

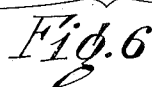
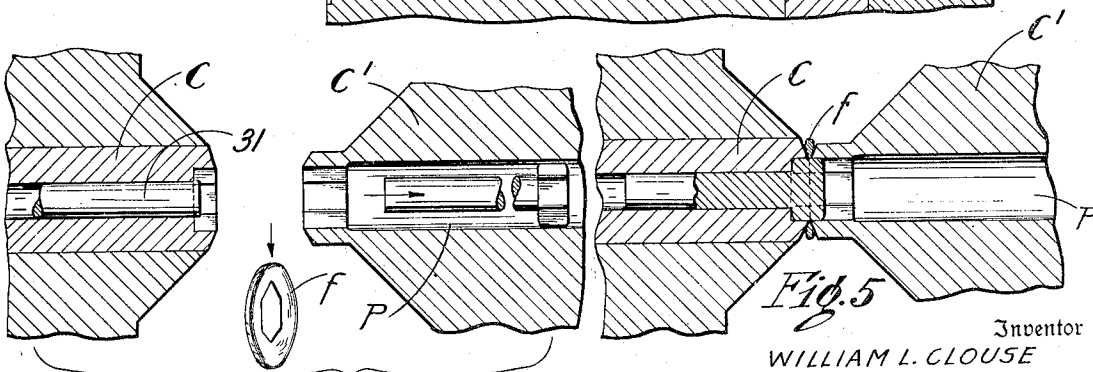
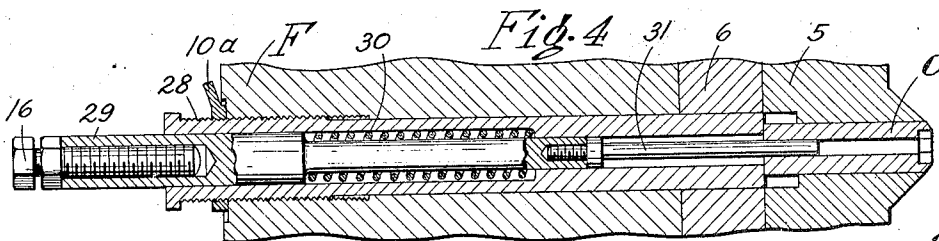
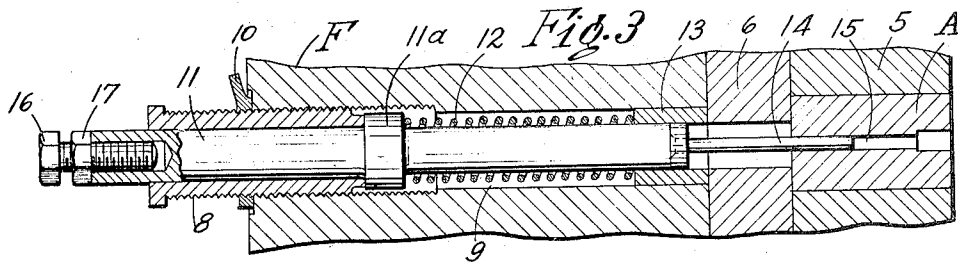
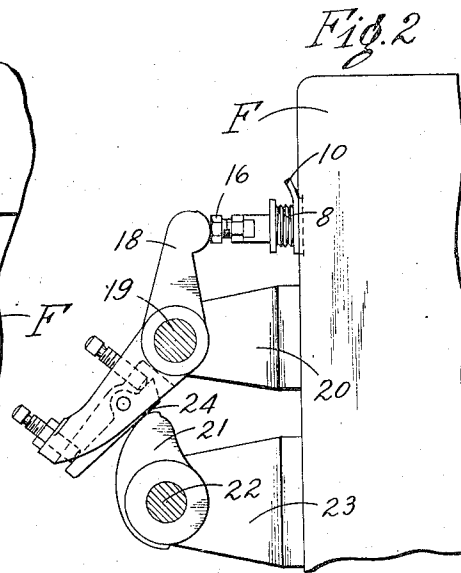
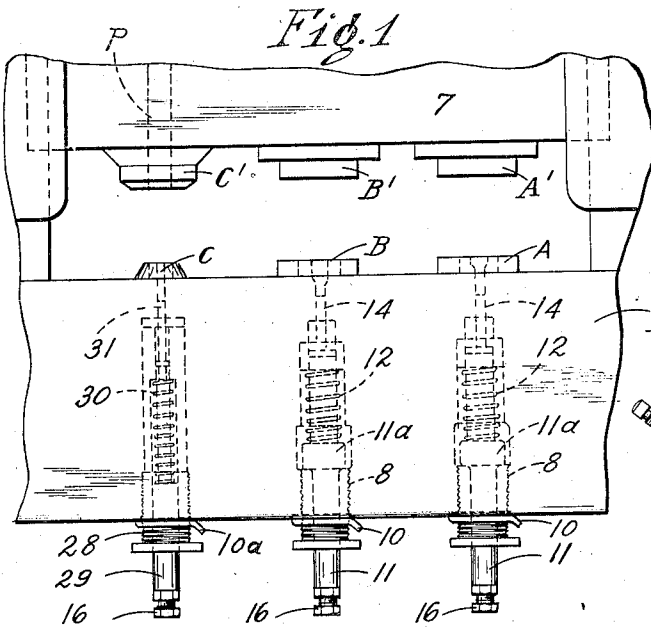
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HEADER

