

C. E. MOORE.

MACHINE FOR FORGING HORSESHOE NAILS.

No. 442,987.

Patented Dec. 16, 1890.

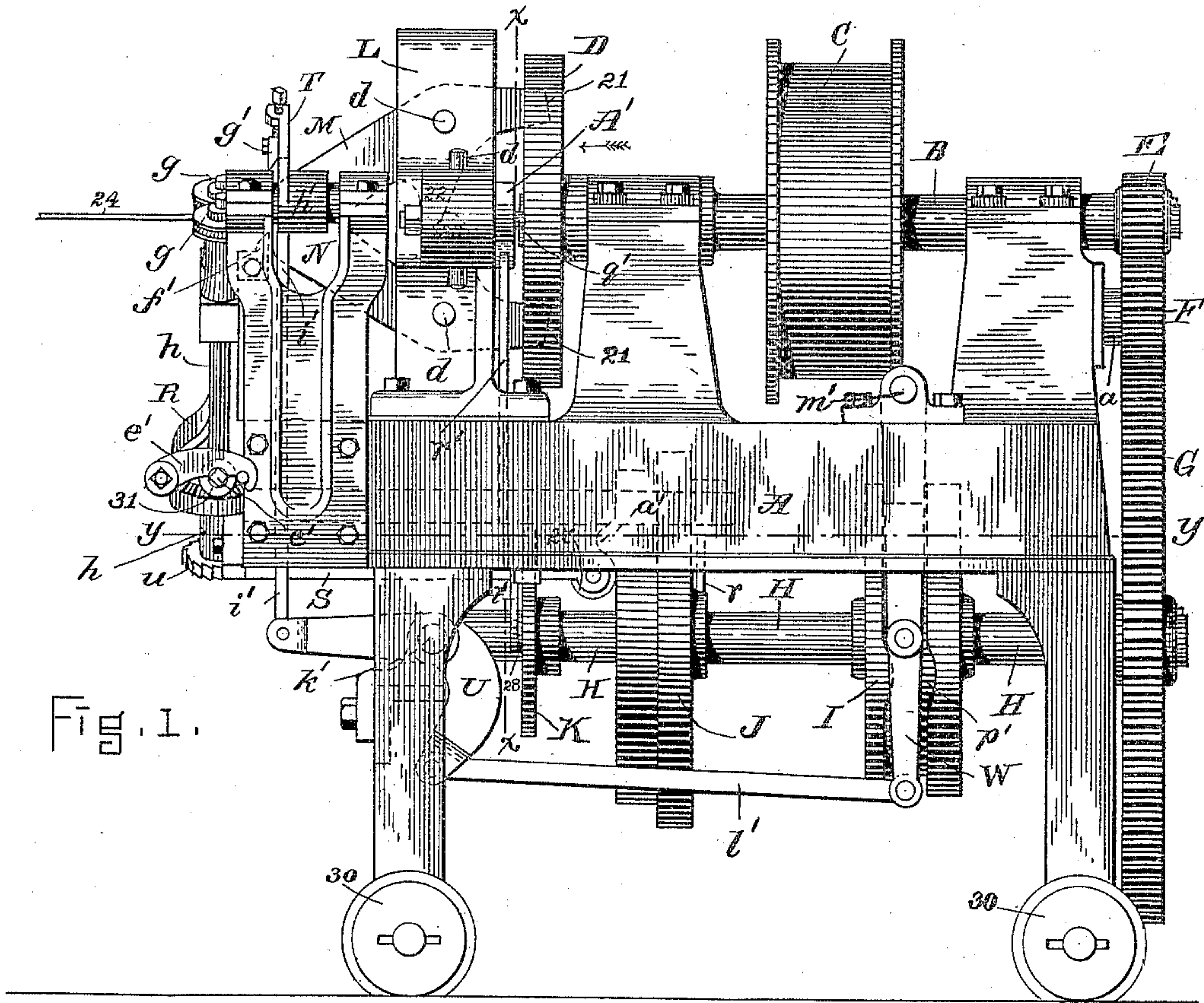


Fig. 1.

