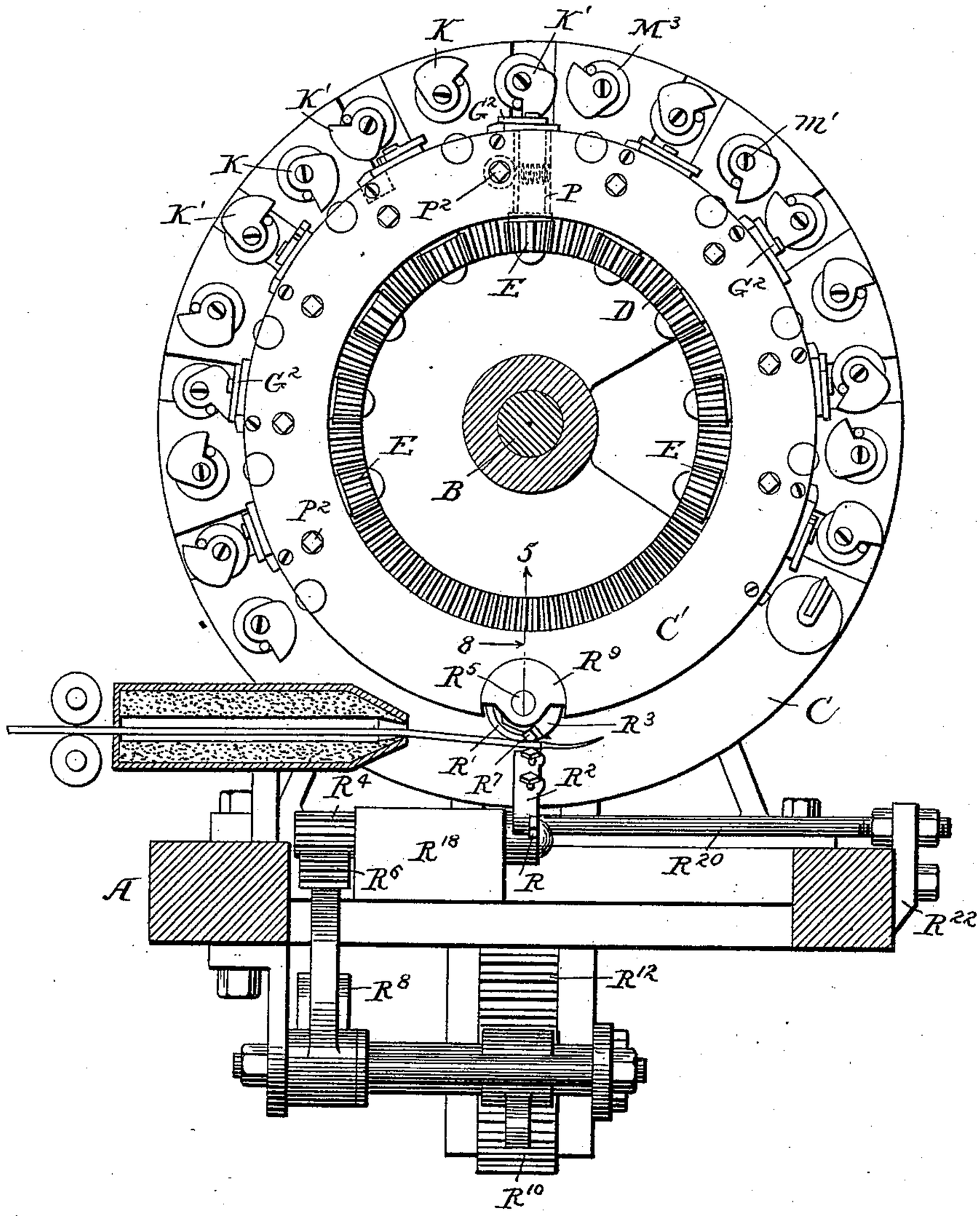
(No Model.) 3 Sheets—Sheet 1.

E. E. PIERCE.

MACHINE FOR FORGING HORSESHOE NAILS.

No. 486,195. Patented Nov. 15, 1892.

Fig. 1.



