(No Model.)

W. E. WARD.

MACHINE FOR FORMING BOLT BLANKS FROM COLD RODS OF METAL.

No. 252,914. Patented Jan. 31, 1882.

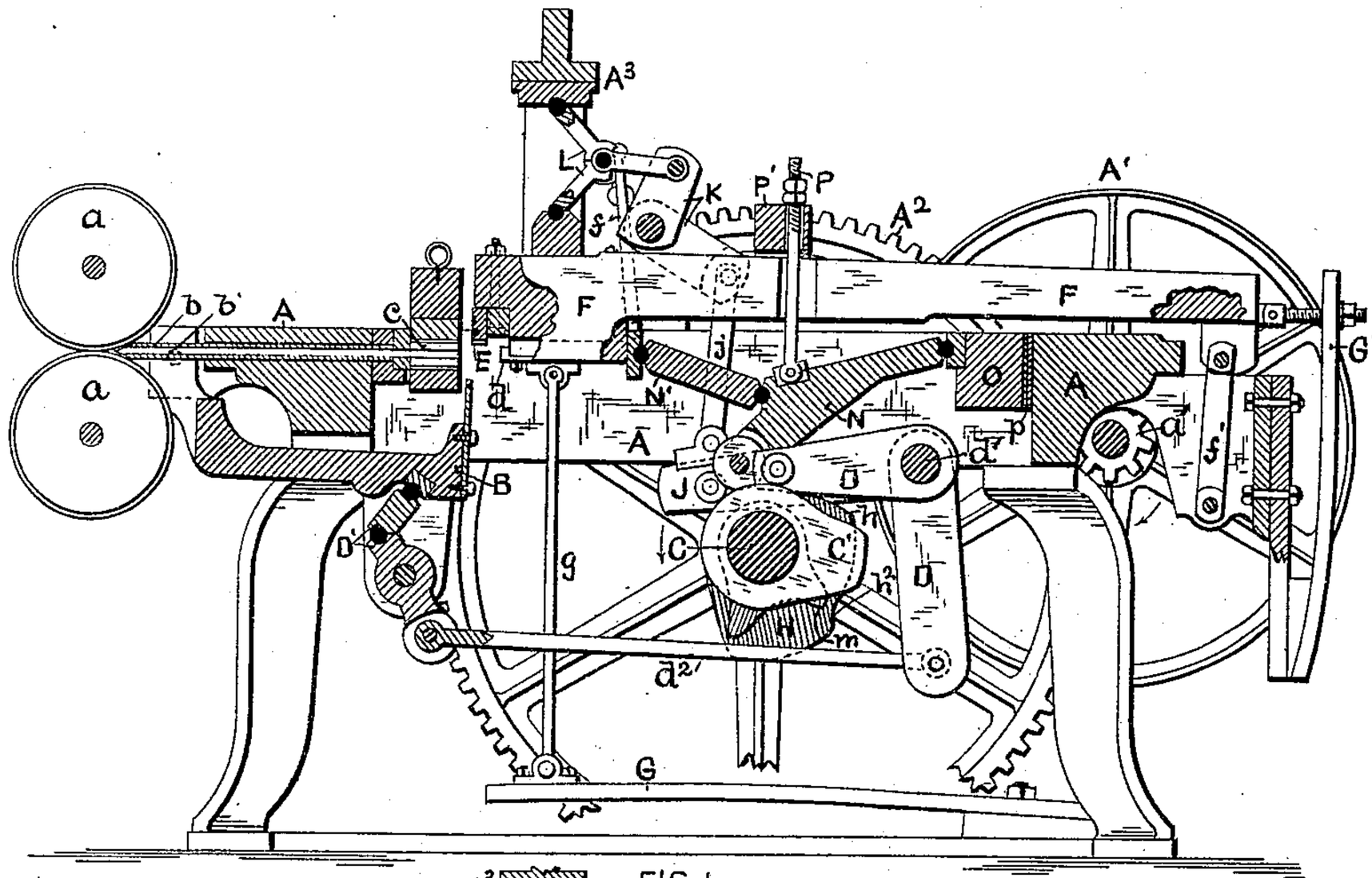

FIG. 1.

