(No Model.) 3 Sheets—Sheet 1.

C. H. MORGAN & V. E. EDWARDS.

DIE HAMMERING MACHINE.

No. 587,372. Patented Aug. 3, 1897.

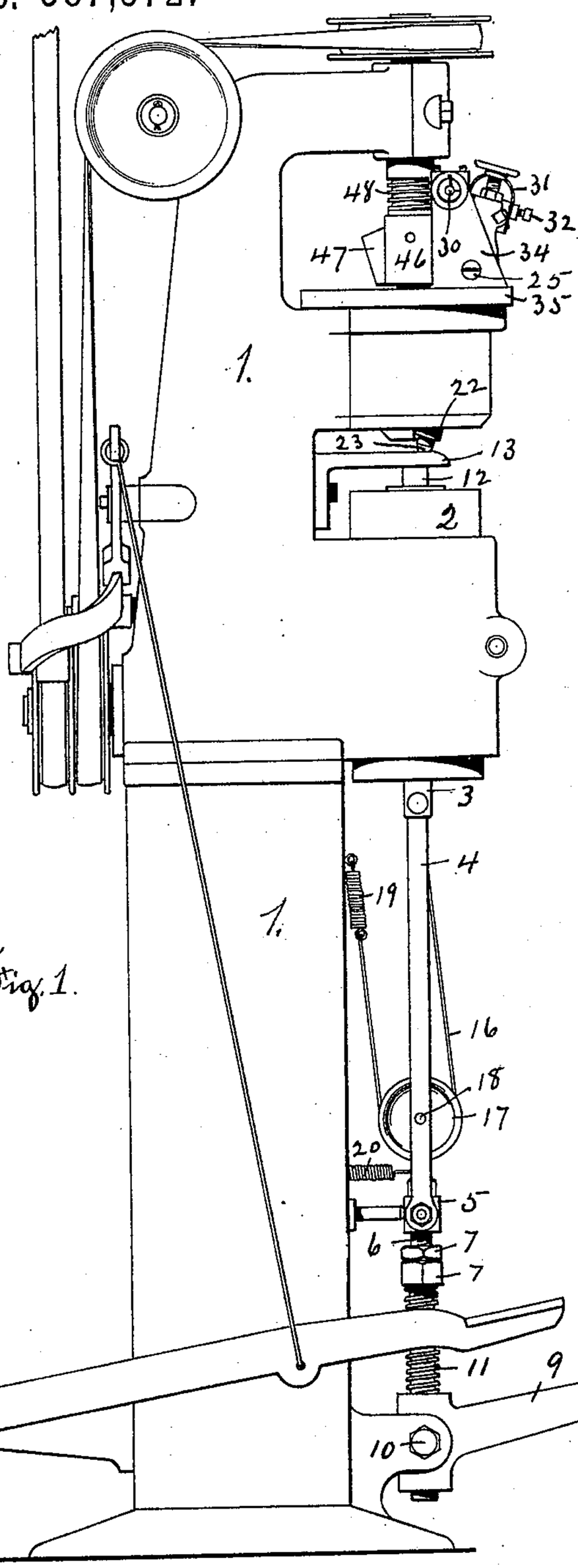

Fig. 1.

