(No Model.) 2 Sheets—Sheet 1.

H. J. BATCHELDER & T. S. VERY.

HORSESHOE MACHINE.

No. 355,635. Patented Jan. 4, 1887.

Fig. 1.

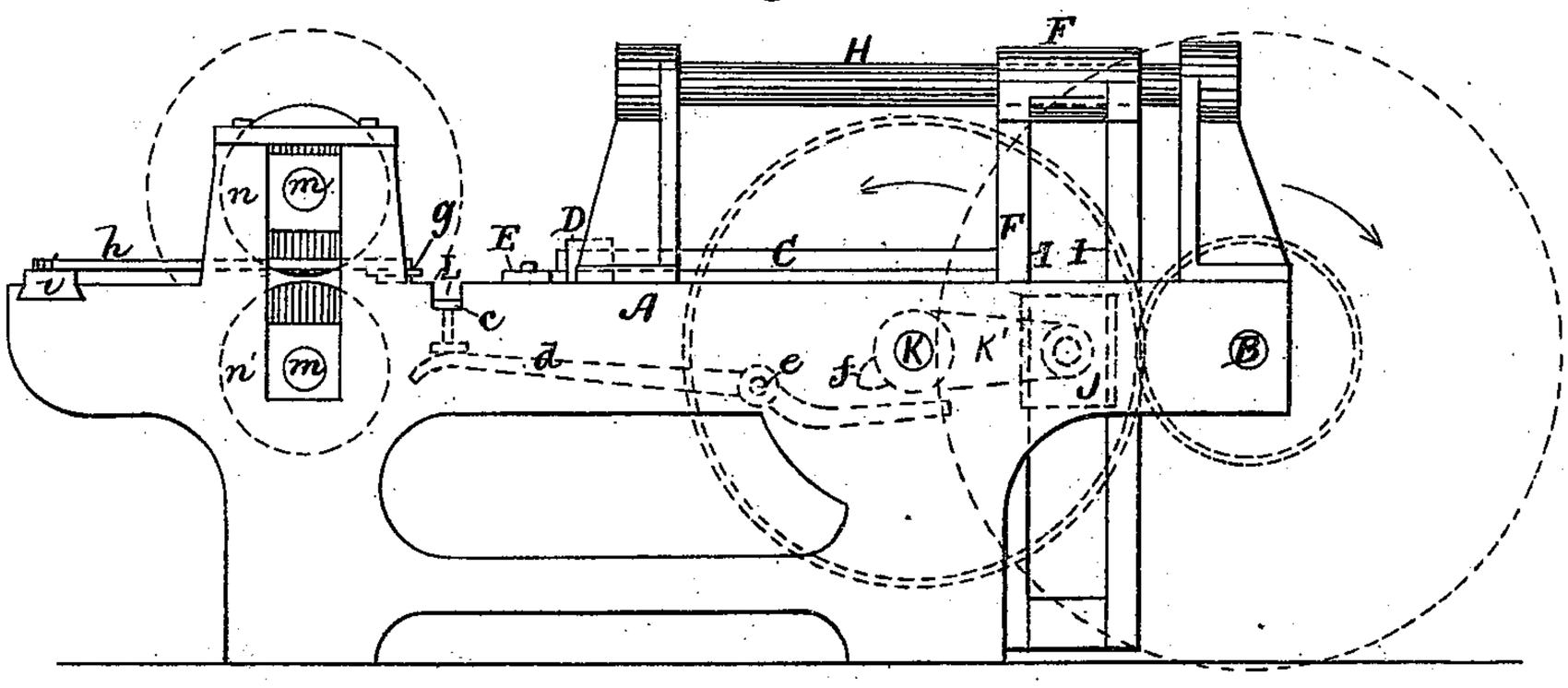

Fig. 2.