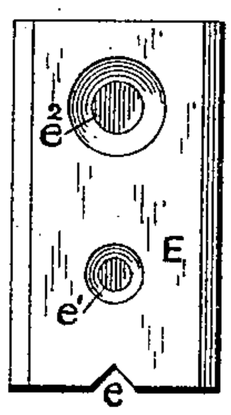

FIG. 4.

FIG. 8.

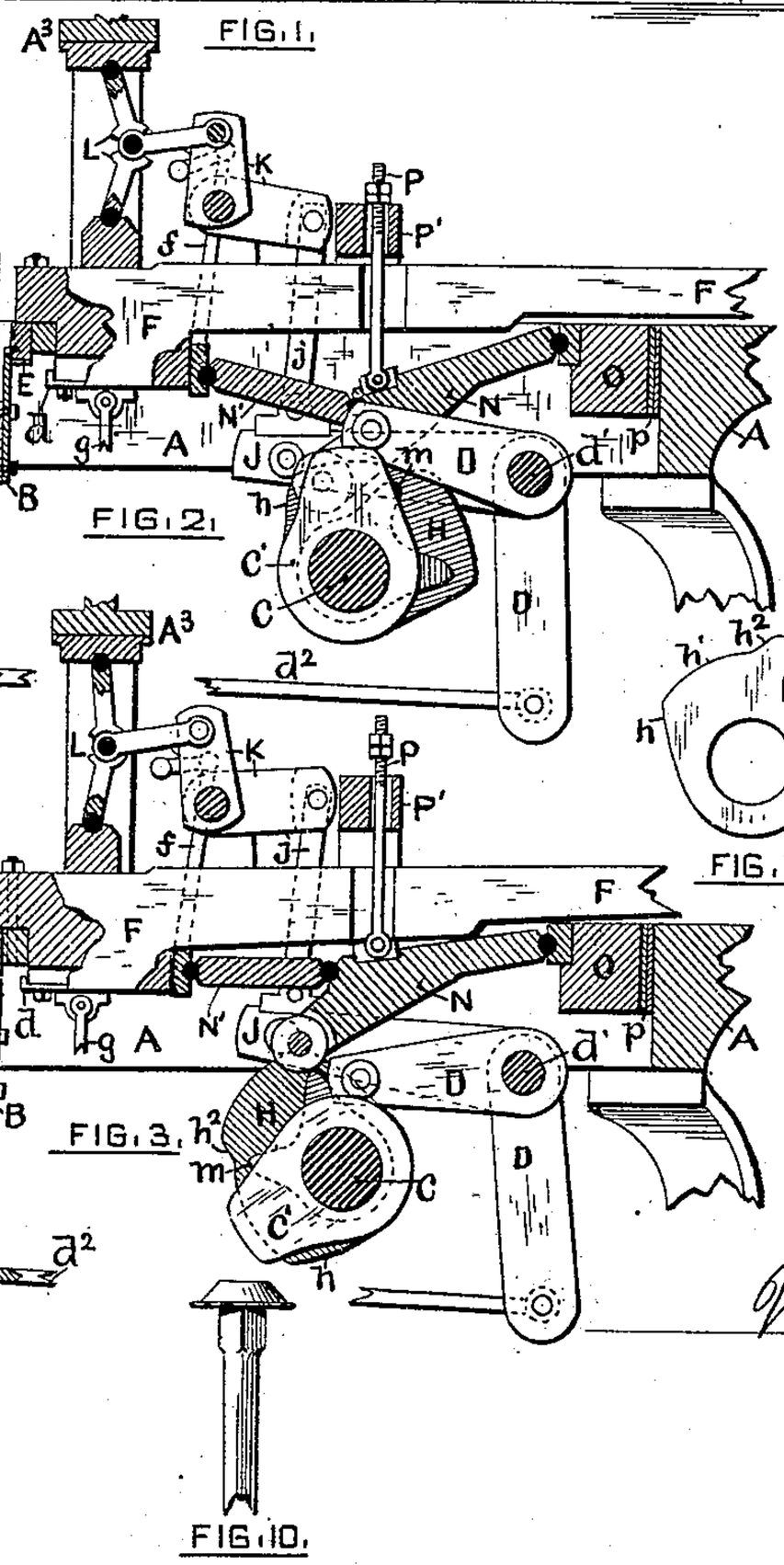

FIG. 2.

