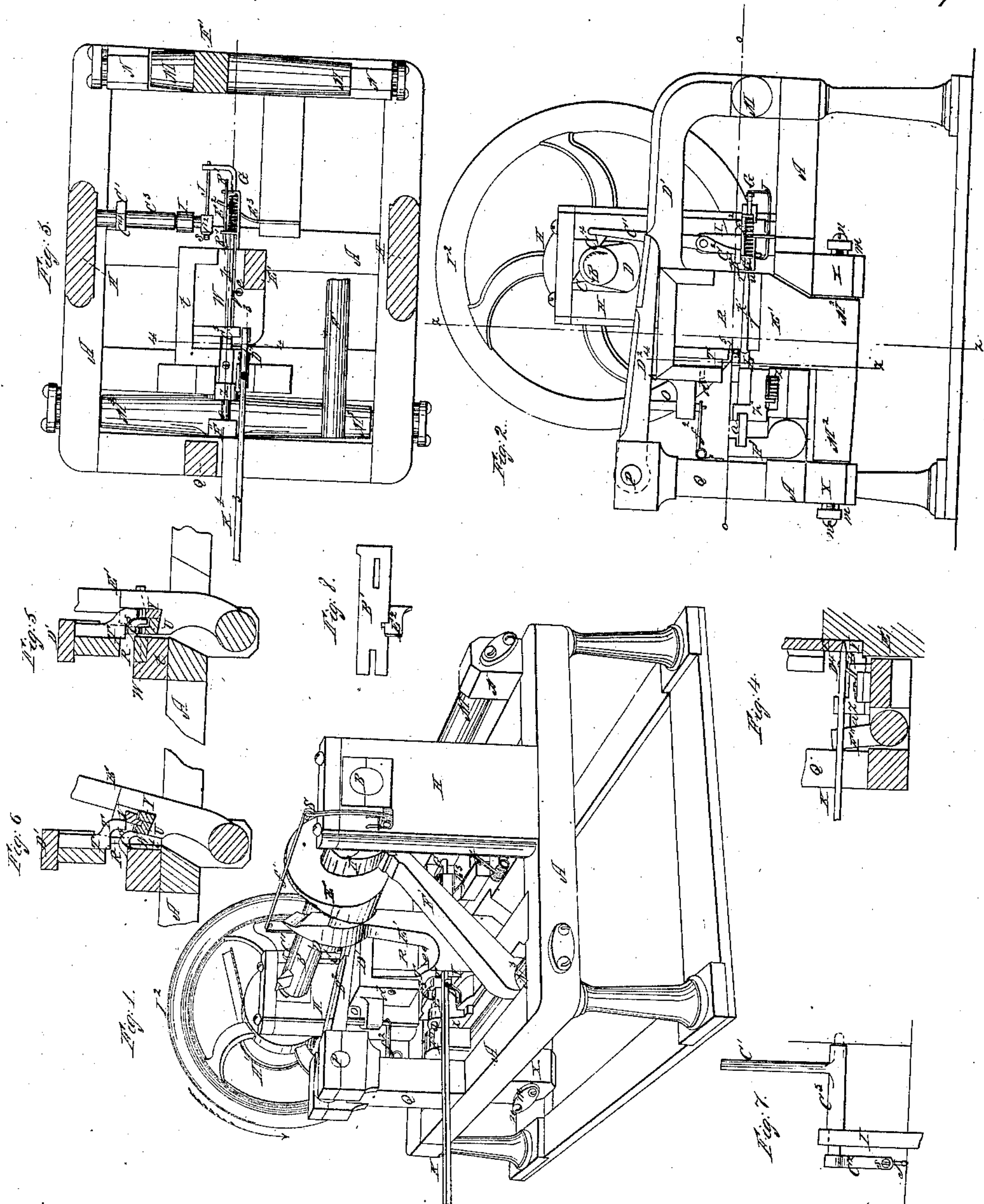


M. Maxim,

Making Spikes,

N<sup>o</sup> 6,160.

Patented Mar. 10, 1849.



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Making Spikes,

N<sup>o</sup> 6160.