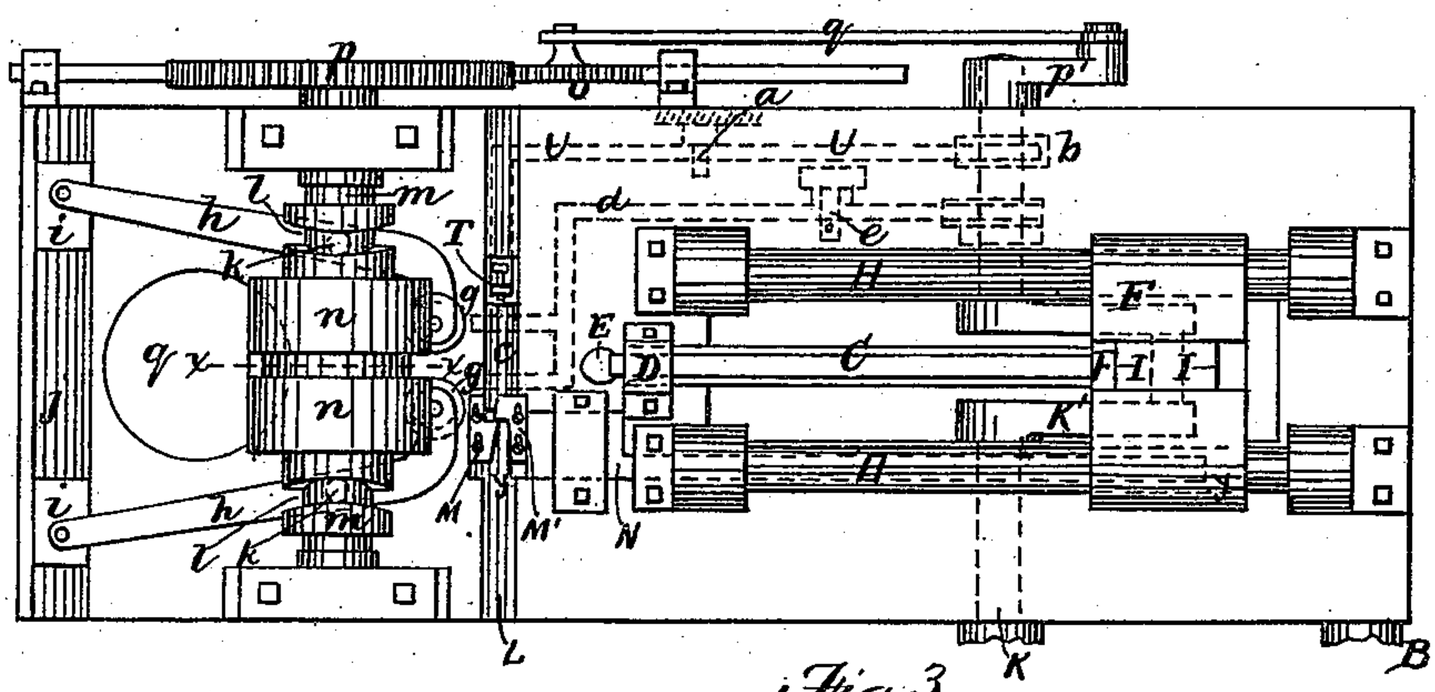

Fig. 4.

Fig. 3.