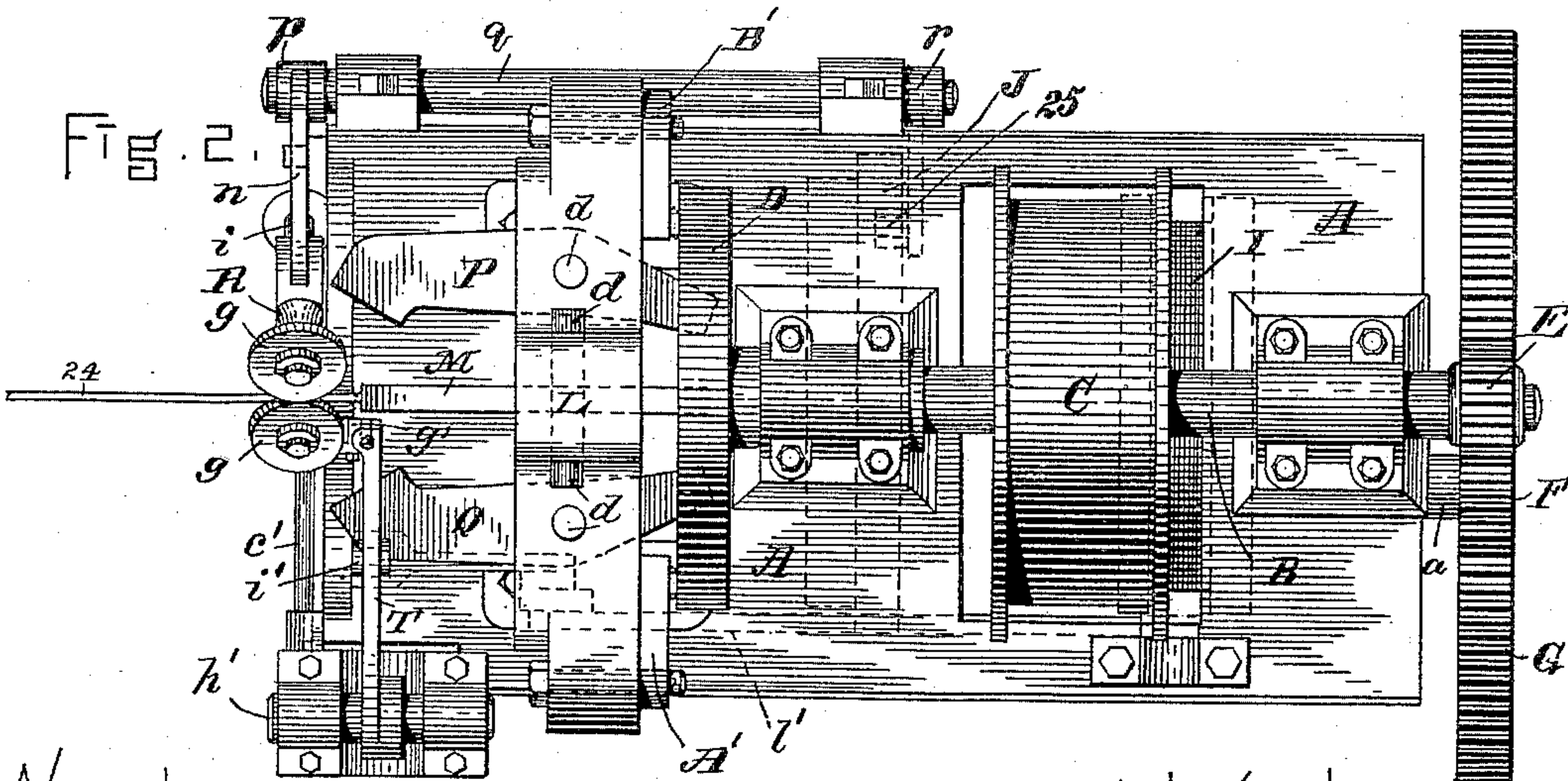


Fig. 2.

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(No Model.)

4 Sheets—Sheet 2.

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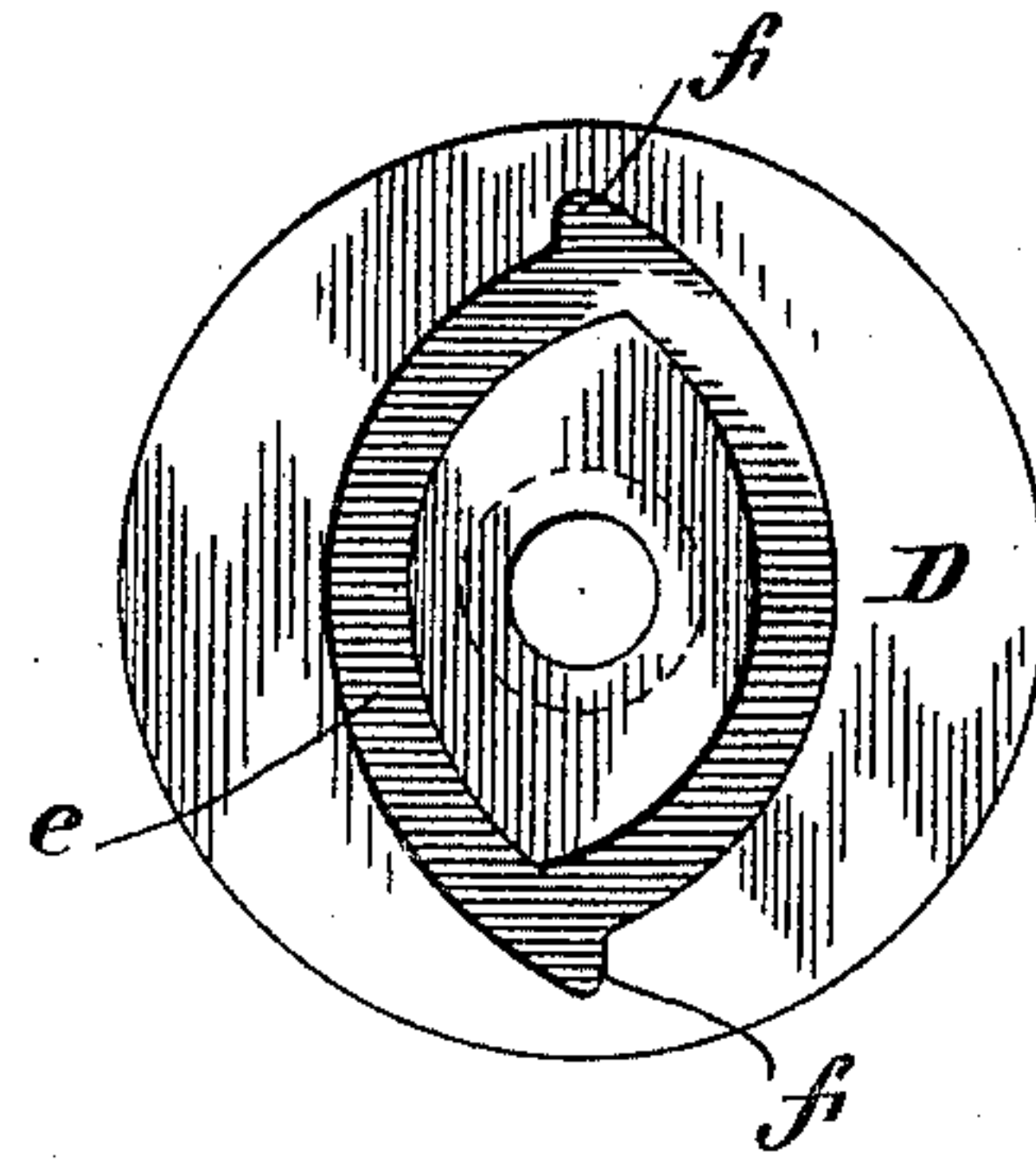
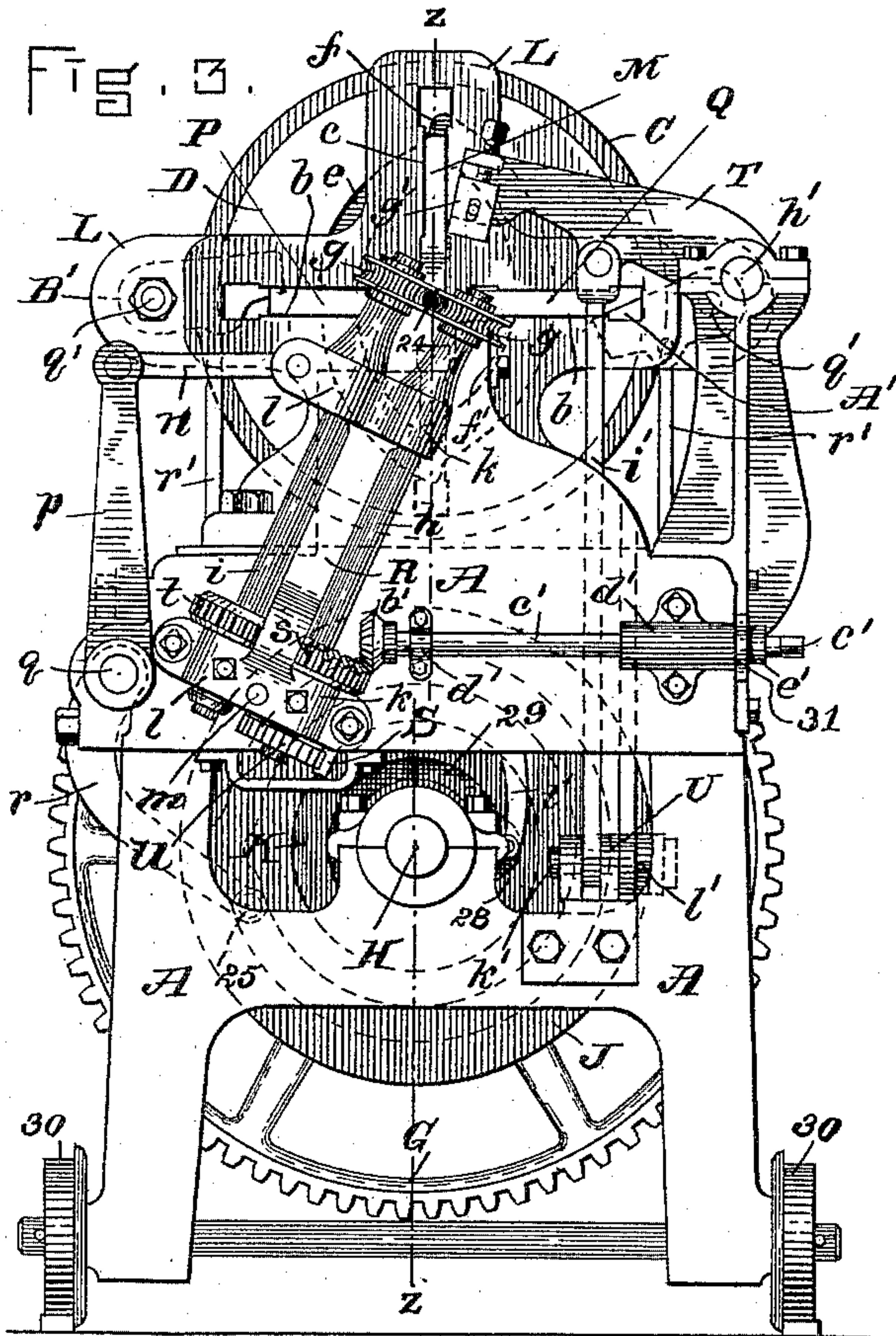