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HEADER

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This invention relates broadly to machines for making bolts, nuts, screws and analogous headed or upset articles and is particularly concerned with blank-ejecting or knock-out mechanism for such machines, the primary object in view being to generally improve and render more durable such mechanism.

More specific objects of the invention are: to provide a blank-ejecting or knock-out assembly for bolt-making and analogous machines which cooperates with the dies in which the articles are formed in a manner such as will most effectively receive and transmit the thrust resulting from the blow of the header slide directly to the frame of the machine and thus limit the spring or deflection in the assembly due to the thrust of the header slide;

To provide a blank-ejecting or knock-out assembly which may be conveniently and accurately adjusted to accommodate varying lengths of bolt blanks;

To shorten the length of the blank-ejecting assembly so as to reduce the accumulated deflection of the parts, thereby making the mechanism more rigid and more positive in its action;

To provide a blank-ejecting and coacting die assembly for use in trimming the heads of bolt blanks, which assembly permits convenient and accurate adjustment of the position of the die with respect to the advanced position of the header slide or the trimming punch carried by the slide;

The foregoing and other objects and advantages will become apparent in view of the following description taken in conjunction with the drawing, wherein:

Figure 1 is a fragmentary plan view of a bolt-making, or upsetting machine, showing a plurality of dies, (three in the present instance) arranged in horizontal alignment, together with blank-ejecting or knock-out mechanism of the type with which the present invention is concerned;

Fig. 2 is a fragmentary view in side elevation of the rear portion of the machine of Fig. 1, showing a preferred type of actuating mechanism for the ejector or knock-out plunger and pin forming part of the ejector assembly;

Fig. 3 is an enlarged central longitudinal sectional view of an ejector or knock-out assembly particularly adapted for use with the extruding and upsetting dies of Fig. 1, reading from right to left of the latter figure;

Fig. 4 is a view similar to Fig. 3 of an assembly

particularly adapted for the trimming die of Fig. 1, this die being the third die of the group;

Figs. 5 and 6 are fragmentary sectional views taken through the trimming die and punch at the advanced position of the header slide and as the slide retracts, to illustrate the ejecting or knock-out operation at the trimming station.

