June 11, 1940. J. C. M. MACLAGAN 2,204,043

COLD FORGING MACHINE

Filed Jan. 11, 1940 3 Sheets-Sheet 1

FIG. 1

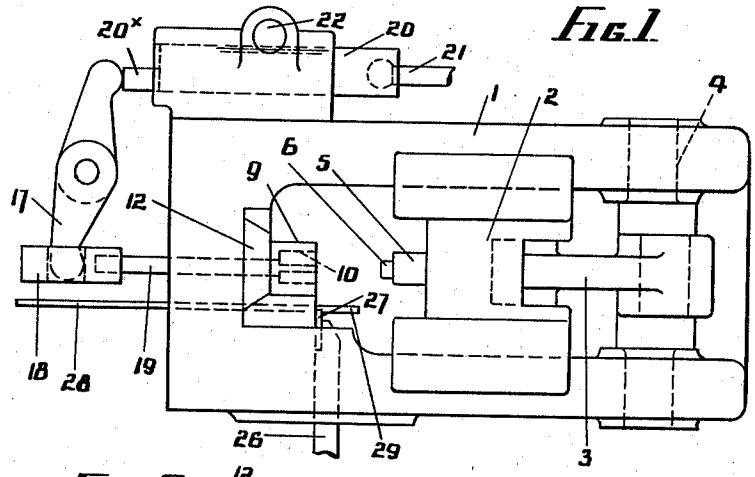


FIG. 2

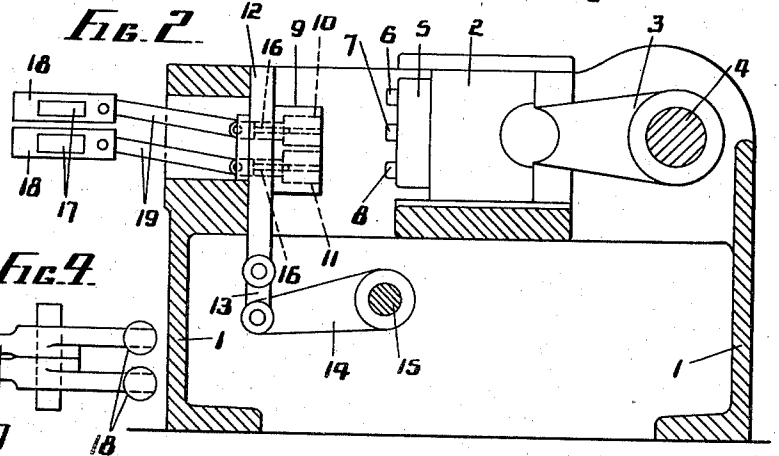
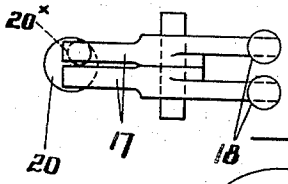


FIG. 4



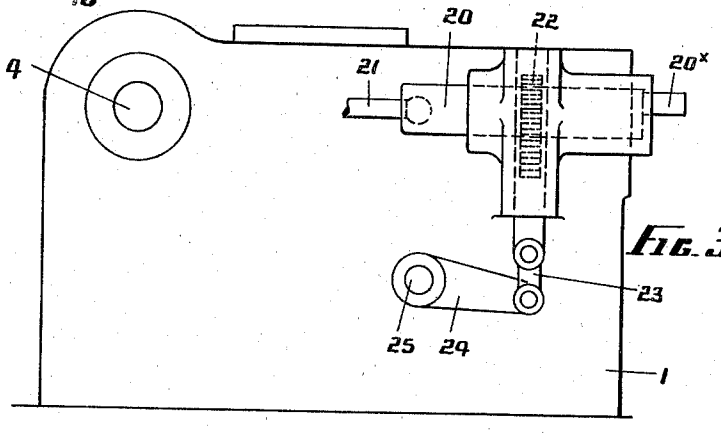


FIG. 3

Inventor:

John C. M. Maclagan

By Cushman, Darby & Cushman

Attys.

June 11, 1940. J. C. M. MACLAGAN 2,204,043

COLD FORGING MACHINE

Filed Jan. 11, 1940 3 Sheets-Sheet 2

FIG. 5.

