H. L. SMITH.

KNOCKOUT MECHANISM FOR HEADING MACHINES.

APPLICATION FILED AUG. 24, 1921.

1,437,919. **Patented Dec. 5, 1922.**

4 SHEETS—SHEET 1.

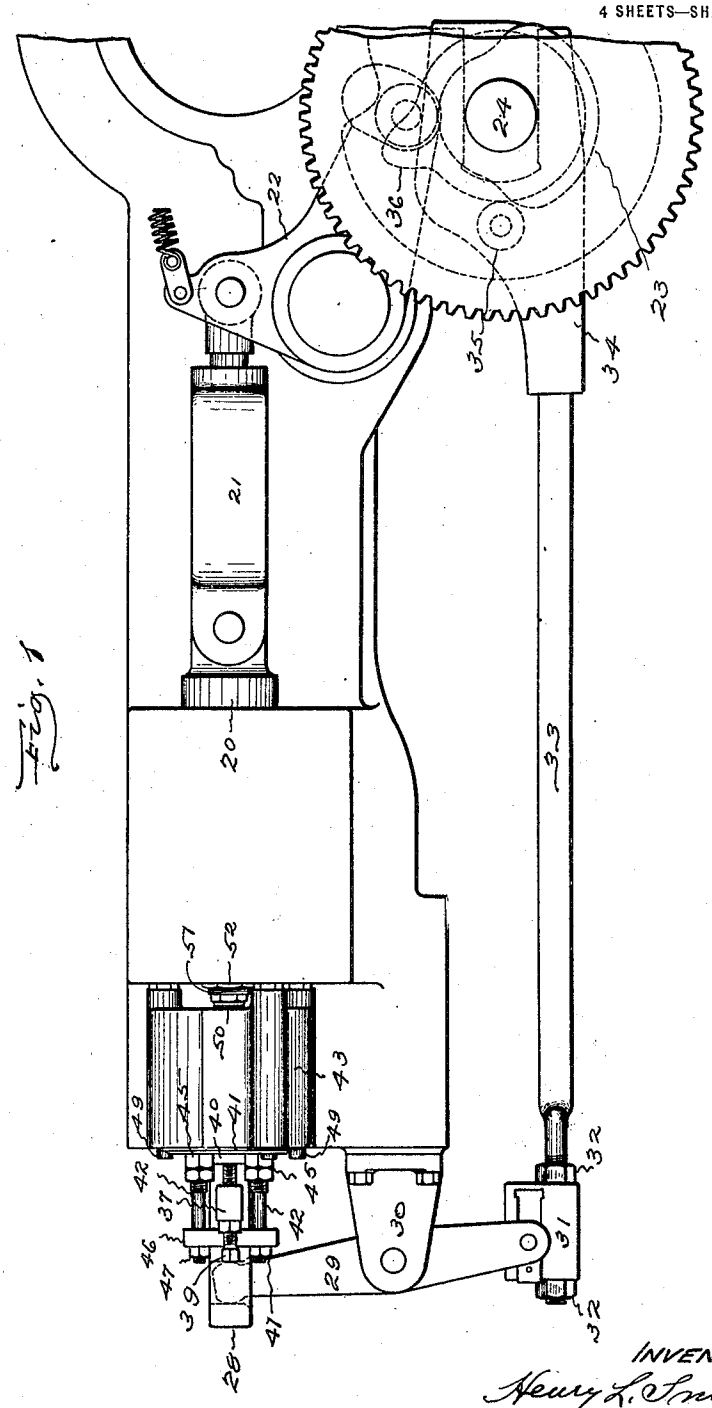


Fig. 1.