For the purpose of illustration only, the improved ejector or knock-out mechanism is shown in operative association with a bolt-making machine of the type wherein a suitable blank length of wire or rod stock is extruded in the first die of a group of aligned dies to a diameter substantially equal to the over-all diameter of the threads of the finished article, this die being indicated at A in Fig. 1, the blank then being transferred to a second die, indicated at B, wherein a portion of the blank so reduced is further extruded to a diameter substantially equal to the pitch diameter of the threads of the finished article and the unreduced portion upset to form a head of a suitable contour. In the event the head is to be trimmed to the desired shape, it is transferred to another die, indicated at C, which is a trimming die, and constitutes the third and last die of the group reading from right to left in Fig. 1. These dies are suitably secured in die holders 5 which in turn are secured to the die breast 6 of the machine. A header slide 7 is mounted for longitudinal reciprocation in the bed frame F and is provided on its forward extremity with punches A' and B' which drive the blanks into the dies A and B, and a trimming punch C' which cooperates with the die C to trim the heads of the blanks to the desired polygonal shape. In order to carry out a preferred method of manufacturing bolts and like headed articles, the trimming punch C' is hollow for purposes which will hereinafter appear.

The invention is primarily concerned with a particular type of ejector or knock-out assembly which cooperates with the various dies to eject the bolt blanks from the latter after the extruding and trimming operations. The knock-out assembly for the extruding dies A and B may be substantially the same in all respects and a description of one will serve for both. Referring to Fig. 3, the knock-out assembly comprises a sleeve or cylinder 8 which is exteriorly threaded so that it may be adjustably secured in a bore 9 formed in the frame of the machine, the said sleeve being locked in adjusted position by means of a nut 10. Mounted to have a sliding fit in the sleeve 8 is a piston or plunger 11 which is formed with an annular enlargement or abutment should

der 11a. That portion of the plunger 11 which lies beyond the shoulder 11a has inserted there-around a compression spring 12 which serves to return the plunger to its retracted position. The one end of the bore 9 is preferably provided with a guide bushing 13 in which the plunger 11 has a snug sliding fit. At its inner extremity the plunger 11 abuts a knock-out pin or analogous member 14 which is adapted to reciprocate in an opening 15 formed in the die indicated in Fig. 3 at A, it being understood that the die could also be the die B shown in the center of the group in Fig. 1. At its rear extremity, the plunger 11 is internally bored or threaded in order to adjustably receive a contact screw or analogous member 16 which is locked in its adjusted position by means of a lock nut 17.

A preferred means of actuating the plunger 11 is shown in Fig. 2, and comprises a rocker arm or pusher 18 which is rotatably mounted on a shaft 19 carried by a bracket 20. The arm 18 is rocked by a cam 21 mounted on a shaft 22 carried by a bracket 23, the shaft 22 being driven from the main crank shaft of the machine, not shown. The one extremity of the rocker arm 18 is provided with an adjustable contact member 24 which forms the subject matter of a separate patent.

In operation, a blank is pushed into the die A or B and extruded, the inner end of the blank abutting against knock-out pin 14. It will thus be seen that the pin 14 takes the full thrust of the blank during the upsetting operation. Since, however, the shoulder 11a abuts against the sleeve 8 and the latter in turn is secured to the frame of the machine, the thrust will be transmitted to said frame and will not be imposed on the rocker arm 18 or other relatively light or movable parts. Another important advantage is the elimination of "spring" when the knock-out pin takes the thrust of the blank, resulting in a definite or fixed location of the successive blanks and a more nearly uniform head and shank dimensioning. There is the further advantage that because of the short length and lack of "spring" of the knock-out parts there is no tendency for the blanks to be kicked or thrown out of the die as by a "bow-and-arrow-movement", which naturally would interfere with the ability of the transfer fingers to properly grab the blank as it moved out of the die, preparatory to its transfer to the next succeeding die. In the position shown in Fig. 3, the pin 14 and plunger 11 are in retracted position. As the header slide moves back or retracts, cam 21 imparts a rocking movement to the arm 18 causing the plunger 11 and pin 14 to move inwardly and eject the blank from the die A.

