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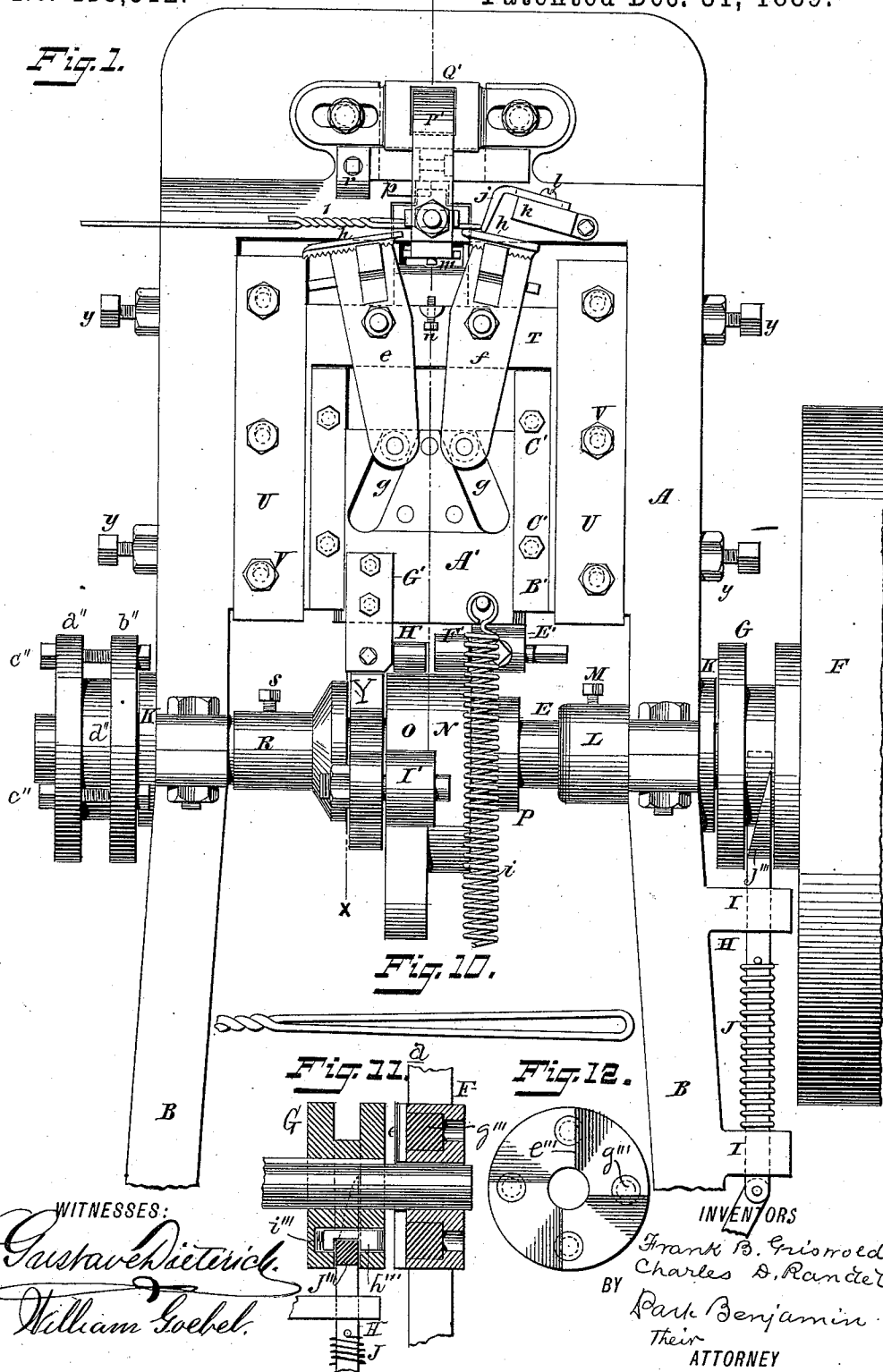
5 Sheets—Sheet 1.

F. B. GRISWOLD & C. D. RANDEL.
MACHINE FOR BENDING WIRE.

No. 418,512.

Patented Dec. 31, 1889.

Fig. 1.



