2 Sheets—Sheet 1.

J. MORGAN.

Machine for Making Harrow Teeth.

No. 240,920. **Patented May 3, 1881.**

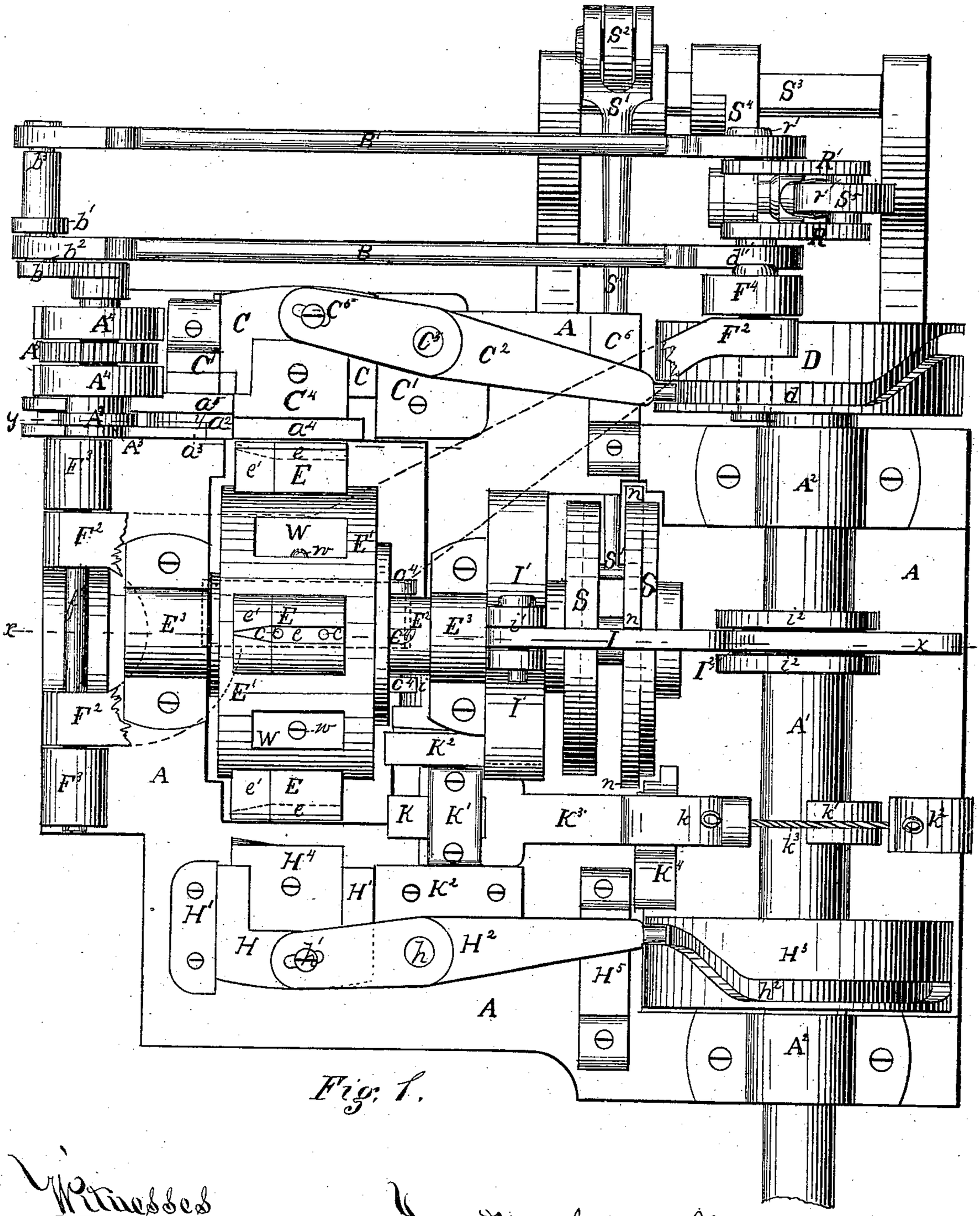

Fig. 1.