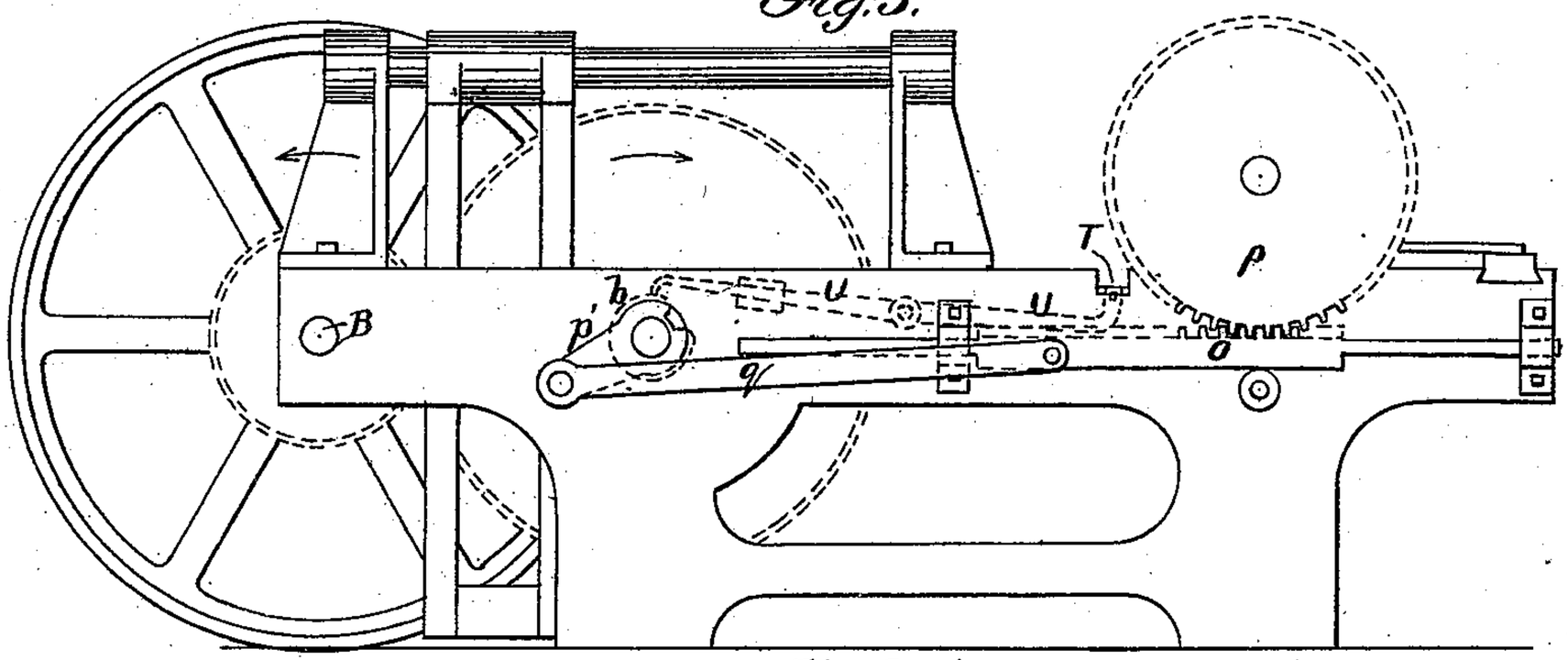

Fig. 5.

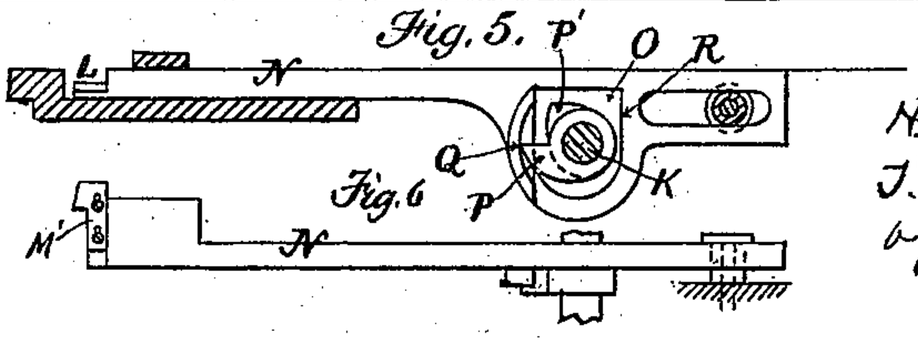

Fig. 6

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HORSESHOE MACHINE.

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Fig. 7.