Witnesses
Jno. G. Hinkel

H. S. McArthur

Inventor
E. E. Pierce.
By Foster & Freeman
Attorneys

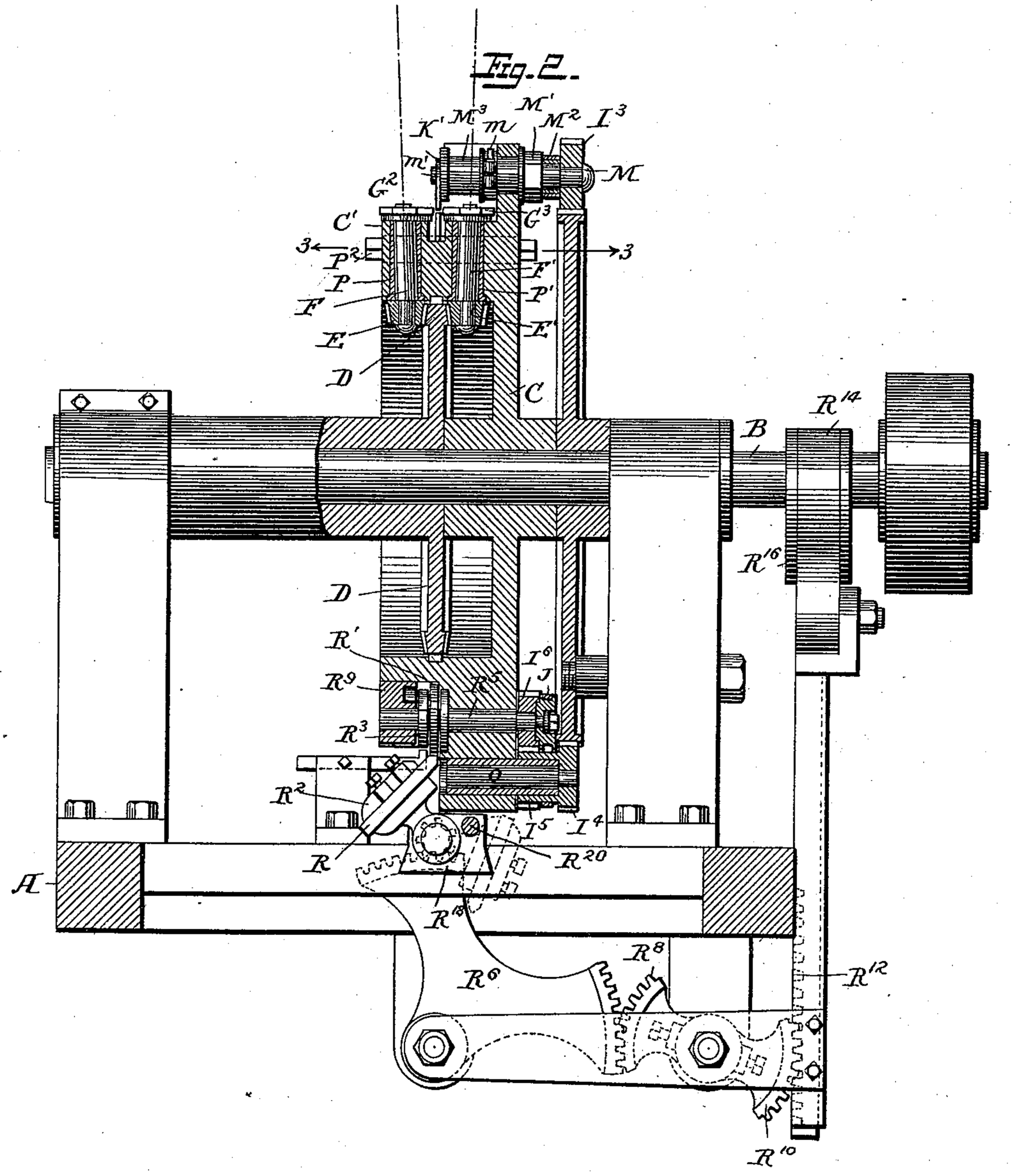
(No Model.) 3 Sheets—Sheet 2.

E. E. PIERCE.

MACHINE FOR FORGING HORSESHOE NAILS.

No. 486,195. Patented Nov. 15, 1892.

Fig. 2.



Witnesses
Jno. J. Hinkel
H. S. MacArthur

Inventor
E. E. Pierce
By Foster & Freeman
Attorneys

(No Model.) 3 Sheets—Sheet 3.

E. E. PIERCE.

MACHINE FOR FORGING HORSESHOE NAILS.

No. 486,195. Patented Nov. 15, 1892.

Fig. 3.