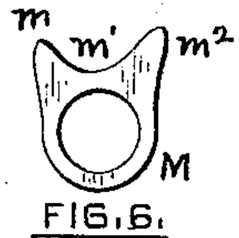

FIG. 6.

FIG. 7.

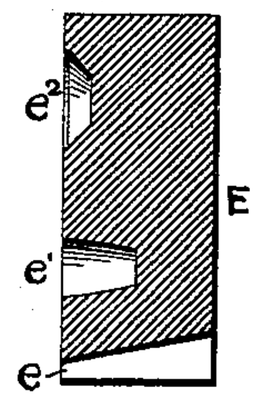

FIG. 5.

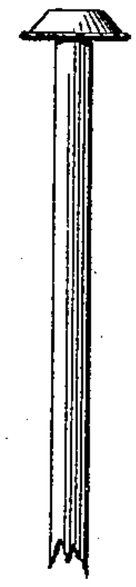

FIG. 9.

FIG. 3.

FIG. 10.

WITNESSES:

W. H. Thurston

Edson Salisbury Jones.

INVENTOR.

W. E. Ward

UNITED STATES PATENT OFFICE.

WILLIAM E. WARD, OF PORT CHESTER, NEW YORK.

MACHINE FOR FORMING BOLT-BLANKS FROM COLD RODS OF METAL.

SPECIFICATION forming part of Letters Patent No. 252,914, dated January 31, 1882.

Application filed April 4, 1881. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. WARD, of Port Chester, county of Westchester, and State of New York, have invented a new and useful Improvement in Machines for Forming Bolt-Blanks from Cold Rods of Metal; and I do hereby declare that the following specification, taken in connection with the accompanying drawings, forming a part of the same, is a full, clear, and exact description thereof.

My invention relates to machines already known in the art for forming headed bolt-blanks from cold rods of metal; and it consists in a certain combination of instrumentalities whereby a head of larger diameter can be made upon a rod than has heretofore been practicable by any bolt-machine involving a cold-pressure process known to the art. As an incident of the mechanical means employed by me in the formation of the head, I am enabled also to obtain with facility a very long squared section under the head, if desired.

My invention is carried out by a machine which is adapted by suitable and well-known mechanism to feed a rod intermittingly a stated distance corresponding with the required length of blank; and while the said rod is held firmly between griping-jaws, with a portion of its end extending beyond such jaws, sufficient in mass to form the head, a ram carrying a die-block provided with a matrix is made to upset such portion of the rod into a shape which is the rudiment of a head. A second matrix, corresponding in form with the final shape which is to be given to the head, is next brought into action to convert the rudimentary head by a second upsetting operation into the completed form desired.

Broadly considered, it is not new to employ a reciprocating ram or plunger in connection with a die-block having several matrix-dies cooperating to progressively form the head of a bolt or rivet; but machines as heretofore thus organized have been adapted to operate on heated rods, or as in rivets upon cold rods of specially soft metal, while my present machine has been specially organized with reference to working on cold rods by what is termed "cold-pressing." As instances of prior organizations I will cite the well-known Weatherhead machine, which embodied a horizontal reciprocating ram or plunger, a die-block mounted upon said plunger and moved thereby, and also vertically-reciprocated between the horizontal reciprocations of the ram, so as to successively present two portions of said die-block for the performance of separate portions of the head-forming operation. In that machine, however, the die-block had one matrix for partially upsetting the heated metal, and thereby partially forming the head, and also a plain face, whereby said upset metal was wholly forced into a head-finishing matrix formed in stationary griping-jaws, said jaws in some form being of course requisite in all bolt-heading machines. I deem it impracticable, however, to form a perfect head of any considerable size by cold-pressing by the use of a plain-faced die and a head-forming matrix in the griping-jaws, partially because of the fact that the latter, being sectional, inevitably results in more or less of an objectionable web or webs on the bolt-heads. I employ a die-block which contains not only the preliminary matrix, but also a matrix for finishing the top and sides of the head, which, however, co-operates with the plain front face of the griping-jaws in squaring up the rear portion of the head.