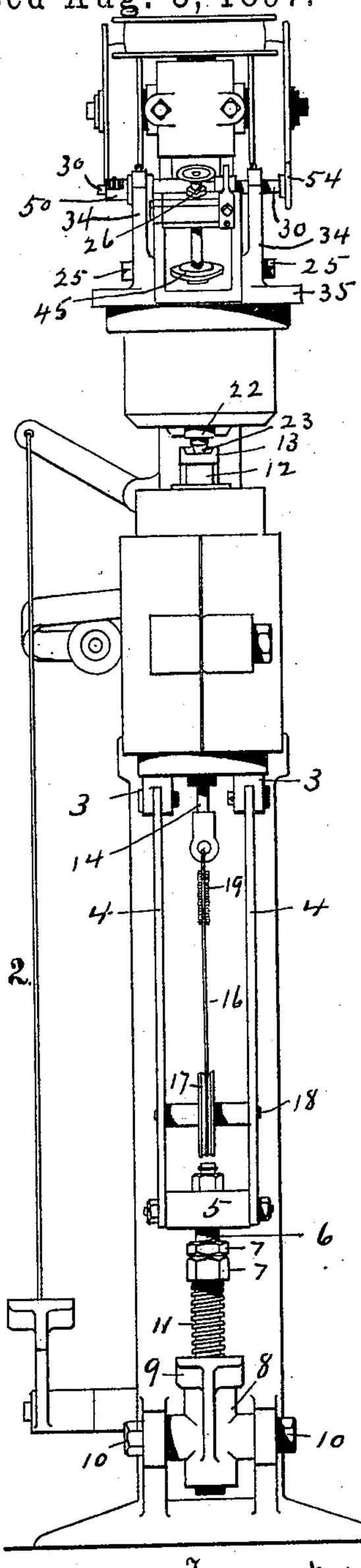

Fig. 2.

Witnesses
A. C. Whiting
Emma K. Foster.

Inventors
Charles H. Morgan.
Victor E. Edwards.
By their Attorney
Rufus B. Fowler.

(No Model.) 3 Sheets—Sheet 2.

C. H. MORGAN & V. E. EDWARDS.

DIE HAMMERING MACHINE.

No. 587,372. Patented Aug. 3, 1897.