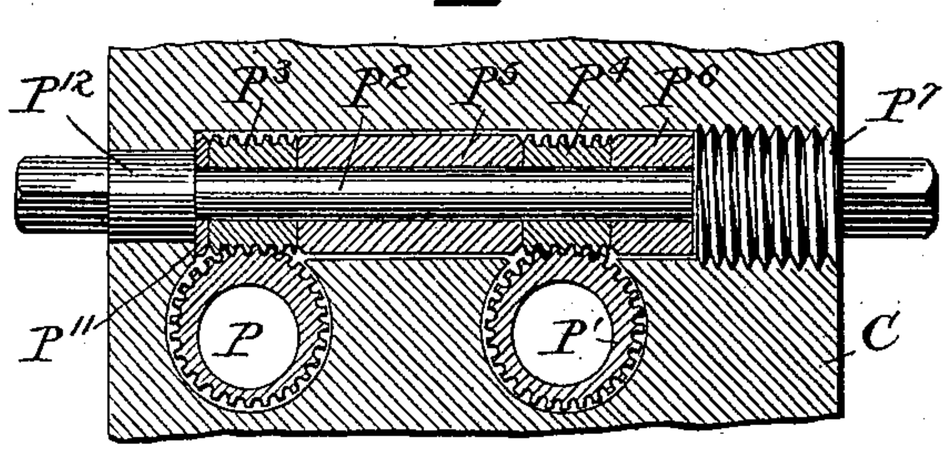


Fig. 4

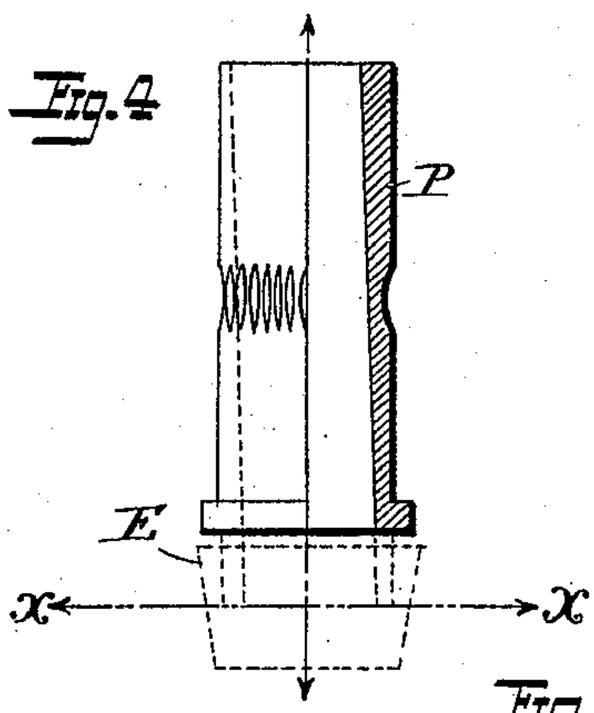


Fig. 5.