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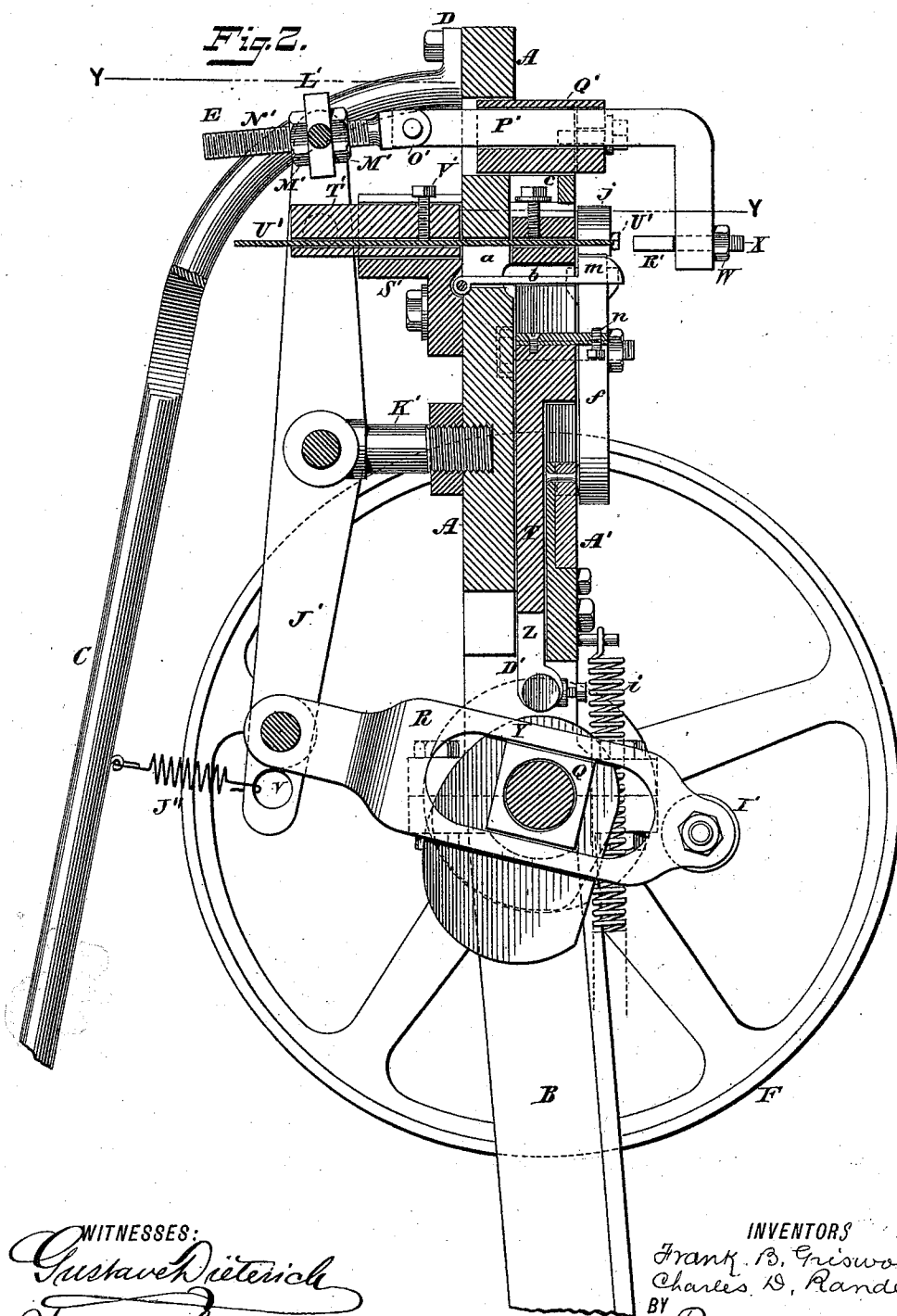
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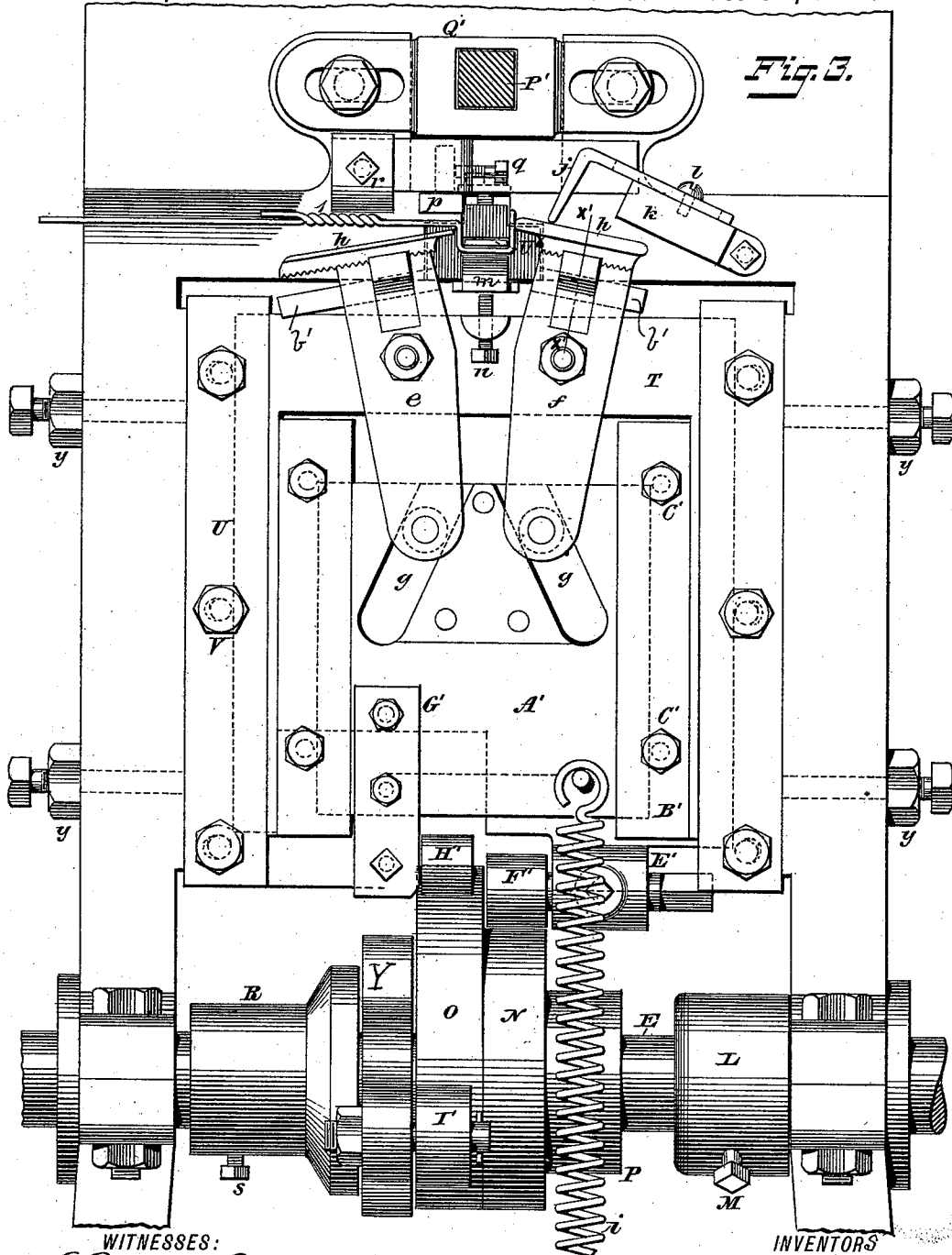
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Fig. 4.