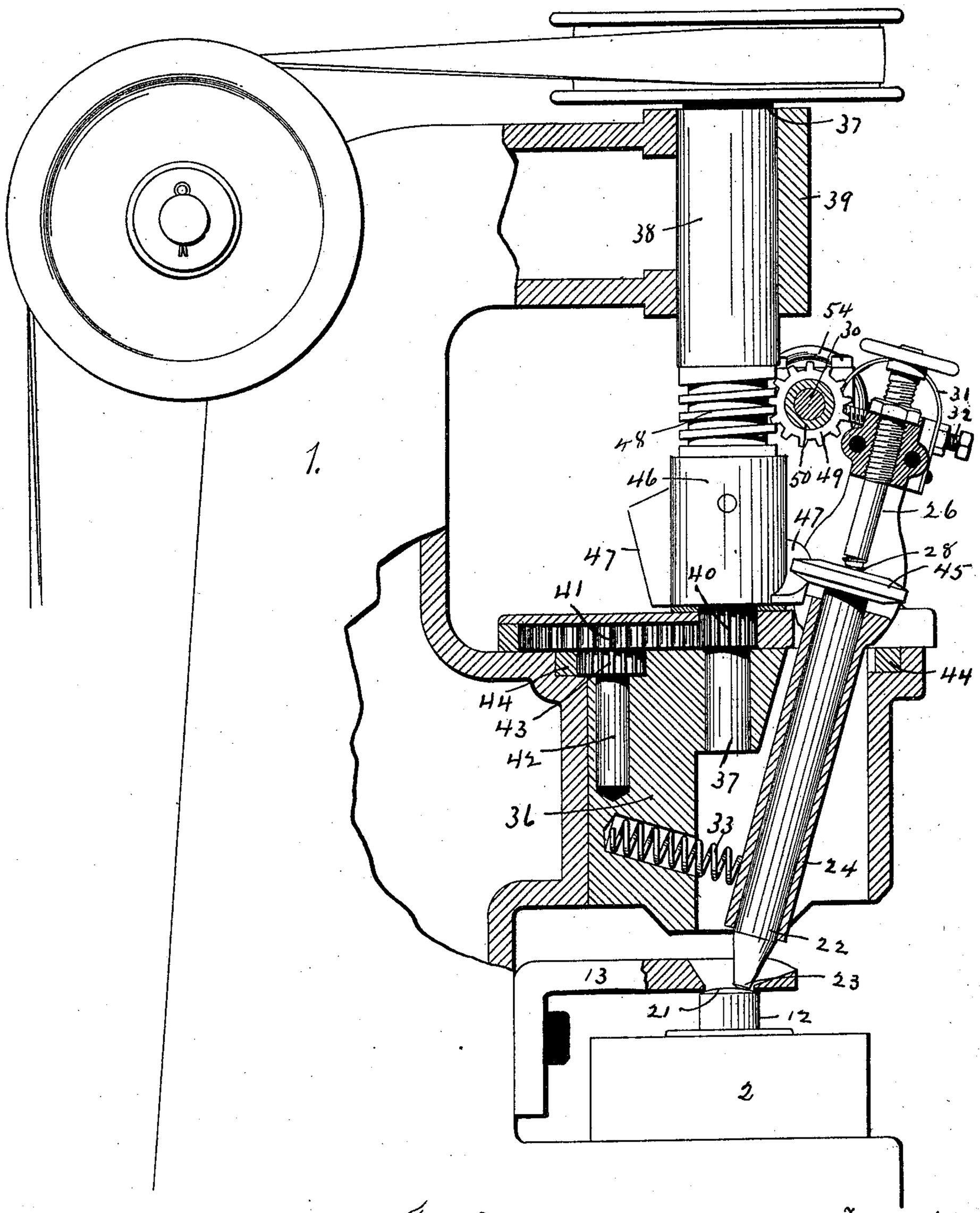

Fig. 3.

Witnesses
A. C. Whiting.
Emma Koster.

Inventors
Charles H. Morgan.
Victor E. Edwards.
By their Attorney
Rufus B. Fowler.

(No Model.) 3 Sheets—Sheet 3.

C. H. MORGAN & V. E. EDWARDS.

DIE HAMMERING MACHINE.

No. 587,372. Patented Aug. 3, 1897.

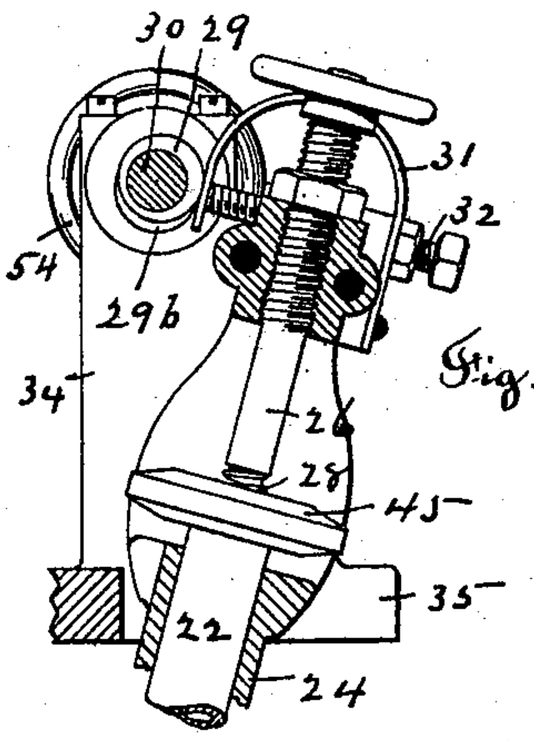

Fig. 4.

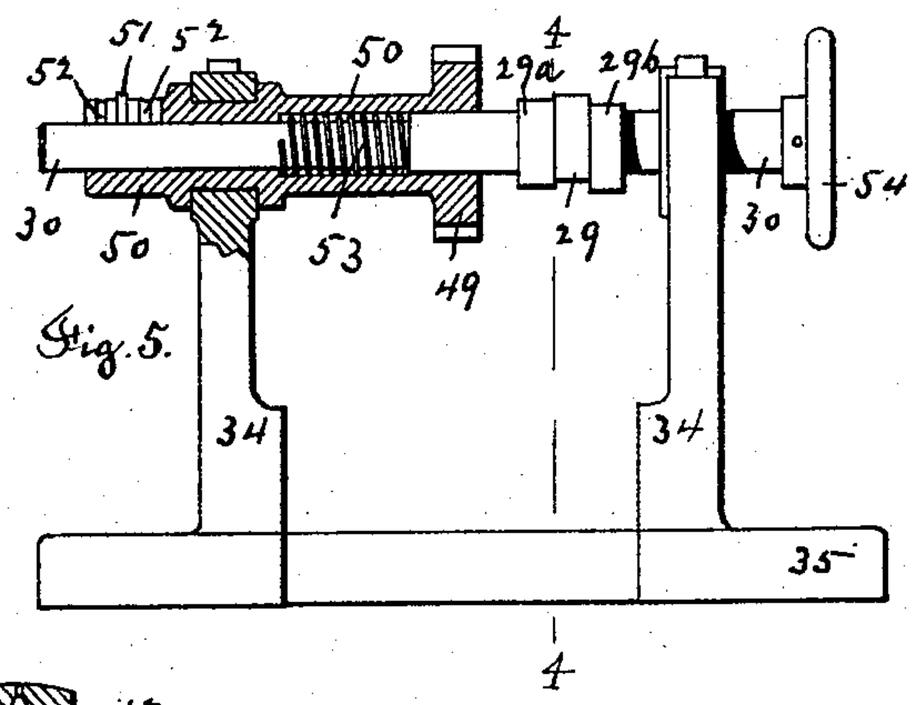

Fig. 5.