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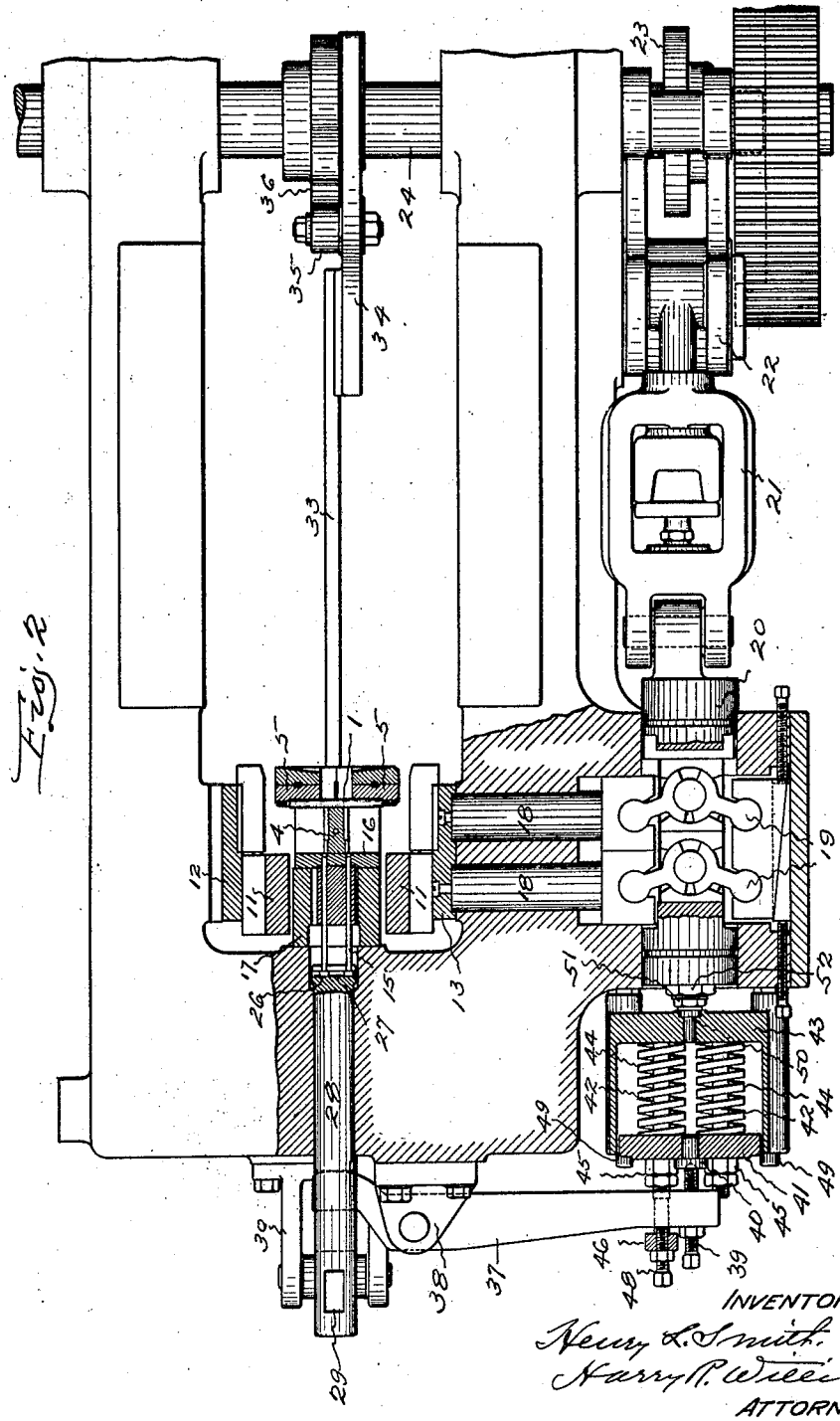
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4 SHEETS—SHEET 3.