Witnesses
C. L. Parker
R. H. Whittlesey

Inventor James Morgan,
By Attorney George H. Christy

2 Sheets—Sheet 2.

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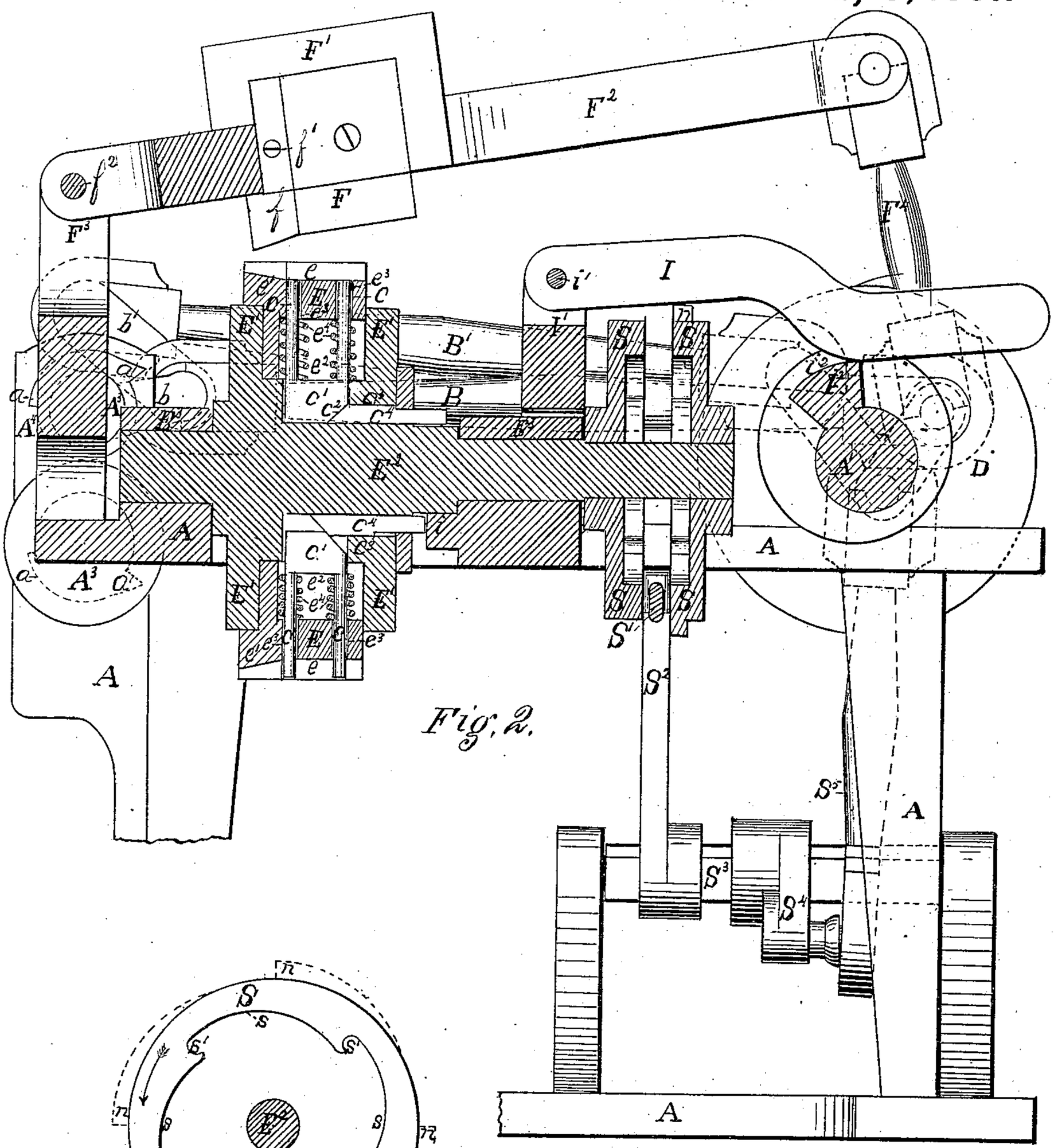

Fig: 2.

Fig: 4.

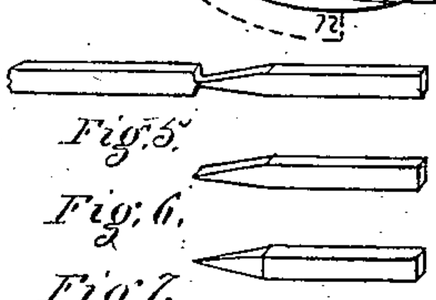

Fig: 5.

Fig: 6.

Fig: 7.

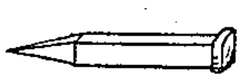

Fig: 8.