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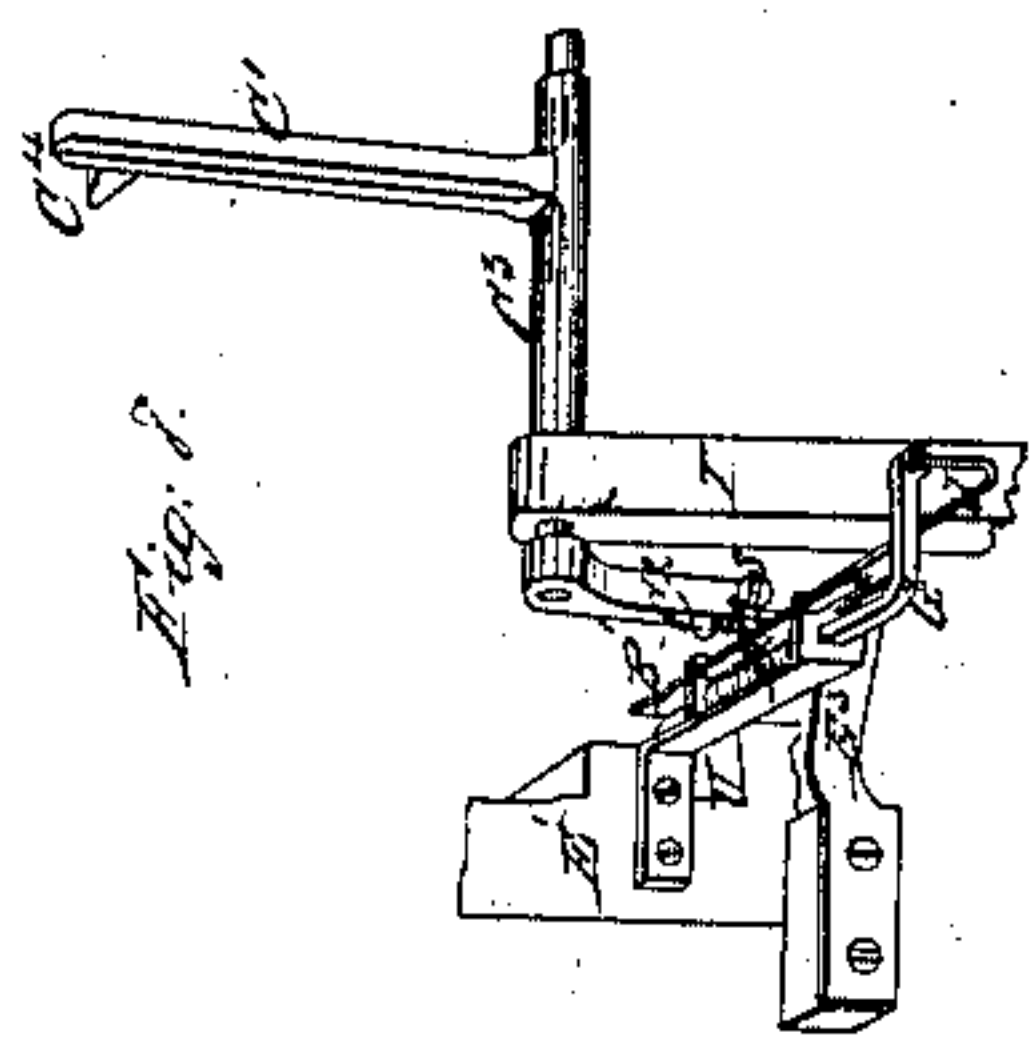
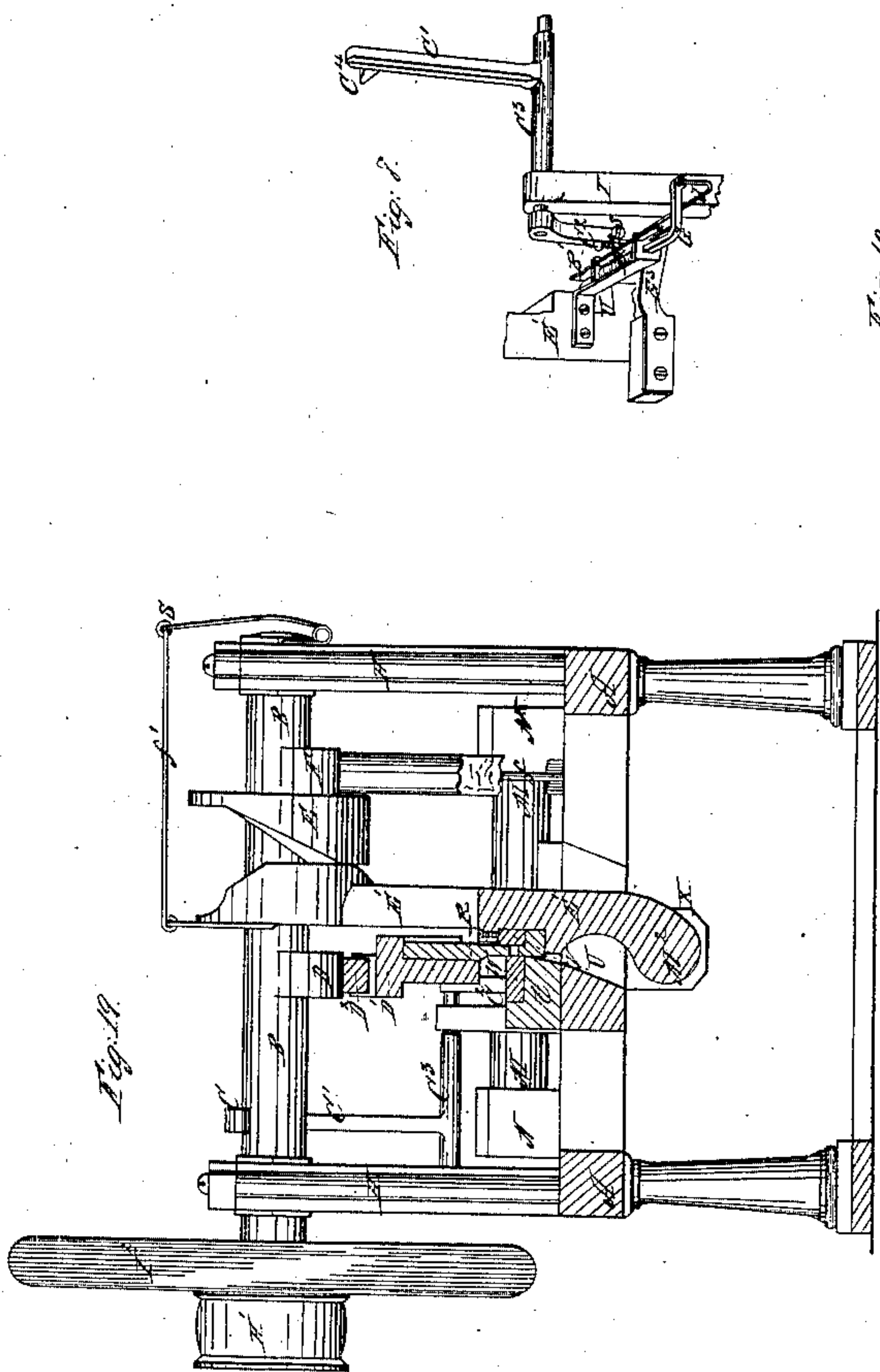


