

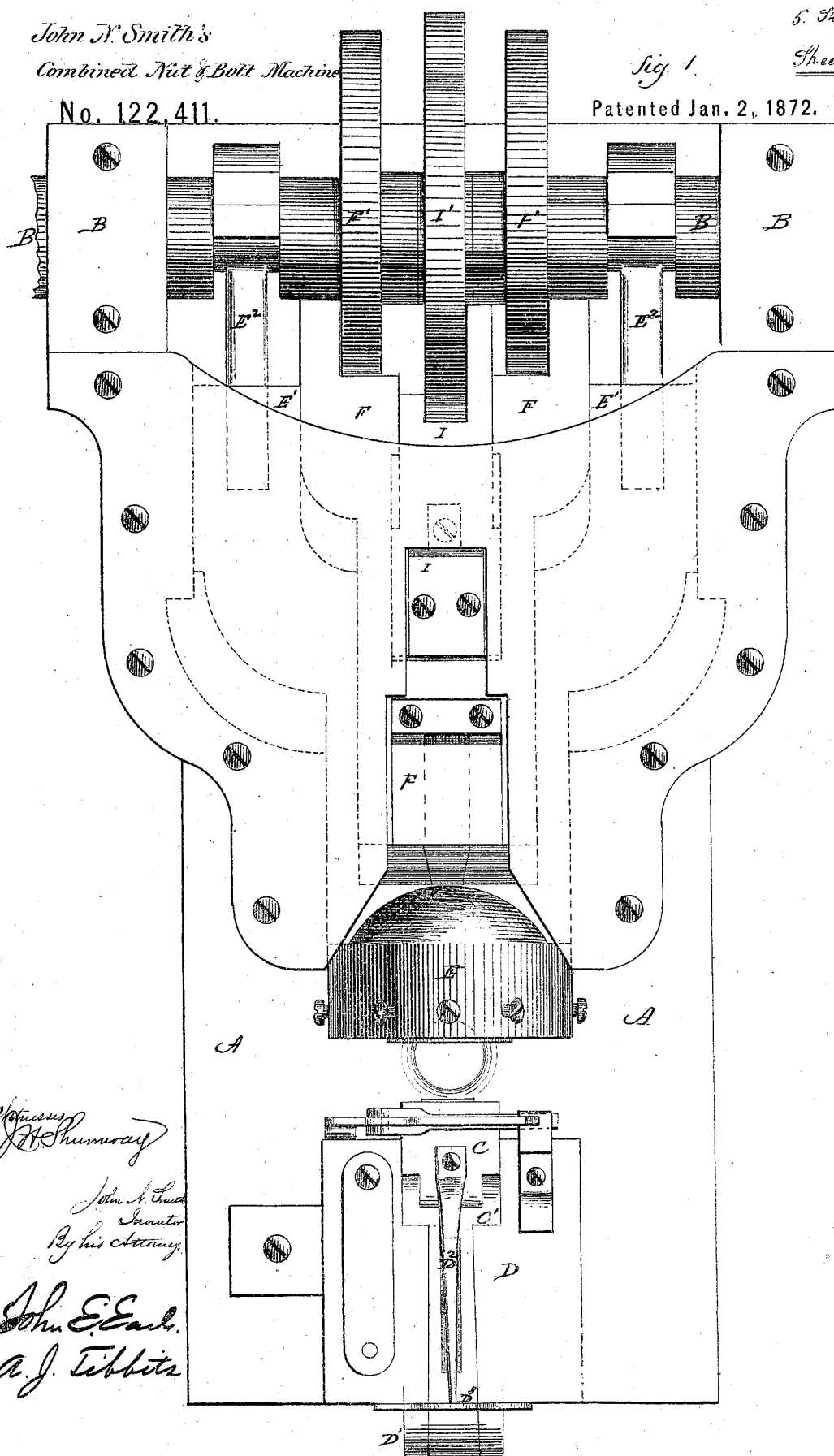
No. 122,411.

5. *Fructs.*

Sheet 1.

Fig. 1.

Patented Jan. 2, 1872.



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John E. Earle.
A. J. Tibbitts

John N. Smith's

Combined Nut & Bolt Machine.