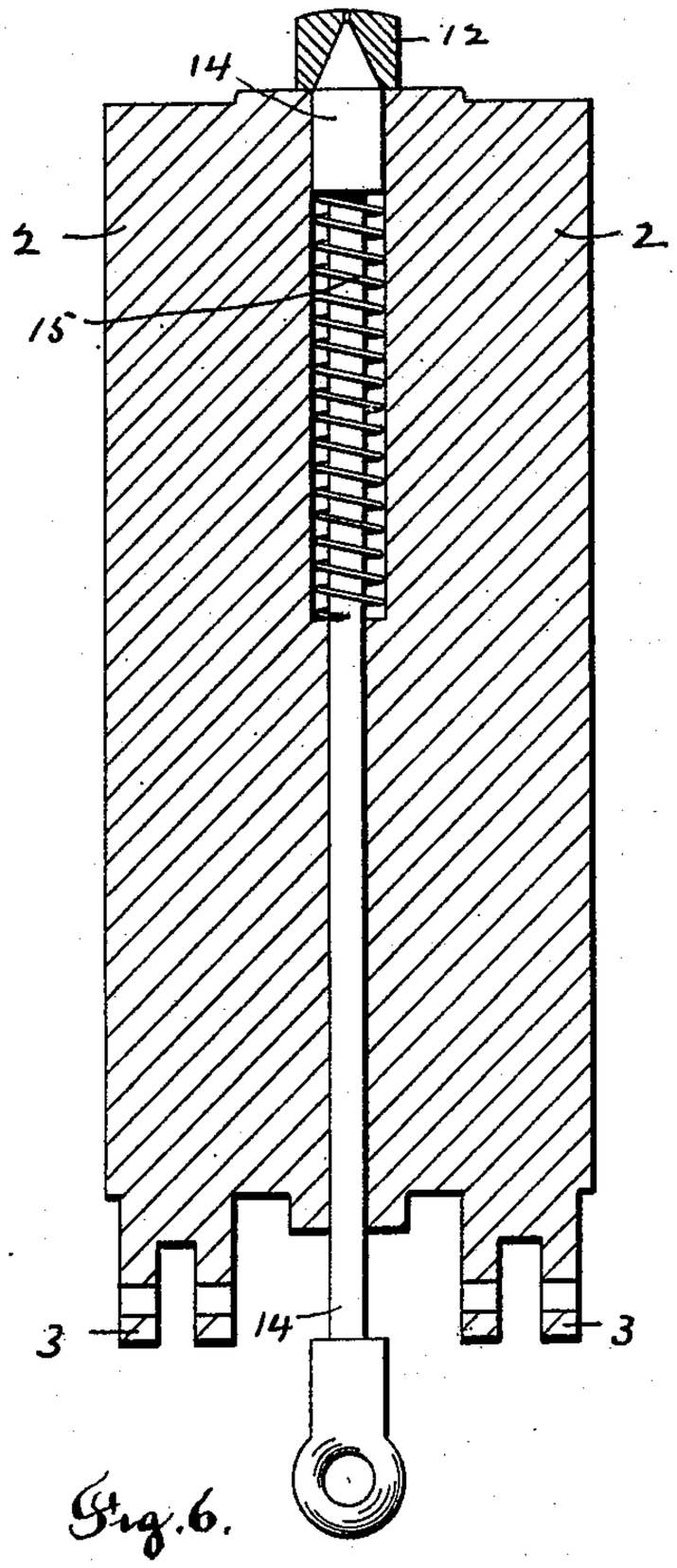

Fig. 6.

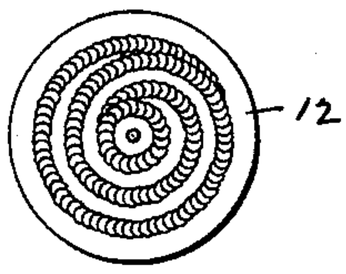

Fig. 8.