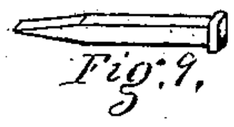

Fig: 9.

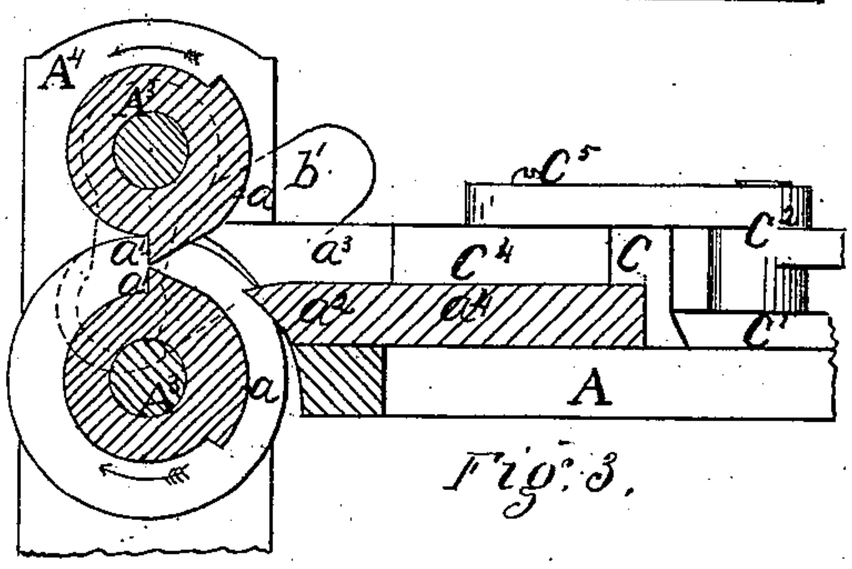

Fig: 3.

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UNITED STATES PATENT OFFICE.

JAMES MORGAN, OF PITTSBURG, PENNSYLVANIA.

MACHINE FOR MAKING HARROW-TEETH.

SPECIFICATION forming part of Letters Patent No. 240,920, dated May 3, 1881.

Application filed February 6, 1880.

To all whom it may concern:

Be it known that I, JAMES MORGAN, of Pittsburg, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Machines for Making Harrow-Teeth; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1 is a top-plan view of my improved machine. Fig. 2 is a vertical sectional view in the plane of the line *x x*, Fig. 1. Fig. 3 is a similar view, but taken in the plane of the line *y y*, Fig. 1, through the feed-rolls. Fig. 4 shows, in rear elevation, a part of the mechanism employed for giving to the die-shaft intermittent rotary motion; and Figs. 5, 6, 7, 8, and 9 are views illustrative of the successive steps in forming harrow-teeth or similar articles from continuous bars with my improved machine.

My invention relates to a machine for making harrow-teeth and similar articles, in which I employ feed-rolls which rotate continuously, but give an intermittent forward feed to the bar, and in so doing sever, or partially sever, the successive blanks and give to them a chisel or wedge point at one end, as in Fig. 5; a device to complete, if necessary, the severance of the blanks, as in Fig. 6, and move them sidewise into the cavity of a female forming die or dies, which dies are fixed to the periphery of a rotary head; mechanism for giving to such dies intermittent rotary motion; a male die arranged and adapted to enter the open side of the female die-cavities, and swage or form a four-sided point on the blank, as in Fig. 7; a griping device for holding the blanks within the die-cavities while a head is upset thereon, as in Fig. 8, with mechanism for operating the header, and mechanism for discharging the finished article from the die-cavities. The particular construction, adaptation, and arrangement of these parts and the operation of the same will appear from the following description:

The frame of the machine is represented at A, which may be of any suitable construction for supporting the several parts of the apparatus. Upon one end of this frame is mounted a driving-shaft, A′, in boxes A^2. Power may be communicated to the shaft in any convenient way. At the other end of the machine a pair of feed-rolls, A^3, are mounted in housings A^4. The usual or any desired means may be employed for making these rolls adjustable toward and from each other or removable, so that bars of different sizes may be passed between them by varying their adjustment or by substituting others. Upon the face of each of these rolls I make tongues *a*, extending part way around, as shown, their length equaling the length of blank desired. The rolls are also geared with pinions A^5, in such relation that these tongues register or coincide, as in Fig. 3, and taking a bite upon a bar fed between them will, with each revolution, pass it along a distance equal to the length of the tongues, but while the rolls are making that part of their revolution in which the cut-away or plain faces of the rolls are adjacent to the bar they will not take a bite upon the bar, and it will be at rest. I also add another feature to these tongues *a*, by which I make a wedge-shaped point upon the rear end of each blank, as well as nearly or quite sever it from the bar, as in Fig. 5. This I do by gradually deepening the tongues or gradually elevating them at their delivery end *a′*, so that as the bar passes between such parts it will be reduced gradually to, or nearly to, its central line at the end of the blank, where the ends of the tongues come nearly or quite in contact, as in Fig. 3; also, the ending of the tongues at this point is abrupt, so as to give practically a square shoulder or end to the bar. The length of the bevel on the end of the blank may be made long or short, as desired, by properly shaping the tongues or the length of their deepened part *a′*.