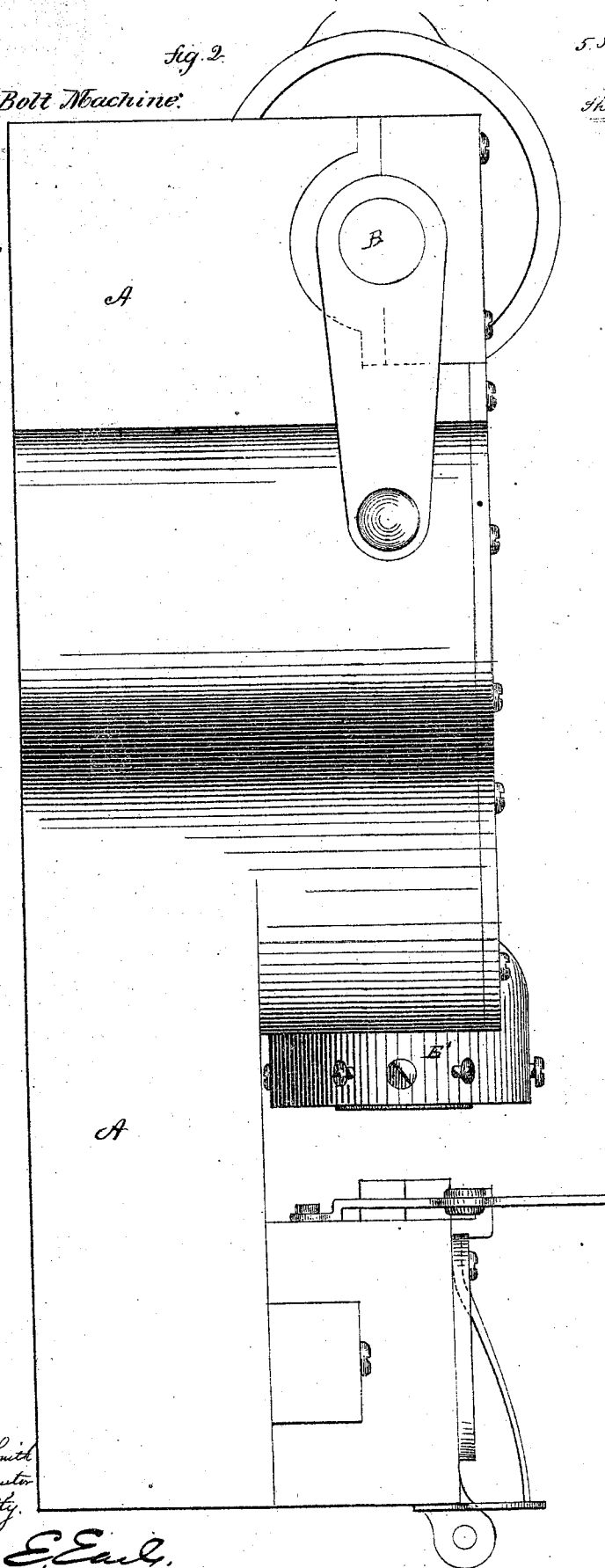
fig. 2.

5 Sheets.

Sheet 2

No. 122,411.

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Sheet 3

fig. 3.