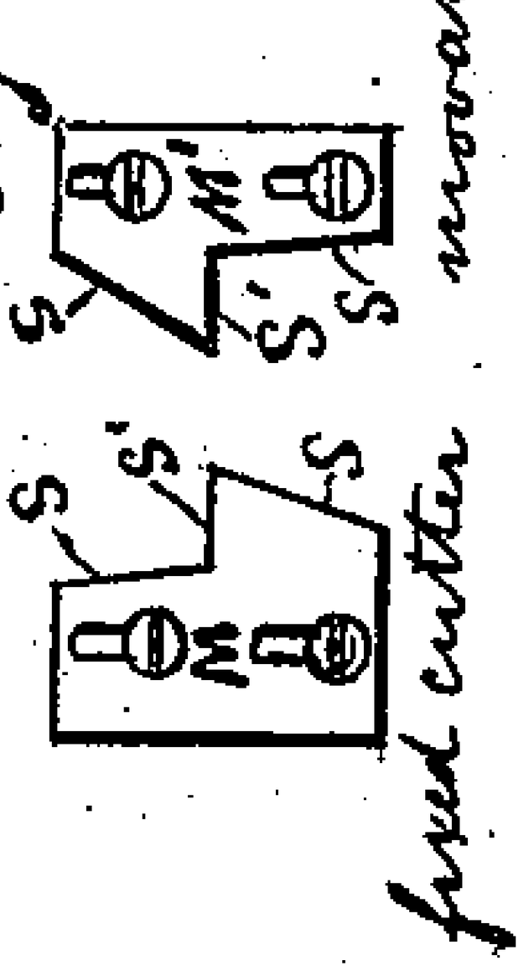
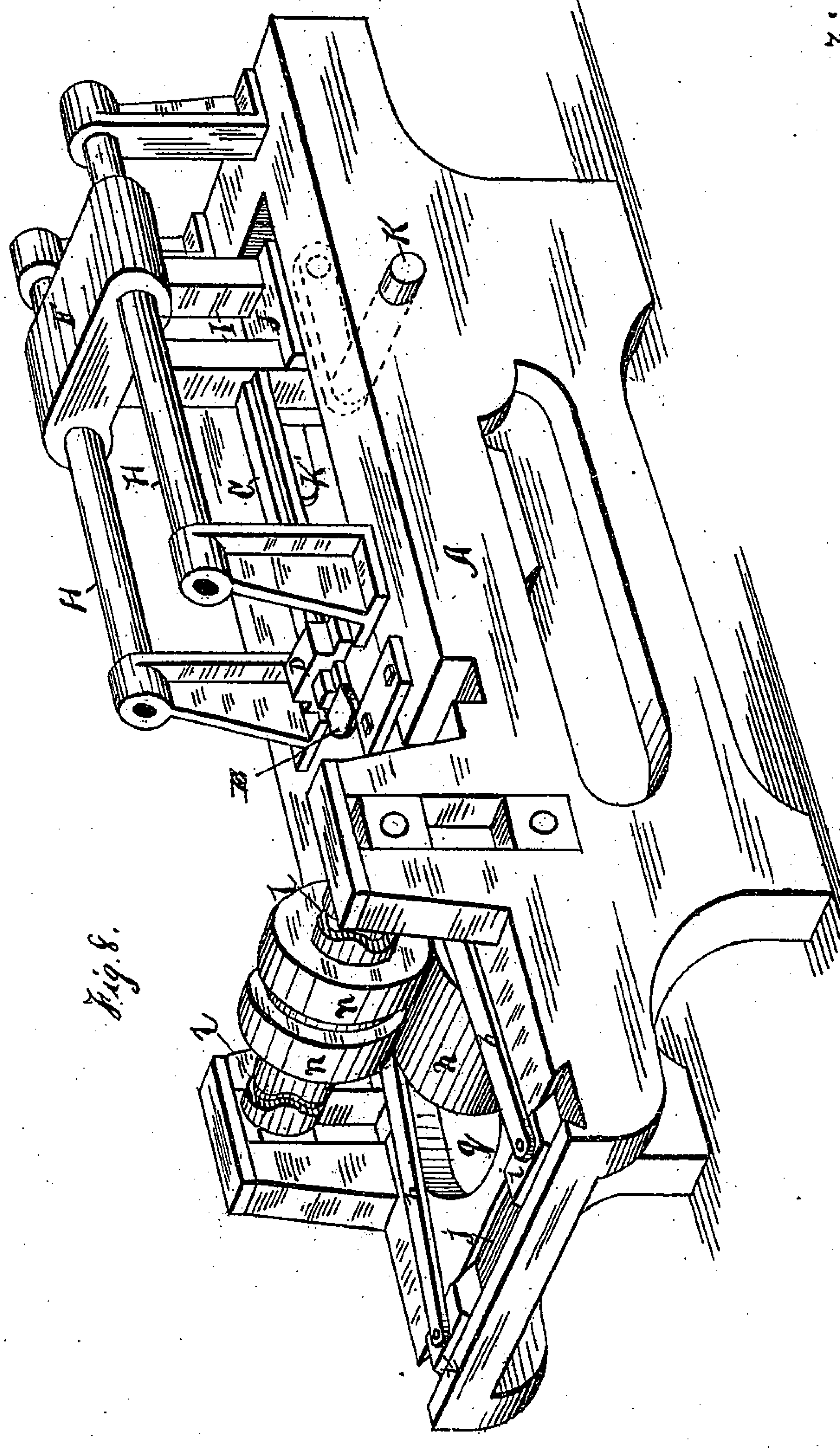