Another variety of prior bolt-heading machines embodied a horizontal reciprocating ram or plunger carrying a die-block, vertically reciprocated as before described, and provided with matrices, substantially as now employed by me; but said machines also had griping-jaws, which, having received a length of rod sufficient for a bolt and had the same severed from the rod, were moved laterally, and thereby placed in coincidence with the die-block carried by the ram. Such machines were necessarily comparatively slow in operation, and in my judgment were unsuited for cold-pressing, because of the liability of variation in the registering with the matrices in the die-block of the end of the rod carried by said laterally-sliding jaws, due to such play or lost motion as would be incident to the use of the numerous jointed parts of the mechanism for effecting the changes of position on the part of the griping-jaws. In my machine the griping-jaws are stationary, except in griping and releasing, and the ram, with its heading-die, is moved for heading an unsevered portion of the rod

directly toward and from said stationary griping-jaws, and therefore my machine may be very rapidly operated, and the matrices of the die-block are registered with relation to the center of the griping-jaws with a minimum of liability to variation.

In riveting-machines two or more punches have heretofore been employed on a vertically-sliding punch-block connected with the head of a horizontal ram or plunger, and said punches were alternately inserted into a stationary matrix corresponding to griping-jaws, as before described, for progressively forming the head of each rivet within said matrix.

With this general explanation of the prior state of the art, it is to be understood that my machine is novel, in that it embodies a ram or plunger carrying a die-plate containing matrices for progressively forming and finishing a bolt-head, and a pair of stationary griping-jaws affording a front face which co-operates with one of the matrices in finishing the bolt-head. As preferably organized by me, the die-block is rigidly secured to the head of the ram, and the ram is so constructed and operated as to move toward and from the griping-jaws in different horizontal planes. It would, however, be within one portion of my invention if the die-block were vertically reciprocated and carried by a ram confined to a reciprocating movement in one plane, if said die-block had matrices for progressively forming and also finishing the bolt-head and the griping-jaws used therewith were stationary.

I do not wholly ignore the partial utilization of the griping-jaws as matrices for use in the forming of bolt-blanks, because, as before herein indicated, such are always employed by me when a square shank is desired beneath the head. Nor would a pair of griping-jaws matriced to co-operate with my matriced die-block in finishing the head of a bolt be outside of certain portions of my invention, provided the main portion of the head-finishing operation was performed by the finishing-matrix of the die-block and the griping-jaws used in connection therewith were stationary. I deem it of great importance in cold-pressing bolt-heads that the compression be performed within a matrix which is moved toward the firmly-grasped rod of metal, as distinguished from performing that work within a stationary matrix, into which the metal is forced by pressure applied to the end of the rod, because in the former case the metal is first made to conform to the contour of the matrix at its deepest portion, and in the latter case said corresponding conformation occurs during the termination of the compression and at a point which is as remote from the outer end or portion of the metal in contact with the compressing device as is the depth of the stationary matrix. In other words, the finishing-matrix as used by me is filled with metal progressively from the bottom outward, whereas the stationary matrix is filled from the top inward, and hence it is difficult in cold-pressing to give large-sized bolt-heads a perfect or symmetrical form or shape adjacent to the bolt-shanks if stationary finishing-matrices are employed, although, as before herein indicated, good results may be obtained with the stationary finishing-matrix and a plain-surfaced plunger in working properly-heated metal.

After a full description of a machine embodying my invention, the several novel features will be specified in the claims hereunto annexed.