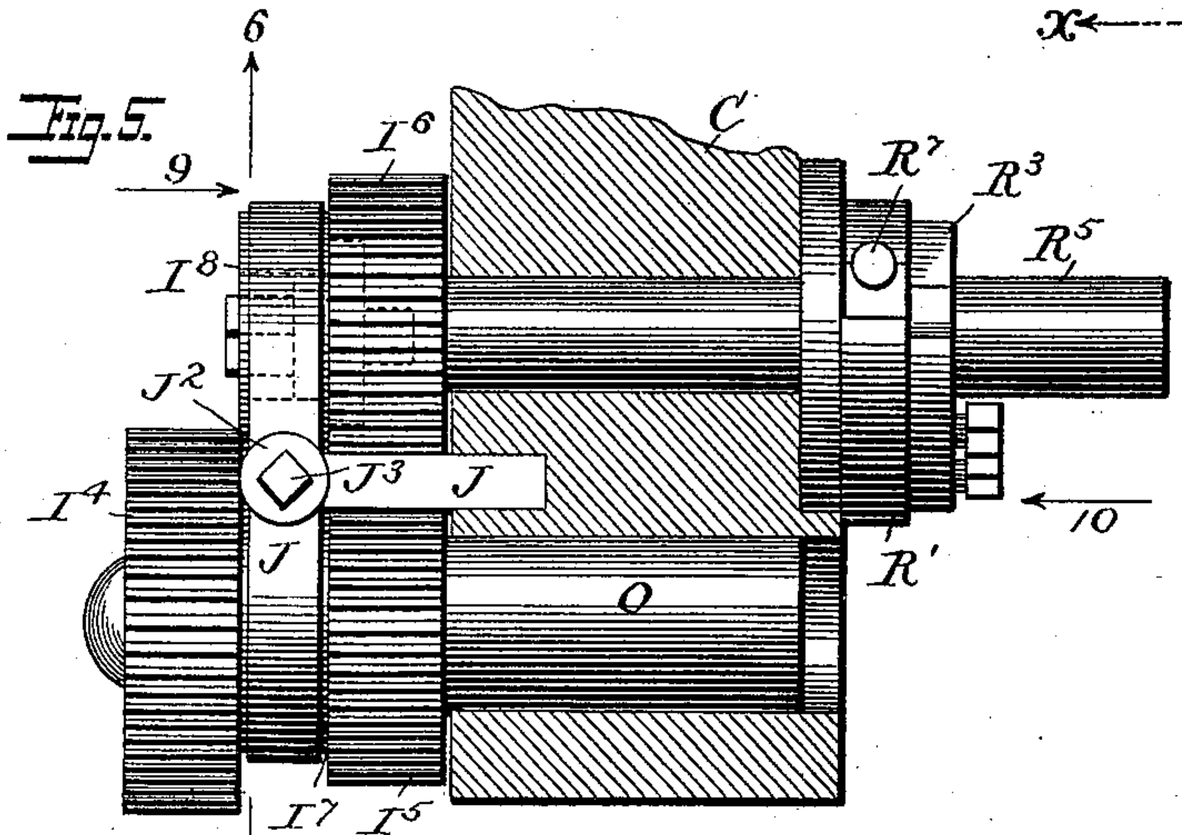


Fig. 7.

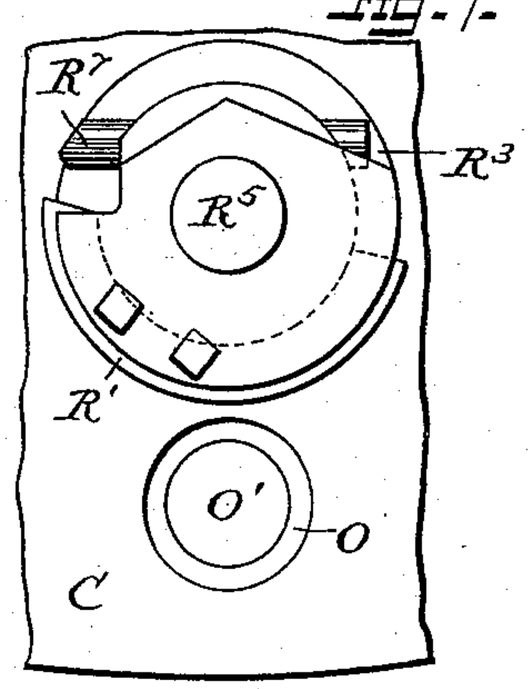


Fig. 6.

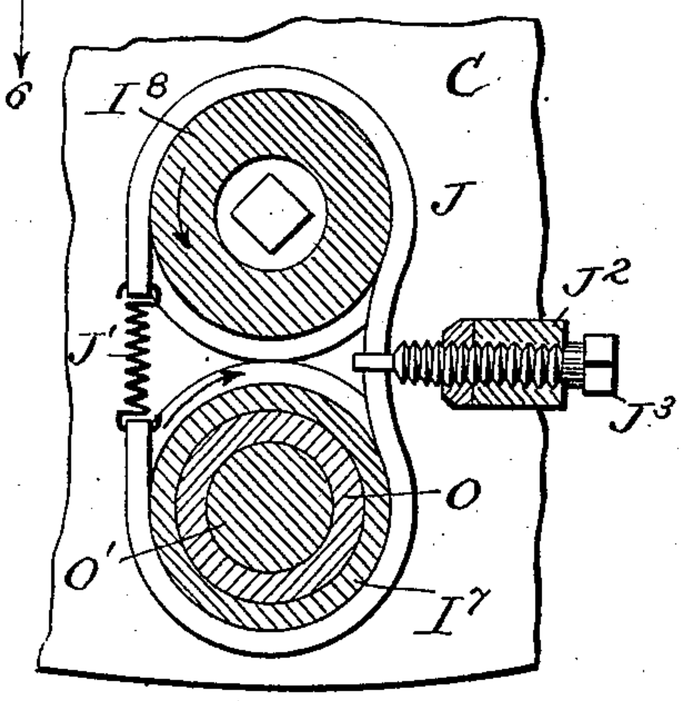


Fig. 9.