Fig. 8.



Witnesses.
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A. L. White

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UNITED STATES PATENT OFFICE.

HAZEN J. BATCHELDER, OF WATERBURY, VERMONT, AND THEODORE S. VERY, OF BOSTON, MASS., ASSIGNORS TO SAID THEODORE S. VERY.

HORSESHOE-MACHINE.

SPECIFICATION forming part of Letters Patent No. 355,635, dated January 4, 1887.

Application filed December 20, 1881. Renewed June 16, 1884. Again renewed June 23, 1886. Serial No. 205,997. (No model.)

To all whom it may concern:

Be it known that we, HAZEN J. BATCHELDER, of Waterbury, county of Washington, and State of Vermont, and THEODORE S. VERY, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Horseshoe-Machines, of which the following is a specification.

This invention has for its object to provide a simple and effective machine capable of cutting a blank from a bar of iron, bending said blank into horseshoe form, and rolling the sides of the bent blank to flatten and compress the blank.

The invention consists in the combinations of parts and details of construction, hereinafter described and claimed.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a side elevation of a horseshoe-machine embodying my invention. Fig. 2 represents a plan view of the same. Fig. 3 represents an elevation of the opposite side. Fig. 4 represents a section on line X X, Fig. 2. Fig. 5 represents a section on line Y Y, Fig. 2. Fig. 6 represents a top view of the mechanism shown in Fig. 5. Fig. 7 represents an enlarged view of the cutters. Fig. 8 represents a perspective view of the machine.

The same letters of reference indicate the same parts in all the figures.

In the drawings, A represents the general frame of the machine, in one end of which is journaled a driving-shaft, B.

C represents a stout rod or bar of metal extending longitudinally of the frame, and adapted to slide in a guide, D, thereon. To one end of the bar C is rigidly affixed a bending-die, E, the margin of which has the form of the inner edge of a horseshoe. The opposite or rear end of the bar C is attached to a cross-head, F, adapted to reciprocate longitudinally of the frame A on guides H H, and carry with it the bar C and its die. The cross-head F is provided with vertical guides or ways I I, between which a slide, J, is adapted to reciprocate.

K represents a crank-shaft, driven by the main shaft B, and having a crank, K′, which is journaled in the slide J. When the shaft K is rotated, the crank K′ reciprocates the slide J vertically in the guides I, and the cross-head F longitudinally on the guides H. The bending-die E is thus reciprocated.

L represents a transverse groove in the upper surface of the frame A, the bottom of said groove being below the plane in which the bending-die reciprocates. Said groove is adapted to receive the bar of iron from which lengths are cut to form horseshoes.

M M′ represent the cutters which sever the iron in the groove L. The cutter M is fixed, while M′ is attached to a reciprocating bar, N, adapted to slide in guides in the frame A and provided with an opening, O, (see Fig. 5,) through which the shaft K passes. The shaft K has two cams, P P′, which reciprocate the bar N, the cam P striking a flange, Q, on said bar and giving the bar a forward movement, and the cam P′ striking the rear edge, R, of the opening O and giving the bar a backward movement.