Fig. 10.

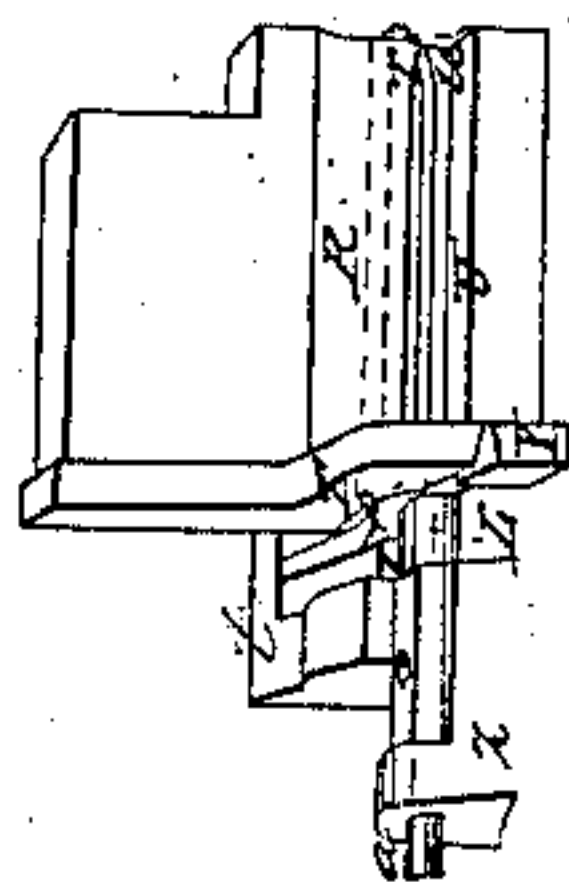


Fig. 16.



Fig. 11.



Fig. 12.

Fig. 20.



Fig. 13.