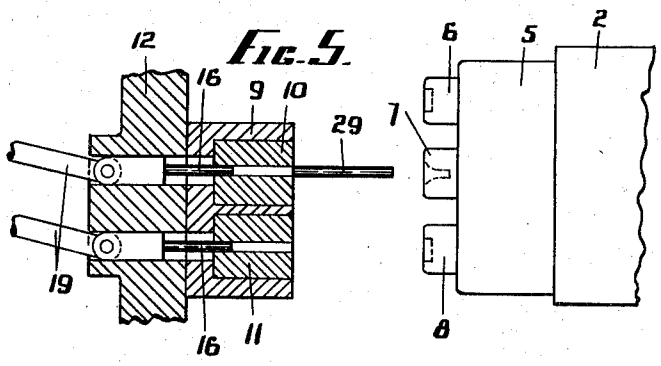


FIG. 6.

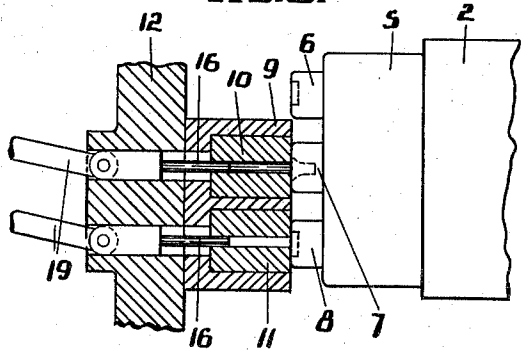
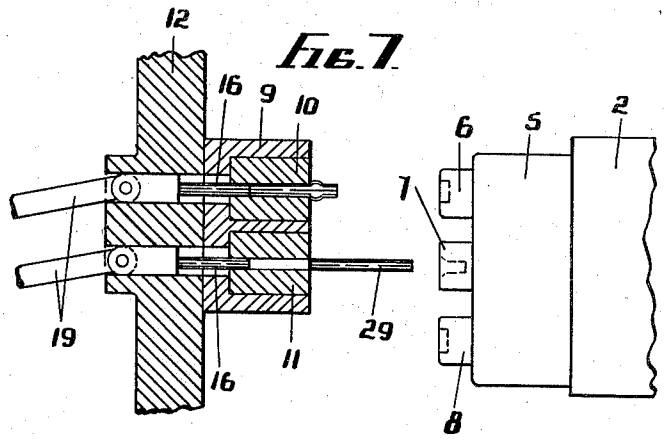


FIG. 7.



Inventor:

John C. M. Maclagan,

By Cushman, Darby & Cushman

Attys.

June 11, 1940. J. C. M. MACLAGAN 2,204,043

COLD FORGING MACHINE

Filed Jan. 11, 1940 3 Sheets-Sheet 3

FIG. 8.

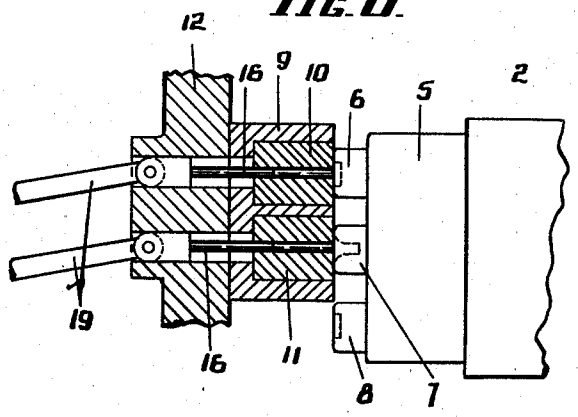


FIG. 9.

