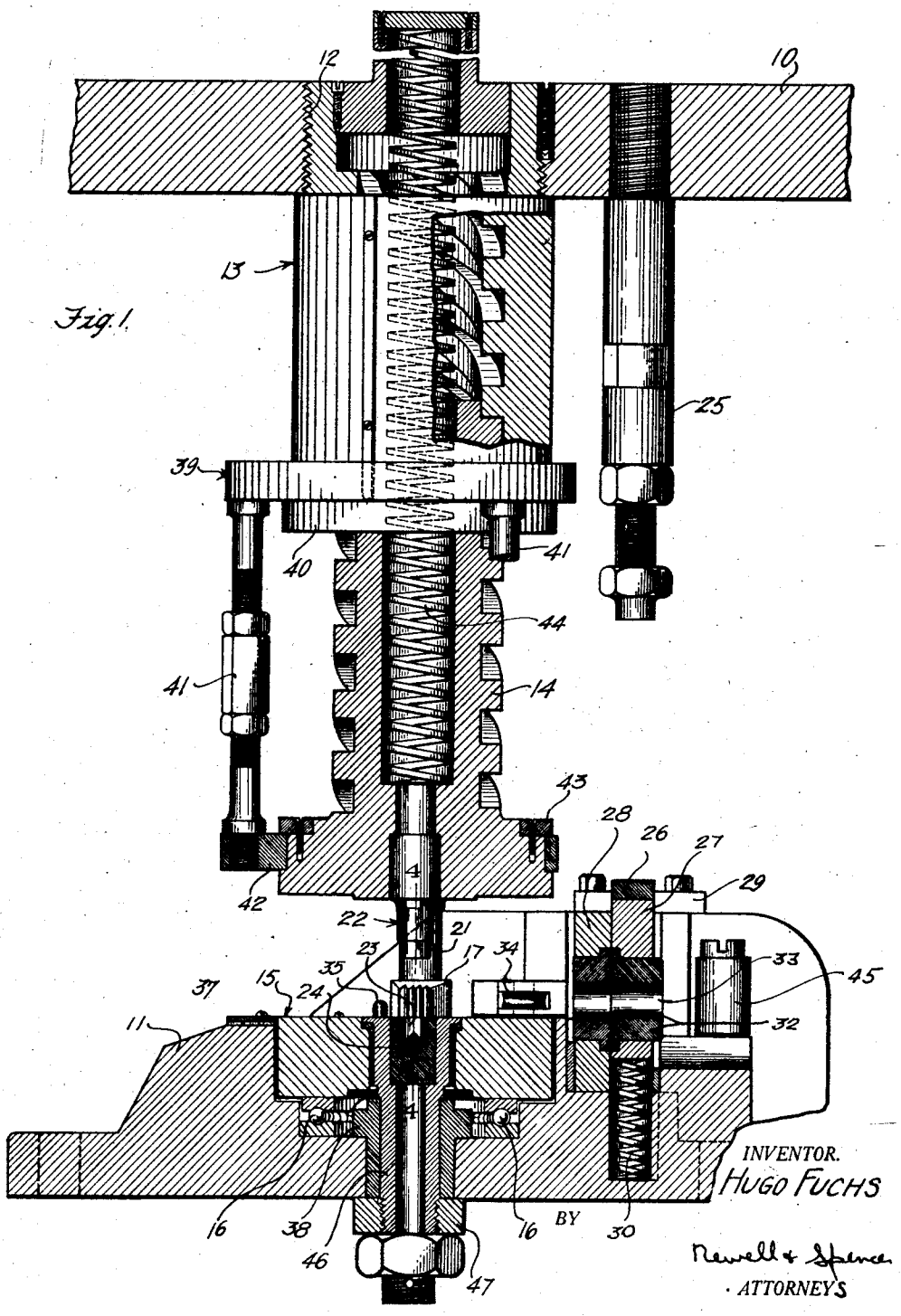
May 24, 1927. 1,630,064

H. FUCHS

METAL BENDING MACHINE

Filed Feb. 1, 1924 3 Sheets-Sheet 1

Fig. 1.