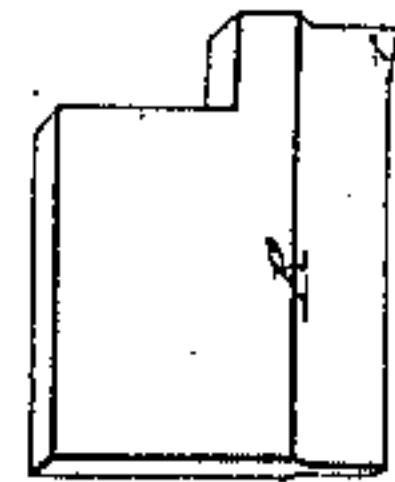


Fig. 15.



Fig. 14.



Fig. 18.

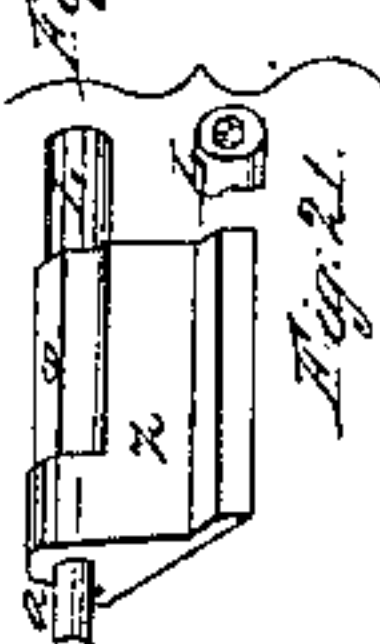
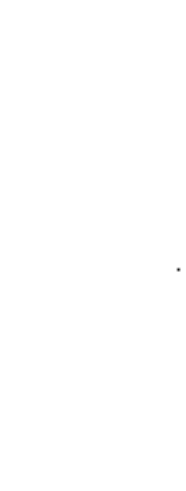


Fig. 17.



Fig. 21.





# UNITED STATES PATENT OFFICE.

MARCUS MAXIM, OF NEW CASTLE, PENNSYLVANIA.

## SPIKE-MACHINE.

Specification of Letters Patent No. 6,160, dated March 10, 1849.

*To all whom it may concern:*

Be it known that I, MARCUS MAXIM, of New Castle, in the county of Mercer and State of Pennsylvania, have invented a new and useful Machine for Making Wrought-Iron or Pressed Spikes to be called "a Wrought or Pressed Spike Machine"; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed drawings, making part of this specification.

Figure 1, is a perspective view showing the machine in the act of pressing a spike, forming the head and preparing a point for the next spike. Fig. 2, is a vertical longitudinal section on the line 1, 1, of Fig. 3 showing a spike in the dies in the act of being headed, pointed, and shaped on its sides. Fig. 3, is a horizontal section on the line *v, v*, of Fig. 2, showing a piece of iron cut from the spike rod and conveyed into the dies in a line with the header. Fig. 4, is a vertical longitudinal sectional view showing the short pointing dies in action, said view being drawn on the line 3, 3, of Fig. 3. Fig. 5, is a transverse sectional view representing the dies in action—drawn on the dotted line 4—4 of Fig. 3. Fig. 6, is a transverse sectional view showing the dies as out of action also drawn on the line 4 4 of Fig. 3. Fig. 7, is an elevation of the horizontal rock shaft *C*<sup>3</sup> and arm *C'* and short post *L*. Fig. 8, is an elevation of the notched guide, or holder *B'* and angular way *E*<sup>3</sup>. Fig. 9, is a perspective view of the mechanism for gaging the length of the spike and forcing it after being cut from the spike rod back against the header and for holding the spike from falling from the under or bottom die, while being cut off from the rod. Fig. 10, is a perspective view of the four dies for pressing the four sides of the spike—the two dies for tapering the end of the rod from which the spikes are to be cut preparatory to being passed into the dies—of the cutter for cutting the spike from the rod detached from the levers by which they are operated. Also of the header detached from the slide. Fig. 11, is the upper beveled die *T* for sloping the upper side of the spike rod at one end, detached from its lever. Fig. 12, is a perspective view of the under beveled die *Y* mate to the upper one *T* represented in Fig. 11, for sloping the under side of the spike rod at the end detached from its lever. Fig. 13, is a perspective view of the upper longitudinal

die *R* for pressing the upper side of the spike. Fig. 14, is a perspective view of the die *U* or mate to die *R* being the bottom die for shaping the under side of spike. Fig. 15, is the side longitudinal stationary die *W* against which the side of the spike is pressed. Fig. 16 is the mate *V* to die *W* being the movable die for pressing the spike against the stationary die *W* on its opposite side. Fig. 17, is the stationary cutter secured to the end of the stationary die *W*. Fig. 18, is a perspective view of the header. Fig. 19, is a vertical transverse section of the machine on the dotted line *z z* of Fig. 2, the machine being represented in the act of pressing the point, and sides of the spike. Fig. 20, side, top, and end view of a finished spike. Fig. 21 view of the concave end of the heading die.