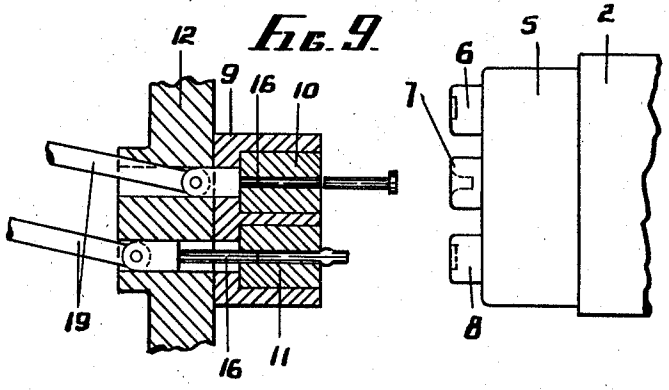
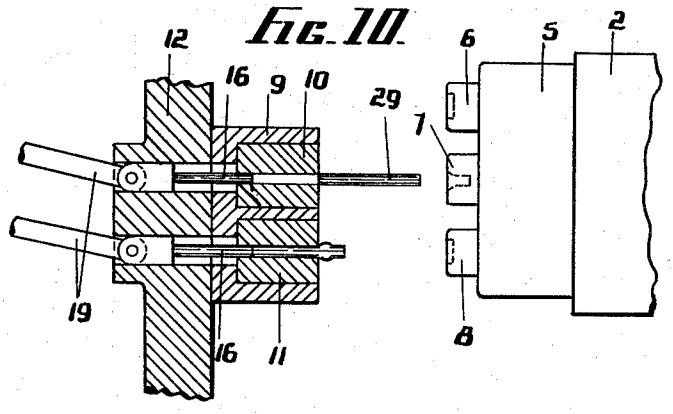


FIG. 10.



Inventor:

John C. M. Maclagan,

By Cushman, Darby & Cushman

Attys.

Patented June 11, 1940

2,204,043

UNITED STATES PATENT OFFICE

2,204,043

COLD FORGING MACHINE

John Campbell Maccall Maclagan, Leeds, England, assignor to Greenwood & Batley Limited, Leeds, England, a British company

Application January 11, 1940, Serial No. 313,455
In Great Britain January 24, 1939

5 Claims. (Cl. 10—12)

This invention relates to cold forging machines for forming the heads on bolts and similar articles and where the bolt head is of such size or proportions as to require two blows from the heading punches to form it, one from the first or coning punch and one from the second or finishing punch.

In cold forging machines of this kind as hitherto constructed one bolt is completely headed for every two heading strokes of the slide carrying the heading punches, and the object of the present invention is to provide means whereby a bolt head is completely formed at each heading stroke of the slide, thereby doubling the customary output in relation to the heading strokes.

According to the invention, the punch slide carries one first or coning punch and two second or finishing punches equally spaced from and one on each side of the first or coning punch, and two dies spaced apart to correspond with the punches with which they are to co-operate are carried by a common member or die slide which is actuated during the return strokes of the punch slide to bring its dies alternately one into register with the first or coning punch and the other into register with one or other of the second or finishing punches according to the direction of movement of said die carrying member or die slide.

Thus during each heading stroke two bolt blanks carried by the dies are operated upon, one, which has immediately previously been coned, by one of the finishing punches, and the other or plain blank by the coning punch. During the return stroke of the punch slide the completely formed bolt is ejected from its die, while the die slide is moved to register the said die with the coning punch and the already coned blank in its die into register with that second or finishing punch which was inoperative in the previous heading stroke. The next heading stroke pushes a fresh plain blank into the vacant die and cones it; at the same time the coned blank in its die is completely formed and ejected while the die slide is moved back again ready for the next heading stroke.

In this way, for each and every heading stroke of the punch slide except the first, in which a plain blank is pushed into one of the dies and coned, a bolt is completed.

In order that the invention may be clearly understood and readily carried into effect, the same will now be more fully described with reference to and by the aid of the embodiment illustrated in the accompanying drawings, wherein—

Figure 1 is a plan of the cold forging machine.

Figure 2 is a sectional side elevation of the machine, and Figure 3 is an elevation taken from the opposite side.

Figure 4 is a detail view of the ejector operating levers of the machine.

Figures 5 to 10 inclusive are diagrammatic fragmentary sectional views illustrating the successive stages in the operation of the machine.

Referring to the drawings, the forging machine comprises a bed 1 in which reciprocates a heading slide 2 operated by a pitman or connecting rod 3 from the crankshaft 4, and the outer end of the slide 2 carries a fixed punch block or holder 5 in which are fitted three punches 6, 7, 8 all arranged in one plane or in line and equally spaced apart. The centre punch 7 is a first or coning punch and the other two 6 and 8, one on each side, are second or finishing punches.