The cutters M M′ are are provided at opposite sides of their meeting edges or shear-blades with diagonal surfaces S S. When the cutter M′ is drawn back, space is afforded between the cutters for the horseshoe-bar. When the cutter M′ is advanced, the two cutters co-operate to sever the horseshoe-bar and separate a blank therefrom, and the diagonal surfaces S S co-operate in tapering the adjacent ends of the bar and blank, so that when the blank is bent into a horseshoe the heels will have the requisite taper.

The groove L is provided with a gage, T, on the end of a lever, U, which is pivoted at *a* to the frame A, and bears at its rear end on a cam, *b*, on the shaft K, said cam having a single depression, which allows the rear end of the lever U to fall and the forward end with the gage T to rise once during each rotation of the shaft. When the gage T rises, it is in position to arrest a horseshoe-bar thrust into the groove L. When the lever U is in contact with the other portions of the cam *b*, its rear end is raised and its forward end with the gage is depressed, the gage sinking below the bottom of the groove L and becoming inop-

erative. These movements of the gage are so timed that it rises and becomes operative as a gage only when the bar of iron is fed into the groove or recess L. The gage arrests the bar; but before the cutters sever it the gage falls and ceases to obstruct the end of the bar. The operation of severing the bar and tapering the ends at the severed portion slightly elongates the blank or portion cut off while it lies in the groove or recess L. If the gage were fixed in said groove, the elongation of the blank would cause it to become slightly bent upward, both ends being confined. By dropping the gage before the blank is severed this is avoided, and the blank is allowed space for elongation.

c represents a lifting device, which is composed of a shelf normally forming a part of the bottom of the groove L and supported by a lever, *d*, which is pivoted at *e* to the frame and is intermittently depressed at its rear end by a cam or stud, *f*, on the shaft K, so as to raise its forward end and the lifter *c*, and thereby elevate the blank after it has been severed to a position where the bending-die can take it when said die moves forward.

g g represent bending-rollers pivoted to the ends of levers *h h*, which are pivoted at their outer ends to slides *i i* in a groove, *j*, in the frame A. The levers *h h* are provided with studs *k k*, engaged with cam-grooves *l l* in a shaft or arbor, *m*. Said arbor supports a roller, *n*, hereinafter described, and is oscillated—that is to say, rotated alternately in one direction and the other—by means of a reciprocating rack, *o*, meshing with a gear, *p*, on the end of said arbor. Said rack is reciprocated by means of a crank, *p'*, on the shaft K and a pitman, *q*, connecting said crank with the rack. The oscillation of the arbor *m* causes the grooves *l l* to oscillate the levers *h h* and move the rollers *g g* alternately toward and from each other.

The rollers *g* are so arranged that when the bending-die E moves forward it will pass between said rollers and press the blank (which it pushes from the lifter in its forward movement) against the rollers, which arrest the ends of the blank, while the die E moves on and bends the blank into a U shape. The rollers *g g* move inwardly after the bending-die has passed between them sufficiently far and press the ends of the blank closely against the curved sides of the die, thereby completing the bending of the blank and giving it the exact shape of the margin of the bending-die. After this the rollers *g g* separate.

The roll *n*, before referred to, is the upper one of a pair of rolls, *n n'*, the arbors *m m'* of which are journaled in boxes in the frame A. Said rolls *n n'* are arranged to receive between them the bending-die E and the bent blank thereon after said die has passed between the bending-rollers *g g* and flatten and compress the sides of the bent blank, eradicating the burrs and protuberances formed on the sides of the blank by the preceding operations, and rendering them hard and compact. The roll *n* is oscillated, as above described, with its arbor *m*, and its oscillations are so timed that it rotates in the direction indicated by the arrow in Fig. 4, when the bending-die approaches the points of nearest approach of the rolls *n n'*, and continues to rotate in the same direction until all parts of the sides of the bent blank are rolled. The blank drops or is knocked off from the bending-die after passing between the rolls *n n'*, and falls through an orifice, *q*, in the frame A. After this the rolls *n n'* rotate in the opposite direction, and the bending-die is retracted.