Fig. 5

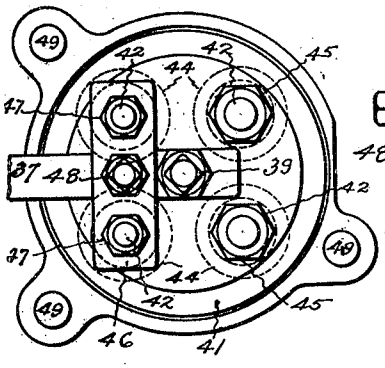


Fig. 3

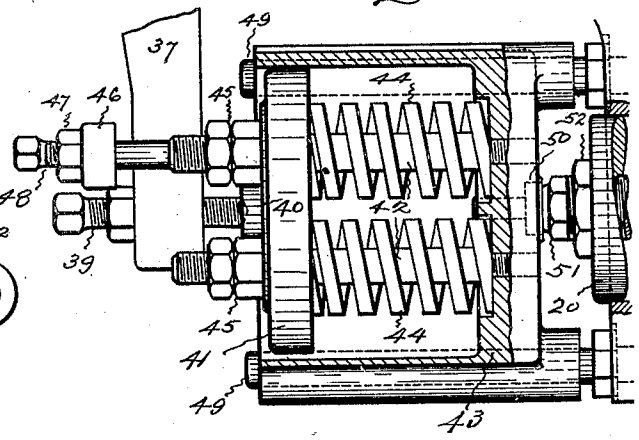


Fig. 4

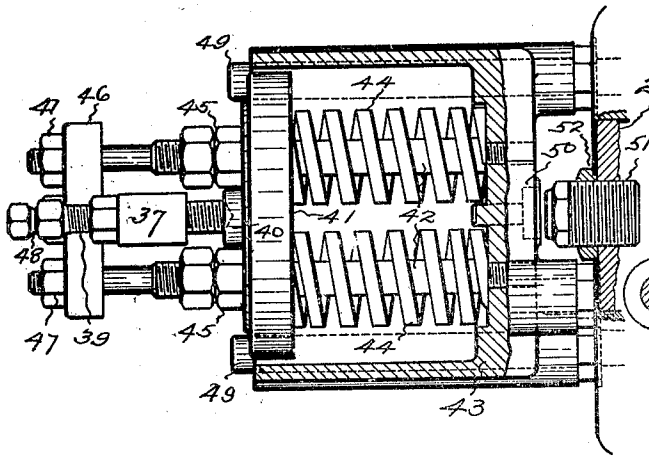
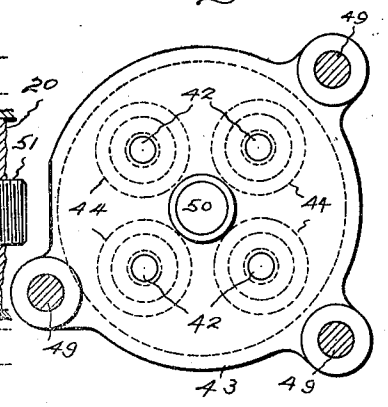


Fig. 6



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4 SHEETS—SHEET 4.

Fig. 7

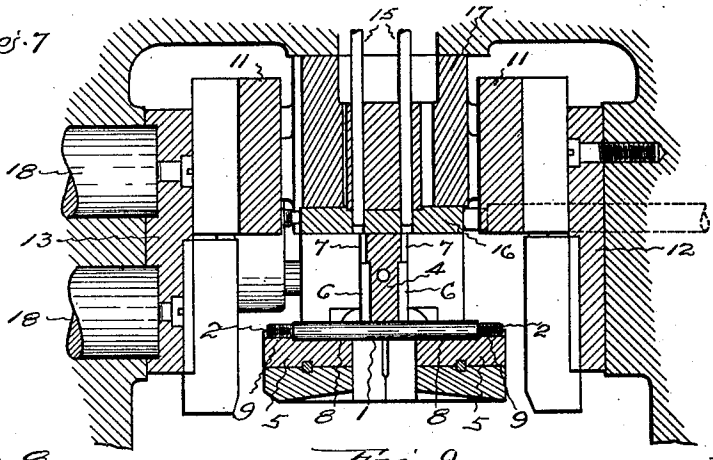


Fig. 8

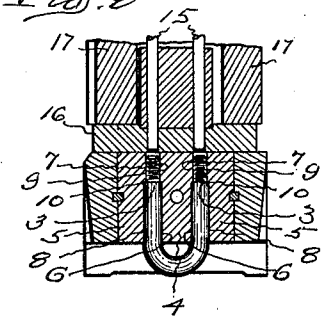


Fig. 9

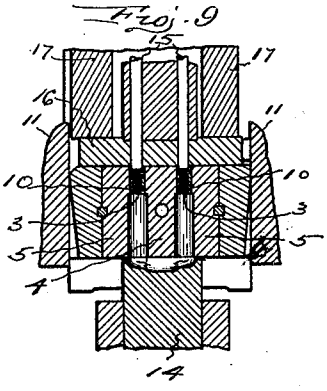


Fig. 10

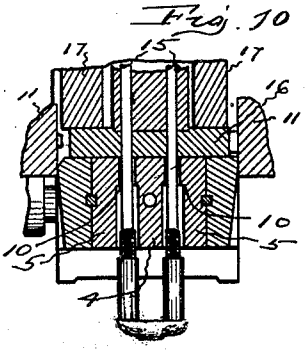


Fig. 11

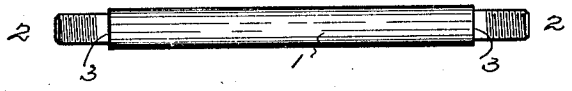


Fig. 12

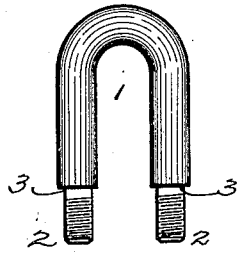
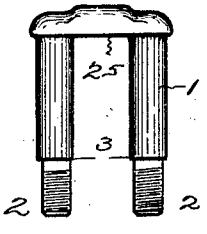


Fig. 13



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Patented Dec. 5, 1922. 1,437,919

UNITED STATES PATENT OFFICE.