Fig. 10.

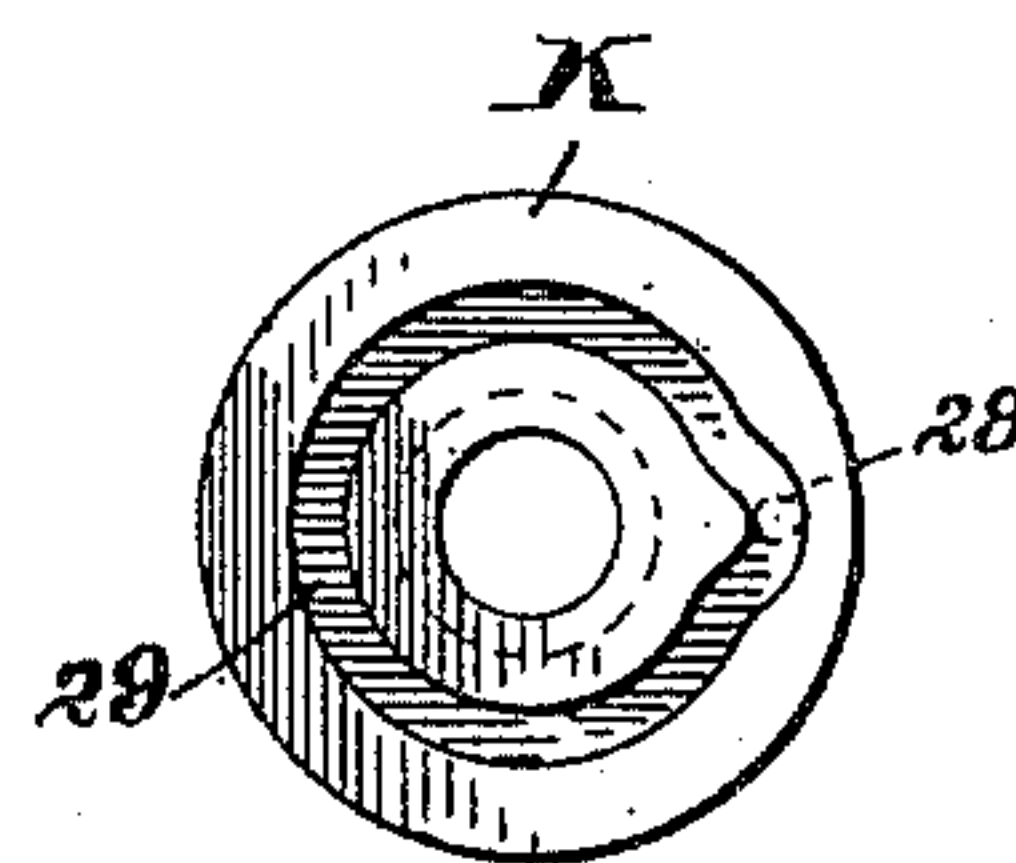


Fig. 11.