In the drawings, Figure 1 represents in partial longitudinal section a machine adapted to carry out my invention. Fig. 2 shows a portion of the same with the heading-ram in a plane to perform the first upsetting operation. Fig. 3 represents the same parts with the ram in the position it assumes when giving the final form to the head. Figs. 4 and 5 represent the head-forming dies in elevation and vertical section. Figs. 6 and 7 show respectively the cams for moving the ram horizontally and vertically. Fig. 8 shows a portion of a rod with its end formed into a rudimentary head. Fig. 9 represents a portion of a rod with a completed bolt-head thereon, and Fig. 10 shows a portion of a rod having a completed head and a long square section thereunder.

Referring to the drawings, A is the frame of the machine, which is to be made of sufficient strength to meet the requirements of the work to be performed.

a a are a pair of feeding-rollers, adapted to be moved intermittingly by any suitable mechanism. A rod of metal of suitable dimensions for the proposed size of bolt-blank is to be supposed as passing between the faces of the feeding-rollers, through the guide-tube *b*, and into and through a pair of griping-jaws, *c c*, one of which is shown in Figs. 1, 2, and 3. The axis of this pair of griping jaws is coincident with the axis of the guide-tube, and any suitable mechanical means for opening the jaws to permit the rod to enter, and then closing them to firmly gripe the rod, may be employed. None such are shown in the drawings, for the reason that such mechanism is well known in this class of machines.

Power is applied to the machine by a pulley, A′, a pinion, *a′*, on the pulley-shaft, and a gear, A^2, on the cam-shaft. The feed-rolls are actuated by the usual mechanism. Assuming the machine to be regularly in action and to have formed a head upon the end of the rod, it is to be supposed that the feeding mechanism has moved forward the headed rod until the face of the head abuts against an adjustable stop, *d*, which gages the length of the bolt-blank. The first operation of the machine is to cut off the blank from the rod, and in so doing leave a portion of the rod projecting beyond the front faces of the griping-jaws, sufficient in mass to form a head for the next blank.

B is a movable shear-cutter, pivoted at *b′*, which is made to vibrate at stated times by

means of the cam C′ on the shaft C, the connection between such cam and the shear being the bell crank lever D, whose fulcrum is at d', the connecting-rod d^2, and the toggle-lever D′. The fellow member of the shear-cutter is the V-shaped score e in the die-plate E. This plate is also furnished with two matrices or cavities, e' e^2, the form of which is shown in front view at Fig. 4 and in sectional view at Fig. 5.

The matrix or cavity e' may be termed the "preliminary matrix-die" for upsetting the metal and partially forming the bolt-head, and the matrix or cavity e^2 is the finishing matrix-die, which should correspond in size and shape to the bolt-head desired. In working heavy rods it is sometimes desirable that more than two matrices be employed.

The plate E is secured to the front end of a ram, F, which can properly be made with a wooden stock and an iron head-piece. This ram is mounted on the frame in a manner well known in the art, being pivoted thereto by links f f', located respectively near its front and rear ends. A spring, G, connected to the ram-head by a rod, g, tends to keep said head in its elevated position, and a spring, G′, connected to the rear end of the ram, tends to keep the same in its rearward position, as shown in Fig. 1. Simultaneously, or nearly so, with the ascent of the shear-cutter B the head of the ram is made to descend by the rising face h of a cam, H, which acts upon a friction-roll mounted on a lever, J. This lever is pivoted at d', and is connected by a pitman, j, to a bell-crank lever, K, which lever is linked to a toggle, L. One member of this toggle bears in a yoke, A^3, forming a part of the frame of the machine, and the other member bears in a block which is secured to and slides upon the ram-head. The descent of the ram-head by the action of the face h of the cam H, co-operating with the shear-cutter B, cuts off the bolt-blank from the rod, and brings the cavity e' into alignment with said rod, as shown in Fig. 2. The bolt-blank having been severed from the rod, the shear-cutter B retires, so that the ram may advance and form the rudimentary head upon the end of the rod, as shown in Fig. 8. The advancement of the ram for this purpose is produced by the tooth m of a cam, M, which engages a friction-roller upon one member, N, of a toggle, N N′. The member N of this toggle bears in a block, O, secured to the frame, and the member N′ bears upon a block which engages the rear of the ram-head. The action of the cam-tooth m partially straightens the toggle N N′ and advances the ram to perform its first upsetting operation, the alignment of the cavity e' with the rod being maintained by the face h' of the cam H during such advancement. The rudimentary head having been formed, the ram retires by the action of the spring G′, (the depression m' in the cam M allowing of such movement,) and the ram-head is again depressed to bring the cavity e^2 into alignment with the partially-headed rod. This second depression of the ram-head is effected by the rising face h^2 of the cam H, which operates the toggle L. The ram-head having been brought into its lowest plane with the cavity e^2 in alignment with the rod, it is next moved forward to upset the end of the rod a second time and produce a completed head. This movement of the ram is effected by the tooth m^2 on the cam M, which straightens the toggle N N′ and moves the ram into the position shown in Fig. 3, the face h^3 of the cam H preserving the alignment during such movement. The rod having been completely headed, as shown in Fig. 9, the ram next retires by the action of the spring G′, and is moved upward to its original position by the spring G, the contour of the cams H and M allowing of such movements. The rod is now fed forward and the operations above described are repeated.