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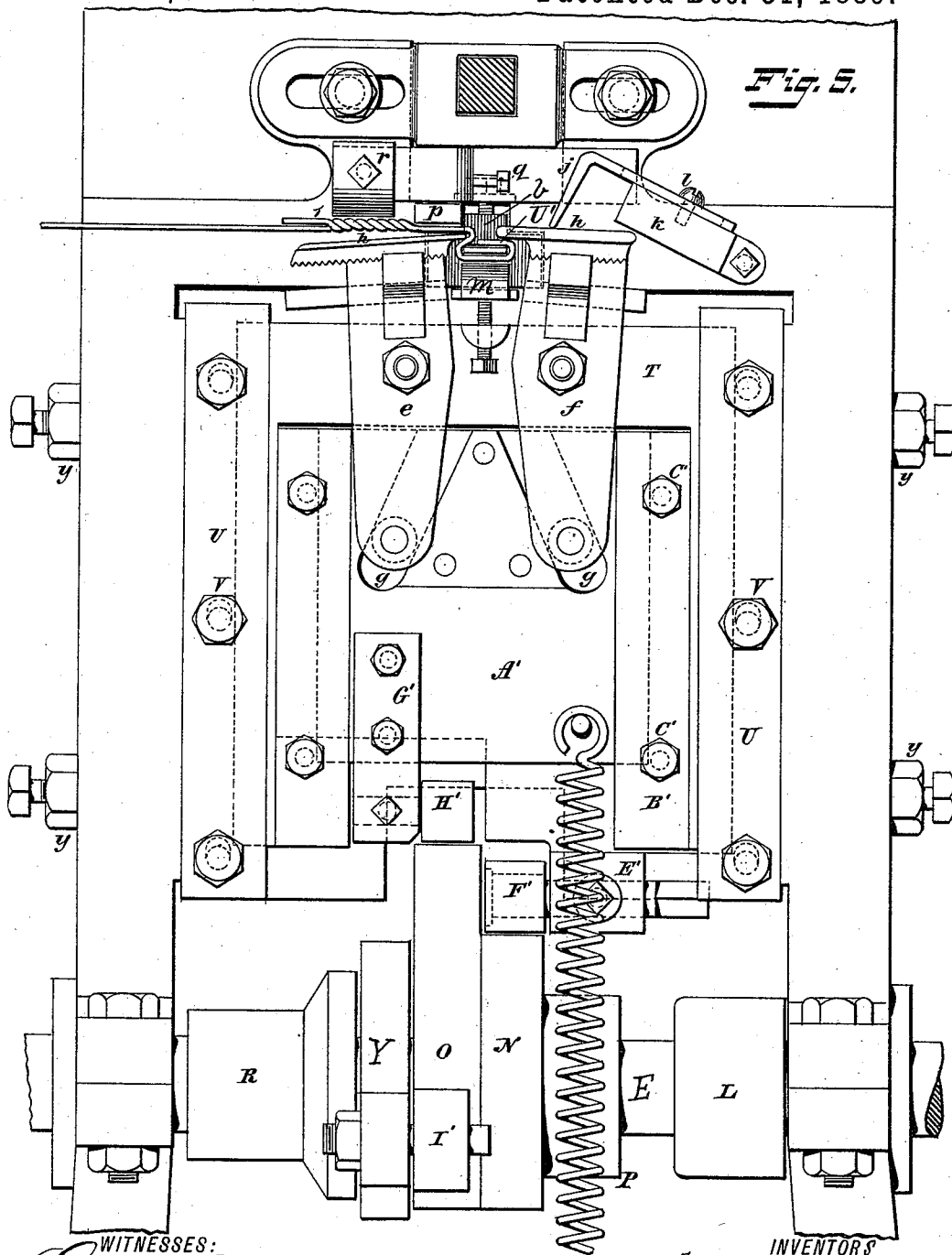
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Fig. 5.