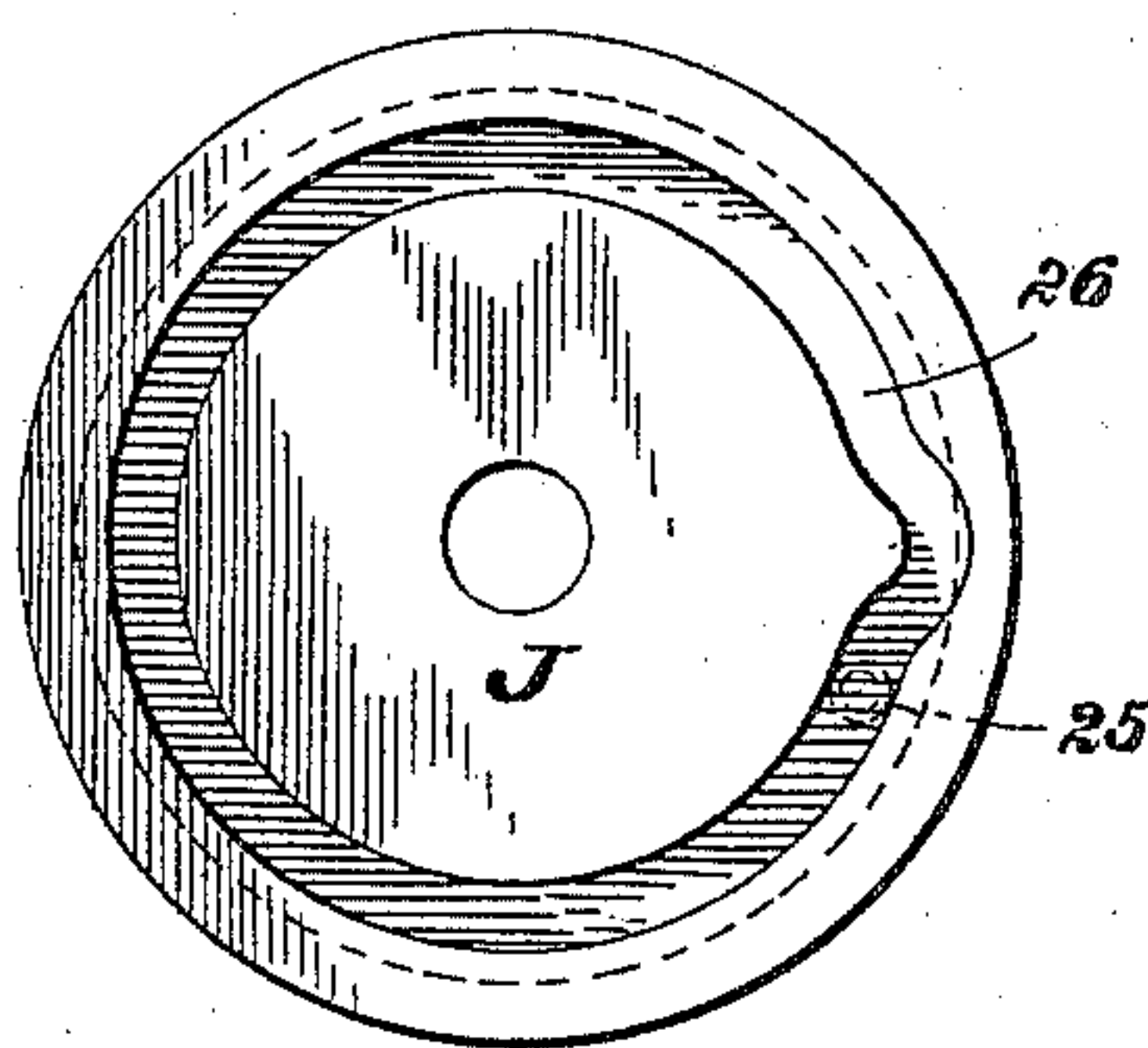


Fig. 12.

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4 Sheets—Sheet 3.