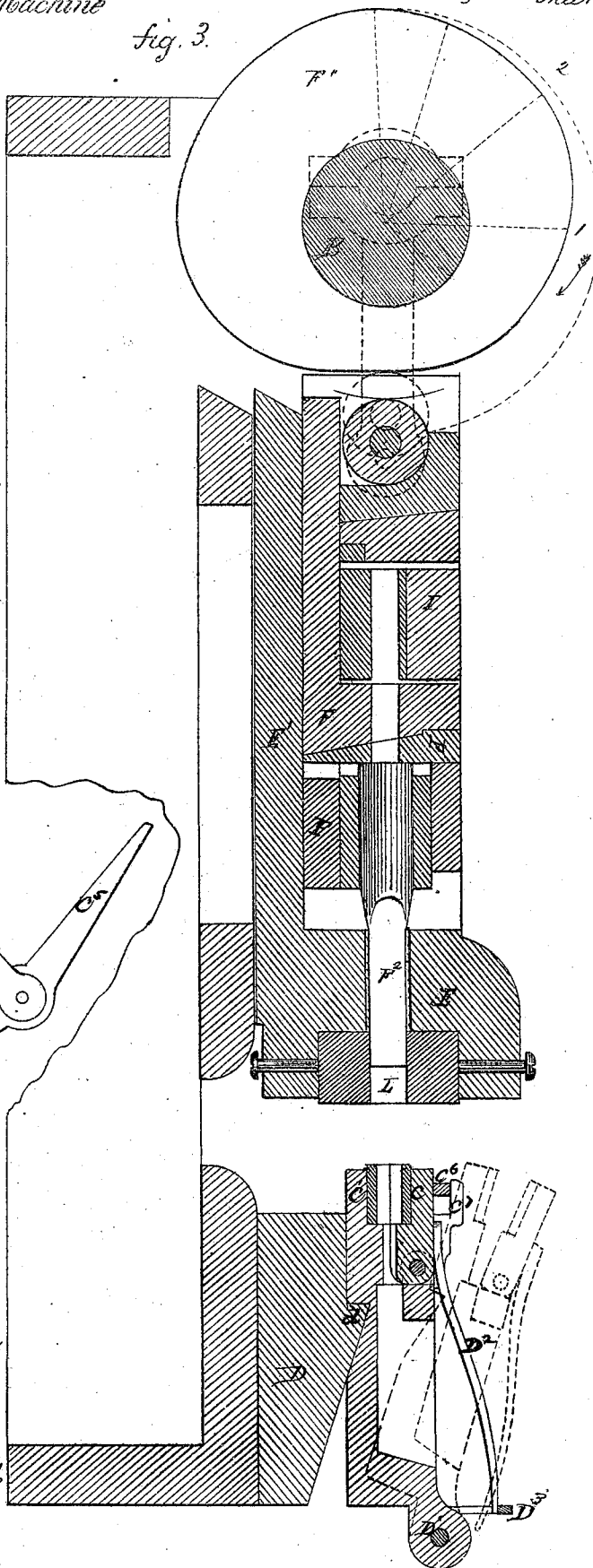


fig. 4.

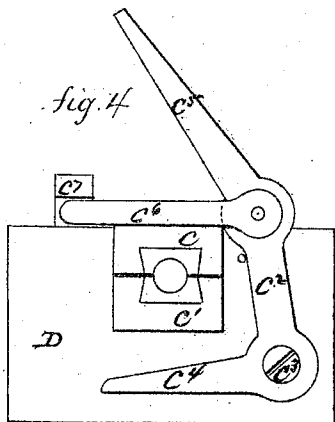
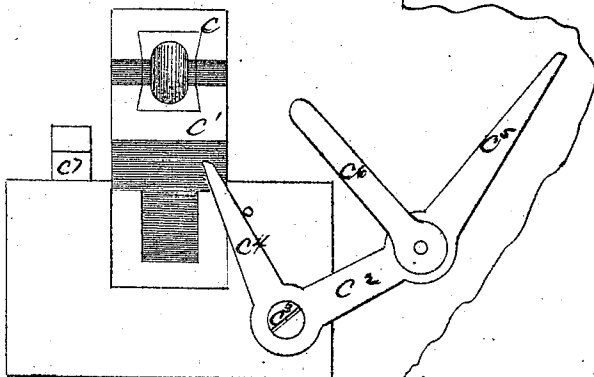


fig. 5.



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Sheet 4.

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Fig. 6.