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5 Sheets—Sheet 5.

F. B. GRISWOLD & C. D. RANDEL.
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Fig. 7.

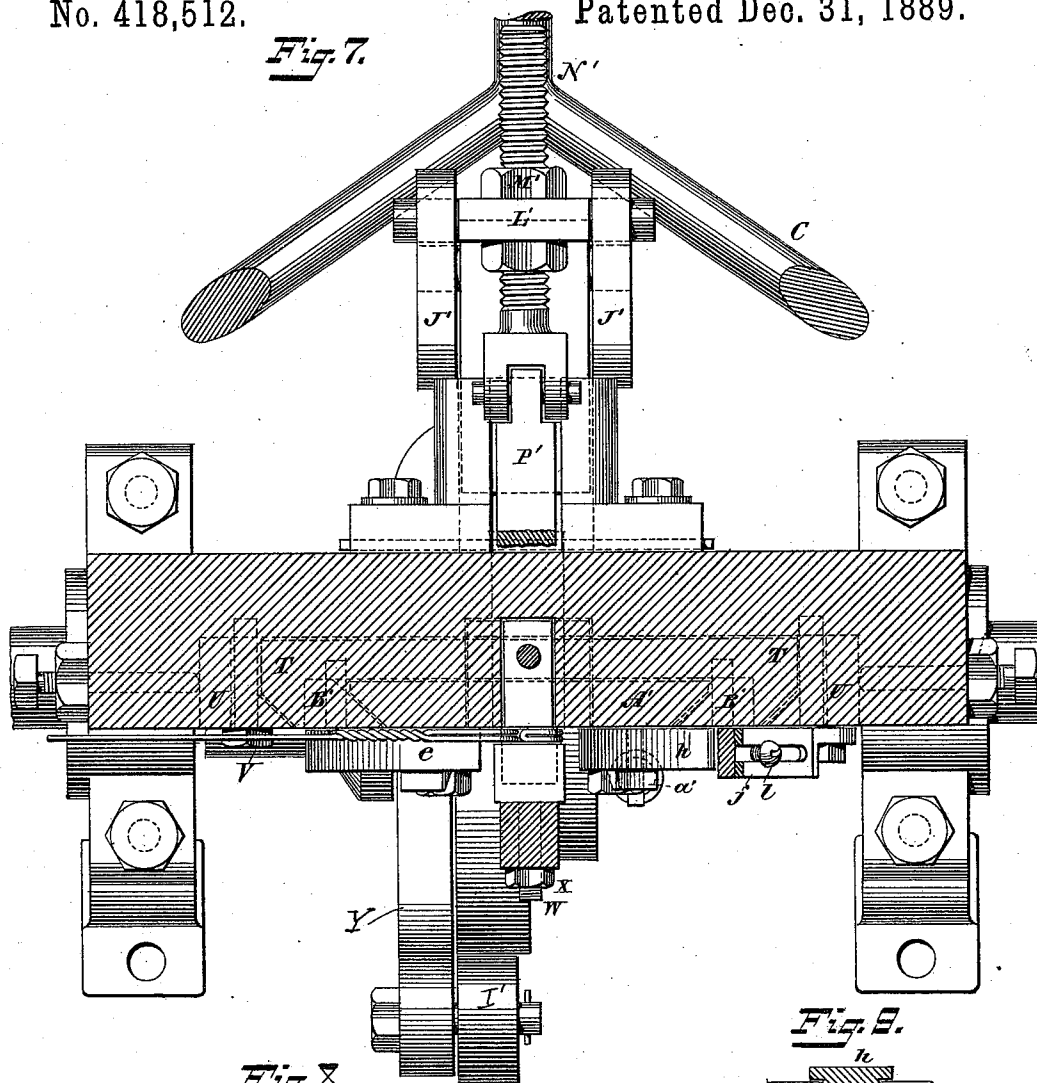


Fig. 8.

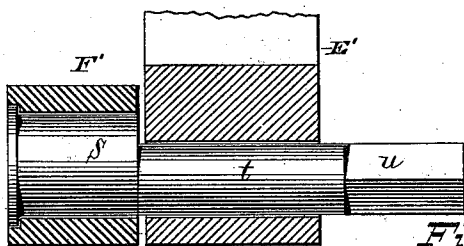


Fig. 9.