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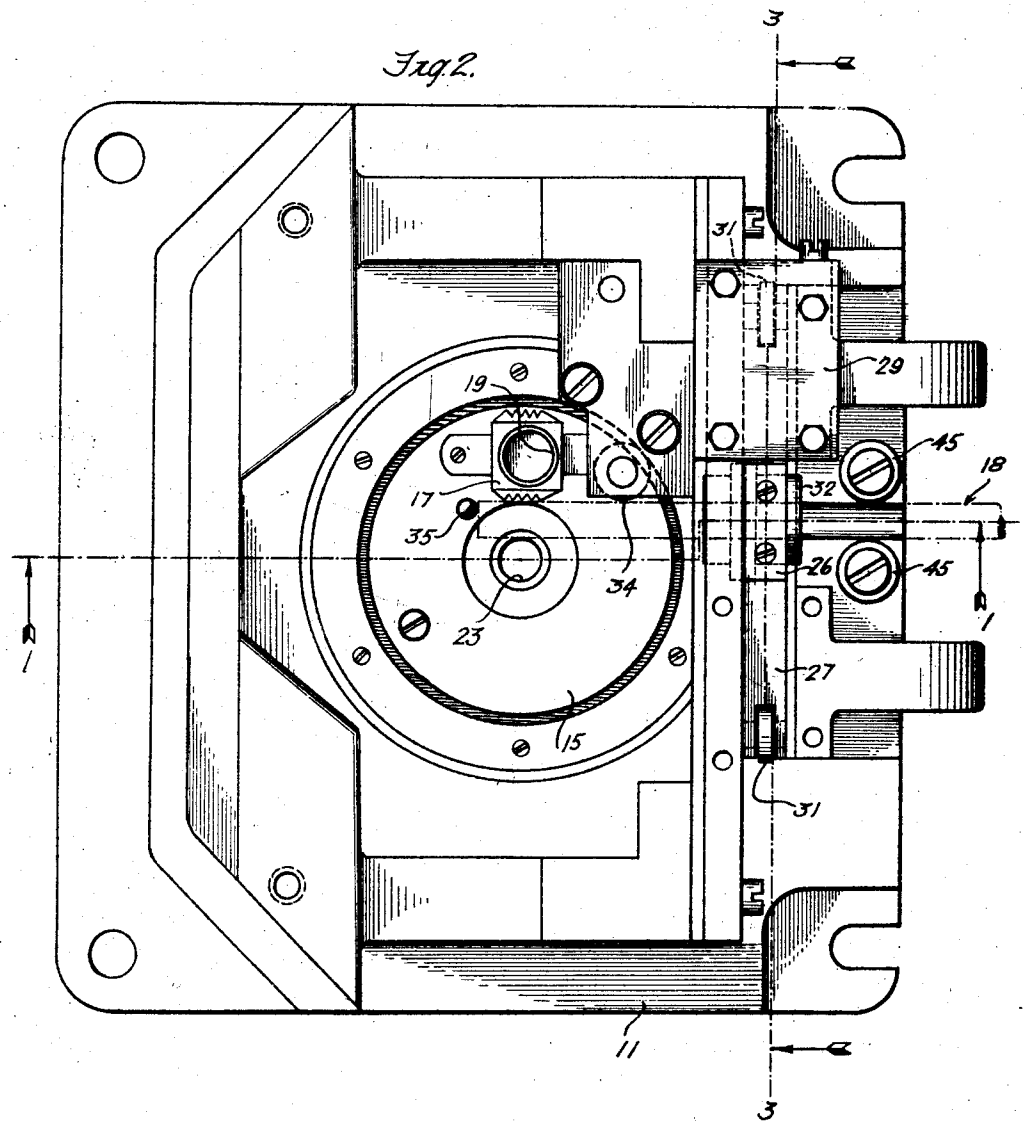
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Fig 2.



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METAL BENDING MACHINE

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Fig. 3.