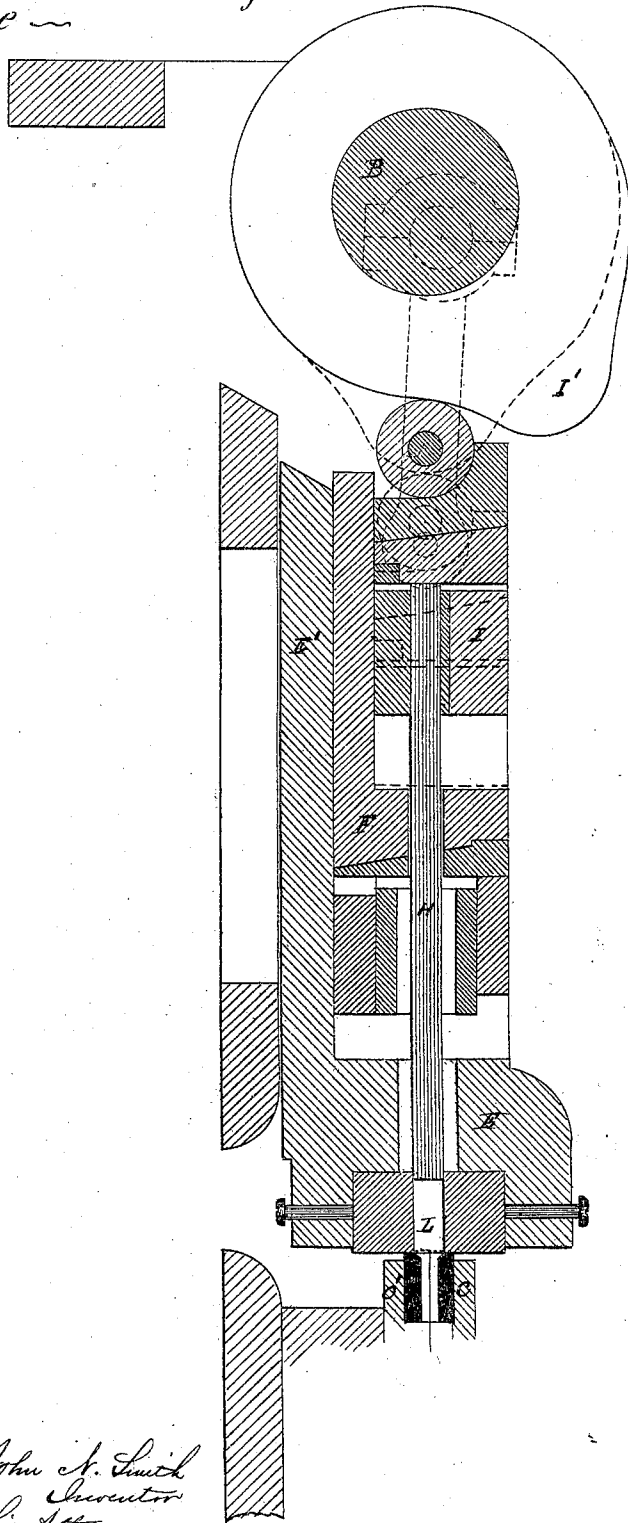
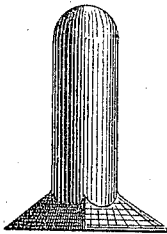


Fig. 7.



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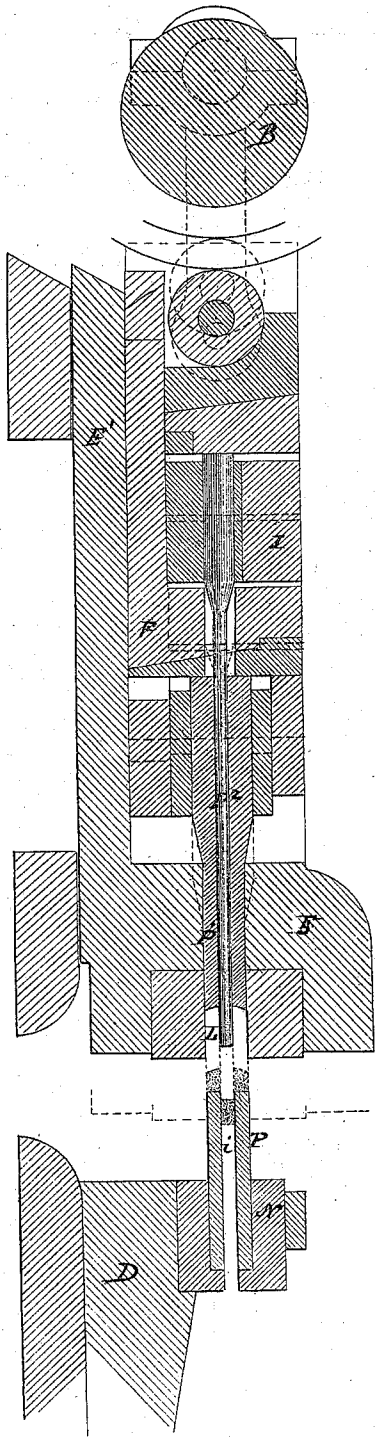
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Sheet 5

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fig. 8



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UNITED STATES PATENT OFFICE.

JOHN N. SMITH, OF NEW HAVEN, CONNECTICUT.

IMPROVEMENT IN COMBINED BOLT AND NUT MACHINES.

Specification forming part of Letters Patent No. 122,411, dated January 2, 1872; antedated December 16, 1871.

To all whom it may concern:

Be it known that I, JOHN N. SMITH, of New Haven, in the county of New Haven and State of Connecticut, have invented a new Improvement in Combined Nut and Bolt Machine; and I do hereby declare the following, when taken in connection with the accompanying drawing and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawing constitutes part of this specification and represents, in—

Figure 1, a top view; Fig. 2, a side view; Fig. 3, a longitudinal central section as set for making ordinary bolt-heads; Fig. 4, an end view of the holding-die as when clamping the blank; Fig. 5, the same raised to receive the blank; Fig. 6, a longitudinal central section of the machine as set and in operation for making what are called agricultural bolts, such as seen in Fig. 7; and in Fig. 8, a longitudinal central section as when arranged for making nuts.