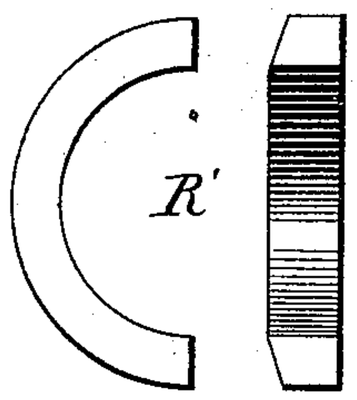
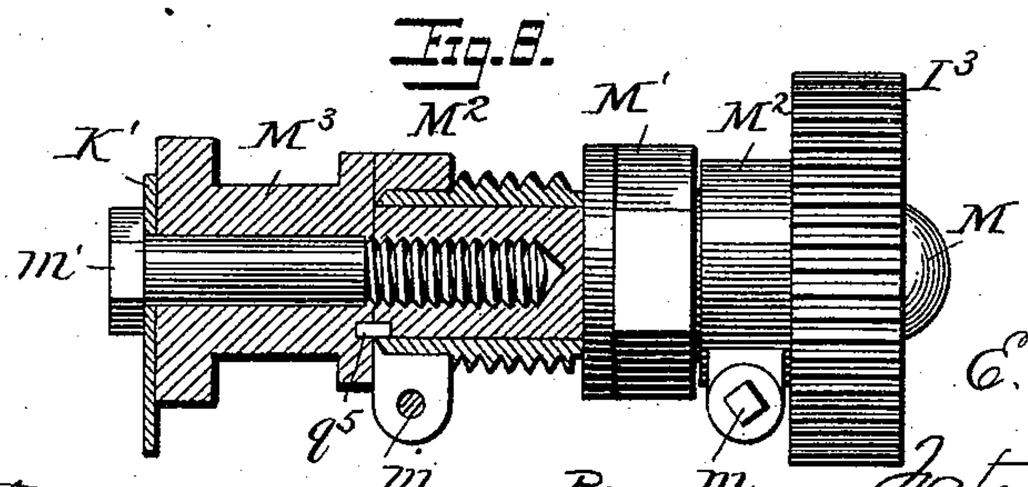


Fig. 8.



Witnesses
Jno. J. Hinkel
H. S. McArthur

Inventor
E. E. Pierce
By Foster & Freeman.
Attorneys

UNITED STATES PATENT OFFICE.

ERASTUS EUGENE PIERCE, OF NEW BRIGHTON, PENNSYLVANIA, ASSIGNOR TO THE STANDARD HORSE NAIL COMPANY, OF SAME PLACE.

MACHINE FOR FORGING HORSESHOE-NAILS.

SPECIFICATION forming part of Letters Patent No. 486,195, dated November 15, 1892.

Application filed November 13, 1891. Serial No. 411,809. (No model.)

To all whom it may concern:

Be it known that I, ERASTUS EUGENE PIERCE, a citizen of the United States, residing at New Brighton, in the county of Beaver and State of Pennsylvania, have invented certain new and useful Improvements in Machines for Forging Horseshoe-Nails, of which the following is a specification.

In the Letters Patent issued to me, Nos. 241,562 and 363,418, is set forth a machine for forging horseshoe-nails from heated metallic bars wherein a revolving carrier is provided with series of dies for gradually drawing down the end of the rod and with cutting devices for severing the rod after the shank and head have been formed; and the object of my invention is to improve the efficiency of machines of this class, to which end my invention consists in constructing certain parts, as fully set forth hereinafter and as illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation, in part section, of a nail-forging machine embodying my improvements. Fig. 2 is a transverse sectional elevation. Fig. 3 is an enlarged section on the line 3 3, Fig. 2. Fig. 4 is an enlarged view, in part section, showing one of the adjustable shaft-bearings. Fig. 5 is an enlarged section on the line 5 5, Fig. 1, looking in the direction of the arrow 8. Fig. 6 is a section on the line 6 6, Fig. 5, looking in the direction of the arrow 9. Fig. 7 is an end view looking in the direction of the arrow 10, Fig. 5. Fig. 8 is an enlarged section showing one of the guides and its shaft, gear, and bushing. Fig. 9 is a detached view illustrating the form of one of the cutters.

It will not be necessary to describe in detail the general construction and operation of the parts of the machine illustrated that correspond to those shown in the aforesaid Letters Patent, as they will be understood from an inspection of said Letters Patent and as my present invention relates to the construction only of certain parts.