The arrows show the direction in which the cam shaft *B* turns.

The same letters in the several figures refer to like parts of the machine.

The nature of my invention and improvement consists in a certain new and useful combination of dies so shaped and arranged and operated that their combined action at their appointed times flattens, or points, the forward end of the spike rod simultaneously with the operation of finishing the sides and point of a spike previously cut from the spike-rod and passed into a set of finishing dies—then heading the spike and discharging it in a finished state—and then advancing the spike rod, thus previously pointed, into the finishing dies and while therein having a portion of it cut off for another spike—the several operations of pointing the spike rod, finishing the point of the spike, heading the spike and discharging the finished spike being performed at every revolution of the cam shaft of the machine. Also in the use of a sliding guide and holder which holds the spike rod on the bottom die while a portion of it is cut off for a spike, said guide and holder retiring out of the way while the spike is being pressed in the dies. Likewise in a novel arrangement and application of a gage for gaging the length of the piece of iron cut off from the spike rod to form a spike and for conveying it when cut off to the heading die. And in a new arrangement of a stationary cutter for cutting the pieces of iron to form the spikes from the rod.

Upon a suitable frame *A* of adequate size



and strength resting upon the caps of four columns, or otherwise arranged are raised two strong pillars H H mortised and tenoned or otherwise secured in the aforesaid frame. In these pillars is made to revolve a horizontal shaft B by the application of any adequate power to said shaft by band and pulley or cog wheels connected with the prime mover—there being a fly wheel I<sup>2</sup> on said shaft to regulate its movements. On this shaft are four cams C, D, E, F, for operating four levers successively. Cam C works the small lever C' C<sup>2</sup> C<sup>3</sup>—the fulcrum of which being the horizontal portion C<sup>3</sup> turning in one of the pillars H and a short post I, which serves as its bearing. Said lever actuating the gage G to move the spike forward toward the header to receive its head. Said gage being connected with the lever by means of a connecting rod J attached to the lever by a screw s and to the bent end of the gage which is brought back by a spiral spring as soon as it has performed its office of forcing the spike forward. Cam D works the compound or double levers D<sup>1</sup> D<sup>2</sup> to which are affixed the upper longitudinal die R and upper first pointing die T, for pointing the spike rod, and for pressing the upper side of the spike when in the dies. Cam E works the slide lever E', to which are affixed the mate Y to the pointing die T and the bottom die U and side die V which are moved simultaneously.

Cam F works the lever F' that moves the header L for heading the spike.

The small lever C' C<sup>2</sup> C<sup>3</sup> consists of a rock shaft C<sup>3</sup>, into which is inserted an arm C' at right angles thereto on which there is a protuberance or triangular projection C<sup>4</sup>, against the under inclined side of which the cam C strikes as the shaft B revolves for moving the upper branch of the lever back from the cam shaft. The lower branch of the lever is also inserted into the horizontal or middle branch C<sup>3</sup>, at right angles to the horizontal portion C<sup>3</sup>. The three branches C', C<sup>2</sup>, C<sup>3</sup>, united in the manner represented in the drawing constitute what I term the small lever for holding and operating the gage G. It will be seen hereafter that the protuberance C<sup>4</sup>, on the upper branch C', of the lever is kept in contact with the shaft B and cam C by the elastic force of the spiral spring F coiled around and attached to the gage. The office of this lever C', C<sup>2</sup>, C<sup>3</sup>, in addition to that of moving the gage G forward to convey the spike within reach of the header is to hold the gage in its required position to arrest the inward movement of the spike rod. This manner of connecting the gage G with the aforesaid lever C' through the agency of the connecting rod J and screw s or other mechanical equivalent and bringing the protuberance of the lever against the periphery of the cam shaft will

have the effect to hold the gage G in a fixed position until the said protuberance C<sup>4</sup>, is struck by the small cam C on shaft B when the said small lever will be vibrated as before stated which will cause the gage G to move longitudinally toward the dies as aforesaid.