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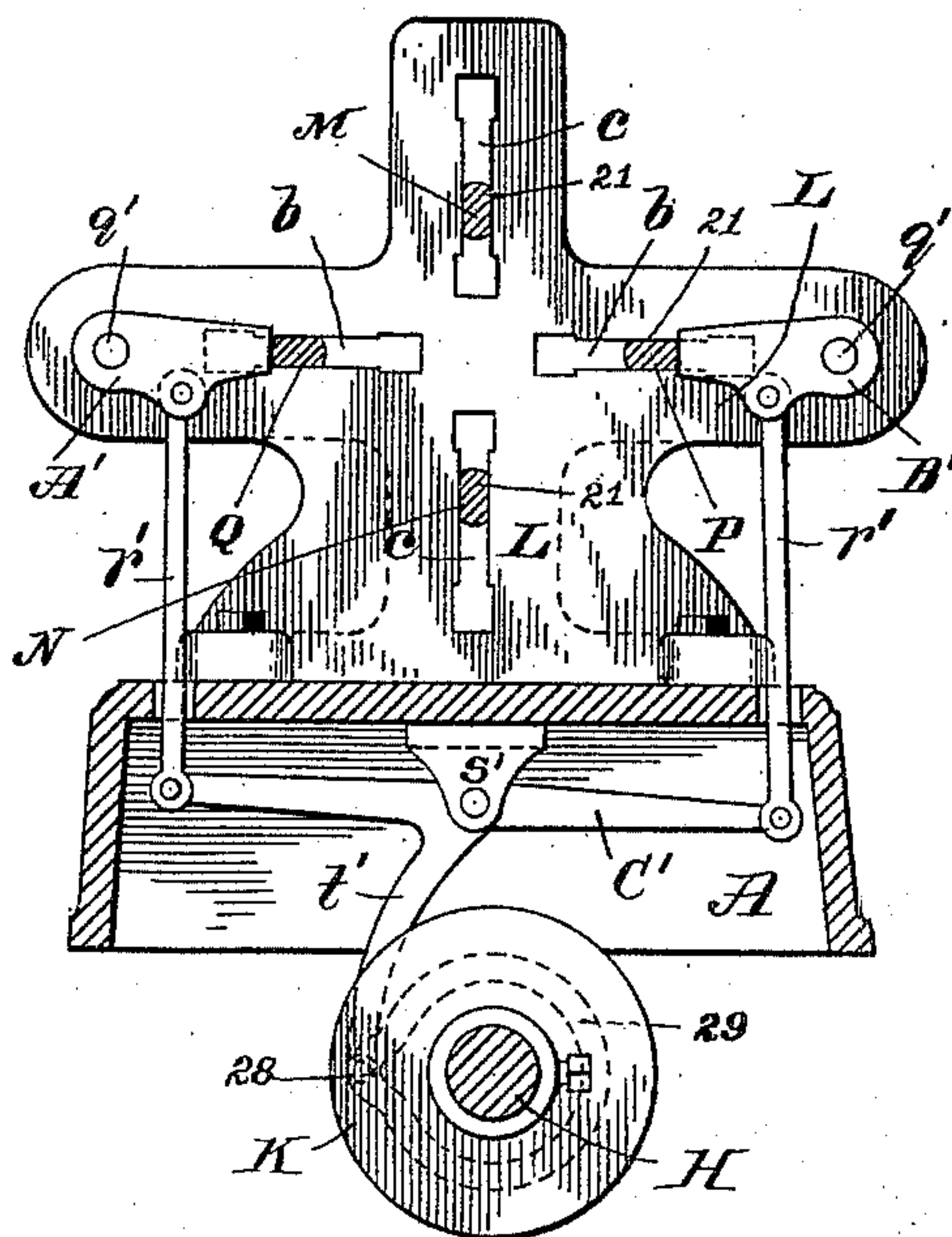
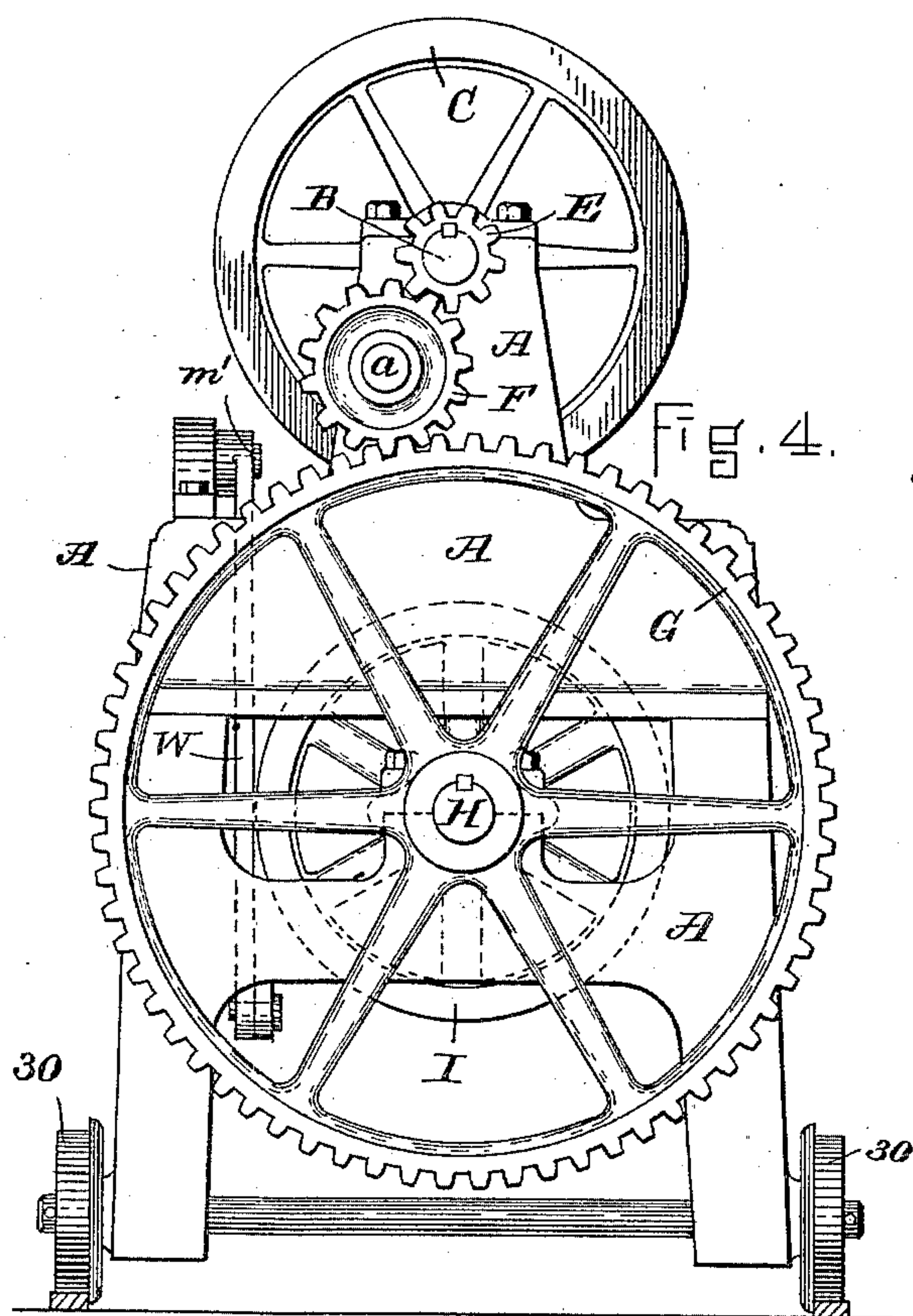
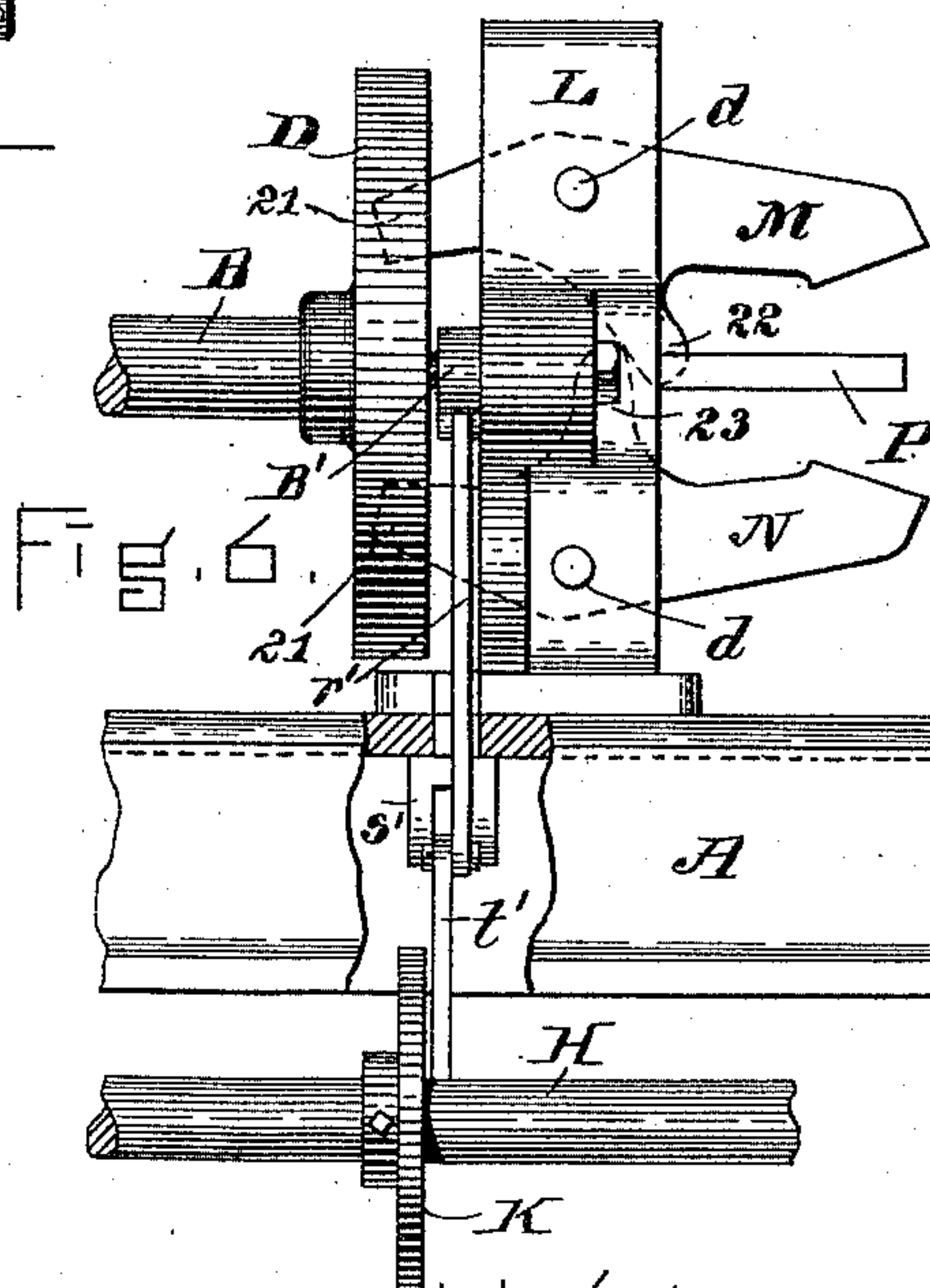
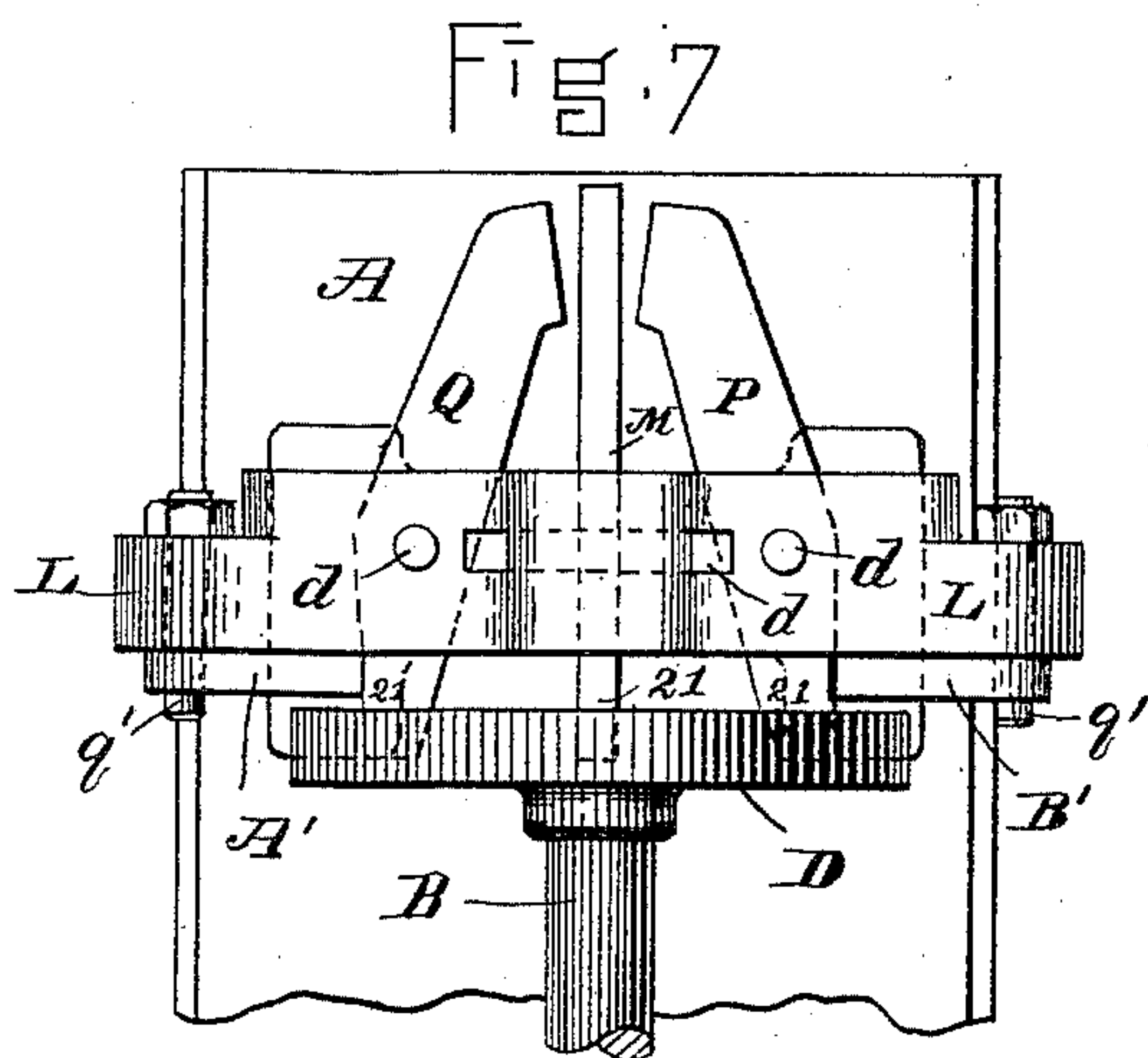