The first improvement relates to the dies G^2 G^3. As set forth in my aforesaid patents, the said dies revolve upon shafts turning in fixed bearings as regards each other, and consequently any wear of the dies cannot be compensated for and it is necessary to substitute new dies for the old ones as soon as the latter become worn. To obviate this objection, I carry the shafts upon the carrier C in movable supports or bearings and provide means whereby said supports may be so adjusted as to separate or bring together the dies to compensate for wear or to insure proper adjustment for different sizes of nails. These adjustable bearings may be made in different ways and different devices may be employed for altering their position. I have shown in the drawings one construction which has proved to be effective.

The bearings P P′ are shown in dotted lines in Fig. 1, in section in Fig. 2, and in detail, Figs. 3 and 4. They are in the form of cylinders, sleeves, or bushings inserted in holes provided for them in the flange C′ of the carrier C and are socketed or bored out eccentric to their peripheries, but more eccentric at the die end than at the bevel-pinion end, and, as illustrated in Fig. 4 and also in Fig. 2, wherein dotted lines show that the sockets diverge, and if the bushing were extended in length to the line x x the bore would at that point be in the center of the bushing. The object in making the bearings adjustable is for the purpose of regulating the width of the nail and the adjustment is accomplished by turning the eccentric bushings in pairs and in unison by means of right and left hand worms P^3 P^4, secured on the stud P^2, Figs. 1, 2, and 3, and which engage the teeth of right and left hand worm-gears cut in the peripheries of the bushings P and P′, respectively. The worms are inserted in the carrier C at right angles to the bushings and at one side, as shown in Figs. 1 and 2. The squared end of the stud P^2 projects from the face of the flange C′ and may be operated with a wrench, and after the proper adjustment is made the screw P^7 in the opposite face of the carrier C is forced in against the stud P^2, locking it and preventing any further movements of the worms or bushings until a new adjustment is needed. To facilitate adjustment, the stud P^2 has a stem for receiving detachable worm-sections P^3 P^4 and a sleeve P^5, and the socket for receiving the end P^{12} of the stud is smaller at that end than at the opposite end where the screw P^7 is inserted and a nut P^6 serves to clamp the

worm-sections, the sleeve P^5, and a washer P^{11} upon the stem. This permits the stud to be inserted in place, after which the washer, the worm-section P^3, the sleeve P^5, the worm-section P^4, and the nut P^6 are put in place successively and there retained by the screw-plug P^7. The bushings are placed in the machine, so that the eccentrics of each pair are equidistant from an established center line between the dies G^2 G^3, so that when one of the studs P^2 is turned the pair of bushings engaged will move in unison and either increase or diminish the distance between the dies, according to the direction in which the bushings are turned, and at the same time maintain the faces of the dies equidistant from the central line between them. The line x x, Fig. 4, passes through the center of the faces of the pinions E E', Figs. 2 and 4. It will thus be seen that the revolving of the bushings and the consequent change of position of the die ends of the shafts F F' would not change the depth of engagement of the teeth of the pinions with the teeth of the gear D on the line x x and only to a very slight degree at either edge of the faces of the pinions, while making considerable adjustment at the die ends of the shafts.

In the course of the operation of the machine the wear of the parts is apt to result in a certain end play of the shafts carrying the guides K', and it is also necessary at times to make slight endwise adjustments of said shafts to avoid said difficulties incident to the loose play and to improve the construction shown in the aforesaid patents, where these shafts M are not adjustable and the same in every respect as the shafts carrying the dies K. I make these shafts shorter than the shafts of the dies K, with means for adjusting them longitudinally and securing them to prevent any play after adjustment. Thus I introduce a supplementary piece M^3 between the end of the shaft and the guide K' of such a length as to bring the guide to the proper position between the dies G^2 G^3. The piece M^3 and the guide K' are both secured to the shaft M by the screw m'. A pin q^5 is made fast in the piece M^3 and projects into a hole in the end of the shaft M, by which means the piece M^3 is always maintained in the same rotative position relative to its driving-pinion I^3. A special bushing M' is provided for the shafts M and is screwed into the carrier C, as shown in Fig. 2. The ends of these bushings are reduced in size and are inscribed and covered by clamping-collars M^2, which are clamped to the bushing by the screws m, and when so clamped constitute a part of the bushing M', abutting at one end against the gear-pinion I^3 and at the other end against the piece M^3. By loosening the screws m any end-play of the shaft caused by wear can be taken up, or a slight endwise adjustment of the shaft made, so as to bring the guide K' to the exact position required between the dies G^2 G^3. The removal of the guide K' and piece M^3 facilitates the changing of the dies G^3.

