

E. W. DUSTON.
 HEADING MECHANISM.
 APPLICATION FILED JAN. 18, 1911.

1,026,082.

Patented May 14, 1912.

2 SHEETS—SHEET 1.

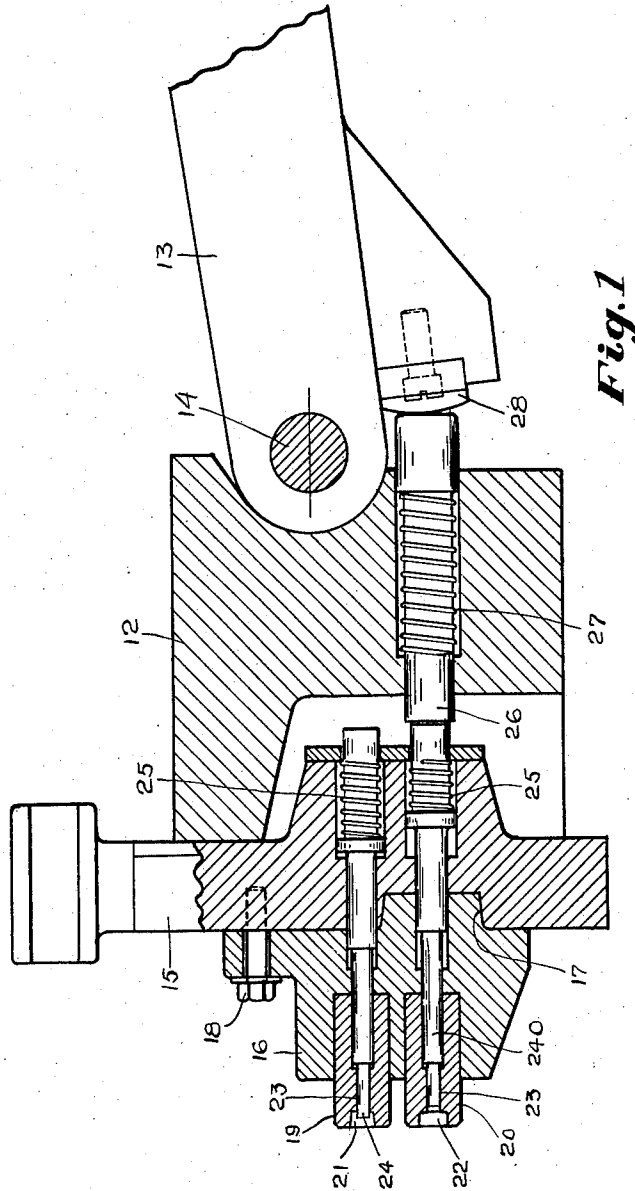


Fig. 1

WITNESSES

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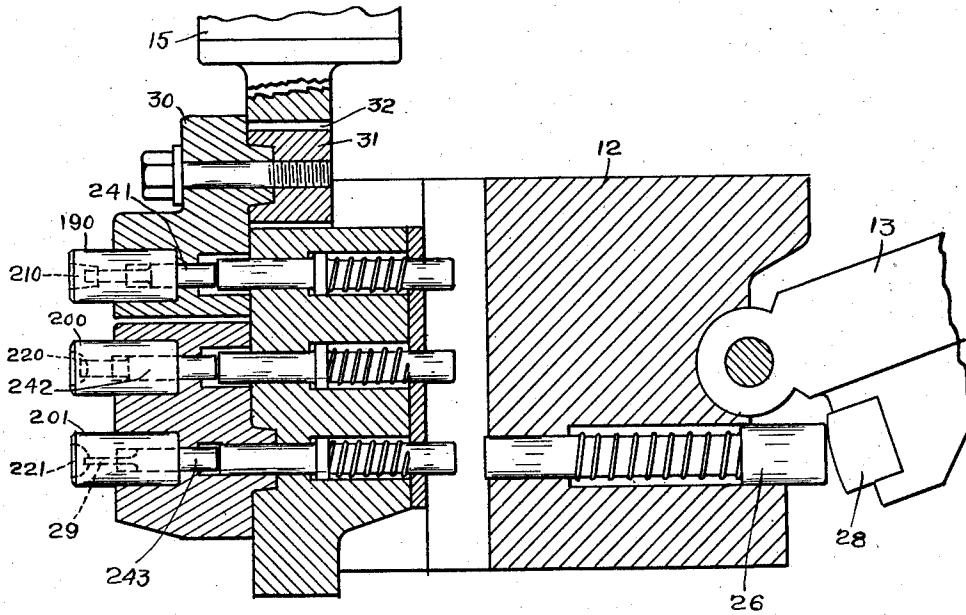


Fig. 2

WITNESSES

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HEADING MECHANISM.