This invention relates to an improvement in a machine for making nuts and bolts, the object being to adapt the same machine to the making of various kinds of nuts, bolts, and washers, as may be required; and consists in the improvements, as more fully hereafter set forth in the claim.

A is the bed of the machine, upon which the operative mechanism is arranged; B, the driving-shaft, arranged in suitable bearings B', and to which power is applied in the usual manner for similar machines.

I will first describe the machine as adapted for making common bolts. These are formed upon short pieces of rod, to which, after the head is formed, another piece of rod is welded to extend the bolt to the length desired. These pieces are first set between the two parts C¹ of a holding-die, and the said die is constructed as seen in Figs. 1, 3, 4, and 5. The lower holder C¹ is fitted into a head-block, D, and with a shoulder, *d*, upon its under side as a rest or support to withstand the pressure when the blank is upset. This part C¹ is pivoted to the block at D¹ so as to be raised from its seat, as denoted in broken lines, Fig. 3. The other part C is pivoted in the part C¹, as seen in Fig. 3, so as to open or swing up from the part C¹. When the blank is to be inserted the die is raised, as denoted in broken lines, Fig. 3, and as seen in Fig. 5. To open the clamping-dies

an arm, D², fixed to the part C, and extending back to a yoke, D³, is operated so that, when the holding-dies are turned up, the arm D² will be depressed, as denoted in broken lines, Fig. 3, and thus open the upper portion of the holding-die from the lower. The die is thus raised by means of a lever, C², pivoted at C³, with an arm, C⁴, extending below the holding-dies; therefore, by laying hold of the handle C⁵ of this lever and drawing it out to the position shown in Fig. 5, the arm C⁴ bears up against the holding device, raising it as seen in Fig. 5. In this position the blank is introduced, the depth of the die being sufficient to receive the blank and leave the requisite quantity of metal to form the head projecting therefrom; then the lever is turned back to allow the holding device to drop and to hold the holding device with its blank in position. A bar, C⁶, is jointed to the lever C², which, so soon as the holding device is dropped, passes over it and enters into or beneath a projection, C⁷, as seen in Fig. 4. The bar C⁶ in that position secures the holding device firmly in its place. After the head has been formed the reverse of this operation allows the removal of the formed bolt-blank and the introduction of the second. E is the die-holder or head, formed in a slide, E¹, extending back and working longitudinally on the frame of the machine in suitable guides, as in Fig. 1, and is caused to move longitudinally by eccentrics on the shaft connected with the slide by the rod E², as seen in Fig. 1, and in broken lines, Fig. 2. The revolution of the shaft causes the head E to advance and recede from the holding device in similar manner to other machines of this class. In guides through the slide E¹ a second slide, F, is arranged also to move longitudinally by the action of cams F¹; and within this a third slide, I, operated by a cam, I¹, each of the slides having its own independent movement and relative to each other, as more fully hereafter described. In the head E a die, L, is arranged in a central position relatively to the blank-holder, and having a central space the size and shape of the sides of the bolt-head to be produced—that is to say, square for a square head, or hexagonal for a six-sided head. In the slide F a follower, F², is secured, and passes through the head E into the die L. The said follower is moved freely in the die L by

the movement of slide F, adjusted longitudinally by a wedge or equivalent device, F^3 —that is, to cause the follower to advance to a greater or less distance.

Standing in the position seen in Fig. 3, the slides F E^1 are drawn back to their fullest extent, the shaft revolving in the direction denoted by the arrow up to the point 1. The die and follower move together. At that point the follower F^2 strikes the end of the blank to commence the upsetting, the follower moving faster or equally as fast as the die to the point 2, at which point the blank has been so far spread as to cause the metal to come in contact with the sides of the die; then from the point 2 to 3 both the die and follower continue to advance, but the die a little faster than the follower. This is done that the follower may, rubbing over the surface of the metal, work it forward for the purpose of filling or perfectly forming the lower angles of the head. From the point 3 to the extreme point 4 the follower moves slightly faster than the die, the eccentrics at that point passing their dead center, which gives a final pressure to the head. This operation overcomes a difficulty which has existed in all machines for forming bolt-heads—that is to say, the filling of the lower angles of the head—and this difficulty occurs in consequence of upsetting the metal within a stationary die or one moving with the same velocity or slower than the follower. By this manner of operating the dies and follower the metal first upset is carried forward by the combined action of the die and follower by the die moving faster through a portion of its operation than the follower. This movement is accomplished by constructing the cam which operates the follower relatively to the cam or eccentric for operating the dies to produce this result.