Assuming it is desired to adjust the retracted position of the knock-out pin 14 to accommodate varying lengths of bolt blanks, it is only necessary to release the nut 10 and thread the sleeve 8 inwardly or outwardly as desired.

In Fig. 4, a knock-out assembly particularly adapted for use with the trimming die C is shown, this assembly comprising a sleeve or cylinder 28 which is adjustably threaded into the frame of the machine in a manner similar to the sleeve 8, heretofore described, and is provided with a lock nut 10a. A piston or plunger 29 is mounted to slide in the sleeve 28 and is provided with a return spring 30. The inner end of the plunger 29 has secured thereto a knock-out pin 31. The die C has a movable or thumb-press fit in the die holder 5, and the inner end of the sleeve 28 abuts against the adjacent end of said

die. Thus, by adjusting the sleeve 28, the position of the die C may also be adjusted. This adjustment is of considerable importance, since it determines the thickness of the flash formed around the head of the bolt when the trimming punch C' advances and trims the head of a blank held by the die C.

In trimming the heads of blanks to the desired polygonal shape, I preferably adjust the position of the die C with respect to the advanced position of the punch C' so that the flash metal remaining around the head of the blank will be of such thickness as to prevent dulling of the tool, note Fig. 5, and which at the same time will be readily broken when the blanks are ejected into the trimming punch C' which is preferably hollow and communicates with a hollow transfer passageway formed in the header slide and indicated at P. Since the metal hardens in proportion to its working or reduction during the trimming operation, it is important that the thickness of the flash metal be maintained at a certain point, otherwise undue wear will be imposed upon the trimming punch and die. This relatively fine adjustment is permitted by means of the sleeve 28. In the preferred method of operation, the blanks are trimmed, then ejected into and through the punch C' by the knock-out assembly as the slide retracts, simultaneously breaking off the flash formed around the head of the blank which drops clear of the blank after the latter enters the hollow trimming punch C', note Fig. 6, in which an attempt has been made to illustrate this action. The cam 21 is so contoured and timed that the blank is driven into and through the hollow punch at least such distance that the shank clears the flash. Thus the flash is cleared or freed from the bolt shank and does not interfere with subsequent trimming operations or become lodged between the die and punch.

In both knockout assemblies described it is important that the thrust of the header slide be transmitted direct to the frame as shown. In the trimming station any indirect transmission of the thrust of the die C will require that the dies be adjusted closer together than the desired thickness of the flash in order to compensate for the amount which the die C springs rearwardly under the thrust of the trimming operation. If the die faces are adjusted to approach each other closely with a blank in position and no provision is made to directly transmit the header thrust, the trimming dies will strike violently together when the machine is operated without a blank in position. In the pin assemblies of this invention the "spring" of the parts is reduced to the point where the die faces may be closely adjusted with a blank in position and yet will not contact when the machine operates idle. It will be apparent from the foregoing description that a knockout assembly constructed according to the teachings of my invention may be adapted to substantially any type of solid die machine.

It will be understood that certain structural changes and variations in arrangement of the several parts may be adopted within the scope of the invention as defined by the appended claims. By "bolt making machine" in the claims is meant any machine adapted for making bolts, nuts, screws and analogous headed or upset articles.

I claim:

1. In a bolt making machine, a supporting frame, a die having a die opening therein, means for working a bolt blank in said die, an ejector pin mounted for longitudinal reciprocation in said

opening to eject bolt blanks therefrom after the working operation, means for reciprocating said pin, and abutment means associated with said pin and directly secured to said frame for backing the pin when the latter is subjected to thrust during the working operation.

2. In a bolt making machine, a supporting frame, a die having a die opening therein, means for working a bolt blank in said die, an ejector pin mounted for longitudinal reciprocation in said opening to eject bolt blanks therefrom after the working operation, means for reciprocating said pin, and adjustable abutment means associated with said pin and directly secured to said frame whereby the thrust imposed upon the pin during the working operation is transmitted directly to said frame independently of said reciprocating means.