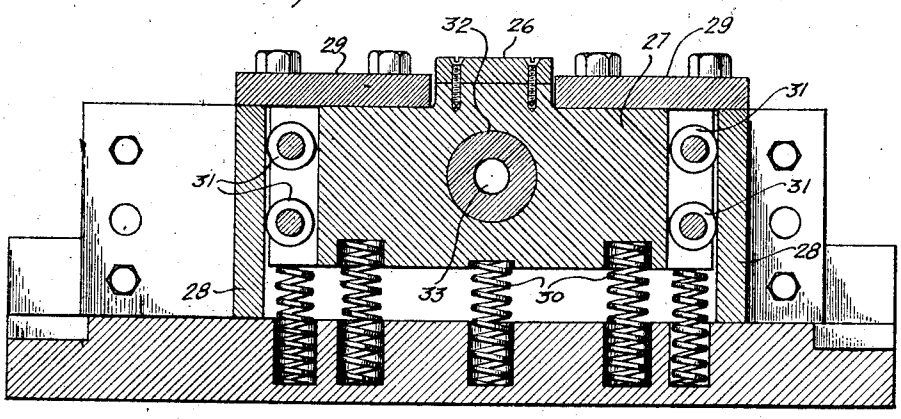


Fig. 4.

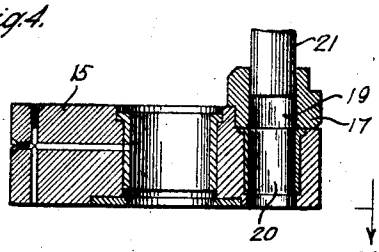


Fig. 5.

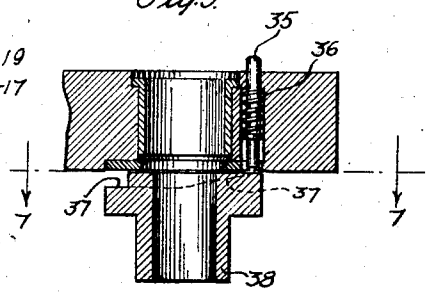


Fig. 6.

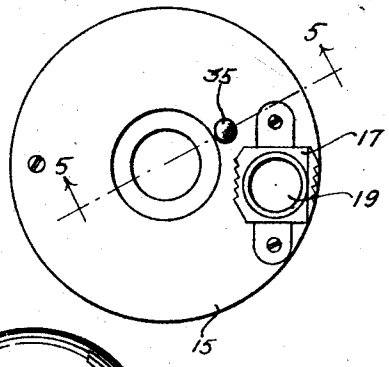


Fig. 7.

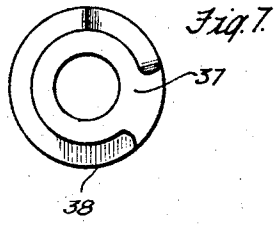
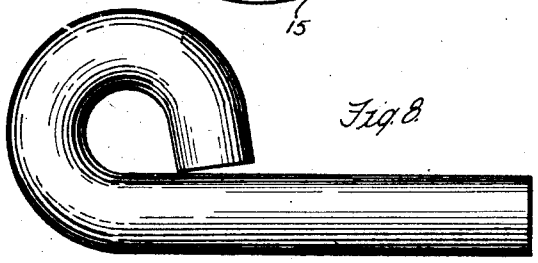


Fig. 8.



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UNITED STATES PATENT OFFICE.

HUGO FUCHS, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO CHAUNCEY M. SINCERBEAUX, OF JACKSON HEIGHTS, NEW YORK.

METAL-BENDING MACHINE.

Application filed February 1, 1924. Serial No. 689,881.

This invention relates to metal bending machines and more particularly to machines for forming hooks or eyes at the ends of sections of bar stock.

In the art relating to metal bending, both hand and power-operated devices for producing hook or eye terminal members on rods or bars have been heretofore known. Such devices have, however, been of a slow-acting type and have been otherwise unsuited to produce hook or eye members as a complete special product in themselves and at a satisfactorily high speed of production.

The principal objects of the present invention are to improve the construction and mode of operation of metal bending machines of the class above described, and to produce a machine which will operate to form hook bolts or eye bolts in a novel and improved manner, and which is capable of a much higher rate of production than machines heretofore produced.

With these objects in view, the invention consists in a machine having the novel and improved features, constructions and combination of parts hereinafter described and particularly pointed out in the claims, the advantages of which will be readily understood and appreciated by those skilled in the art.

The invention will be clearly understood from the accompanying drawings, illustrating the invention in its preferred form, and the following detailed description of the constructions therein shown.

In the drawings,

Figure 1 is a view in vertical section of a hook forming device embodying the invention, the section being taken along the line 1—1 of Fig. 2.

Fig. 2 is a plan view of the lower or bed plate portion of the device shown in Fig. 1.