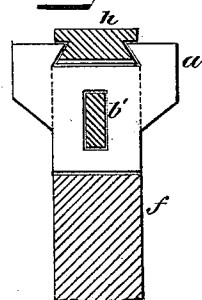


Fig. 11.

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UNITED STATES PATENT OFFICE.

FRANK B. GRISWOLD AND CHARLES D. RANDEL, OF TROY, NEW YORK.

MACHINE FOR BENDING WIRE.

SPECIFICATION forming part of Letters Patent No. 418,512, dated December 31, 1889.

Application filed September 9, 1889. Serial No. 323,421. (No model.)

To all whom it may concern:

Be it known that we, FRANK B. GRISWOLD and CHARLES D. RANDEL, both of Troy, Rensselaer county, and State of New York, have invented a new and useful Improvement in Machines for Bending Wire, of which the following is a specification.

The invention relates to a machine for bending wire to produce the hook on the end of a bale-band, said hook forming with an eye on the opposite end of said band a fastening, whereby the band is held in place on the bale.

The invention consists in the construction and arrangement of the machine, and more particularly in the mechanism for actuating the bending-jaws to bend the wire over a suitable forming-tool, and in the various instrumentalities for effecting adjustments of the various parts, all as hereinafter more particularly set forth.

In the accompanying drawings, Figure 1 is a front elevation of the machine. Fig. 2 is a sectional view on the line X X of Fig. 1. Fig. 3 is a front elevation of the machine at and above the driving-shaft, showing the position of the parts when the hook is in the stage represented in Fig. 4. Fig. 5 is a similar elevation of the same parts of the machine, showing the position of the parts when the hook is in its complete form, as represented in Fig. 6. Fig. 7 is a horizontal section on the line Y Y, Fig. 2. Fig. 8 is an enlarged vertical section of roller E' and bearing F'. Fig. 9 is an enlarged vertical section of one of the wire-bending jaws on the line X' X', Fig. 3. Fig. 10 shows the wire in loop form previous to being bent into hook shape. Fig. 11 shows the completed hook. Fig. 11^a is a transverse sectional view of the clutch mechanism. Fig. 12 is a face view of the notched clutch-disk.

Similar letters of reference indicate like parts.

A is the main frame of the machine, which is supported directly upon the legs B B (the lower extremities of which are broken away) and also by a forked strut C. The upper extremity of said strut is secured to the upper part of said frame, as shown at D, Fig. 2. The driving-shaft E is journaled in boxes supported between the legs B and frame A.

Driving-pulley F is loose on said shaft, and a pulley G is fast therein. Any simple form of clutch mechanism is provided whereby said pulley G and the driving-pulley F may be placed into or out of connection at will. Said clutch mechanism (described in detail farther on) is preferably operated by means of a rod H, which passes down through projections I on the frame and terminates below in a treadle or foot-plate. (Not shown.) The spiral spring J, surrounding the rod H, normally tends to keep the clutch out of operation; but when the foot-plate is pressed down and the rod H thereby carried downward the clutch mechanism is thrown in gear, and the motion of the driving-pulley F is thus communicated to the pulley G, and hence to the shaft E.

K is a boss solid with the frame A and legs B, and serving to increase the length of the bearing for the driving-shaft E.

L is an adjustable collar secured in place by the set-screw M. Upon said shaft E are two cams N and O, provided with a hub P. Said cams and hub are preferably cast in one piece. On the opposite side of the cam O and upon the shaft E is a squared collar Q, Fig. 2, which is received in the elongated slot in the sliding link Y, so that said link may move longitudinally upon the collar. Beyond the collar Q again is an adjustable collar or sleeve R, which is fixed in place upon the shaft E by the set-screw S.

In the front side main frame A there is a rectangular recess in which is received the sliding plate T. The sliding plate T is retained in said recess by means of the vertical guide-plates U. The plates U are trapezoidal in a horizontal section, as shown in dotted lines in Fig. 7. The front edges of the sliding plate T are beveled off, as shown in the same figure. The plate T being set in the recess in the frame A, the plates U are placed in position, so that the inclined sides of said plates come opposite to the beveled edges of the plate T. The plates U are provided with slots through which pass screw-bolts V, by which said plates are secured to the frame. Guide-ways are thus formed in the main frame A, in which the plate T may freely slide vertically.

In the front face of the plate T is a recess

in which is disposed a smaller slide-plate A'. The plate A' is secured in the plate T by the plates B', which have angular faces corresponding to the beveled outer edges of the plate A', and which are secured to said plate T by the screw-bolts C'. The plates B' therefore form ways in which the plate A' may slide vertically in the plate T. It will be understood, therefore, that the plate T has a free vertical reciprocating motion in the main frame A, and that the plate A' has a similar free vertical reciprocating motion in the plate T.