A die block 9 is provided inside the bed 1 at the end remote from the crankshaft 4 and carries two dies 10, 11 in the same plane as the punches 6, 7, 8 and correspondingly spaced, said die block 9 being attached to a reciprocated shifter slide 12 adapted to move in a common plane which contains the axes of the dies 10, 11 and co-operating punches 6, 7, 8. The shifter slide 12 is operated by a link 13 and arm 14 from a rocker shaft 15 which, in turn, is actuated by a lever and cam mechanism (not shown) affording an appropriate dwell after each stroke of its to-and-fro movement, the cam mechanism being operated by a 2 to 1 reduction gear from the crankshaft 4. The movement of the shifter slide 12 is so controlled that with the die holder 9 at one extreme end of its travel the die 10 is in axial alignment with the centre or coning punch 7 and the other die 11 is in axial alignment with the finishing punch 8, whilst when the die holder 9 is in the other extreme position the die 11 which was opposite or aligned with the finishing punch 8 is in register with the centre or coning punch 7 when the other die 10 is then in axial alignment with the other finishing punch 6.

An ejector mechanism for ejecting the finished bolts or the like from the dies comprises ejector pins 16, one for each die 10, 11 sliding in guides behind the dies and operated by rocking levers 17 through ejector blocks 18 and links 19. The ejector links 19 are arranged to pivot and have the ends formed to accommodate the sliding motion of the die block 9 with guides for the ejector pins 16 relative to the ejector blocks 18 in their respective guides, whilst the rocking

levers 17 are operated by a cylindrical slide 20 actuated by a push rod 21 from a cam mechanism (not shown) on the crankshaft 4. In this connection an eccentric extension 20× is provided on the cylindrical slide 20 to alternately engage the rocking levers 17 by virtue of said slide 20 being rotated through an appropriate angle, and this partial rotation of the cylindrical slide 20 is obtained by a reciprocating toothed rack 22 in mesh with teeth on the cylindrical slide 20, the said rack 22 being operated by a link 23 and arm 24 from a rocking shaft 25 which, in turn, may be actuated by a lever and cam mechanism, or similar means, from a cam shaft which is geared by 2 to 1 reduction gearing to the crankshaft 4.

A cut-off slide 26 with a knife 27 is provided to cut off the wire stock 28 and carry each cut-off blank 29 across to the centre line of the die to receive it.

The operation of the machine is as follows:—

The requisite length or blank 29 of wire stock is carried across to the centre line of the die on the end of the knife 27 by means of a transfer finger (not shown) when the heading slide 2 is towards the back of its travel (see Figure 5), and is held there until the centre or coning punch 7 pushes the stock or blank 29 into the aligned die 10. When the stock or blank 29 has just entered the said die 10 the knife 27 withdraws clear of the advancing punch 7 which continues to push the stock or blank 29 fully into the die 10 and up against its ejector pin 16, the wire left projecting beyond the die face being upset or coned (see Figure 6).

The punch slide 2 now recedes and a length or blank 29 of wire stock is cut off and presented to the empty die 11 which, by operation of the shifter slide 12, has moved into the loading position in register with the coning punch 7, whilst the die 10 carrying the coned blank has been brought into register with one of the finishing punches 6 (see Figure 7). Thus upon the next forward or heading stroke of the punch carrying slide 2 the partly formed or coned head on one wire blank is completed by the finishing punch 6 and the plain blank is partly headed by the coning punch 7 (see Figure 8).

The punch carrying slide 2 again recedes, the finished bolt is ejected, while the shifter slide 12 is moved across in the opposite direction back to its original position (see Figure 9) so as to bring the die 11 now carrying a coned blank into register with the other or opposite finishing punch 8 and the other or empty die 10 in alignment with the centre or coning punch 7 ready to receive another plain wire blank 29 (see Figure 10) before the punch carrying slide 2 again advances to complete the coned blank and cone the plain blank at one blow (see Figure 6), the sequence of operations depicted by Figures 6 to 10 inclusive being repeated throughout the running of the machine so as to cone one blank and complete the heading of the other blank at each and every heading stroke of the punch slide 2.