The amount of the horizontal movements of the ram is governed by an adjustable rod, P, which is attached to the toggle member N, and has its upper ends threaded and provided with nuts, the lower of which bears upon a yoke, P′, pivoted on the frame of the machine, and by varying the thickness of the packing p between the rear of the block O and the frame, the forward throw of the ram may also be varied, because said block O constitutes the abutment or base for the toggle N, and by adjusting said base forward or rearward the front end of the ram will be moved more or less forward with relation to the surface of the frame, between which and block O the packing is interposed. A proper arrangement of these means of adjustment produces a greater or less engagement of the cam-teeth m m^2 with the friction-roll upon the toggle-lever N, and consequently a greater or less horizontal movement of the ram. An adjustment of the rod P and packing p and of the blade upon the shear B also regulates the amount of stock which is to enter into the head of the blank, for the distance of the face of the plate E from the face of the jaws c c will be regulated by the rod P and packing p, and the distance of the blade of the shear B from the face of said jaws can be regulated by packing placed behind it, so that the blank will be severed from the rod at a greater or less distance from the face of the jaws, and more or less of the end of the rod will project to be formed into the head.

If it is desired that the bolt-blank shall have a squared portion immediately beneath the head, as shown in Fig. 10, the griping-jaws c c are shaped so as to admit of such squared portion being formed by the upsetting operations, which will drive the metal into the angular cavities provided in the jaws for such purpose.

In machines for making bolts from round rods by the action of a single head-forming die it is very difficult to form a squared portion under the head of any considerable length. By employing, however, two dies, one of which has the effect to thicken the end of the rod, as illustrated at Fig. 8, the metal is so disposed that

the second head-forming die is able to drive it into the angular cavities in the griping-jaws and produce a squared portion of much greater length.

I have exhibited in the drawings and have above described a practical machine for accomplishing the heading of rods to form bolt-blanks. It is obvious, however, that various other mechanical devices and combinations may be employed to effect the movement of the ram or header, so that it will occupy successively as many different planes relatively to the griping-jaws as there are matrices in the die-block, thereby bringing each of said matrices successively into accurate alignment with the center of said jaws. By this arrangement the ram would always occupy the same horizontal plane.

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

1. The combination, substantially as before set forth, of the rod guide, the stationary griping-jaws, which gripe the end of a rod and hold the same during the heading operation, a die-block containing two or more matrices for progressively forming and finishing a bolt-head, and the mechanism, substantially as described, for changing the planes of elevation of said matrices to enable them to act successively in upsetting, shaping, and finishing the end of a metal rod to form a bolt-head prior to cutting the headed portion from the rod.

2. The combination, substantially as before set forth, of the stationary griping jaws, the ram or header provided with a series of head-forming dies, the mechanism, substantially as described, for changing the header to different planes of elevation for bringing such head-forming dies successively into alignment with the griping-jaws, suitable feeding devices for advancing the header-rod intermittingly, and movable shears for cutting off the headed bolt-blank, the whole combined by suitable connecting mechanisms.

W. E. WARD.

Witnesses:
EDSON SALISBURY JONES,
W. H. THURSTON.