1,026,082.

Specification of Letters Patent.

Patented May 14, 1912.

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To all whom it may concern:

Be it known that I, ERNEST W. DUSTON, a citizen of the United States, residing at Waterbury, county of New Haven, State of Connecticut, have invented an Improvement in Heading Mechanism, of which the following is a specification.

This invention relates to machines for making bolts, screws, and the like and has reference more particularly to machines for forming heads on such articles.

The general object of the invention is to provide a single machine capable of forming and completing a head of any desired shape or size, and which is capable of operating upon the material while cold.

Considerable difficulty has been encountered in bolt heading machines as heretofore constructed, particularly when operating upon material in a cold condition, which is by far the cheapest and quickest process of manufacture, first, in producing heads whose size relative to the diameter of the bolt is greater than a certain ratio, and, second, in producing perfect square heads or other heads having sharply defined angles or other projections.

Bolt heading machines as usually constructed comprise a die for holding the blank on which the head is to be formed and one or more punches, so called, having in their ends forming cavities. These punches are arranged to strike the end of the blank held in the die, causing the portion thereof projecting from the die to be upset in the forming cavity, thereby producing a head. Where more than one punch is used these punches are arranged to operate successively upon the blank, the first punch acting to upset the blank to form a rough head thereon, while the second punch operates still further to upset this rough head and shape the same into the desired form.

In forming bolt heads by machines of the character above referred to, the size of the head formed is dependent upon the amount of the blank which is left projecting from the die, and which is consequently upset by the punch. It has been found, however, that when an attempt is made to upset while cold a portion of the blank the ratio of whose length to its diameter is more than a certain amount, the blank instead of being properly upset will buckle and result in

flaws in the finished head. With machines as heretofore constructed, therefore, the size of head which can be formed cold is limited by the diameter of the bolt on which such head is formed.

In forming bolt heads by striking a blank with a punch having a forming cavity, it is impossible to produce a head having sharply defined angles or projections, such, for example, as a square head, for the reason that the material of the head cannot, by such means, be made to fill completely all of the angles of the forming cavity. It has therefore been necessary heretofore, in making square headed bolts, to perform upon these bolts a separate process known as reheading, which is done in a separate machine.

The chief object of the present invention therefore, is to provide a machine in which the length of blank which may be properly upset to form a head is not limited by the diameter of the blank, and in which heads of substantially any desired form can be produced in finished condition, thereby obviating the necessity of the reheading operation in the production of square or similar heads. This and other objects of the invention, together with means whereby the same may be carried into effect, will best be understood from the following description of certain forms or embodiments thereof illustrated in the accompanying drawings forming a part of this specification.

In said drawings:—Figure 1 is a vertical section of the punch head of a bolt heading machine, showing the punch carrier for bringing the punches successively into operative position, and also showing a part of the actuating mechanism for the punch head; Fig. 2 is a similar view of a modified construction.

Fig. 1 shows the mechanism particularly adapted for the manufacture of square headed bolts. In said figure, 12 denotes the usual punch head which is slidably mounted in guideways (not shown) in the machine frame and is reciprocated therein by any suitable means such, for example, as the operating arm 13 pivoted at 14 to said head. The arm 13 may be one of a pair of toggle links operated by a crank or eccentric on the main shaft of the machine, or may be a pitman connected with a crank on said shaft, according to the operating means employed

in the machine to which the invention is applied, as will be clear to those skilled in the art. 15 denotes a punch carrier to which is secured the punch block 16 provided with heading punches. The punch block 16 is preferably pivoted to the punch carrier, as by means of a boss 17 received in a recess in the punch carrier, and is held in adjusted position by means of a clamp screw 18 passing through a slot in the punch block. The punch carrier 15 is movable transversely of the punch head 12 to bring the punches successively into operative position opposite the die.

The parts thus far described, except as hereinafter pointed out, all may be of substantially the form and arrangement usual in machines of this character. The die for holding the blank, the means for shifting the punch carrier 15, and the mechanism for operating the arm 13 are not shown as they form no part of the present invention and are familiar to those skilled in the art.

In accordance with the present invention the heading punches, 19 and 20, of which two are shown in Fig. 1, are provided with forming cavities 21 and 22 respectively, the first being of a form approximating to some degree the form of the head to be made, and the latter being of the exact size and shape of said head. Beyond said forming cavities said punches are provided with bores 23. 24 and 240 denote plungers carried by the punch carrier 15 and operating in the bores 23. Said plungers are normally held with their ends adjacent the cavities 21 and 22 by means of springs 25. The plungers 24 and 240 may each be formed in one piece as shown in Fig. 1, or if desired the portion operating in the bores 23 may be separate from the portion receiving the springs 25.

