

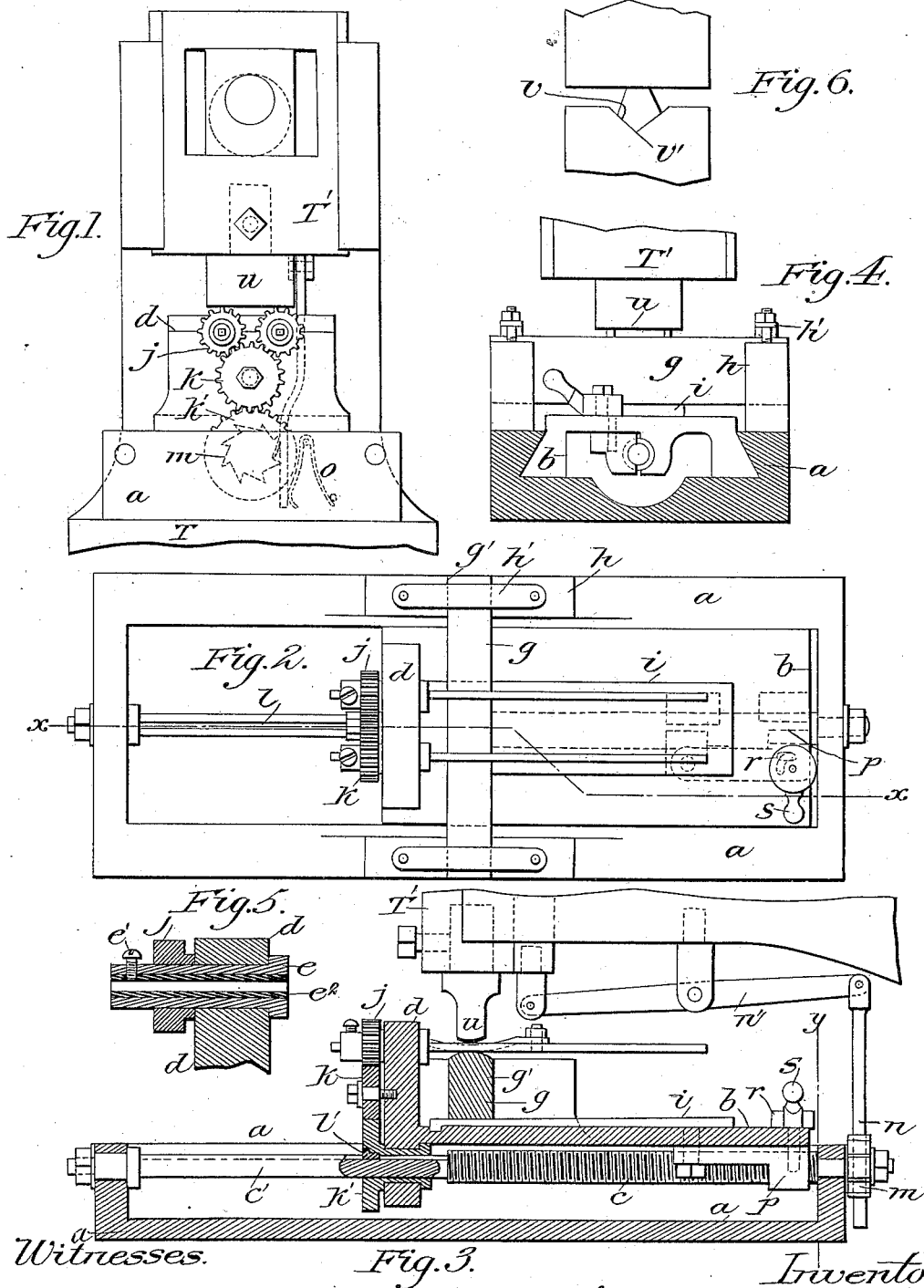
(No Model.)

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APPARATUS FOR TAPERING METALLIC BLANKS.

No. 383,142.

Patented May 22, 1888.



Witnesses.

Fig. 3.

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# UNITED STATES PATENT OFFICE.

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## APPARATUS FOR TAPERING METALLIC BLANKS.

SPECIFICATION forming part of Letters Patent No. 383,142, dated May 22, 1888.

Application filed July 9, 1887. Serial No. 243,833. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES NOBS, a citizen of the United States, residing at Newark, Essex county, New Jersey, have invented certain new and useful Improvements in Apparatus for Tapering Metallic Blanks by Percussion, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

My present invention is for the purpose of converting a piece of wire into a tapering broach by the action of a hammer; and it consists in means for intermittently rotating the blank for the broach upon an anvil, in means for striking the blank intermediate to such rotations, in means for feeding the blank longitudinally, and in means for gradually raising the anvil during such longitudinal feed.