HENRY L. SMITH, OF WATERBURY, CONNECTICUT, ASSIGNOR TO THE E. J. MANVILLE MACHINE COMPANY, OF WATERBURY, CONNECTICUT, A CORPORATION OF CONNECTICUT.

KNOCKOUT MECHANISM FOR HEADING MACHINES.

Application filed August 24, 1921. Serial No. 495,085.

To all whom it may concern:

Be it known that I, HENRY L. SMITH, a citizen of the United States, residing at Waterbury, in the county of New Haven and State of Connecticut, have invented a new and useful Improvement in Knockout Mechanism for Heading Machines, of which the following is a specification.

This invention relates to the mechanism which is provided for pushing out of the dies, blanks that have been operated upon by the punch or punches of a metal heading machine.

The invention is illustrated herein as embodied in a form which is applicable to heading machines of the type shown in United States patent to Campbell No. 926,170, June 29th, 1909 that are more particularly designed for making shackle bolts, as described in my application No. 465824, filed April 30th, 1921 for patent for machine for forming shackle bolts.

The object of the invention is to provide a knock-out mechanism of this character which is so constructed that it will not only remove from the dies the blanks that have been acted upon by the punch, but will assist in supporting the blanks and aid in resisting the force of the blows of the punch on the blanks, notwithstanding the fact that the blanks may vary slightly in length, and thus insure correct shape and exact dimension for the section of the blanks that is required to be accurate.

For example, in a shackle bolt, and in fact in any shoulder bolt, the body section or that part between the head and shoulder must be of exact length while the threaded end beyond the shoulder frequently varies in length. To insure the required dimensions of the necessary sections, the dies are shouldered and the knock-out pins are pushed against the threaded ends of the blanks so as to back them up with a cushioning pressure, regardless of the lengths of the threaded ends, and relieve the hammer of the shoulders on the blanks against the shoulders in the dies when the punch delivers its blow, without battering the ends of the blanks or ends of the knock-out pins, thus insuring a uniformly exact product.

In the accompanying drawings Figure 1 shows a side elevation of the frame of a heading machine provided with a knock-out mechanism which embodies this invention. Fig. 2 is a plan of the same with parts in section. Fig. 3 is a sectional plan on larger scale of the knock-out cushioning means in one position. Fig. 4 is a sectional elevation with the parts in another position. Fig. 5 is a view of one end of the cushioning means. Fig. 6 is a view of the other end of the same. Fig. 7 is a horizontal section through the dies of the shackle heading machine with the parts in the positions occupied before a blank is bent. Fig. 8 is a view of the dies and knock-out pins with the blank bent to U-shape. Fig. 9 is a similar view with the blank finally shaped by the punch. Fig. 10 is a view showing the pins removing the finished blank from the dies. Fig. 11 is a view of a blank before it is bent. Fig. 12 is a view of a blank bent to U-shape. Fig. 13 is a view of a shackle blank in final shape.

In the shackle heading machine referred to the blank 1, which is a straight piece of rod with threaded ends 2 beyond the shoulders 3, is fed between the mandrel 4 that forms the central die member and the swinging die members 5 so as to lie in the horizontal position illustrated in Fig. 7. The outer faces of the central die member have semi-circular grooves 6 for receiving the body of the blank and smaller semi-circular grooves 7 for receiving the threaded ends of the blank, while the inner faces of the swinging die members have corresponding grooves 8 for the body and grooves 9 for the threaded ends of the blank. During the operation of the machine the die members 5 are swung around from the position shown in Fig. 7 so as to bend the blank into the U-shape shown in Fig. 8, in which position the limbs of the blank fill the die grooves 6 and 8 while the threaded ends occupy the grooves 7 and 9 with the shoulders 3 on the blank close against the shoulders 10 in the die openings. After the blank has been bent to U-shape the blocks 11 are moved forward to fill the spaces between the dies and the fixed plate 12 on one side of the die pocket in the frame, and between the dies and the laterally movable plate 13 on the other side of the die pocket, then the dies are pinched together by forcing the plate 13 with the intermediate filling blocks and dies carrying the blank, toward the plate 12. When the dies are held in this manner the punch 14 strikes the bent end