This construction or operation is designed for bolts the heads of which have parallel sides; but in the class of bolts known as agricultural bolts—that is to say, the bolts in which the edge is made very thin, as in Fig. 7—a different operation is necessary; and for this class of bolts the third slide I is brought into use, as seen in Fig. 6, the use of the slide F in this class of bolts being dispensed with, and the follower F^2 is removed. For the blank-holding devices I employ one similar to that above described, with this difference only, that the shape of the under side of the bolt-head is inclined, (see $c c'$;) the holding-die is accordingly inclined or recessed on its front vertical face, and the follower H is secured in the slide I, operated by the cam I^1 , the follower extending forward through the slide F into the die L in like manner as the follower F^2 , before described. This follower is adjusted longitudinally by means of a wedge, I^3 , or equivalent device, in like manner as before described for the follower F^2 . The head or die advances by the action of its eccentrics up to the holding-dies, as before described, the blank passing into the die; then the follower advances by the action of the cam I^1 upsetting

the metal and forming the thin head against the face of the holding-dies, as seen in Fig. 6.

It will be observed that, in consequence of the head being so thin, the upsetting cannot take place until the die L has passed into close proximity with the holding-die, the head being practically formed nearly or quite in the recess in the end of the die L; and as the upsetting must take place while the die L is in that position, it is necessary that the follower should move more rapidly than the die in forming the head, as before described; hence the peculiar shape of the cam I^1 , as in Fig. 6.

Oval-headed bolts or rivets with a thin edge are formed in the same manner; it being only necessary that the end of the follower be made the shape of the surface of the head required, and the face of the holding-dies shaped accordingly.

To make nuts with this machine the three slides are called into operation, as seen in Fig. 8; but the holding device $C C'$ is removed and a fixed holder, N, set into its place, holding a hollow stationary punch, P, the punch being externally of the shape of the nut to be produced. Into the die L a follower, P^1 , extends, its forward end made concave to give the requisite "crown" to the nut; and from the slide I the punch P^2 extends centrally through the follower P^1 for piercing the nut. By the action of the cams, the construction of which is as before described, the head E advances onto the punch P, forward of which the bar of metal, of which the nut is to be formed, has been placed, and cuts the blank from the bar; the blank passing into the die is compressed by the crowner or follower P^1 to give the required shape; then the piercing-punch P^2 advances, perforating the nut and carrying the perforation into the punch P, through which it passes out, as denoted in stippled section. The piercing-punch withdraws first, then the head E, and lastly the follower, leaving the finished nut to drop from the machine. The motion of the parts relatively to each other being precisely the same as before described, the surface of the nut is smoothed by the die L passing over it.

The adjustment of the punch, follower, and dies in their respective slides is made by any of the well-known clamping devices.

Thus I have produced a machine which, by simply changing the dies and punches, will produce nuts, washers, and bolts of various kinds required.

I am aware that machines are in use in which the inclosing-die and punch or plunger are forced up at different times, the first to inclose and the second to upset; also, that in such machines the punch has been forced up by a series of consecutive movements; that all these movements have been effected by cams operating upon the punch and the inclosing-die. I do not, therefore, claim any of these; but

What I do claim is—

1. The construction and arrangement relative to one another, herein described, of the

die-head E, die L, slide E¹, the slide F, the wedge or equivalent device, slide I with adjusting-wedges in the rear thereof, and the cams F¹ F² and I¹.

2. I claim, jointly with the subject-matter of the first claim, the interchangeable devices F², H, P¹, and P², as and for the purpose set forth.

3. I claim, jointly with the subject-matter of the first claim, the interchangeable holders C, C¹, c c', P, and N.

4. In combination with the movable die for forming the head of a bolt, I claim the holding device, consisting of the jaws C C¹ pivoted to-

gether and to the head-block so as to be raised from their seat for insertion of the blank or removal of a formed blank, substantially as described.

5. In combination with the subject-matter of the fourth clause of claim, I claim the lever C², provided with the arm C⁴ and holding-bar C⁵, operating to raise or secure the holding device in the head-block, substantially as set forth.

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