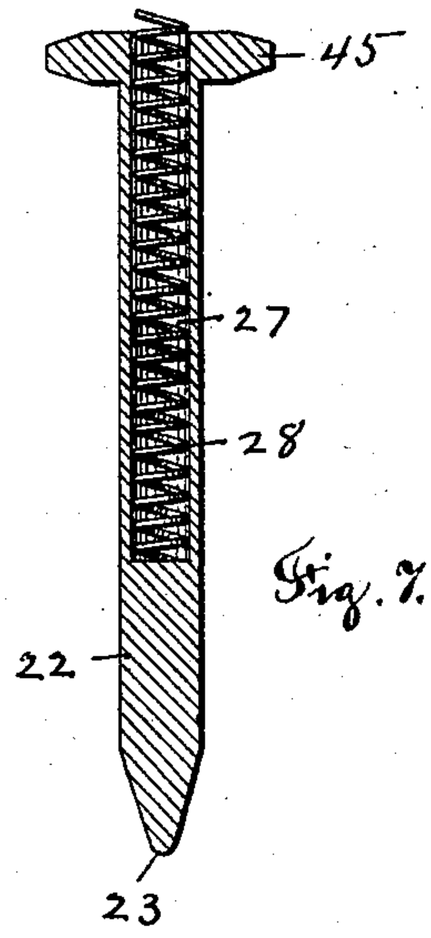

Fig. 7.

Witnesses
A. C. Whiting.
Emma Foster.

Inventors
Charles H. Morgan.
Victor E. Edwards.
By their Attorney
Rufus B. Fowler.

UNITED STATES PATENT OFFICE.

CHARLES H. MORGAN AND VICTOR E. EDWARDS, OF WORCESTER, MASSACHUSETTS, ASSIGNORS TO THE MORGAN CONSTRUCTION COMPANY, OF SAME PLACE.

DIE-HAMMERING MACHINE.

SPECIFICATION forming part of Letters Patent No. 587,372, dated August 3, 1897.

Application filed December 14, 1893. Serial No. 493,683. (No model.)

To all whom it may concern:

Be it known that we, CHARLES H. MORGAN and VICTOR E. EDWARDS, citizens of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Improvement in a Die-Hammering Machine, of which the following is a specification, containing a full, clear, and accurate description of the same, accompanied by drawings forming a part of the specification and representing a die-hammering machine embodying our invention, in which—

Figure 1 represents a side elevation of the machine; Fig. 2, a front elevation of the same. Fig. 3 represents a side elevation of the upper portion of the machine on a larger scale than Fig. 1, a portion being shown in sectional view in order to disclose the actuating mechanism for imparting a reciprocating motion to the hammer and for controlling the force, direction, and location of the blow upon the surface of the die. Fig. 4 represents a sectional view of the rotating cam-spindle by which the inclination of the hammer is varied, the section being taken on line 4 4, Fig. 5. Fig. 5 is a view of the rotating cam-spindle with its supporting-framework detached from the machine and with the worm-gear carried about said spindle, shown in central sectional view. Fig. 6 is a central sectional view of the die-supporting anvil and showing a die-centering spindle concentrically held in the anvil. Fig. 7 is a central sectional view of the reciprocating hammer; and Fig. 8 represents the face of a die, showing the spiral path of the point of the hammer as it travels over the face of the die and is controlled by the operation of the machine.

Similar numerals refer to similar parts in the different figures.

The commonly-practiced method of hammering the draw-plate or wire-drawing die by hand for the purpose of upsetting the die and reducing the diameter of its hole when the same has been worn by continued use has the disadvantage that the hammering process must obviously depend upon the uncertain skill and judgment of the operator; and the purpose and object of our invention is to provide a machine for hammering the draw-plates or dies used in drawing wire by which the force, direction, and location of the blow upon the face of the die shall be positively controlled by the operation of the machine.

Referring to the accompanying drawings, 1 denotes the supporting-framework of the machine, in which is held a cylindrical anvil 2, capable of a vertical sliding motion and provided at its lower end with lugs 3 3, to which are pivoted the links 4 4, by which the anvil is connected to the cross-bar 5, which is attached to the upper end of the screw-threaded rod 6, carrying the nuts 7 7 and extending through a hole in the rocking frame 8, which is provided with a foot-treadle 9, by which the frame 8 is rocked upon the pivots 10 10.