In the drawings, Figure 1 is an end elevation of the apparatus, including the table of a punching-press and the reciprocating head for actuating the hammer. Fig. 2 is a plan of the broach-tapering apparatus detached from the table and the hammer shown without the reciprocating head. Fig. 3 is a longitudinal section on line *xx* in Fig. 2. Fig. 4 is a vertical section on line *yy* in Fig. 3. Fig. 5 is a section of one of the bearings *d*, with the sleeve or holder *e* upon a larger scale, and the end of a blank clamped therein; and Fig. 6 is a diagram showing the hammer and anvil for a five-sided broach.

The fixtures I have devised may be applied to any kind of press or tool provided with a reciprocating head or slide to actuate the hammer, the fixtures in the drawings being placed upon a table, *T*, and the reciprocating slide *T'* being provided with a hammer, *u*, to operate conjointly with an anvil provided in the fixtures to taper the broach in the desired manner.

The device may be operated to produce a polygonal broach with any number of sides, but is shown herein adapted to form square broaches. For such purpose square wire highly annealed can be bought, and it is immaterial in my process whether such wire be straightened or not, as the process itself produces a perfectly-straight broach from crooked wire. Round wire would be used to make broaches of other forms than square.

*a* is the bed, dovetailed to fit a carriage, *b*, which is moved longitudinally upon the bed by a screw, *c*, and carries in bearings *d* two rotary sleeves or holders, *e*, geared together and to the screw and provided with clampscrews *e'*, to grasp the blanks *f*. The blanks project over the carriage and over a transverse anvil, *g*, the ends of which are vertically movable in slots *g'* in guides *h* at each side of the carriage and are pressed downward in the slots by springs *h'*. The lower side of the anvil rests upon a wedge, *i*, affixed upon the carriage and movable therewith, and adapted, as the carriage is traversed from right to left, to slowly raise the anvil.

The bearings *d* are fixed across one end of the carriage, and the holders *e* are provided each with a gear, *j*, rotated by an intermediate wheel, *k*, and a gear, *k'*, fitted to slide longitudinally upon the shank *c'* of the screw as the carriage is fed along thereby. The screw-shank *c'* has a groove, *l*, to fit a feather, *l'*, in the gear *k'*, and the end of the screw is provided with a ratchet-wheel, *m*, which is actuated by a pawl, *n*, pivoted to a lever, *n'*, actuated by the head *T'*.

The movement of the hammer from the anvil may be very slight, merely sufficient to permit the corners of the broach to turn between the anvil and hammer; but in practice the stroke of the head *T'* would be regulated to produce the desired movement of the pawl *n*, the latter being pressed toward the wheel *m* by a spring, *o*, and the pawl movement being just sufficient to turn the ratchet-wheel *m* one tooth during the downward movement of the pawl.

The gears *j* are shown one-half the size of the gear *k'*, so that to rotate the sleeve *e* one-quarter of a turn the pawl is required to rotate the ratchet-wheel one-eighth of a turn, and the latter is therefore provided with eight teeth. By such means the blank *f* is intermittently rotated one-quarter of a turn, and the reciprocation of the hammer toward the anvil operates to press the blank thereon intermediate to such rotations, and the anvil being supported rigidly and the hammer reciprocated positively the operation forms the blank into a perfect square between the opposed surfaces. The ratchet-wheel, being affixed to the screw,

rotates the screw to operate upon the carriage by a detachable nut, *p*, and thus moves the carriage from right to left during the hammering operation.

5 The anvil, as before stated, is movable vertically in the slots *g'*, and its under side rests upon the wedge *i*, which is formed of one-half the taper of the proposed broach and affixed to the upper side of the carriage to move there-  
10 with. The movement of the carriage, while it thus draws the broach gradually along between the hammer and anvil, operates to raise the anvil positively and to thus diminish the distance between the anvil and hammer, which  
15 latter is reciprocated positively to the same point during the entire operation.

The bed *a* is made of sufficient length for the carriage *b* to travel as far as the length of the broach may require, and when the broaches  
20 are finished the detachable nut *p* is withdrawn from the screw by the eccentric *r* and handle *s*, or any equivalent device, and the carriage shifted to the initial position, as shown in Fig. 3, and the nut re-engaged.

25 The actual result of the operation is to strike the broach four separate blows during each rotation at points exactly ninety degrees apart and to gradually taper it as the hammer and anvil are approximated to one another by the  
30 operation of the wedge. The broaches thus made are peculiarly straight and sharp and require no preparation, except hardening, to fit them for immediate use, and the process is adapted to produce with equal facility broaches  
35 of any size which can be formed from wire and with any number of sides.