I claim:

1. A cold forging machine for forming heads on bolts and the like, comprising in combination a reciprocating punch slide, a coning punch carried by the punch slide, two finishing punches carried by the punch slide one on each side of and equally spaced from the coning punch, a die slide, two dies carried by the die slide and spaced apart to correspond with the spacing of the punches on the punch slide, and means for moving the die slide during each return stroke of the punch slide to bring the dies alternately one into register with the coning punch and the other into register with one or other of the finishing punches according to the direction of movement of the die slide.

2. A cold forging machine for forming heads on bolts and the like, comprising in combination a reciprocating punch slide, a coning punch carried by the punch slide, two finishing punches carried by the punch slide one on each side of and equally spaced from the coning punch, a die slide, two dies carried by the die slide and spaced apart to correspond with the spacing of the punches on the punch slide, means for moving the die slide during each return stroke of the punch slide to bring the dies alternately one into register with the coning punch and the other into register with one or other of the finishing punches according to the direction of movement of the die slide, and means for ejecting finished bolts from the dies alternately one during each return stroke of the punch slide.

3. A cold forging machine for forming heads on bolts and the like, comprising in combination a reciprocating punch slide, a coning punch carried by the punch slide, two finishing punches carried by the punch slide one on each side of and equally spaced from the coning punch, a die slide, two dies carried by the die slide and spaced apart to correspond with the spacing of the punches on the punch slide and guides in the die slide one behind each die, means for moving the die slide during each return stroke of the punch slide to bring the dies alternately one into register with the coning punch and the other into register with one or other of the finishing punches according to the direction of movement of the die slide, ejector pins slidably mounted one in each guide, a pair of ejector blocks, links connecting the ejector pins to the ejector blocks respectively, a pair of rocking levers associated one with each ejector block, and means for alternately operating the rocking levers one during each return stroke of the punch slide.

4. A cold forging machine for forming heads on bolts and the like, comprising in combination a reciprocating punch slide, a coning punch carried by the punch slide, two finishing punches carried by the punch slide one on each side of and equally spaced from the coning punch, a die slide, two dies carried by the die slide and spaced apart to correspond with the spacing of the punches on the punch slide, means for moving the die slide during each return stroke of the punch slide to bring the dies alternately one into register with the coning punch and the other into register with one or other of the finishing punches according to the direction of movement of the die slide, guides in the die slide one behind each die, ejector pins slidably mounted one in each guide, a pair of ejector blocks, links connecting the ejector pins to the ejector blocks respectively, a pair of rocking levers associated one with each ejector block and a cylindrical slide having an eccentric extension, means for reciprocating said cylindrical slide during each return stroke, and means for partially rotating said cylindrical slide to cause the eccentric extension to engage the rocking levers alternately.

5. A cold forging machine for forging heads on bolts and the like, comprising in combination a punch slide, a crankshaft, a pitman connecting the punch slide to the pitman whereby the punch slide is reciprocated, a coning punch carried by

the punch slide, two finishing punches carried by the punch slide one on each side of and equally spaced from the coning punch, the three punches being all in the same plane, a die slide, two dies carried by the die slide and spaced apart to correspond with the spacing of and in the same plane as the punches on the punch slide, link and lever mechanism for moving the die slide in the common plane of the dies and punches during each return stroke of the punch slide to bring the dies alternately one into register with the coning punch and the other into register with one or other of the finishing punches according to the direction of movement of the die slide, guides in the die slide one behind each die, ejector pins slidably mounted one in each guide, a pair of ejector blocks, pivoted links connecting the ejector pins to the ejector blocks respectively so as to accommodate the movements of the die slide, a pair of rocking levers operatively associated one with each ejector block, a cylindrical slide, an eccentric extension on said cylindrical slide, a push rod for reciprocating the cylindrical slide during each return stroke of the punch slide, a toothed segment on said cylindrical slide, a toothed rack meshing with said toothed segment and reciprocated to cause the eccentric extension to engage the rocking levers alternately, and means for feeding a plain bolt blank to the die brought into register with the coning punch during each return stroke of the punch slide.

JOHN CAMPBELL MACCALL MACLAGAN.