In order to improve the operation of the cutter devices for severing the forged blank from the end of the rod, I make use of the construction which I will now describe. The device for severing the nail from the rod consists of the adjustable semicircular revolving cutter R', having its shaft journaled in the carrier C and in the removable block R^9, Figs. 1 and 2, secured in a recess in the flange C', and the oscillating cutter R, having its shaft journaled in an adjustable block R^{18}, secured to the bed-plate A, together with means for adjusting the cutters in the proper position relative to the nail and to each other. The cutter R' is made in the form shown in Fig. 9, one side being beveled, thereby making the inner surface wider than the outer surface. The cutter-holder R^3, which may be integral with or secured to the shaft R^5, has a groove corresponding in shape to but a little wider than the cutter. The cutter is placed in the holder with its beveled side against the beveled side of the groove in the holder and is held in place by screws acting against its opposite side, as shown in the drawings. The bevel on the cutter and in the holder is not a necessity, but only a security against a wrong adjustment when the cutter is put in place and against its being thrown out when working. This cutter R' has a radial end face and is rotated in the same manner as the cutter R' described in Patent No. 363,418; but in this case the cutting off of the nail is done at a point farther from the center of the carrier C, which necessitates smaller connecting-gears, as shown in Fig. 5.

The cutter R is secured in the holder R^2 by screws, and when in position to do the cutting stands in a vertical plane in one direction, Fig. 1, and at an angle of about forty-five degrees in the other direction, Fig. 2. Its upper end is formed into a chisel shape by grinding or otherwise and the cutting-edge stands at right angles to the face of the carrier C. During the cutting the cutter R is practically motionless, the cutting being accomplished by the nail being forced downward by the cutter R' in the same manner as by ordinary shears having a lower stationary blade and an upper moving blade. The cutter R may be moved by any suitable devices. Thus the rock-shaft carrying the cutter R has at its opposite end a pinion R^4, and a vibratory rotary motion is imparted to the cutter through this pinion, the gear-segments R^6, R^8, and R^{10}, the rack R^{12}, the link and connecting strap R^{14}, and the eccentric R^{16}, attached to the shaft B. The movement of the cutter R being derived from an eccentric, the cutter appears to be in motion all the time, but the cutting being done when the cutter is at its forward end of the stroke, and the time required to sever the nail from the rod being very short, the cutter is practically motionless during that time, as before stated. By this construction the cutter

R is carried out of the range of the heat from the furnace, and also away from the moving parts of the machine while the nail is being forged.

The cutter rotates through about two hundred and ten degrees, and the dotted lines, Fig. 2, show its position when farthest removed from the nail at the time when the nail is about one-half completed. The cutter R′ can be adjusted in the direction of the length of the nail by moving it backward or forward in the groove in the holder R^3, and when properly adjusted, so as to act on the nail exactly at its junction with the rod, it is secured by the screws, as before described. The cutter R can be adjusted in the direction of the length of the nail by means of the nuts on the rod R^{20}, one end of the rod being attached to the block R^{18} and the other end passing through the bracket R^{22}, the nuts acting on opposite sides of the bracket to move the block R^{18} in either direction, the pinion R^4 having a wider face than the segment R^6, so as to allow of such adjustment. Instead of swinging upon a center the cutter may slide back and forth.

In order to insure the shearing of the bar at the proper angle, I provide means whereby the angle of the bar may be varied. This may be done by means of any suitable contact-piece, so that I make use of a presser R^7, Figs. 1, 5, and 7. This presser is a solid cylinder with one end beveled so as to present a flat surface to the nail-rod, and is secured in the cutter-holder R^3 by being made a driving fit therein, or in any other suitable manner. The cutting-edge of the cutter R when cutting off the nail is below the position of the nail when being forged to avoid its coming in contact with the dies G^2 when coming to or going from the position shown in the drawings, which is the position in which the cutter is alone, and the duty of the presser is to act on the nail-rod at a point a short distance back of the nail and depress the rod at that point, so that the nail will be cut at the desired angle. It will be readily understood that if the rod were inclined downwardly when the cutting was done the angle of the cut on the top of the nail-head would not be the same as if the rod were level or inclined upwardly. By the use of the presser any desired angle of cut can be obtained by having the presser project more or less from the holder R^3, according to the requirements of the particular case.