26 denotes a rod slidably mounted in the punch head 12 and adapted to engage the ends of the plungers 24 and 240 as said plungers and the punches with which they cooperate are brought successively into operative position by the punch carrier 15. The rod 26 is normally held in the position shown in Fig. 1 by means of a spring 27 and is movable toward the left from the position shown, thereby providing means for actuating the plungers.

28 denotes a lug carried by the arm 13 which may be fixed or adjustably secured to said arm or formed integral therewith as desired. The lug 28 is arranged to engage the end of the rod 26 and move the same to the left when the arm 13 is adjacent the horizontal position as shown in Fig. 1, said lug thereby serving as actuating means for the plungers.

In the operation of the machine the arm 13, whether a toggle link or a pitman, is moved downwardly on its pivot 14 toward the position shown in Fig. 1, said pivot to-

gether with the punch head 12 moving toward the left to bring the punch 19, which in the first part of the operation of forming a head is in operative position, into engagement with the blank, said blank entering the bore 23 and forcing back the corresponding plunger 24, the springs 25 and 27 yielding for this purpose. As the arm 13 approaches the horizontal position the lug 28 is brought into engagement with the rod 26, as shown in Fig. 1. At this time the movement of the punch head 12 is very slight, so that the arm 13 having advanced the punch may be considered as holding the same in advanced position. At this time, however, the engagement of the lug 28 with the rod 26 causes the plunger 24 to be forced against the end of the blank, thereby forcing the portion of the blank within the bore 23 either wholly or partly out of said bore and upsetting the same in the cavity 21. It will be noticed that at this time the end of the blank is supported by the bore 23, which is of substantially the same diameter as said blank, so that the blank cannot buckle during the upsetting process. Upon the return of the punch head 12 the punch carrier 15 is shifted, by mechanism not shown, to bring the plunger 240 into a position to be engaged by the rod 26, as shown in Fig. 1. Upon the next forward movement of the punch head 12 the partly formed bolt head is struck by the punch 20 causing the material thereof to be partly upset within the forming cavity 22. This blow is not sufficient to cause the material of the head to be forced completely into the corners of the cavity 22 if this cavity be of angular form. Upon the actuation of the plunger 240, however, when the arm 13 approaches horizontal position, the material of the head is still further upset in the cavity 22 causing a perfect head to be formed.

In Fig. 2 is shown an embodiment of the invention designed more particularly for use in forming slotted heads. In this form of the invention the punch head 12, actuating arm 13, lug 28, rod 26, and punch carrier 15 all are or may be substantially as above described in connection with the form shown in Fig. 1, except for such modifications as will be obvious or as will be hereinafter described. In accordance with this modification, however, three heading punches are employed, these punches being designated by the numerals 190, 200, and 201 respectively, and within the bores of which operate plungers 241, 242, and 243. These punches are provided with forming cavities designated respectively by the numerals 210, 220, and 221. The punches 190 and 200, plungers 241 and 242 and cavities 210 and 220 correspond substantially to the punches, plungers, and cavities in the form of the invention above described, except that the cavity 220

is made of a form suitable for a slotted head. The end of the plunger 243 is reduced in size to form a flat, blade-like projection 29. The recess 221 is substantially similar in form to the recess 220 but is slightly larger than said last named recess.

The operation of the punches 190 and 200 and of the plungers 241 and 242 is substantially the same as that of the punches and plungers in the form of the invention shown in Fig. 1. The punch head 12 is first advanced to force the end of the blank into the bore of the punch 190, the plunger 241 is actuated to upset this end in the cavity 210, the carrier 15 is shifted to bring the punch 200 into operative position, this punch is actuated to upset the material of the head in the cavity 220, and the plunger 242 thereafter actuated to upset the material still further in said cavity. Upon the return of the head 12 after this last operation, the punch carrier 15 is again shifted to bring the punch 201 and plunger 243 into operative position. Upon the next forward movement of the punch head 12 the bolt head is struck by the punch 201, and the plunger 243 is thereafter actuated to force the end 29 thereof into the bolt head, thereby forming in said head a depression or slot. The cavity 221 is slightly larger than the cavity 220 to permit a slight expansion of the head caused by the displacement of material incidental to the formation of said depression or slot.

As herein shown the punch 190 is carried by a punch block 30 which is pivoted to a slide 31 received in a slot 32 formed in the punch carrier 15, to permit said punch 190 to be adjusted both longitudinally and transversely of said punch carrier. This feature is not claimed herein as it is covered by the claims of my application for Letters Patent filed January 18, 1911, Serial No. 603,295.