Fig. 3 is a view in vertical section taken along the line 3—3 in Fig. 2.

Fig. 4 is a detail view in vertical section of a rotatable forming plate, the section being taken substantially on the line 4—4 of Fig. 1.

Fig. 5 is a sectional detail along the line 5—5 in Figure 6 of a portion of the forming plate and certain associated parts.

Fig. 6 is a plan view of the rotatable forming plate.

Fig. 7 is a detail plan view along the line 7—7 in Figure 5 of a stop controlling cam member; and

Fig. 8 is a view in side elevation of an eye member such as may be formed by the device illustrated.

The machine embodying the invention in its preferred form, as illustrated in the drawings, comprises a vertically reciprocating head member 10 and a stationary bed plate 11 on which the work is held. The head member 10 of the machine may be mounted to slide vertically on suitable guides and may be driven through suitable connections from a suitable source of power.

Projecting downwardly from the reciprocating head 10 and preferably seated therein by means of a screw-threaded connection 12 is a worm nut 13 having a series of internal threads of relatively deep pitch into which is threaded a worm member 14. The worm member 14 is supported upon the worm nut 13 by mechanism comprising a ring 39 loosely mounted upon the worm nut and arranged to engage a flange 40 on the nut to limit the downward movement of the ring with relation to the worm nut. To the ring 39 are attached at their upper ends a series of supports 41, the lower ends of which are attached to a ring 42 surrounding the lower end of the worm 14, the worm being rotatable therein. The worm 14 is held from axial movement with relation to the ring 42 by means of a flange at the lower end of the worm and a collar 43 secured to the worm, between which elements the ring 42 is engaged. The worm 14 is normally held in its limiting lowermost position with relation to the worm nut 13 by means of a coiled spring 44.

The mechanism for bending the stock comprises the rotatable bending or forming plate 15 mounted on the bed plate 11 below the worm member 14. When the reciprocating head 10 is in its uppermost position, the lower end of the worm 14 is spaced from the forming plate 15 a distance sufficient to permit the insertion of a section of stock between the worm member and the forming plate. When the head 10 is moved downwardly, the worm member 14 is carried downwardly until an element at the lower end thereof engages a stop carried by the forming plate. When the downward movement of the worm member 14 is thus arrest-

ed. the continued downward movement of the worm nut 13 produces a rotary movement of the worm member and thereby rotates the forming plate 15 to bend the work in the manner hereinafter described.

The forming or bending plate 15 is mounted for rotation about a vertical axis upon a tubular member 46 and rests on ball bearings 16 seated on the bottom of a recess in the bed plate 11. The plate is provided with a toothed jaw or gripping member 17 secured thereto which is adapted to grip the work 18 and draw it through an arcuate path as the plate is revolved. The toothed jaw member 17 is provided with an opening 19 in vertical alinement with a similar opening 20 extending through the forming plate 15. The alined openings 19 and 20 are adapted to receive a downwardly extending pin 21 projecting from the lower end of the worm member 14. The pin 21 extends into the opening 19 in even the elevated position of the worm member so that the worm member and the forming plate rotate together and at all times occupy like angular positions.

The lower end of the worm member 14 is provided also with a downwardly projecting centrally disposed pin 22 which, in the descending movement of the head 10, enters a centrally disposed recess 23 in a removable seat 24 in the forming plate. The abutment of the pin against the lower face of the recess in the seat 24 checks further descent of the worm and further downward movement of the head causes the worm to rotate as above described, and through the engagement of the driving pin 21 with the jaw 17 causes corresponding rotation of the forming plate. In the rotation of the forming plate the bar or rod 18 forming the stock is drawn and bent about the center pin 22 thereby to form the desired hook or eye at the end of the bar. The extent of downward movement of the head and worm before rotation of the plate begins may be altered by substituting a seat member 24 of different depth.

As the forming operation is completed a cut-off actuating stud 25 carried by the head 10 engages a strike-plate 26 carried by a vertically movable cut-off blade 27 through which and a fixed blade 28 the stock 18 extends. The blade 27 is mounted in a vertical guideway formed by guide plates 28 in which it is held by the cover plates 29. Suitable springs 30 hold the blade in its normal elevated position and antifriction rollers 31 at the opposite ends of the blade member engaging the guide plates 28 facilitate its operation. The cutting blades are provided with hardened annular cutting members 32 through the alined openings 33 of which the work is inserted.