In operating the machine rapidly, it has been found that there is a tendency to throw the shafts or there is lost motion or backlash of the gears, especially those driving the cutter R′, resulting from wear or careless fitting. To obviate these objections, I combine a suitable brake with such of the shafts as have to be regulated in their movements. Thus motion is imparted to the cutter R′ by the gears I^4, I^5, and I^6, Figs. 1, 5, and 6. Attached to or integral with the gear I^4 on the counter-shaft O′ is a hollow cylinder I^7, whose inside diameter is slightly larger than the outside diameter of the bushing O. On the outer end of the cylinder I^7 is secured the gear I^5, thus forming a neck between the gears I^4 and I^5. At the side of the gear I^6 is a disk I^8, which has a short hub or boss extending into said gear. This construction is only for convenience, as the gear and disk may be in one piece. The gear and disk may both be secured to the end of the shaft R^5 by a key, or, as shown in the drawings, by a collar bolt or screw extending into the shaft. The disk I^8 has a groove or channel in its periphery, and this groove, together with the neck between the gears I^4 and I^5, forms a seat for the brake-strap J, Figs. 2, 5, and 6. The ends of the strap are connected by a spiral spring J′, Fig. 6. A stud J^2, Figs. 5 and 6, is driven or screwed into the carrier C and its outer end tapped to receive the screw J^3. This screw is reduced in size for a short distance at the point and enters a small hole in the center of the strap. By this means the strap is kept in proper position. The amount of friction is controlled by the strength of the spring and by the screw J^3, forced in to increase the tension or withdrawn to decrease it. The cylinder I^7 and disk I^8 revolve in the direction indicated by the arrows and the friction tends to draw the ends of the strap toward each other, thus giving a greater brake-power than if they were revolving in the opposite direction.

Without limiting myself to the precise construction and arrangement of parts shown, I claim—

1. The combination, in a nail-making machine, of series of roller-dies, carrying and driving mechanism whereby said dies are revolved positively and are brought successively in pairs into operation upon all the opposite faces and sides of a rod and movable bearings for the roller-dies, and means for adjusting said bearings to vary the distance between the dies of each pair, substantially as set forth.

2. The combination of the die-carrier, dies, shafts, and cylindrical bearings with eccentric sockets and external teeth, and a shaft with reverse worms engaging said teeth, substantially as described.

3. The combination of the dies, shafts, cylindrical bearings and a worm-shaft provided with separate sections having the worm-teeth and means for clamping said sections to the shaft, substantially as set forth.

4. The combination, with the guides K′ and with the revoluble carrier, of shafts carrying said guides and means for adjusting said shafts longitudinally in their bearings, substantially as set forth.

5. The combination, with the rotatable die-carrier, guides K′, and shafts of said guides, of supplementary pieces M^3, bushing M′, adjustable in the carrier, and clamping-collars M^2, substantially as set forth.

6. The combination, with the rotatable die-carrier having a recess, of a block R^9, fitting

said recess, and a cutter-shaft having its bearings in the carrier and at one end in said block and supporting a cutter, substantially as set forth.

7. The combination, with the die-carrier, of a rotating cutter carried by said carrier and a coacting cutter supported by a stationary part of the machine and means for moving the latter into and out of operative position at intervals, substantially as set forth.

8. The combination of the rotating die-carrier, a revolving cutter supported thereon, having a radial end face, and a reciprocating cutter having a face adapted to shear with the end face of the revolving cutter when said reciprocating cutter is stationary, substantially as set forth.

9. The combination of the cutter R, rock-shaft, driving-shaft B, and eccentric, gear-segments R^6 R^8 R^{10}, rack R^{12}, and connecting link and strap R^{14}, substantially as set forth.

10. The combination, with the rotating die-carrier and rotating cutter R′, of an oscillating cutter R, movable into and out of cutting position in a plane at right angles to the carrier, substantially as set forth.

11. The combination of the rotatory die-carrier and cutter R′, rock-shaft and cutter R, and means for adjusting the bearings of said shaft in the direction of the length of the nail, substantially as set forth.

12. The combination of a rotatable die-carrier, rotating cutter thereon, and presser arranged to make contact with the nail-bar to deflect the same to a place below that in which the bar is fed, substantially as and for the purpose set forth.

13. The combination of the cutter-holder R^3 and presser R^7, carried thereby and arranged to deflect the bar below the plane on which it is fed, substantially as and for the purpose set forth.

14. The combination, with the cutter-shaft and counter-shaft, of disks or pulleys thereon and brake-strap J and means for adjusting the same, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ERASTUS EUGENE PIERCE.

Witnesses:
THEO. C. DEITRICH,
H. H. HANCOCK.