Extending downward from the plate T is a projection which carries the sleeve-bearing E', Fig. 8, for the roller F', same figure. The roller F' is acted upon by the cam N.

G' is a plate bolted to the plate A', extending downward therefrom, and carrying the roller H', which is acted upon by the cam O.

At one extremity of the sliding link R is journaled a roller I', Fig. 2, and this roller is also operated upon by the cam O. The other end of the link R is pivoted between parallel sides of the lever J', Fig. 2. The lever J' has its fulcrum at the extremity of a stud K', Fig. 2, which is threaded and thus connected to the rear side of the main frame A.

Between the upper ends of the sides of the lever J' is pivoted a cross-bar L', which receives the nut M', through which nut passes the screw N'. The screw N' is pivoted at O' to the bar P', and this bar passes through the box Q', which is secured in a recess in the main frame A. The outer end of the lever P' is bent downward and carries a horizontal presser-foot R'.

Bolted to the rear side of the frame A is a box S', into which passes a bar T', which is pivoted between the sides of the lever J'. Extending longitudinally through said bar T' is a smaller flat bar or forming-tool U'. The forming-bar U' is secured in the bar T' by means of the set-screw V', which passes through a slot in the upper side of the box S', thence down through the bar T', and its lower end bears against the bar U'. The bar U' passes through an opening a in the main frame A, Fig. 2, and thence through an opening in the anvil b. The anvil b is a block of metal which is supported in an opening in the main frame A, which opening is above the large rectangular opening in said frame in which the plate T reciprocates. The anvil is secured in said opening by the set-screw c. The forming-bar U' projects beyond the anvil on its front side, and its extremity comes directly opposite and in line with the presser-foot R'.

Upon the front side of the plate T are pivoted two jaws e f. At the lower extremities of these jaws are rollers which enter inclined slots g in the sliding plate A'. At the upper extremities of the jaws e f are secured the plates h.

We have now described generally the principal parts of the machine, and before proceeding farther into details we will state

briefly the general operation of the parts. When the clutch mechanism is thrown in gear and the shaft E is rotated, the cam N, acting upon the roller F', moves upward the sliding plate T until the plates h on the jaws e f come above the projecting end of the bar U'. When the jaws e f reach this position, the sliding plate T is at the end of its upward movement, and this plate therefore remains at rest. The cam O then acting on the plate A' causes that plate to move upward, and in consequence thereof the slots g in said plate operate to carry the ends of the jaws e f apart, and hence to close their upper ends together. The cam O also acts on the roller I' on the link R, causing that link to move longitudinally on the square collar Q. The lever J' is thus oscillated on its fulcrum K', and its upper end is therefore moved rearwardly. The consequence of this is that the bar U' is retracted until its extremity projects for a distance equal to about one and a half diameter of the wire operated on beyond the anvil b, and simultaneously the bar P' is also retracted, so that the presser-foot R' thereon is brought into proximity with the anvil b. As the rotation of the shaft E continues, the lever J' is vibrated in the opposite direction by means of spring J'', and the bar U' and presser-foot R', controlled thereby, are returned to their normal position, while the coiled spring i, which is secured to a pin on the sliding plate A', draws down said plate and the slots therein open the jaws e f, and then the spring, continuing its pull, draws down the larger sliding plate T.

The object and purpose of the machine are to bend a loop of wire previously made in the shape shown in Fig. 10 into the hook form represented in Fig. 11. The blank 1 is inserted from the left-hand side of the machine below the projecting end of bar U' until its extremity meets the inclined face of the bent pivoted stop j, Fig. 1. The parts then being in the position shown in Fig. 1, the end stop j rests upon the plate h on the upper end of the jaw f. The stop j therefore limits the distance to which the blank may be inserted, and this distance may be varied by moving said stop longitudinally upon its supporting-bar k, through which bar the pivot passes, and clamping it in the desired position by means of the set-screw ll. In order to allow of this movement, the stop j is slotted, and the screw l passes through the slot. The blank 1 is inserted, as stated, below the projecting end of bar U' and also above the extremity of the pivoted bar m, Fig. 2. Bar m is pivoted in the box S' and extends through an opening in the frame A and below the anvil b. Its outer end is rounded, so as to facilitate insertion of the blank between said end and the bar U'. The bar m normally stands as shown in Fig. 2—that is, in its lower position—so that a space is left between its outer end and the bar U'. The clutch is now thrown into action. The shaft E re-