Fig. 5.



WITNESSES.

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4 Sheets—Sheet 4.

Patented Dec. 16, 1890.



UNITED STATES PATENT OFFICE.

CHARLES E. MOORE, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO ANN M. PUTNAM, OF SAME PLACE, AND GEORGE N. FLETCHER, OF DETROIT, MICHIGAN.

MACHINE FOR FORGING HORSESHOE-NAILS.

SPECIFICATION forming part of Letters Patent No. 442,987, dated December 16, 1890.

Application filed June 23, 1890. Serial No. 356,482. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. MOORE, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Machines for Forging Horseshoe-Nails, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making
10 part of this specification, in which—

Figure 1 is a side elevation of a machine for forging horseshoe-nails constructed in accordance with my invention. Fig. 2 is a plan of the same. Fig. 3 is a front elevation of the same. Fig. 4 is a rear elevation of the same. Fig. 5 is a transverse vertical section on the line *x x* of Fig. 1, looking in the direction of the arrow, the parts being in a different position. Fig. 6 is an elevation of a portion of
20 the side of the machine opposite to that shown in Fig. 1, a part of the frame-work being broken away. Fig. 7 is a plan of the front portion of the machine, showing the side hammers in the positions they occupy when locked by the stops. Fig. 8 is a horizontal section of the machine on the line *y y* of Fig. 1. Fig. 9 is a longitudinal vertical section of the machine on the line *z z* of Fig. 3; Figs. 10, 11, and 12, details.

30 My invention relates to certain improvements on the machine for forging horseshoe-nails for which Letters Patent of the United States No. 432,634 were granted to me July 22, 1890, in which the hammers are operated in pairs by means of a cam-wheel, and has for its object to produce a machine of this character of simple construction which can be operated with great speed without liability of breakage or derangement of its parts.

40 To this end my invention consists in certain novel combinations of parts and details of construction, as hereinafter set forth and specifically claimed.

In the said drawings, A represents the bed or frame of the machine, which is mounted on wheels 30 to enable it to run on a track, whereby it may be conveniently moved toward and from the furnace in which the nail-

rods are heated or wherever otherwise required for use.

50 B is the main or driving shaft, which turns in suitable bearings in the frame-work and carries the driving-pulley C and at its front end a large cam-wheel D for actuating the hammers, as hereinafter described. To the rear end of the driving-shaft B, outside the frame-work, is secured a gear E, which meshes with an intermediate gear F, mounted on a stud *a* and meshing with a large gear G, secured to the rear end of a shaft H, which turns
55 in bearings at the opposite ends of the frame-work and carries the cam-wheels I J K, the functions of which will be hereinafter described, the relative sizes of the gears E F G being such that the cam-shaft H will make
60 one-seventh as many revolutions as the main shaft B.