Continuous rotary motion is given to the rolls by two rods or pitman-bars, B B′, which couple one of the rolls with the driving-shaft A′. The connection to the roll is made by a double crank, *b b′*, the wrists of which are in different radial planes—that is, the arm *b′* of the outer crank extends from the end of wrist b^2 in a different direction from arm *b*, but, by preference, so that its wrist b^3 shall be the same, or nearly the same, distance from the axial line of the roll as the wrist b^2, and the two wrists be separated from each other nearly

a quadrant. By this arrangement dead-centers are avoided, and one or the other of bars B B′ will at all times be acting upon the rolls with considerable leverage, and thus the rolls will be moved steadily, notwithstanding the varying work which they perform.

The connection of bars B B′ to the driving-shaft is similar to that with the rolls, but with other crank-connections interposed. Thus the bar B is pivoted to a wrist-pin, d', which extends out from wheel D. To the end of this wrist a crank-arm, R, with wrist r, is attached, to which a pitman, S^5, is connected, as hereinafter described; and from the end of wrist r another arm, R′, is extended in a different direction from arm R, and terminates in a wrist, r', to which bar B′ is pivoted. The wrists d' and r' stand in the same relation to their center of motion as the wrists b^2 and b^3, and for a like purpose. Any suitable box or pivot connection may be used on the ends of bars B B′.

In the line of feed I arrange a guide-box having a bottom, a^2, and vertical sides a^3. The length and position of sides a^3 is made such that the ends of the blanks shall successively stop or rest at the ends of such sides most remote from the rolls, or, in other words, the distance from the delivery-point of the rolls to the remote end of walls a^3 is equal to the length of a blank. The bottom a^2 is extended beyond this point a distance equal to the length of a blank and in the line of feed, forming thereby a flat table, a^4, onto which the blanks are successively pushed endwise by the feeding operation. In order to push these blanks sidewise off the table I make use of a sliding block or holder, C, guided by dovetail-shaped cheeks or guides C′, which are secured to the frame or bed-plate. Motion is given to sliding block C by a lever, C^2, pivoted to the bed, as at C^3, one end having a pin-and-slot connection, C^5, with the block, and the other end working in a cam-groove, d, cut in the periphery of wheel D.

A removable die, C^4, is secured by bolts or screws to the face of block C, and it is so arranged as to sweep or be carried across the table a^4 by the movement of the block. A plate, C^6, supports the rear end of lever C^2. One end of die C^4 works close to the adjacent ends of side strips, a^3, so that the two constitute a shear to sever the blanks in case this is not wholly done by the tongues on the feed-rolls. As thus arranged there is one blank between the table a^4 and the delivery of the rolls, and room is thus secured for the working of die C^4 without danger of interfering with the action of the rolls. As the die C^4 moves across the table a^4 the blank thereon is pushed sidewise into the cavity e of a die, E. Three, four, or more of these dies are used. They are secured on the periphery of a rotary head or wheel, E′, by passing the bases or stems of the dies into mortises cut radially into the head, and they are secured therein by screws w, or otherwise, so that they may readily be removed and others substituted, when desired. Notches W are, by preference, made in the face of the die-head, between the die seats or mortises, and the screws w pass from the walls of these notches to or against the die-stems.