volves, and the sliding plate *T* ascends. The extremity of the plate *h* on the jaw *f* first meets the blank on the right-hand side of the bar *U'* and bends it upward, and shortly afterward the similar plate *h* on the jaw *e* meets the blank on the other side of bar *U'* and bends that portion of the blank upward. The position of the parts of the machine is shown in Fig. 3, and the shape of the blank in its existing stage in Fig. 4. It will now be observed that the extremity of the bar *m* has also moved upward, because it has been met by a screw *n* on the upper edge of plate *T* and pushed up by that screw. The end of bar *m*, therefore, always supports the blank from below, and finally compresses it against the under side of the bar *U'*. The sliding plate *T* having reached the limit of its upward travel, the cam-roller *F* runs upon the truly circular part of the cam *N*, and hence said plate remains at rest. The plate *A'*, however, now begins its upward movement, and the slots therein act upon the jaws *e f* to close them in the manner already described. The effect of the closing of the jaws is as follows: The jaw *f* bends the free end of the loop backward over the bar *U'*, and the jaw *e* makes a horizontal bend in the loop in the opposite direction. The result is the hook shown in Fig. 6, and the position of the parts of the machine is as represented in Fig. 5. Referring more particularly to the jaw *e*, it will be observed that the plate *h* on the end of this jaw has entered and forced the wire into the space between the upper side of the bar *U'* and a stop or guide *p*. This guide has a stem, (best shown in Fig. 3, dotted lines,) which enters a projection in the frame *A*, and is secured therein by a set-screw *q*. By loosening the set-screw *q* the guide *p* may be raised or lowered, and in this way the interval or space between the bar *U'* and said guide may be increased or diminished, and the angle formed in the wire when crowded into the space may be made larger or smaller. In order to prevent the body or twisted portion of the blank from being bent, a fixed guide *r* is provided. It will be observed that the pivoted stop *j* rests upon the plate *h* on jaw *f* and rises with that jaw as the latter ascends. The roller *H'* now passes upon the non-eccentric portion of cam *O*, and said cam begins to act upon the roller *I*, causing the link *R* to move longitudinally upon the collar *Q*, and the lever *J'* to begin its vibration. As the upper end of the lever *J'* moves rearwardly the bar *U'* is retracted, and the presser-foot *R'* is carried against the front side of said loop. The loop is thus flattened laterally between the presser-foot *R'* and the anvil *b*. This completes the operation of the machine, the completed hook, Fig. 11, is removed, the bar *U'* is once more carried forward by the action of the cam *O* and spring *J''*, the spring *i* returns the plates *T* and *A'* to their original position, and then another blank may be inserted.

We will now refer more particularly to the various adjusting devices in the machine. To some of these reference has already been made; but for the sake of clearness they are again briefly noted.

First. The collar *L* is adjustable upon the shaft *E*, and is secured in place by the set-screw *M*.

Second. The collar *R* is adjustable upon the shaft *E*, and is secured in place by the set-screw *s*.

Third. The extent of vertical movement of the plate *T* may be regulated by means of the cam-roller *F'*, which (Fig. 8) is a sleeve on the eccentric end *S* of the roller-shaft *t*. The end *u* of said shaft is squared, so that by rotating said shaft in its bearing *E'* the vertical position of the roller may be altered, and hence the extent of upward movement imparted by the cam *N* to the plate *T* may be regulated.

Fourth. The extent of swing of the lever *J'* may be adjusted by transferring the pivot-pin of the link *R* to the lower opening *v* in said lever or by screwing the fulcrum *K'* more or less inward. The extent of motion of the bar *P'* is regulated to correspond by adjusting the screw *N'* in the nuts *M' M'*.

Fifth. The screw *V'* being loosened, the bar *U'* may be adjusted by hand longitudinally in the bar *T'* and anvil *b*, so as to project more or less in front of said anvil.

Sixth. The timing of the upward movement of the pivoted bar *m* and the extent of its movement may be regulated by means of the screw *n*.

Seventh. The guide *p* may be raised or lowered in its support, and then secured in place by the set-screw *q*.

Eighth. The presser-foot *R'* may be set out more or less from the bar *P'* by means of the screw *W* and nut *X* and by the horizontal screw *N'*.

Ninth. The set-screws *y* pass through the frame *A* and bear against the plates *U*. Their object is to provide for wear between the bevel-faces of the parts *T* and *U*. To this end the screws *V* pass through enlarged openings in plates *U*, as shown in Fig. 3.

Tenth. The upper sides of the jaws *e f* are serrated. The lower sides of the plates *h* are serrated to correspond, so that the serrations in the plates lock with the serrations in the jaws. The plates *h* have a dovetail cross-section. (See Fig. 9.) A clamping-piece *a'* is received in the jaw and engages with the plate *h*. A pin or cotter *b'* passes through the jaw and clamping-piece and secures all the parts together. By removing the pin *b'* the clamp *a'* may be raised, the plate *h* lifted, so that the serrations no longer lock, and then the plate may be set in a new position on the jaw, as desired. In this way the plates *h* may be caused to project more or less from the jaws.

Eleventh. The stop *j* may be adjusted on its support *k* and secured as placed by the screw *l*.

On the left of the shaft *E* is shown a sim-

ple friction device for checking the momentum of said shaft when it has completed its revolution. This consists of two disks $a'' b''$, connected by bolts c'' . The disk b'' is fast to the boss K and the shaft turns freely in said disks. On the shaft is a fixed disk d'' , which is clamped between the disks $a'' b''$ by the action of bolts c'' , so that the friction between the disk-faces acts to check the rotation.