The screw-threaded rod 6 is capable of a vertical sliding motion in the frame 8 and is pressed upward by a spiral spring 11, acting against the upper side of the frame 8 and the under side of the lower nut 7.

By depressing the foot-treadle 9 the cross-bar 5 is thrown forward, drawing the anvil 2 downward to allow a die 12 to be inserted between the upper end of the anvil and the under side of the projecting bracket 13.

Sliding concentrically in the anvil 2 is a centering-spindle 14, pointed at its upper end to fit the tapering hole in the die, and is pressed upward by the action of a spiral spring 15. To the lower end of the centering-spindle 14 we attach a cord or chain 16, which passes around a pulley 17, rotating upon the spindle 18, carried by the links 4 4. The opposite end of the cord 16 is attached to a spiral spring 19, which is attached to the framework of the machine, so that when the anvil 2 is drawn down by the depression of the foot-treadle 9 the centering-spindle 14 will be drawn down twice as far as the anvil, causing the upper and pointed end of the centering-spindle to be drawn within the anvil in order to allow a die 12 to be inserted in position.

The links 4 4 and rod 6, capable of being rocked about the axis of the pivots 10 10, form a toggle-joint which draws down the anvil by the depression of the foot-treadle 9, and when

the foot-treadle is released the several parts are returned to their normal position, as represented in Fig. 1, by the action of a spring 20, which connects the upper end of the rod 6 with the framework 1, thereby carrying the anvil 2 upward and bringing the die 12 against the under side of the bracket 13. The bracket 13 is provided with an opening which exposes the upper surface 21 or face of the die to the action of a reciprocating hammer 22, provided at its lower end with a cone-shaped peen 23. The hammer 22 is capable of a longitudinal sliding motion within a sleeve 24, forming part of the hammer-supporting frame, which is pivoted upon the screws 25 25.

The upper end of the hammer-supporting frame carries an adjusting-screw with its axis in alinement with the axis of the reciprocating hammer 22.

The hammer 22 is provided with a central circular chamber 27, in which is placed a spiral spring 28, with its lower end resting against the end wall of the chamber 27 and with its upper end bearing against the lower end of the adjusting-screw 26. The hammer-supporting frame, of which the sleeve 24 forms a part, is capable of a slight rocking motion upon the screws 25 25 in order to vary the inclination of the hammer, and this variation is effected by means of a cam 29, Fig. 4, carried upon a rotating spindle 30 and acting against the surface of a blade-spring 31, which is interposed between the surface of the cam 29 and the end of an adjusting-screw 32, held in the upper end of the hammer-supporting frame, causing the inclination of the hammer to be varied as the cam 29 is rotated, the cam 29 acting against the tension of a spiral spring 33, bearing against the lower end of the hammer-sleeve 24, which serves to hold the screw 32 and blade 31 against the surface of the cam 29.

The pivotal screws 25 25 are held in the upright standards 34 34, which extend upward from a plate 35, attached to the upper surface of a rotating hammer-carriage 36, journaled in the framework 1.

The hammer-carriage 36 is journaled concentrically with a rotating spindle 37, which is journaled within a sleeve 38, held in an upper projecting arm of the frame 1, in which it is securely clamped and held in a fixed position by a cap 39. The spindle 37 is provided with a pinion 40, engaging a gear 41, attached to a spindle 42, journaled in the carriage 36 and carrying a pinion 43, which engages an annular rack 44, held by the framework of the machine, so that the rotation of the spindle 37 will cause the carriage 36 to be rotated, carrying the sleeve 24 and reciprocating hammer 22 and causing the peen-shaped point 23 of the hammer to be carried around the center of the die 12 as the die 12 is held by the centering-spindle 14 with its axis in alinement with the axis of the spindle 37.

The upper end of the reciprocating hammer 22 is provided with a flange 45, which is engaged by a cam 46, attached to the spindle 37 and having a spiral segmental wing 47, by which the reciprocating hammer is raised and released to be forced downward by the action of its inclosed hammer-spring 28 at each revolution of the spindle 37.

The lower end of the sleeve 38 is provided with a worm 48, which engages a worm-gear 49, carried upon a sleeve 50, inclosing a spindle 30 and journaled in one of the standards 34.