In order to limit the length of the section of stock supplied to the forming plate for an operation a stop pin 35 shown in Fig. 1 is mounted in the forming plate 15 in position to be engaged by the end of the stock 18 as the stock is extended through the openings 33 into position to be operated upon as shown in dot and dash lines in Fig. 2. In order to prevent interference of the stop member with the operation of the device, provision is made for withdrawal of the stop pin from its projecting position when rotation of the forming plate begins. To bring this about the stop pin 35 is mounted for vertical movement in the forming plate and is acted upon by a spring 36 tending to move the stop pin downwardly against a cam surface 37 formed on the upper side of a stationary bushing member 38. Bushing 38 is clamped to the bed plate 11 preferably by a shoulder on the tubular member 46 which is secured in place by the nuts 47 as shown in Fig. 1. Pin 35 normally rests on the high portion of cam surface 37 so as to project above the face of plate 15 to stop the end of the stock. As the plate 15 begins to rotate, the pin 35 rides down the inclined cam surface 37 and is at once withdrawn so as not to interfere with the bending operation.

In order to determine the extent of the bending, that is, the degree of opening of the hook or its complete closure to form an eye, the supports 41 are provided with turnbuckles which enable the supports to be adjusted in length to adjust the ring 39 toward and from the ring 42. It will be seen that adjusting the vertical position of the ring 39 with relation to the ring 42 adjusts the length of travel of the worm nut longitudinally of the worm and thereby determines the extent of rotation of the worm and the forming plate. The length of the cut-off actuating stud 25 may also be varied to control the time of the severing operation which may occur at any desired point in the cycle, either before or after the hook is completely formed.

In order to guide the stock as it is fed to the machine, two rolls 45 are mounted on the bed plate in advance of the cutting-off mechanism and arranged to receive the stock between them, as shown clearly in Fig. 2. A third guide roll 34 is mounted on a block secured to the bed plate so as to engage the stock between the cutting-off mechanism and the bending devices to assist in locating the stock.

In the operation of the machine the reciprocating head 10 may be operated continuously or intermittently, and the operating mechanism therefor may be under control of the operator if desired. In the operation of the machine, starting with the head 10 in its elevated position, a section of bar stock is inserted by the operator between

the rolls 45, through the cutting members 32, and along the guide roll 34 and the gripping jaw 17, until it engages the stop 35. With the stock in this position, upon the downward movement of the head 10 the worm nut and worm are moved downwardly together until the pin 22 is seated in the recess 23 in the seat 24, the pin thus being located substantially in contact with one side of the stock, as will be noted from inspection of Fig. 2. During the further downward movement of the head 10, the worm nut 13 is moved downwardly independently of the worm 14, thereby rotating the worm, and through the engagement of the pin 21 in the opening 20 in the forming plate the forming plate is rotated thereby bending the stock about the pin 22. During the latter part of the downward movement of the head, the lower end of the stud 25 engages the plate 26, thereby actuating the cut-off plate 27 to sever the stock. During the rotation of the forming plate, the stop pin 35 is moved downwardly out of operating position, so that it does not interfere with the bending operation. As the head 10 moves upwardly, the worm 14 is held in its lowermost position by the coiled spring 44 until the ring 39 engages the flange 40, the worm nut 13 then moving upwardly independently of the worm. During this movement of the nut, the worm is rotated back to its initial position, thereby rotating the forming plate back to its starting position. As the forming plate is rotated to starting position, the stop pin 35 is projected upwardly into operative position by the cam 37. During the last part of the upward movement of the head, the worm 14 is lifted away from the forming plate to a position shown in Fig. 1. The parts are thus restored to position to receive another section of stock between the worm and forming plate.

Having explained the nature and object of this invention and having specifically described a machine embodying the invention in its preferred form, what is claimed is—

1. In a metal bending device, a rotatable member for holding and bending the work, a worm nut movable toward and from the rotatable member along the axis of rotation thereof, and a worm member separate from the rotatable member and adapted to engage therewith and to be rotated by the movement of the worm nut toward the rotatable member.