- 10 The clutch mechanism here shown is as follows: The inner face of the hub of pulley F is notched, as shown at e''' . The bottoms of the notches are formed in removable steel pins g''' , so that wear may be provided for.
- 15 Arranged transversely to the pulley G is a sliding key or pin h''' , which is normally pushed outwardly by a spring i''' . The pin, when it projects from the pulley G, enters and engages with one of the notches e''' .
- 20 j''' is a yoke on the end of rod H, which enters the groove or channel on the periphery of pulley G and is received in a notch in the key or pin h''' . The effect of pulling down the rod H is to allow the pin h''' to be pushed
- 25 outward by its spring and to engage with the driving-pulley F.

I claim—

1. In a wire-bending machine, a forming-bar or projection, as U' , a bending-jaw, as f , having its operating end disposed at one side of and below said forming-bar, a support to which said jaw is pivoted, and a cam having a vertically-inclined surface acting upon said jaw, in combination with mechanism for imparting vertical motion to said support and to said cam, the aforesaid parts operating and timed to carry the operating end of said jaw to a position above said forming-bar and then to swing said jaw on its pivot to cause its operating end to move over said bar, substantially as described.

2. In a wire-bending machine, a bending-jaw, as f , a forming-bar or projection, as U' , a block or anvil, as b , from which said bar U' projects, a presser-foot or follower, as R' , disposed in front of the end of said bar, mechanism for imparting longitudinal motion to said bar, mechanism for imparting longitudinal motion to said follower, mechanism for moving said jaw to carry its said operating end to a position on the same side of and above said bar, and mechanism for moving said operating end in a horizontal direction over said bar, substantially as described.

3. In a wire-bending machine, the combination of the forming-bar U' , bending-jaws $e f$, movable slide T, upon which said jaws are pivoted, slide A' , movable in said slide T and having cam-slots g , in which slots enter pins or rollers on said jaws $e f$, and mechanism for reciprocating said slides, substantially as described.

4. In a wire-bending machine, the combination of the forming-bar U' , bending-jaws $e f$, movable slide T, upon which said jaws are pivoted, slide A' , movable in said slide T and having cam-slots g , in which slots enter

pins or rollers on said jaws $e f$, driving-shaft E, and cams O and N on said shaft, the said cam O acting upon the slide A' and the cam N upon the slide T to impart motion to said slides, substantially as described.

5. In a wire-bending machine, the combination of the forming-bar U' , bending-jaws $e f$, movable slide T, upon which said jaws are pivoted, slide A' , movable in said slide T and having cam-slots g , in which slots enter pins or rollers on said jaws $e f$, driving-shaft E, and cams O and N on said shaft, the said cams acting, respectively, upon the slides A' and T to move the same in one direction, and a spring i , secured to said slide A' and to an abutment and operating to retract said slides, substantially as described.

6. In combination with the forming-bar U' , the driving-shaft E, and cam N on said shaft, the slide T, carrying the pivoted jaws $e f$ and provided with the eccentrically-journaled cam-roller F' , acted upon by said cam N, substantially as described.

7. In a wire-bending machine, a support, a forming-bar or projection around which the wire is bent, protruding from said support, mechanism for retracting said bar, a follower supported in front of said bar, and mechanism for moving said follower toward said support, substantially as described.

8. In a wire-bending machine, the lever J' , the forming-bar U' , connected to said lever J' and receiving reciprocating longitudinal motion therefrom, driving-shaft E, and transmitting mechanism between said shaft E and lever J' for imparting vibratory motion to said lever, substantially as described.

9. In a wire-bending machine, the lever J' , bar T' , pivoted to said lever and reciprocated thereby, forming-bar U' , longitudinally adjustable in said bar T' , driving-shaft E, and mechanism between said shaft E and lever J' for imparting vibratory motion to said lever, substantially as described.

10. In a wire-bending machine, the lever J' , forming-bar U' , connected to said lever J' and receiving reciprocating motion therefrom, bent follower-bar P' , connected to said lever and also reciprocated thereby and carrying a follower or presser-foot R' , disposed in front of the end of said forming-bar U' , driving-shaft E, and mechanism between said shaft E and lever J' for imparting vibratory motion to said lever, substantially as described.

11. In a wire-bending machine, the forming-bar U' , the movable presser bar or block m , arranged below said bar U' , and the vertically-moving slide T, the said slide in its upward motion meeting said block m and moving the same into proximity with the bar U' , substantially as described.

12. In a wire-bending machine, in combination with the forming-bar U' and the pivoted bending-jaw f , the pivoted bent stop j' , having its free end resting on said jaw f , substantially as described.

13. In a wire-bending machine, in combina-

tion with the forming-bar U' and the pivoted bending-jaw f , the pivoted support k , and bent stop j , adjustable on said support, the said stop resting upon said jaw f , substantially as described.

5 14. The combination, in a bending-jaw, as f , of the body portion having serrations on its upper face, the top plate h , having on

its under side corresponding serrations, the clamp a' , and key b' , substantially as described.

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