The head E′ is carried upon a shaft, E^2, which is journaled in boxes E^3 on the main frame or bed. An intermittent rotary motion is given to this shaft by mechanism hereinafter described, and such motion carries the dies E from the place of performing one step in the operation to the next. In so doing they are successively carried from the feed-table a^4 upward to the upper side of the shaft, where the point of the blank is swaged or pressed to a pyramid form, as in Fig. 7. To this end the side walls of the cavities e are given a form corresponding to the previously tapered sides of the blank, and the bottom of the cavity takes an upward slope along the part corresponding to or between the converging walls. On account of the excess of wear on this part of the die-cavity I make it in a separate part or piece, e', which is secured to the body E of the die by screws, or otherwise, so that it may be removed and renewed, as desired. Also the cavities e are made deeper than the thickness of the blank, so that it may lie wholly within the cavity, even while the wedge-shaped end of the blank rests on the elevated part of the cavity at its apex. The object of this is to prevent the spreading out of the blank as it is swaged or pointed. This swaging is done by a vertically-reciprocating die, F, Fig. 2, the lower edge of which is adapted in form to enter the cavities e, and by closing the open side of the cavity to wholly inclose and shape the blank. I also make the wedge-shaped part f of the die F of a separate piece, and secure it to the body of the die, or to the block F′, in any convenient way, as by screws f', so that it may be reset or adjusted upward or downward, or removed and another piece substituted. I do this because this part of the die is subjected to the greatest wear or work, and being thin at its edge or apex it requires more frequent renewal than the rest of the die. The lower edge of this part f of the die is inclined downward toward its apex, so as to correspond to the walls of cavity e.

The block F′, to which die F is attached, is secured to or forms a part of a reciprocating beam, F^2, which is hinged or pivoted at one end by a rod, f^2, to a bifurcated standard, F^3, which extends upward from the main frame. At its other end this beam is connected by a pitman, F^4, with the wrist d'. As thus arranged the rotation of wheel D will give a vertically-reciprocating stroke to the die F, carrying it into and out of the die-cavities e as they are successively brought under it by the rotation of head E′. It will be observed that the depressed point or apex of die F first acts upon the blank, thus forcing the metal in the blank backward, and thereby securing a regular and symmetrical point. When the die F is withdrawn

from cavity *e* the die-head is given another quarter-turn, carrying the partially-completed blank to the heading apparatus on the side of the frame opposite that from which the blank was fed or pushed into the die-cavity. I here arrange a clamping device similar in construction and operation to the pushing-in device.

A sliding block or frame, H, guided by dovetail cheeks H′, is operated by lever H^2, which is pivoted to the frame by pin *h*. This lever is connected at one end by pin and slot *h′* to the sliding block, and its other end runs in a cam-groove, h^2, cut in the periphery of a wheel, H^3, which is carried on the driving-shaft. A plate, H^5, supports the rear end of the lever.

A removable die, H^4, is secured by screws or otherwise to the block H, and the working-edge of this die is made like that of die F, and is adapted, on the forward movement of block H, to enter the die-cavity *e* and bear against or clamp the blank throughout its length. While the blank is thus clamped the heading or upsetting operation is performed. This is done by a heading-die, K, which is carried in a sliding box or head, K′. Dovetail-shaped ways or strips K^2 guide the die and box, and a stem, K^3, extends back from head K′ to and against the driving-shaft A′, where it ends in an enlarged head, *k*, adapted to be operated on by a wiper, *k′*, on the shaft. This wiper gives the header a forward stroke, while a spring, k^2, connected to head *k* by rod k^3, gives reverse motion to the header. A projection, K^4, from the main frame gives support to the rear end of stem K^3. By the forward stroke of the header the projecting end of the blank is upset, forming a head thereon, as in Fig. 8, and at the same time the metal in the blank is crowded into the die-cavity, filling it in all parts and giving to the blank a full and well-finished outline. The form of cam-groove h^2 is such as to hold the die H^4 against the blank while this heading operation is performed, and also to remove it from the cavity before the dies E are given another quarter-turn. While this next part revolution is being given the finished article is discharged from the die-cavity *e* by means of push-rods *c*. These rods have a radial arrangement, like the dies E, and they pass through chambers e^2 and guide-holes e^3 in such dies to the bases of cavities *e*. At their inner ends these rods are joined to a block, *c′*, the under corner of which is cut away, making an inclined face, c^2, against which a bar, c^4, having a correspondingly-inclined end, abuts. These bars c^4 pass through mortises c^3 leading from the rear face of head E′ to the interior chamber, and are adapted to move endwise therein. When they are pushed inward they lift the blocks *c′* by their action on the incline c^2, and thus the rods *c* are thrust outward into the die-cavities *e*, as represented on the under side of Fig. 2, and the cavities will be cleared. When the force which gave bars c^4 their inward thrust is removed the springs e^4, arranged around the rods *c*, will force the blocks *c′* downward or inward, and thus withdraw rods *c* from the die-cavities, as shown on the upper side of Fig. 2. The side walls of the die-stems are, by preference, extended to the base of the mortise in the die-head, so as to give the dies a solid bearing, and the blocks *c′* are made of proper form to enter the chamber e^2 between these side walls as they are lifted. If preferred, however, the chambers e^2 may be made below the stems of the dies and the stems made solid, with the exception of holes e^3; but I prefer the construction shown, as the work is thereby made more compact and space is economized. The requisite inward thrust is given to bars c^4 by an incline, *i*, on the cross-bar of the frame, along which the outer ends of bars c^4 are carried as they rotate with the head E′. This incline is extended through nearly the quarter of revolution, and ends or terminates on the under side of shaft E^2. Easy and steady working of bars c^4 is thus secured. When the bars have passed the incline the springs e^4 withdraw the rods *c* from the die-cavities, as before stated.