As the hammer-carriage 36 is rotated by means of the spindle 37 and intermediate gearing the attached plate 35 and standards 34, by which the spindle 30 is supported, will also be carried around the worm 48, causing the sleeve 50 to be slowly rotated and rotating the spindle 30, journaled concentrically within the sleeve by means of a projecting pin 51, which extends into a segmental opening in the sleeve 50 and enters one of three notches 52, thereby holding the spindle 30 against longitudinal movement and against the tension of a spiral spring 53, held within the sleeve 50 and acting against a shoulder upon the spindle 30 to move the spindle endwise within the sleeve. Upon the spindle 30 are placed a series of cams 29, 29^a, and 29^b, each having a different throw and capable of being successively brought to act against the screw 32 by the longitudinal movement of the spindle 30. The spindle 30 is provided with a small hand-wheel 54, and the spindle is moved longitudinally by rotating the spindle to carry the projecting pin 51 out of one of the notches 52, moving it endwise to bring the requisite cam into action and again locking the spindle from further movement by carrying the pin 51 into one of the notches 52.

If the cam carried upon the spindle 30 and acting against the screw 32 to rock the hammer-supporting frame be an eccentric, it will be obvious that the pointed end of the hammer as it is carried in a circular path over the face of the die by the rotation of the hammer-carriage will be radially moved toward or away from the center of the die, causing the point of the hammer to describe a spiral path over the face of the die, as represented in Fig. 8, and the movement of the hammer over the face of die can be varied as desired by the use of properly-shaped cams.

If dies of uniform size were to be hammered by the machine, a rotating spindle 30 carrying a single cam would be sufficient; but in order to adapt the machine to dies of varying size we deem it preferable to place a series of cams upon a spindle which is capable of being instantaneously moved lengthwise and locked in any desired position. We do not, however, confine ourselves to any particular construction by which the longitudinal unlocking of the cam-spindle is effected, that shown in the accompanying drawings being only one of many obvious methods by which the same result can be accomplished.

The operation of our improved die-hammering machine is as follows: The foot-treadle 9 is depressed, rocking the frame 8 8 upon the pivots 10 10 and carrying the upper end of the rod forward, thereby drawing down the anvil 2 and, by means of the cord 16, drawing down the centering-spindle 14 through twice the movement of the anvil 2 and causing the upper pointed end of the spindle to be drawn within the anvil, allowing a die 12 to be inserted in position upon the upper end of the anvil. The foot-treadle is then released and the rod 6 and links 4 4 are returned to their vertical position, as shown in Fig. 1, by the tension of the spring 20, allowing the anvil 2 to be held up by the spiral spring 11 and the centering-spindle 14 to be pressed upward into the tapering hole of the die by means of the spring 15, causing the die to be brought concentric with the spindle 14 and also to be held firmly against the lower surface of the bracket 13. The spindle 37 is then rotated and a reciprocating motion imparted to the hammer 22 by means of the rotating cam 46 and hammer-spring 28, while at the same time the hammer is carried around the center of the die by the rotation of the hammer-carriage 36 and also rocked upon the screws 25 25 by the action of one of the cams upon the spindle 30 and the spring 33.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. In a die-hammering machine, the combination of a reciprocating hammer and anvil upon which the die is held, a spring supporting said anvil against the blows of said hammer, a fixed bracket by which the die is held by the pressure of said anvil-spring, and means for withdrawing said anvil against the tension of said anvil-spring, substantially as described.

2. The combination of an anvil upon which the die is supported, means for depressing said anvil to receive the die, and a retractile spring by which said anvil is raised, substantially as described.

3. The combination of an anvil upon which the die is held, said anvil being capable of a sliding motion, a rocking frame, links connecting said frame and said anvil, a lever projecting from said rocking frame and a retractile spring, whereby said anvil is moved longitudinally to receive the die and carry it into position, substantially as described.

4. The combination of an anvil upon which the die is held, a concentric centering-spindle capable of sliding in said anvil, withdrawing mechanism by which said anvil is moved longitudinally to receive the die, a flexible connection connecting said spindle with the fixed frame of the machine, said flexible connection passing around a pulley carried by said anvil-withdrawing mechanism, whereby said spindle is moved faster than said anvil, substantially as described.

5. The combination of an anvil upon which the die is held, a rocking frame 8, a screw-threaded rod 6, carried by and capable of sliding in said frame, a nut 7 carried by said rod, a spring acting against said nut to raise the rod out of said frame, and links connecting said rod and said anvil, substantially as described.