of the blank and heads that end into the form shown in Fig. 9. The pinch on the dies is then released, the filling blocks drawn back and the blank pushed out by the knock-out pins 15 as shown in Fig. 10. The knock-out pins pass through openings in a slide plate 16 and backing block 17 that are behind the dies in the die pocket. The plate 13 is moved over for pinching the dies by plungers 18 actuated by toggles 19. Fig. 2. These toggles are operated for the purpose of pinching and releasing the dies by a reciprocatory slide 20 that is connected by a link 21 with an angle lever 22 which is rocked by a cam 23 on the cam shaft 24. Figs. 1 and 2.

Further details of these mechanisms are not illustrated and described herein for they are fully set forth in the application previously mentioned and form no part of the present invention, which relates merely to the construction and action of the knock-out mechanism whereby the distance between the shoulders 3 on the blank (Fig. 11) that is accurately determined when the blank is formed, will always insure an exact distance between the under side of the head 25 and the shoulders 3 of the finished bolt. (Fig. 13.)

The knock-out pins 15 have heads 26 which lie in a horizontal slot 27 in the end of the knock-out plunger 28. Fig. 2. The knock-out plunger is engaged by the upper end of a vertical lever 29 pivotally mounted in a bracket 30 fastened to the frame. The lower end of this lever is connected with a block 31 which is adjustably fastened by nuts 32 to the end of a reciprocatory bar 33. The other end of this bar is attached to a fork 34 which embraces the cam shaft 24 and has a roll 35 that is engaged by a cam 36 on the cam shaft. Fig. 1. This cam is so timed that at the proper moment the bar is reciprocated, the lever oscillated, the plunger reciprocated and the knock-out rods pushed forward to eject a blank from the dies and then returned to position back of the dies.

The outer end of the knock-out plunger is slotted and projecting into the slot is the end of a horizontal lever 37 which is pivotally held in a bracket 38 fastened to the frame. The slot in the plunger into which the lever 37 extends is of sufficient length to permit the plunger to be moved forward for ejecting a blank without interfering with the action of the lever 37. Fig. 2. The other end of this lever carries an adjustable screw stud 39 that is arranged to engage with a central boss 40 on a circular disk 41 which is slidably mounted on four posts 42 that project outwardly from the bottom of a cup-shaped cage 43. On the posts 42 and thrusting between the bottom of the cage and the disk are four springs 44. The springs push the disk outward and the ends of the posts are threaded and provided with adjusting and locking nuts 45 to limit the outward movement of the disk and provide the desired tension for the springs. Two of the posts 42 extend outward further than the other two and are connected by a plate 46 which is fastened to the posts by nuts 47 and is provided with an adjustable screw stud 48 that is engaged with the back of the lever 37 which the plate spans. Figs. 4 and 5.

The cage 43 which carries the cushioning springs and disk and that is thus connected with the lever 37 is slidably mounted on three posts 49 which project from the frame. In the back of the bottom of the cage is a hardened block 50. Fig. 2. In the front end of the toggle operating slide 20 is an adjustable hardened stud 51 that is screwed into the slide and locked in place by a nut 52. Figs. 2 and 4. When the slide moves forward to cause the toggle to effect the pinching together of the dies on a blank, the stud 51 engages the block 50 and pushes the cushioning cage forward sufficiently to cause the knock-out pins to press with a yielding force against the ends of the blank held in the dies.

With this mechanism the ends of the knock-out pins are normally behind the back faces of the dies in such positions that they will not interfere with the action of the dies (Fig. 7) and when the dies are closed together by the toggle mechanism the toggle mechanism through the cushioning means pushes the ends of the pins closely against the ends of the blank. Fig. 9. This takes place regardless of variations in the length of the threaded ends of the blanks and the pressure of the pins assists in sustaining the force of the blow of the punch and relieves the pressure of the shoulders 3 on the blank against the shoulders 10 in the dies when the blow is struck. The spring cushion permits the ends of the pins to be set firmly against the end of the blank and yet allows a slight yielding under the percussion of the blow of the punch so that the ends of the pins and the threaded ends of the blank will not be battered. After the punch has acted and been withdrawn the pins are pushed forward for ejecting the blank (Fig. 10) without interference by the cushioning mechanism which has held the pins against the ends of the blank. As a result of this construction the length of the limbs from the heads to the shoulders at the threaded ends will be the same in all of the product and the shoulders and threads will not be bruised or marred in any manner thus insuring a uniformly accurate out put for the machine to which the mechanism is applied.