From the bed A rises a frame L, made in the form of a cross and having four slots—two horizontal ones *b b*, Figs. 3 and 5, and two vertical ones *c c*, Figs. 5 and 9—in which are placed the hammers M N P Q, which vibrate on pivots *d*, passing through the frame L. These hammers, arranged as described, are operated alternately in pairs by the groove
75 *e* of the cam-wheel D, within which fit the rear ends or helves 21 of the hammers, the form of the groove *e* being such that when the two side hammers are thrown toward each other to give the blow the upper and lower
80 hammers will be simultaneously drawn back, and vice versa, the hammers being thus actuated in both directions without the aid of springs or other auxiliary devices and caused to act upon all four sides of the nail
85 being forged. The cam-groove *e* is provided at two points diametrically opposite to each other with recesses or enlargements *f*, into which the helves 21 of each pair of hammers enter a short time previous to their operative
90 faces being brought together, whereby sufficient play or loose movement of the hammers is produced previous to their contact with the nail-rod to cause them to strike the same with a rebounding blow similar to that struck
95 with an ordinary hammer when held in the

hand, the greater part of the forward movement of each pair of hammers being produced positively by the cam-groove, while the remainder or latter portion of the forward movement is effected by the momentum of the hammers themselves, which causes them when running at a high rate of speed to be carried forward with sufficient force to give a smart and powerful drawing blow, after which they are free to rebound or recede from the heated nail-rod, as the recesses *f* are of the proper length and shape to admit of this movement. The pivots on which the hammers oscillate are located near their rear ends, thus placing the larger and heavier portion of each hammer in front of its pivot, whereby the momentum of the hammers is increased as they are thrown forward by the cam to give the blow. The faces of the hammers are provided, as usual, with suitable grooves or dies of the proper form to give the nail the desired shape. By releasing the hammers from the positive action and control of the cam-groove just previous to their contact with the nail-rod, as described, and allowing them to complete their movement by their own momentum and then rebound before being again acted upon positively by the cam-groove and brought under its control, a more concussive and instantaneous impact is produced, whereby the character or quality of the blow is improved and rendered much more effective, as it is a well-known fact that a gradual or positive blow, even at a very high rate of speed, will cool heated iron much more quickly than an instantaneous blow from a hammer carried forward by its own momentum and free to rebound or recede at the instant of its impact and that a blow from a hammer of the latter description will do more effective work at a much slower rate of speed than can be accomplished with a positively-actuated hammer.

It will be obvious that in this machine the absolute freedom of the hammers to rebound or recede from the iron at the instant of the delivery of the blow will diminish the actual time of contact of the hammer-face with the heated iron to a minimum, and thereby proportionately reduce its cooling effect upon the nail being formed, it being desirable to have the hammer-faces in actual contact with the nail-rod for the shortest possible length of time, as it is of the utmost importance to maintain the nail-rod at a white heat during the formation of the nail, as otherwise inferior results will be produced, and it is evident that the greater the length of time that the large cool body of iron composing the front end of the hammer remains in contact with the small portion of iron which forms the nail the sooner it will be reduced from a white to a red heat, in which latter condition the iron cannot be worked to advantage.

The above-described cam-wheel with its groove and the manner in which it actuates the hammers are substantially the same as

shown and described in my aforesaid Letters Patent No. 432,634, and form no part of my present invention.

As the lower hammer *N* of the vertical pair will not by reason of its weight be carried forward by its momentum to complete its movement as quickly as the upper hammer *M*, I provide the latter with a projection 22, which bears against a similar projection 23 on the lower hammer, by which means the movement of the hammers *M N* is equalized to insure their both meeting on a central line passing through the axis of the nail-rod.

I will now proceed to describe the manner in which the nail-rod is fed into the machine.

g g are a pair of feed-rolls, the peripheries of which are slightly concave, and are provided with sharp teeth to prevent them from slipping on the nail-rod 24 as the latter passes between them. These rolls are secured to the upper ends of a pair of shafts *h i*, supported in bearings *k l* in an inclined frame or carrier *R*, pivoted on a pin or stud *m*, projecting from the front of the frame-work, as seen in Fig. 3, and operated by a rod *n*, pivoted thereto and at its opposite end to a lever *p*, secured to the front end of a horizontal rock-shaft *q*, supported in bearings on one side of the bed or frame *A* and carrying an arm or lever *r*, Figs. 1, 2, and 3, at the inner end of which is an anti-friction roll 25, which runs in a cam-groove 26, Fig. 12, formed in one side of the cam-wheel *J* on the shaft *II*, whereby as the said cam-wheel is rotated the frame *R* is rocked on its pivot *m* to carry the nail-rod over into the path of the cutters, to be hereinafter described, and return it to its normal central position between the hammers.

To the shafts *h i*, near their lower ends, are secured the gears *s t*, Fig. 3, which engage with each other, and at the lower end of the shaft *h* is secured a ratchet-wheel *u*, with which engages a long sliding pawl-bar *S*, Figs. 1, 3, and 8, supported in suitable guides, as seen in Fig. 8, and carrying at its inner end an anti-friction roll 27, said pawl-bar being operated against the influence of a spring *w* by a cam *a'*, projecting from one side of the wheel *J* on the shaft *II*, the spring *w* serving to keep the pawl *S* constantly in contact with the ratchet-wheel *u*, and also to return said pawl to its normal position after it has been operated by the contact of the cam *a'* with its roll 27, the feed-rolls being in this manner intermittently rotated to carry forward the nail-rod at the required times.

The amount of movement of the ratchet-wheel *u* is so arranged as to produce the exact amount of feed of the nail-rod required for a nail of the length desired, and the mechanism is so timed that the nail-rod will be fed forward while it is being swung back with the frame *R* to its central position after the nail last made has been severed therefrom. The gear *s* of the feed-roll shaft *h* has beveled teeth on its upper side, with which engages the beveled pinion *b'*, secured to the inner

end of a horizontal shaft c' , the outer end of which is adapted to receive a removable handle, (not shown,) by which means the feed-rolls can be rotated by hand when the nail-rod is first entered between them, so that it can be readily carried forward to a position to be operated upon by the hammers. When the machine is in operation, this horizontal shaft c' is slid back within its bearings d' , so as to disconnect the beveled pinion b' from the gear s on the shaft h , the shaft c' being held back by a latch e' , Figs. 1, 2, and 3, which fits on either side of a collar 31 on the shaft, whereby it is adapted to lock said shaft with its pinion either in or out of engagement with the gear s .

f' g' are the cutters by which the finished nail is severed from the nail-rod after being formed by the hammers. The lower cutter f' , which is stationary, is secured to the front of the frame-work A , and the upper or movable cutter g' is secured to the outer end of a lever T , pivoted to the frame-work at h' , the cutters being both secured in place by means of screws and slots, whereby they may be adjusted vertically to cause them to meet at the exact level desired.