2. In a hook forming device, a rotatable member for holding and bending an end section of a rod, a worm nut movable toward and from the rotatable member along the axis of rotation thereof, a worm carried by the worm nut and adapted to be brought into engagement with the rotatable member and to then be rotated by the further travel of the worm nut, means for causing the rotatable member to rotate with the worm, cut-off means for the work, and means traveling with the worm nut for actuating the cut-off means as the rotatable member completes its forming operation.

3. In a hook forming device, a rotatable forming plate, means on the plate for gripping the work, a worm nut movable toward and from the plate along the axis of rotation thereof, a worm member carried by the worm nut and normally spaced from the forming plate, said worm member being brought into rotatable engagement with the plate by the movement of the worm nut toward the plate, and means for varying the extent of rotation of the worm produced by the worm nut.

4. In a hook forming device, a rotatable forming plate, a cut-off device having alined openings through which stock is passed to a position having an end disposed on the face of the plate, means on the plate for gripping the work, a worm nut movable toward and from the plate along the axis of rotation thereof, a worm member carried by the worm nut and normally spaced from the forming plate, said worm member being brought into rotatable engagement with the plate by the movement of the worm nut toward the plate, means for varying the extent of rotation of the worm, and means traveling with the worm nut for actuating the cut-off device as the plate completes its forming movement.

5. In a hook forming device, a rotatable forming plate, a movable stop device projecting from the face of the plate, guide means whereby a rod may be directed across the face of the plate into engagement with the stop, work gripping means carried by the plate and spaced from the center thereof, a worm nut movable toward and from the plate along the axis of rotation thereof, a worm carried by the worm nut and having a centrally disposed pin extending toward the plate, said plate being provided with a recess to receive the pin, means for causing the plate to rotate with the worm when further axial movement of the work is checked by engagement of the pin with the plate whereby the end rod section is bent about the pin by the gripping means, and means for withdrawing the stop device during the rotation of the plate.

6. In a hook forming device, a rotatable forming plate, means on the face of the plate for gripping a rod section, a reciprocating head movable toward and from the face of the plate, means carried by the head for engaging and rotating the plate as the head moves toward the plate, cut-off means through which the work is passed to the forming plate, and means carried by the head for actuating the cut-off means.

7. In a hook forming device, a rotatable forming plate, means on the face of the plate

for gripping a rod end section, a reciprocating head movable toward and from the face of the plate, screw means carried by the head for engaging the plate and rotating the same under the movement of the head toward the plate whereby to bend the rod section, cut-off means through which the work extends to the plate, and means carried by the head for engaging and operating the cut-off means.

8. In a hook forming device, a rotatable forming plate, means on the face of the plate for gripping a rod end section, a reciprocating head movable toward and from the face of the plate, a worm nut carried by the head, a worm member carried by the nut and adapted to be brought into rotative engagement with the plate by the advancing movement of the head to thereby bend the rod section, spring means for maintaining the worm member in engagement with the plate during the receding movement of the head to thereby reverse the rotation of the head, and adjustable stop means carried by the worm and engaged by the nut near the end of the receding movement to withdraw the worm from the rotatable forming plate.

9. In a hook forming device, a rotatable forming plate, means on the face of the plate for gripping a rod end section, a reciprocating head movable toward and from the face of the plate, a worm nut carried by the head, a worm member carried by the nut and adapted to be brought into rotative engagement with the plate by the advancing movement of the head to thereby bend the rod section, spring means for maintaining the worm member in engagement with the plate during the receding movement of the head to thereby reverse the rotation of the head, adjustable stop means carried by the worm and engaged by the nut near the end of the receding movement to withdraw the worm from engagement with the plate cut-off means for the work, and an adjustable actuating member for the cut-off means carried by the head for severing the stock at any desired point in the forming operation.

10. In a hook forming device, a rotatable hook forming member, means for locating a rod in position to be acted upon by said member, a driving member reciprocable in the direction of the axis of rotation of the hook forming member, and connections for converting reciprocating movement of the driving member into rotary movement of the hook forming member.

11. In a hook forming device, a rotatable hook forming member, means for locating a rod in position to be acted upon by said member, a driving member reciprocable in the direction of the axis of rotation of the hook forming member, connections for converting reciprocating movement into rotary movement of the hook forming member and means for cutting the rod actuated by the driving member.

Signed at New York city this 16th day of January 1924.

HUGO FUCHS.