The invention claimed is:

1. In a metal heading machine the combi-

nation with the dies, of an ejecting mechanism comprising a reciprocatory knock-out pin, mechanism actuated from a moving part of the machine for causing the knock-out pin to press against the end of a blank held in the dies, and mechanism for causing the knock-out pin to eject a blank from the dies.

2. In a metal heading machine the combination with the dies, of an ejecting mechanism comprising a reciprocatory knock-out pin, yielding mechanism actuated from a moving part of the machine for causing the knock-out pin to press against the end of a blank held in the dies, and mechanism for causing the knock-out pin to eject a blank from the dies.

3. In a metal heading machine the combination with the dies and means for closing the dies, of an ejecting mechanism comprising a reciprocatory knockout pin, yielding mechanism actuated from the die closing means for causing the knock-out pin to press against the end of a blank held in the dies, and mechanism for causing the knock-out pin to eject a blank from the dies.

4. In a metal heading machine the combination with the dies, of an ejecting mechanism comprising a reciprocatory knock-out pin, a plunger connected with the pin, a lever for reciprocating the plunger, a lever bearing against the plunger, and yielding means actuated from a moving part of the machine for causing the latter lever to press the plunger forward.

5. In a metal heading machine the combination with the dies, of an ejecting mechanism comprising a reciprocatory knock-out pin, a plunger connected with the pin, a lever for reciprocating the plunger, a lever bearing against the plunger, and means including a plurality of springs actuated from a moving part of the machine for causing the latter lever to press the plunger forward.

6. In a metal heading machine the combination with the dies, of an ejecting mechanism comprising a reciprocatory knock-out pin, a plunger connected with the pin, a lever for reciprocating the plunger, a lever bearing against the plunger, and means including a movable cage containing cushioning springs actuated from a moving part of the machine for causing the latter lever to press the plunger forward.

7. In a metal heading machine the combination with the dies and means for closing the dies, of an ejecting mechanism comprising a reciprocatory knock-out pin, a plunger connected with the pin, a lever for reciprocating the plunger, a lever bearing against the plunger, and means including a cushion actuated from the die closing means for causing the latter lever to press the plunger forward.

8. In a metal heading machine the combination with the dies and a toggle mechanism for closing the dies, of ejecting mechanism comprising a reciprocatory knock-out pin, a plunger connected with the pin, a lever for reciprocating the plunger, a lever bearing against the plunger, and means including a cushion actuated from the toggle mechanism for causing the latter lever to press the plunger forward.

9. In a metal heading machine the combination with the dies, of ejecting mechanism comprising a reciprocatory knock-out pin, a plunger connected with the pin, a lever for reciprocating the plunger, a lever bearing against the plunger, a movable cage containing springs and a disk pressed outwardly by said springs against said latter lever, and means actuated from a moving part of the machine for moving said cage and through said disk causing the latter lever to press the plunger forward.

10. In a metal heading machine the combination with the dies and a toggle mechanism for closing the dies, of ejecting mechanism comprising a reciprocatory knock-out pin, a plunger connected with the pin, a lever for reciprocating the plunger, a lever bearing against the plunger, a movable cage containing springs and a disk pressed outwardly by said springs against said latter lever, and means actuated from said toggle mechanism for moving the cage and through said disk causing the latter lever to press the plunger forward.

11. In a metal heading machine the combination with the dies and mechanism for closing the dies, of ejecting mechanism comprising a reciprocatory knock-out pin, a lever for reciprocating the knock-out pin, a lever bearing against the plunger, and means for causing the latter lever to press the plunger forward when the dies are closed.

12. In a metal heading machine the combination with the dies, of means for ejecting a blank from the dies, yielding mechanism engaging the ejecting means and actuated to normally force said means against a blank held in the dies, and mechanism operated independently of and without interference by said yielding mechanism for ejecting the blank from the dies.

HENRY L. SMITH.