The cutter-lever T is operated to bring the cutter g' down upon the cutter f' to sever the nail from the rod by means of a vertical rod i' , pivoted at its lower end to a bell-crank lever U , fulcrumed at k' and connected by a rod l' with a lever W , fulcrumed at m' and carrying below the center of its length an anti-friction roll n' , Fig. 8, which fits within a cam-groove p' , formed in the periphery of the wheel I on the cam-shaft H , this cam-groove being of such form that the cutter-lever T will, through the connections described, be operated once at each complete revolution of the wheel I . In the machine here represented seven complete revolutions of the driving-shaft B , which produce a single revolution of the cam-wheel I , as before described, are required to bring the cutters and feed mechanism into action; but by changing the relative sizes of the gears E F G , which connect the driving-shaft with the cam-shaft, the number of blows to which the nail is subjected previous to being cut off may be varied, as desired. The cam-wheels I J are so timed with respect to each other that the cutter-lever T and the feed-roll frame R will commence to move at the same time, the arrangement of the mechanism being such that the feed-rolls will swing the nail-rod onto the stationary cutter f' before the movable cutter g' reaches it. The edge of the lower cutter is located below the level of the side hammers, and, as this cutter is stationary, the nail-rod when swung over must be carried downward at the same time to bring it into contact with the edge of the cutter, and therefore the movable frame R is normally inclined at an angle, as seen in Fig. 3, whereby as it is moved by the mechanism described it will swing the nail-rod downward directly onto the edge of the

stationary cutter, which is properly adjusted for this purpose.

In the machine herein described the nail is cut off flatwise, whereby a cleaner and more perfect cut can be given to its head than if it was cut off edgewise. Hence the vertical hammers must be arranged to give the last blow, which necessitates the employment of stops to catch the side hammers, which would otherwise interfere with the lateral movement of the nail-rod as it is swung over onto the edge of the stationary cutter. As, however, the side hammers are operated positively during the greater portion of their forward movement by the cam-groove e , as described, it is obvious that the stops can only be thrown into position to intercept the side hammers at the instant when they are released from the control of the said cam-groove, which takes place when their helvies or rear ends 21 enter the enlargements f , the stops then acting to hold the hammers in the position shown in Fig. 7 and prevent them from completing their forward movement by their own momentum, as would otherwise occur.

A' B' , Fig. 5, represent two stops one for each of the side hammers, which stops are pivoted at q' q' to the frame L and are swung into and out of place (one upward and the other downward) by rods r' , pivoted thereto and at their lower ends to the opposite ends of a horizontal lever C' , pivoted at its center to a hanger s' on the frame-work A and having a depending arm or branch t' , carrying at its lower end an anti-friction roll 28, which fits within a cam-groove 29, Fig. 11, in the wheel K , and thus as the latter is rotated the stops are operated at the proper times to intercept the hammers at the instant they pass out of the control of the cam-groove e and release them when they are again brought under the control of the said cam-groove, whereby the hammers are prevented from coming into contact with the nail-rod while it is being swung over onto the edge of the lower cutter, as would occur if the stops were not employed.

The operation of the machine is as follows: The nail-rod having been entered between the feed-rolls g g , the latter are rotated by hand through the medium of the shaft c' until the nail-rod has been projected as far as required to make a nail of the desired length. The machine is then set in operation and the nail subjected to the repeated blows of the two pairs of hammers until the cam-wheel I has been rotated into a position to vibrate the lever W and cause the lever T , with its cutter g' , to descend. Just previous to this, the vertical hammers having given the last blow, the side hammers are caught by the stops A' B' , and the nail-rod is then instantly moved to one side directly onto the edge of the stationary cutter f' by the movement of the feed-roll frame or carrier R , which commences to swing forward and downward on its pivot m at the same time that the cutter-lever T be-

gins to descend, but completes its movement in time to bring the nail-rod squarely onto the lower cutter before the upper cutter reaches it. The vertical hammers now come together, striking a blow without having the nail-rod between them, and the nail is then cut off, after which the stops A' B' are withdrawn by the action of the cam-wheel K and the side hammers commence to separate from each other, when the cutter-lever T commences to rise, the nail-rod being at the same time swung back into its central position and simultaneously fed forward in time to receive the next blow of the vertical hammers. The operation is then repeated, as before described, until the nail-rod is used up, when the machine is stopped, a new nail-rod inserted, and the operation continued as before.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a machine for forging horseshoe-nails, the combination, with the hammers operated alternately in pairs by a cam-wheel on the main or driving shaft, of a cam-shaft connected by gears with the main shaft and carrying the cam-wheels I J, the stationary cutter f' , and the movable cutter g' , the latter mounted on the lever T, the lever W, connected with the lever T and actuated by the cam-wheel I, to operate the movable cutter, the oscillating frame or carrier R, with its feed-rolls and their connected shafts, and suitable connections between the frame R and the cam-wheel J, whereby the feed-roll carrier is oscillated at the required times, and a ratchet-wheel and pawl for intermittingly rotating the feed-rolls, substantially as set forth.

2. In a machine for forging horseshoe-nails, the combination, with the feed-rolls and their shafts geared together and mounted in an oscillating frame or carrier, operated substantially as described, and a ratchet-wheel secured to one of said feed-roll shafts, of the sliding pawl S and the cam a' and spring w for operating the same, substantially as described.

3. In a machine for forging horseshoe-nails, the combination, with the hammers operating alternately in pairs, as described, and the sta-

tionary and movable cutters, of the feed-rolls with their connected shafts mounted in an oscillating frame or carrier R, normally inclined at an angle, whereby the nail-rod when swung over by the movement of said frame is brought down onto the edge of the lower cutter located below the level of the side hammers, substantially as described.

4. In a machine for forging horseshoe-nails, the combination, with the hammers operated alternately in pairs by a cam-wheel having a groove for the reception of the hammer-helves and provided with recesses or enlargements, whereby the hammers are released from the control of the cam previous to giving their blow and left free to complete their movement by their own momentum, of stops adapted to intercept the side hammers after they have passed out of the control of the cam-grooves and prevent them from striking the nail-rod just previous to the cutting off of the nail and means for operating said stops at the required times, substantially as set forth.

5. The combination, with the side hammers operated by a cam-wheel, substantially as described, of the stops A' B', pivoted to the frame L, the lever C', connected with said stops by rods r' and having an arm or branch t' , carrying a roll 28, and the cam-wheel K, whereby the stops are operated to intercept the side hammers, substantially in the manner and for the purpose set forth.

6. In a machine for forging horseshoe-nails, the combination, with the feed-rolls and their shafts mounted in the oscillating frame or carrier R, of the connecting spur-gears s t , the former provided with beveled teeth, the sliding shaft c' , with its beveled pinion b' , adapted to engage with the beveled teeth of the gear s , and the latch e' , for locking the shaft c' , with its pinion b' , in or out of engagement with the gear s , substantially as described.

Witness my hand this 20th day of May, A. D. 1890.

CHARLES E. MOORE.

In presence of—

P. E. TESCHEMACHER,
HARRY W. AIKEN.