3. In a bolt making machine, a supporting frame, a die having a die opening therein, means for working a bolt blank in said die, an ejector pin mounted for longitudinal reciprocation in said opening to eject both blanks therefrom after the working operation, means for reciprocating said pin, a sleeve-like member directly secured to said frame, and abutment means associated with said pin and arranged to abut said sleeve member when the pin is in retracted position and subjected to thrust during the working operation.

4. In a bolt making machine, a bed frame, a die having a die opening therein, means for working a bolt blank in said die, an ejector pin mounted for longitudinal reciprocation in said opening to eject bolt blanks therefrom after the working operation, means for reciprocating said pin, a sleeve adjustably threaded in said frame, and abutment means associated with said pin and arranged to abut said sleeve when the pin is in retracted position and subjected to thrust during the working operation.

5. In a bolt making machine, a bed frame, a die having a die opening therein, means for working a bolt blank in said die, an ejector pin mounted for longitudinal reciprocation in said opening to eject bolt blanks therefrom after the working operation, means for reciprocating said pin, a sleeve member adjustably threaded in said frame, a plunger associated with said pin and arranged for reciprocatory movement in said sleeve, and an abutment associated with said plunger and arranged to abut said sleeve when the pin and plunger are in retracted position and the pin is subjected to thrust during the working operation.

6. In a bolt making machine, a bed frame, a die having a die opening therein, means for working a bolt blank in said die, an ejector pin mounted for longitudinal reciprocation in said opening to eject bolt blanks therefrom after the working operation, means for reciprocating said pin, a sleeve adjustably threaded in said frame, a plunger mounted for reciprocatory movement in said sleeve, said pin being actuated by said plunger, and an abutment formed on said plunger and arranged to abut said sleeve when the pin is in retracted position and subjected to thrust during the working operation.

7. In a bolt making machine, a bed frame, a die having a die opening therein, means for working a bolt blank in said die, an ejector pin mounted for longitudinal reciprocation in said opening to eject bolt blanks therefrom after the working operation, said frame being formed with an opening in alignment with said die opening, a sleeve adjustably threaded in the opening formed in

the frame, a plunger mounted for reciprocatory movement in said sleeve and having the pin adjacent to one end thereof, an abutment shoulder formed on said plunger and arranged to abut said sleeve when the pin is in retracted position and subjected to thrust during the working operation, and means for reciprocating said plunger.

8. In a bolt making machine, a supporting frame, a die having a die opening therein, means for working a bolt blank in said die, an ejector pin mounted for longitudinal reciprocation in said opening to eject bolt blanks therefrom after the working operation, means for reciprocating said pin, abutment means associated with said pin and directly secured to said frame and arranged to transmit the thrust imposed on the pin to said frame when the pin is in its retracted position, and means for adjusting the retracted position of said abutment means in accordance with varying lengths of bolt blanks.

9. In a bolt making machine, a bed frame, a die having a die opening therein, means for working a bolt blank in said die, an ejector pin mounted for longitudinal reciprocation in said opening to eject bolt blanks therefrom after the working operation, said frame being formed with an opening in alignment with said first-named opening, a sleeve directly secured to said frame in said opening, a reciprocating member mounted in said sleeve and having the said pin adjacent to one end thereof, abutment means associated with said reciprocating member and arranged to abut said sleeve when the pin is in retracted position and subjected to thrust during the working operation, and means for adjusting said sleeve to thereby adjust the limit of retraction of said pin in accordance with varying lengths of bolt blanks.

10. In a bolt making machine, a supporting frame, a die having a die opening therein, means for working a bolt blank in said die, an ejector pin mounted for longitudinal reciprocation of said opening to eject bolt blanks therefrom after the working operation, said frame being formed with an opening in alignment with said die opening, a sleeve adjustably threaded in said frame opening, a plunger mounted for reciprocatory movement in said sleeve, a return spring for normally urging said plunger to its retracted position, an abutment shoulder formed on said plunger and arranged to abut said sleeve when the pin is in its retracted position, a pusher arranged to depress said plunger against the resistance of said spring, and a pusher-contact member on the end of said plunger.