The lever E', in which are secured the lower preparatory pointing die Y, the lower longitudinal finishing die U and one of the side dies V is hung on centers M<sup>2</sup>, M<sup>2</sup>, which turn in boxes X X secured to the frame A, said center serving as its fulcrum on which the said lever moves to the right and left in the arc of a circle toward and from the stationary side die W by the rotary motion of the cam E and the elastic force of the spring S connected to the lever E' by the connecting rod f'. The office of this lever E', is to hold and convey the dies U, V, Y to their destined point of action upon the spike.

m, n, are plates and screws for setting the lever longitudinally. A plate and pair of screws are applied to each center. The screws enter stationary parts of the frame or pillars raised thereon. The plates move with the screws toward or from the centers.

Lever F', or heading lever which is worked by cam F, is hung upon its centers M<sup>3</sup>, and turns in the arc of a circle described from the center M<sup>3</sup>, which center serves as the fulcrum of said lever and is provided with set screws and plates the same as those applied to the centers of the lever last named and is for the same purpose. The office of this lever is to work the heading slide or carriage Z and header L for heading the spike which sliding carriage Z is connected to the short arm F'', of the heading lever by a toggle or connecting bar a.

The compound lever D' D<sup>2</sup> to which the upper preparatory or pointing die T mate to die Y, and upper or finishing die R mate to bottom die U are affixed, is hung upon centers M, P, the centers M being at the back of the frame and those lettered P being at the front, in a post Q standing upon the frame A. The lower branch of the compound lever to which the aforesaid dies T R are affixed rises from the center M, curves forward and passes horizontally beneath the cam shaft B and upper branch D<sup>2</sup>, of the lever to near the front of the frame when it is connected to the upper branch of the lever immediately above it by the vertical connecting rod or toggle O by which the power of the said upper branch of the lever upon which the cam D acts is imparted to the lower branch containing the dies R, T. The levers D' and E' contain recesses or seats in which are placed and secured the dies R T U V being secured thereon by blocks and screws d, e or other suitable mechanical devices so that they can be easily removed and replaced when required. The screw d holds



the dies T and R. The screw  $e$  secures the dies U, V. The spring  $f^2$ , keeps the lever  $D^2$ , up and against the shaft and its cam D when not pressed down by cam D. The office of levers  $D^1$ , and  $D^2$ , aforesaid is to hold and serve as a vehicle for conveying the top die R to its proper point of action upon the spike and also to hold and convey another short bevel die T which presses upon the end of the spike rod from which the spikes are to be cut previous to being fed into the long dies to flatten the rod.

The cams on the cam shaft of course are to be so formed as to give the required movements to the dies by acting on the levers to which the dies are affixed.

The dies T and Y are beveled on their pressing faces so as to form when they come opposite each other in the act of pressing the end of the spike rod, a recess or space of a V shape nearly corresponding with the required shape of the end of the spike rod previously to its being conveyed into the long dies. In front of these dies is placed a hollow rest and guide  $D^4$ , secured to the frame through which the spike rod K is conducted to the preparatory pointing dies T and Y aforesaid. The bottom die U upon which the spike rod is conveyed after being partially pointed is made in the form represented in Figs. 2, 5, 6, 10, 14, 19, 16. The movable side die V is formed as represented in Figs. 3, 5, 16, 19. The stationary side die W is formed as represented in Figs. 3, 5, 15, and 19. This die is secured in a metallic stock or bed plate  $t$  fastened to the frame A. The cutter  $C^5$ , is arched next the face of the die W. Its shank is straight and is screwed to the die W. The arched form gives it greater strength and likewise forms an arched space over the header which moves back and forth in said space.

The upper die R is shaped as represented in Figs. 1, 2, 5, 6, 10, 13 and 19. Its under surface is the same form of the upper surface of the under die U and is designed with the under die to shape and finish two sides of the spike and to finish its point. The heading die L is recessed in the end that first strikes the spike rod and forms the head, the recess being the form of the required head. The form of recess represented in Fig. 21 makes the form of head represented in Fig. 20, which represents a spike when finished. This heading die is screwed or otherwise fastened to the sliding carriage Z. A helical or other spring  $z$  is placed in a cavity made in one of the transverse pieces of the frame beneath the carriage having one of its ends bearing against the frame and its other end against a projection from the carriage for the purpose of throwing back the carriage after a head has been formed.