Any suitable or desired mechanism may be employed for giving to dies E and shaft E^2 the desired intermittent rotary motion. That which I prefer to employ is substantially the same as that embodied by me in a separate application which is now pending. I will describe this mechanism briefly.

On the rear end of shaft E^2 are secured two disk-wheels, S S, which are separated by a little space. The inner or adjacent faces of these wheels are cut out, forming the rim scroll-shaped inclines *s*, terminating in hook-seats *s′*, which are so shaped that a double hook, S′, arranged to work on such inclines, can pass over them in one direction from one set of hook-seats, *s′*, to the next, but if drawn in the opposite direction the hook will catch in the seats and give motion to the shaft. In the prior application referred to one such scroll-disk was used with a single hook. I prefer, however, to use two and a double hook, as shown, as the driving force is better balanced and greater strength is secured. The hook S′ receives from the driving-shaft a reciprocating motion, the length of its throw being equal to the distance between hook-seats *s′*. This motion is secured as follows: The outer end of hook S′ is coupled to the upper end of arm S^2, which extends upward from rock-shaft S^3. A horizontal arm, S^4, from this rock-shaft is connected by a pitman, S^5, with the crank-wrist *r*, before mentioned. Thus the rotary movement of wheel D is converted into the desired reciprocating movement in hook S′.

In order to arrest the rotary movement of dies E with precision and at the desired points, I make use of ratchet-shaped stops *n*, arranged on the periphery of wheel S. A bar, I, is pivoted at one end to standard I′, as at *i′*, and is extended backward over wheel S, so as to engage stops *n*. The rear end of this bar rests in a cam, I^2, with side walls or guides, i^2, on

either side of the bar to keep it in position. As the cam revolves the bar is successively lifted, and when so lifted, as represented in Fig. 2, the stop *n* is moved past it by the rotary movement of S. The bar I then is allowed to descend in time to engage the next stop *n*. The distance between stops *n* of course coincides with that between hook-seats *s'*.

While I have designed my machine expressly for making harrow-teeth having a head and a four-sided point, yet by a slight change in the form of the shaping-dies other forms of product may be made—as, for example, wedge-pointed spikes, as in Fig. 9. In such case the swaging-die F is not needed, and the bottom of die-cavity *e* is made straight or flat instead of sloping upward at the apex. Also, the edge of die H^4 is made straight. Aside from this the construction and operation of the machine will be the same as before described.

I claim as my invention—

1. In a machine for making harrow-teeth, a rotary die head or carrier, in combination with the pointing-dies E and F, the female die E having a three-walled open-sided cavity, *e*, therein, the side walls of which converge at one end of the cavity to junction, while the bottom of the cavity has a corresponding upward slope at the converging end, and the male die F having at one end of its working edge or face a forwardly-sloping wedge-shaped or pointed projection, *f*, the two dies being adapted, as described, to swage a four-sided pyramid point on a wedge-pointed blank, substantially as set forth.

2. The rotary die head or carrier E', in combination with dies E, arranged radially therein, push-rods *c c*, arranged to enter the die-cavities near their ends, block *c'*, joining the two rods within the chambered die-stems and head, springs c^4, for withdrawing rods *c* from the die-cavities and bar c^4, and stationary incline *i*, for forcing the rods into the cavities, substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand.

JAMES MORGAN.

Witnesses:

C. L. PARKER,

R. H. WHITTLESEY.