In Fig. 4 two square broaches are shown upon the anvil, with the hammer resting thereon, and in dotted lines the hammer is shown  
40 raised to its full height, as it appears in Fig. 1, with the broaches similarly shown in dotted lines in their diagonal position while turning over upon the anvil.

To adapt the sleeve or holder *e* to grasp and  
45 rotate blanks of different sizes, it is provided internally, as shown in Fig. 5, with a removable bushing, *e'*, perforated to receive the required blank, and provided with a hole through one side to receive the clamp-screw *e'*.

50 Fig. 6 shows the anvil required to form a broach with an uneven number of sides, the same being provided with a groove, *v*, to fit two of the adjacent sides, and the hammer operating upon the flat side opposite the lower  
55 angle, *v'*. A parallel anvil and hammer—such as are shown in Fig. 4—may be used to form broaches with any even number of sides, as four, six, or eight, the ratchet mechanism in all cases being actuated suitably to turn each  
60 side successively into contact with the anvil or hammer.

To change the angle of rotation, the ratchet-wheel *m* may be made exchangeable for other  
65 wheels with more or less teeth, or the gear-wheels *j*, or any other means employed for transmitting the movement from the ratchet-wheel to the blank, may be made changeable,

like the feed-wheels upon a turning-lathe, to vary the angle of rotation with the same ratchet-wheel. Any other means of grasping and  
70 holding the blanks may be used, and, as stated above, the mechanism for intermittently rotating the blanks and for producing upon them the graduated pressure required to produce  
75 the tapering form may be constructed and operated in any desired manner without departing from my invention.

It is obvious that the apparatus would form a round tapering pin if the hammer and anvil were provided with half-round notches of suit-  
80 able dimensions, and I do not, therefore, limit my invention to the formation of polygonal objects only.

It is obviously essential that pressure of varying intensities should be exerted upon the  
85 blank to produce a taper form as it is fed longitudinally, and it is immaterial whether such pressure be effected by moving the hammer positively to the same point at each stroke and  
90 moving the anvil gradually toward it, as shown herein, or retaining the anvil in a fixed position and gradually varying the stroke of the hammer in the desired ratio.

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

95 1. An apparatus for producing polygonal metallic broaches, consisting in the combination, with a rotary holder for the blank, of an anvil for supporting the blank, means for moving the blank longitudinally upon the an-  
100 vil, means, as a pawl and ratchet, for producing an intermittent partial rotation of the blank, and a reciprocating punch or hammer for pressing the blank upon the anvil, the whole arranged and operated as and for the  
105 purpose set forth.

2. In an apparatus for tapering metallic blanks, the combination, with a rotary holder for the blank, of an anvil for supporting the  
110 blank, a reciprocating hammer or punch for pressing the blank upon the anvil, and means actuated by the reciprocating hammer for intermittently rotating the blank and moving it longitudinally, and the means, substantially  
115 as described, for gradually raising the anvil during such longitudinal movement.

3. In an apparatus for tapering metallic blanks, the combination, with a rotary holder for the blank, of an anvil for supporting the  
120 blank, a reciprocating hammer or punch for pressing the blank upon the anvil, a carriage for sustaining the rotary holder and movable longitudinally upon a suitable bed, a feed-screw for traversing the carriage upon the  
125 bed, means connected with the carriage for gradually raising the anvil, a ratchet-wheel connected with the feed-screw, and a pawl actuated by the same means as the reciprocating hammer and operating upon the ratchet-  
130 wheel to rotate the screw and the rotary holder, as and for the purpose set forth.

4. In an apparatus for tapering metallic blanks, the combination, with a rotary holder for the blank, of an anvil for supporting the

blank, a reciprocating hammer and punch for  
pressing the blank upon the anvil, a carriage  
for sustaining the rotary holder and movable  
longitudinally upon a suitable bed, a feed-screw  
5 for traversing the blank upon the anvil, guides  
for the anvil to move vertically, a wedge sus-  
taining the anvil and moved longitudinally to  
raise the anvil gradually during the longi-  
tudinal movement of the blank, a ratchet-wheel  
10 connected with the feed-screw, and a pawl actu-  
ated by the same means as the reciprocating

hammer and operating upon the ratchet-wheel  
to rotate the screw and the rotary holder, as  
and for the purpose set forth.

In testimony whereof I have hereunto set my 15  
hand in the presence of two subscribing wit-  
nesses.

CHARLES NOBS.

Witnesses:

HUGO BOEPPLE,  
THOS. S. CRANE.