The gage G to gage the length of the

spike and also to force the spike back toward the heading die to be headed is a bar of metal bent at right angles near one end its longer side being attached to the side lever  $E'$ , by metallic perforated plates in which it slides back and forth and its shorter side being connected to the small lever  $C'$  by means of the rod J as aforesaid. The plate by which the gage and forcing slide is connected to the side lever  $E'$  is bent at right angles at one end and forming a flange by which it is screwed to the said side lever. It is bent in an opposite direction at the other end forming a guide and support for the gage and holder containing an opening in which the gage moves back and forth and a T shaped head over which the slotted end of the sliding holder  $B'$ , moves. A small plate formed with a T shaped head and opening similar to those just described and for a similar purpose is secured to the aforesaid flanged plate near the lever. The helical spring for bringing back the gage after it has performed its office of conveying the spike to the header is coiled around the said gage between the outer turned end of the plate and the small plate last named having one end of said helical spring bearing against a pin passed through the gage. The stop pin just mentioned is inserted into the gage G and strikes against the turned end of the plate and arrests the back movement of the gage.

The holder for holding the piece of iron to form the spike while being cut from the spike rod upon the lower die and until said piece of iron after being cut off is brought nearly in contact with the stationary side die W and by which it is prevented from falling from the lower die, is a plate of metal  $B'$ , Fig. 8 slightly curved at one end and slotted or forked at the other end and slotted near the curved end where it moves over the aforesaid T shaped heads of the guide plates. This holder is notched on its lower edge to receive the upper edge of an inclined guide plate  $E^3$ , bolted to the frame for moving said holder as the side lever is vibrated or moved on its center. Said plate  $E^3$  acting as a double stationary cam causing the holder to move in, to grasp the spike as the lever  $E'$ , moves to the right and to move out as the said lever moves to the left.

The screw  $s$  that connects the connecting rod J to the arm  $C^2$  of the small lever serves to bring the gage nearer to or remove it farther from the dies as may be required in setting it correctly for arresting the advance of the spike rod in the long dies.

*Operation:* The operation of this machine is as follows.

First.—The machine being put in motion by any adequate power applied by band and pulley to the cam shaft B, the rod of iron



R, from which the spikes are to be cut previously pointed by the preparatory pointing dies T, Y, is fed in from front in a horizontal position as represented in Figs. 1, 3, and 4, on, or through, the guide D<sup>4</sup> to the bottom and side die U and V until it strikes against the gage G. Immediately after the rod is fed in, as aforesaid, the side cam E acts upon the side lever E', causing it to move and press the rod *k* toward the stationary cutting off knife C<sup>5</sup>, and at the same time to move the holder B', which holds the inner end of the rod against the dies, back over the pointed end of the rod simultaneously with the operation of cutting off the piece to form a spike; which retreating movement of the holder is effected by the stationary inclined plate E<sup>3</sup> over which the lower or grooved edge of the holder B' moves, said inclined plate being set and fixed at such angle as to move the holder the required distance and at the required time so that before the spike shall have touched the stationary side die W the holder B', will have moved back beyond the ends of the dies. The inclined plate E<sup>3</sup> will also cause the holder B' to move in toward the dies to be in readiness to hold the end of the spike rod where it is again moved in between the dies to form another spike.

As soon as the piece of rod cut off passes by the knife C<sup>5</sup>, far enough to come in range of the header L, which works under or through, the arch in the cutting off knife C<sup>5</sup> cam C acts upon the small lever C', which connects with the gage G by means of the connecting rod J and screw *s* as before described, and forces the piece of iron for the spike back toward the header L and sufficiently far beyond the ends of the dies R, U, V, W, to give the required amount of iron for the head which will be formed against the ends of these dies—the cam C continuing to revolve until it has passed over the protuberance C<sup>4</sup> on the lever C', the helical spring F<sup>2</sup>, then acts and suddenly throws back the gage G beyond the rear ends of the dies R, U, V, and out of their way. The side die V is then caused to press the spike *k* firmly against the stationary side die W by the action of the cam E on the line E'. The cam D then acts upon the compound lever D', D<sup>2</sup>, and presses the die R down upon the spike sufficiently hard to shape the point, the pressing surfaces of the top and bottom dies at *r*, *u*, being of the exact shape of the spike, when they come together as shown in Fig. 2. The spike being thus held and pressed in the dies the heading die is next brought against the end of the spike that projects beyond the ends of the longitudinal dies by the action of the cam F and the lever F', which connects with the sliding carriage Z in which is secured the horizontal sliding die L made with a de-

pression in its end of the exact size and shape of the required head of the spike as shown at Fig. 21 forcing it horizontally against the end of the spike *k* with sufficient force to form the head which will be flat on the surface that is crushed and spread over the ends of the longitudinal dies R, W U V and convex or angular on the surface formed in the aforesaid depression of the heading die Fig. 21, as represented in Fig. 20, which is a representation of the spike when finished.