6. The combination with an anvil upon which the die is supported of a carriage placed above said anvil and capable of rotating concentrically with the axis of the die, a sleeve held in said carriage at an angle with its axis of rotation, a hammer held in said sleeve, means for rotating said carriage and means for imparting a longitudinal reciprocating motion to said hammer, substantially as described.

7. The combination of an anvil upon which the die is supported, a carriage placed above said anvil and capable of rotating about the axis of a die held thereon, a rocking frame supported by said carriage, a reciprocating hammer held in said rocking frame, means for rocking said hammer-supporting frame, means for imparting a longitudinal reciprocating motion to said hammer and means for rotating said hammer-carriage, substantially as described.

8. The combination with an anvil upon which the die is supported and a concentric spindle by which the die is centered, of a rotating carriage having a rotation about an axis coincident with the axis of said centering-spindle, and a reciprocating hammer held by said carriage, said hammer being placed at an angle with the axis of said carriage, substantially as described.

9. The combination with an anvil upon which the die is supported and a centering-spindle held by said anvil, of a carriage having a rotary motion about an axis coincident with the axis of said centering-spindle, a reciprocating hammer held by a sleeve pivotally held in said carriage, whereby said hammer is capable of angular adjustment with reference to the axis of said carriage, substantially as described.

10. The combination of an anvil upon which the die is supported, a carriage carrying a reciprocating hammer, means for moving said carriage in a circular path coincident with the axis of the die, a hammer having a longitudinal reciprocating movement and supported by said carriage and means for changing the axis of the hammer relatively to the axis of the die, whereby the direction of the blow upon the face of the die is varied.

11. The combination with an anvil upon which the die is supported, and means for centering the die upon said anvil, of a carriage having a rotary motion about an axis coincident with the axis of the die, a reciprocating hammer carried by said carriage, whereby said hammer is carried in a circular path around the axis of the die and means by which the point of said hammer is moved radially

upon the face of said die and causing the point of the hammer to move in a spiral path, substantially as described.

12. The combination with a rotating carriage, of a sleeve pivoted in said carriage, a reciprocating hammer sliding in said sleeve, a rotating cam engaging said hammer to raise the same off the die and a spring applied to said hammer to force it against the die, substantially as described.

13. The combination with a rotating carriage, by which the hammer is carried in a circular path around the axis of the die, of a hammer held in said carriage and capable of an angular variation with reference to the axis of said carriage, a cam acting to vary the angle of said hammer and a spring acting against said cam to reverse the motion of said hammer, substantially as described.

14. The combination with a reciprocating hammer held in a pivoted frame, by which the angle of the hammer is changed in order to vary the direction of the blow, of a rotating spindle, and a series of cams carried upon said spindle adapted to act upon said pivoted frame and rock the same, said spindle being capable of longitudinal movement, in order to bring each of said cams into action, substantially as described.

15. The combination of a rotating carriage, by which the hammer is carried in a circular path around the axis of the die, a rocking frame pivoted in said carriage, a reciprocating hammer carried in said rocking frame and means by which said frame is rocked, and the angle of said hammer varied with reference to the axis of said carriage, substantially as described.

16. The combination of a rotating carriage, a rocking frame pivoted in said carriage, a reciprocating hammer carried in said rocking frame, a rotating spindle mounted upon and carried by said rotating carriage, a worm-gear held upon said spindle, a stationary worm held concentrically with the axis of said rotating carriage and engaging said worm-gear, and a cam carried upon said spindle and acting to rock said rocking frame and thereby vary the path of the hammer over the face of the die, substantially as described.

17. The combination of a rotating carriage, by which the hammer is carried in a circular path, a reciprocating hammer held in said carriage, a spindle concentric with said carriage, a pinion attached to said spindle and engaging a gear 41 attached to a spindle 42, journaled in said carriage, a pinion 43 on said spindle 42 and a fixed annular rack 44 engaged by said pinion 43, whereby a rotary motion is imparted to said carriage, substantially as described.

CHAS. H. MORGAN.
VICTOR E. EDWARDS.

Witnesses as to C. H. Morgan:
PAUL B. MORGAN,
O. G. NYSTROM.

Witnesses as to V. E. Edwards:
A. F. BACKLIN,
CARL HARTER.