While I have referred to the mechanism above described as particularly designed for use in the cold heading of bolts and similar articles, it will be observed that this mechanism might be used equally well in the formation of heads upon blanks when in heated condition, and such use is considered to be within the spirit and scope of my invention.

Having thus described my invention I claim:

1. The combination with a heading punch having a bore of substantially the diameter of the end of the blank to be headed and arranged to receive the same, of a plunger of substantially the same diameter as said bore and operating therein to force the end of said blank therefrom and upset the same outside said bore as it is forced therefrom, the walls of said bore acting to support said end during the upsetting operation.

2. The combination with a heading punch having a forming cavity and a bore of less diameter than said cavity beyond the same, said bore being of substantially the diameter of the blank to be headed and arranged to receive the same, of a plunger of substantially the same diameter as said bore and operating therein to force the end of said blank therefrom and upset the same in the forming cavity, the walls of said bore acting to support said end during the upsetting operation.

3. The combination with a heading punch having a forming cavity and a bore of less diameter than said cavity, said bore being of substantially the diameter of the end of the blank to be headed and being arranged to receive the same, of a plunger of substantially the same diameter as said bore and operating therein to force the end of said blank therefrom and upset the same in the forming cavity, the walls of said bore acting to support said end during the upsetting operation, and mechanism for advancing said punch to enter the end of said blank into said bore and thereafter holding said punch in advanced position and advancing said plunger to upset said end.

4. In a machine of the character described, the combination with a heading punch having a bore adapted to receive the end of a blank, and a plunger operating in said bore for partly upsetting said end, of a second heading punch having a bore similar to the bore of the first named punch, a second plunger operating in the bore of the last-named punch for further upsetting the end of said blank, and actuating means for said plungers for moving the same relatively to said punches, said punches and plungers being shiftable to bring either pair into operative position with respect to said blank and to bring either of said plungers into position to be operated by said actuating means.

5. In a machine of the character described, the combination with a heading punch having a forming cavity and a bore of less diameter than said cavity beyond the same adapted to receive and support the end of a blank, and a plunger operating in said bore to force a portion of the blank therefrom and upset the same in the forming cavity, of a second heading punch having a cavity and a bore similar to the cavity and bore of the first-named punch, a second plunger operating in the bore of the last named punch to force the remainder of the blank therefrom and upset the same in the forming cavity, actuating means for said plungers for moving the same relatively to said punches, and a punch carrier in which said punches and plungers are mounted, said carrier being movable to bring either of said punches into operative posi-

tion and to bring the corresponding plunger into operative relationship to said actuating means.

6. The combination with a heading punch 5 having a forming cavity and a bore of less diameter than said cavity beyond the same adapted to receive and support the end of a blank, of a yielding plunger located in said bore adapted to be depressed upon the advance of the blank within said bore, and 10 means for positively actuating said plunger to force the end of said blank from said bore and upset the same.

7. The combination with a punch head, of 15 a heading punch positively actuated by said head and having a forming cavity and a bore beyond said cavity, a plunger operating in said bore and mechanism for positively actuating said head to cause said 20 punch to receive the end of a blank within said bore and for thereafter positively actuating said plunger with respect to said punch to cause said plunger to force the material of said end from said bore and 25 upset the same within said cavity.

8. The combination with a punch head, of a heading punch positively actuated by said head and having a forming cavity and a bore beyond said cavity, a plunger carried 30 by said head and operating in said bore, means for actuating said head to cause said punch to receive the end of a blank within said bore, and means carried by said head and operated by said first named actuating

means for positively actuating said plunger 35 with respect to said punch to cause said plunger to force the material of said end from said bore and upset the same within said cavity.

9. The combination with a punch head, of 40 a heading punch carried by said head and having a bore, a plunger carried by said head and operating in said bore, an arm for actuating said head to cause said punch to receive the end of a blank within said bore, 45 a rod carried by said head and adapted to engage said plunger for positively actuating the same relatively to said punch to force the material of said blank from said bore and upset the same, and a lug carried by 50 said arm for engaging and positively operating said rod.

10. The combination with a punch head, of a heading punch carried by said head and having a bore, a plunger operating in 55 said bore, an arm for actuating said head to cause said punch to receive the end of a blank within said bore, and a lug carried by said arm for positively actuating said plunger relatively to said punch to force 60 the material of said blank from said bore and upset the same.

In testimony whereof I affix my signature in presence of two witnesses.

ERNEST W. DUSTON.

Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."