The beveled portions *r*, *u*, of the upper and under dies that form the point of the spike prevent the possibility of the spike moving longitudinally in the dies during the heading operation. While the upper die R is descending upon the spike *k* by the action of the cam D on the compound lever in which the die R is secured the die T which is secured in the same compound lever is made to descend upon the end of the spike rod R resting upon the bevel die Y and presses and flattens the end of the continuous spike rod for the succeeding spike to be cut off—said preparatory flattening of the spike rod being necessary to the due formation of the spike by the succeeding operation of the long dies. This is an important feature of my machine, and is what particularly distinguishes it from other spike machines in use.

The header having performed its office of heading the spike and the cam D having passed by the compound lever and the cam F by the lever F' the slide Z with the heading die is forced back by the action of the spring *z* Fig. 2 and the compound lever is raised by the action of the spring *f*<sup>2</sup> and kept in contact with its cam D and shaft B, and the lever E is moved to the right by the spring S which keeps it in contact with the cam E. The lever F' is kept in contact with the cam F and lever B by the spring *f*. The small lever C' is held in contact with shaft B and cam C by the action of the helical spring F<sup>2</sup>. As the lever E', is moved to the right by the action of the spring S the spike *k* duly finished, is carried back on die U until the head of the spike comes in contact with the arch of the cutting off knife C<sup>5</sup> which serves as a cleaver, drawing the spike off the bottom die U, which falls out of the way, before the spike rod K is fed in again.

Secondly.—Before the spike rod K is fed into the long dies R U V W against the gage G, it is first fed into the preparatory flattening dies T, Y, to receive the pressure of these two bevel flattening and pointing dies which flatten and also widen the point of the rod. As soon as the cam shaft B of the machine makes nearly a revolution and the side lever E', falls back to the right bringing the bottom die U within range of



the rod K as it rests in the gage B<sup>4</sup>, (see Fig. 3,) the rod K is fed in against the gage G which will then be on a line with the spike rod the side lever E', will then move on its bearings until the spike is carried to the line of the heading die and in contact with the stationary side die W which die W will reduce the width of the end previously flattened in the dies T, Y, to the width of the spike rod, at the same time lengthening the point as it thus narrows it. By these two pressures, first by the bevel dies or preparatory pointers T, Y, and secondly by the pressure of the side dies V, W, the end of the spike is now so much reduced that it is readily brought to the desired shape by the bevel pointed dies R U, which, when they come together in the manner represented in Fig. 2, form a space of the exact shape of the required spike from head to point. But before the spike is pressed by the dies V, W, and R U and when it is in a line with the heading die L as represented in Fig. 3, it is moved longitudinally toward the heading die L the required distance to form the head by the action of the cam C and small lever and gage G as herein before described. The operation of flattening the end of the rod takes place simultaneously with the operation of shaping the sides of the spike. As soon as these operations and the heading operation are completed the dies open and the finished spike falls from the dies in the manner before stated; when the spike rod is again moved forward to the gage G for a repetition of the operation.

The first portion of the description of the operation relates to the formation of the first spike from the spike rod. The second

portion relates to the formation of the second spike and succeeding spikes, when the spikes will be pointed and pressed on its sides simultaneously with the operation of flattening the end of the spike rod preparatory to being passed into the long dies by the preparatory pointing dies T, Y, the office of which is to prepare the end of the rod for the succeeding spike (for the point) while the previous one is being finished in the long dies. This operation being of the greatest importance as it enables the finishing dies to do their work with great ease and perfection.

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

1. The combination of the dies T, Y, V, W, U, R, L, gage G holder B', and cutter C<sup>5</sup>, arranged and operating substantially as above described for making wrought spikes from a spike rod in a cold, or heated state, the spike rod being flattened at one end and the spike gaged, pointed, headed, and discharged at every revolution of the cam shaft B as herein fully set forth.

2. And this I claim whether the several parts be arranged precisely in the manner above described, or in any other mode, or manner, which may be substantially the same and by which analagous results shall be produced.

In testimony whereof I have hereunto signed my name before two subscribing witnesses.

MARCUS MAXIM.

Witnesses:

NICHOLAS J. MCGANN,  
JAS. DICKSON.