11. In a bolt making machine, a supporting frame, a movably mounted trimming die having a die opening therein, a blank ejecting pin adapted to reciprocate in said opening to eject blanks therefrom, and means adjustably secured in said frame and backing said die, said pin having reciprocatory movement in said means.

12. In a bolt making machine, a supporting frame, a trimming die having a die opening therein, said frame being formed with an opening in alignment with said die opening, a sleeve-like member adjustably secured in said frame opening and abutting at one end against said die to form an adjustable backing for the latter, said pin having reciprocatory movement in said sleeve member.

13. In a bolt making machine, a bed frame, a trimming die having a die opening therein, said frame being formed with an opening in alignment with said die opening, a sleeve adjustably secured in said frame opening and abutting at

one end against said die to provide an adjustable backing for the latter, an ejector pin mounted for longitudinal reciprocation in said die opening to eject bolt blanks therefrom, a plunger mounted for reciprocatory movement in said sleeve arranged to actuate said pin, and means for reciprocating said plunger.

14. In a bolt making machine, a bed frame, a die holder, a trimming die having a die opening therein, said die being movably mounted in said die holder, said frame being formed with an opening in alignment with said die opening, a cylindrical sleeve adjustably threaded in said frame opening and abutting at one extremity against said die to provide an adjustable backing for the latter, a plunger mounted for reciprocatory movement in said sleeve, an ejector pin abutting one end of said plunger and arranged to reciprocate in said die opening to eject bolt blanks therefrom, a return spring mounted in said sleeve around said plunger, and means for depressing said plunger against the resistance of said spring.

15. In a bolt making machine, a bed frame, a movably mounted trimming die, and an adjustable sleeve threaded in said frame and abutting at one end against said die to provide an adjustable backing means for the latter.

16. A blank-ejecting assembly for bolt making machines comprising a supporting frame, a die mounted on said frame, a longitudinal bore in said die, a longitudinal bore in said frame in axial alignment with the bore in said die, a portion of the bore in the frame being threaded and a smooth unthreaded portion adjacent thereto, a sleeve fitting said bore, said sleeve provided exteriorly with a threaded portion and interiorly with a blank-ejector bore and the end of the sleeve adjacent the die constituting an abutment face to receive the thrust resulting from the work performed upon the blanks in the dies.

17. In a bolt machine, a bed frame, a reciprocating header slide mounted in said frame, a

trimming die having a cylindrical shank receiving portion and a polygonal head receiving portion rigidly secured in said frame, a trimming punch having a polygonal head receiving portion carried by said slide in operative alignment with said die, said punch being provided with an axially extending passageway for bolt blanks, means provided in the bed frame for adjusting the relative positions of the die and the punch at the end of the forward stroke of the header slide so that the resultant trimming flash will remain intermediate the end faces of the head of the blanks after being trimmed by said punch and means for ejecting the blank from the die at the completion of the forward stroke of the header slide, said ejecting means being so timed with respect to the movement of the header slide as to drive the blank entirely into said passageway and move said flash longitudinally of the head of the blank and cause the shank of the blank to clear the flash and permit the flash to drop clear of the blank.

18. In the manufacture of bolt blanks, the method which consists in extruding a length of wire or rod stock to obtain a blank having the desired shank dimensions, upsetting a portion of a blank to form a head thereon, trimming the head of the blank by moving polygonal head receiving punches toward each other to trim metal from the shank face of the head toward the top face of the head and simultaneously trim from the top face of the head toward the shank face of the head and permitting a certain amount of flash metal to adhere to the circumferential portion of the head between said punches to prevent dulling of the trimming punches and then on the same stroke ejecting the blank from the one of said punches entirely into a hollow formed in the other of said punches with sufficient force to completely sever the flash and cause the shank of the blank to clear the flash.

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