The bar C of the bending-die is preferably thicker than the die itself, to make it sufficiently stiff, and to accommodate the bar when the die is passing between the rolls *n n'* we provide the roll *n* with a groove, *t*, extending only partly around the periphery of the roll, said groove being of sufficient depth to receive the portion of the bar C that projects above the bending-die. The portion of the periphery of the roll *n* between the ends of the groove is of sufficient extent to roll the bent blank, as described.

The general operation of the described mechanism is as follows: The bar of horseshoe-iron is placed in the groove L, with its inner end against the gage T, said end having been previously tapered. The bar is then severed, leaving a blank on the lifter *c*. After this the sequence is as follows: first, the lifter rises; secondly, the bending-die moves forward, forcing the blank against the rolls *g g* and bending the same; thirdly, the bending-rolls *g g* are moved inwardly, completing the bending of the blank; and, fourthly, the bent blank is passed with the die E between the rolls *n n'*. The result of these operations is a blank rolled, compacted, and made smooth on its outer edge and on its sides, the rollers *g g* having a smoothing and compacting effect. The mechanism employed is simple and effective, and is not liable to be disarranged or broken by ordinary use.

It will be observed that of the surfaces *s' s'* of the cutters M M', which are at right angles to the groove L, the surface of the movable cutter M faces the outer end of the groove, while the corresponding surface of the fixed cutter faces the rear end. This arrangement leaves the end of the bar of horseshoe-iron B' unobstructed when the movable cutter is retracted, as shown in Fig. 7, so that said bar can be fed directly forward without lateral change of position.

We claim—

1. In a horseshoe-machine, the combination of the cutting-off and end-tapering mechanism, the reciprocating former, the bending and edge smoothing rolls, mechanism for positively oscillating said rolls to cause them to follow the outline of the former, and the oscillating smooth-surfaced rolls for flattening and compressing the sides of the shoe, as set forth.

2. In a horseshoe-machine, the combination, with the reciprocating bending-die, of the lat-

erally reciprocating or vibrating bending-rolls and mechanism, consisting of the pivoted levers *h h* and positively-rotated cams *l l*, whereby said rolls are positively oscillated, and thereby adapted to press the ends of the blank inwardly against the sides of the bending-die, as set forth.

3. The combination of the bending-die attached to the end of a reciprocating rod or bar of greater thickness than the die and the oscillating rolls *n n'*, having their rolling-surfaces separated sufficiently to admit the former between them, the roll *n'*, having a groove, *t*, extending partly around its periphery, and adapted to receive the end of the bar C when the die E is projected between the rolling-surfaces of the rolls *n n'*, as set forth.

4. The combination of the reciprocating bending-die, the flattening-rolls *n n'*, mechanism for oscillating said rolls, the bending-rolls journaled in levers *h h*, and the cams *l l*, for positively oscillating said levers to cause their rollers to press the shoe against the sides of the bending-die while the die is moving forward and to remove the rollers *g g* when the die is receding, as set forth.

5. In combination with the bending-die and its supporting-bar, the cross-head F, adapted to slide on substantially horizontal guides on the frame of the machine, a slide, J, adapted to slide vertically in guides on the cross-head, and a rotating crank-shaft journaled in the frame of the machine and having its crank journaled in the slide, whereby the bending-die is reciprocated horizontally, as set forth.

6. In a horseshoe-machine, the combination, with the cutting-off and end-tapering devices, of the movable gage and mechanism for imparting intermittent action to said gage, whereby the latter is made inoperative while the horseshoe-bar is being severed and tapered, thereby affording room for the lengthening of the blank caused by the action of the severing and tapering devices.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, this 11th day of November, A. D. 1881.

HAZEN J. BATCHELDER.
THEODORE S. VERY.

Witnesses:
LEWIS O. MORSE,
JAS. K. FULLERTON.