June 19, 1934. R. L. WILCOX 1,963,572

KNOCKOUT MECHANISM

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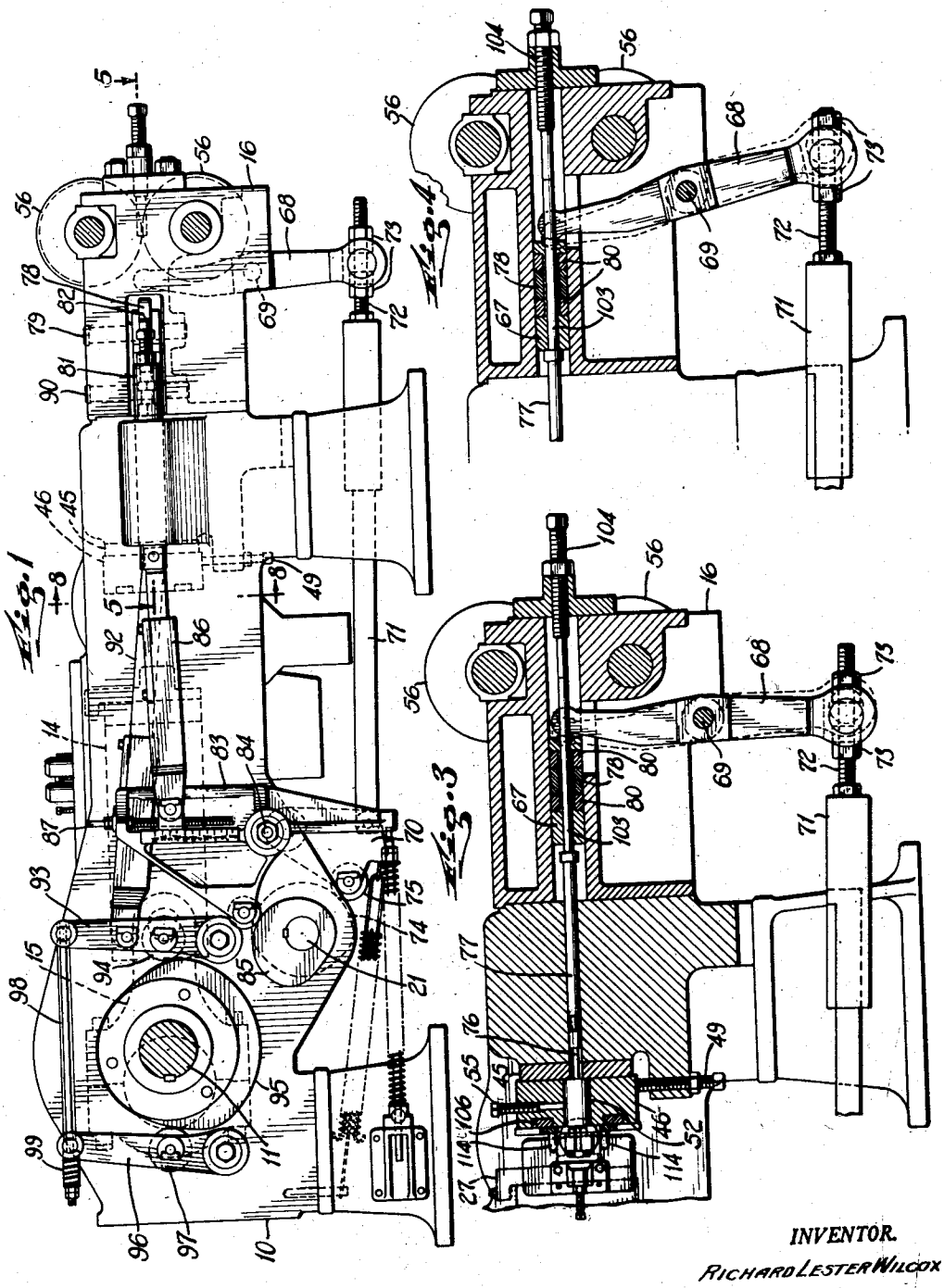


Fig. 1

Fig. 4

Fig. 3

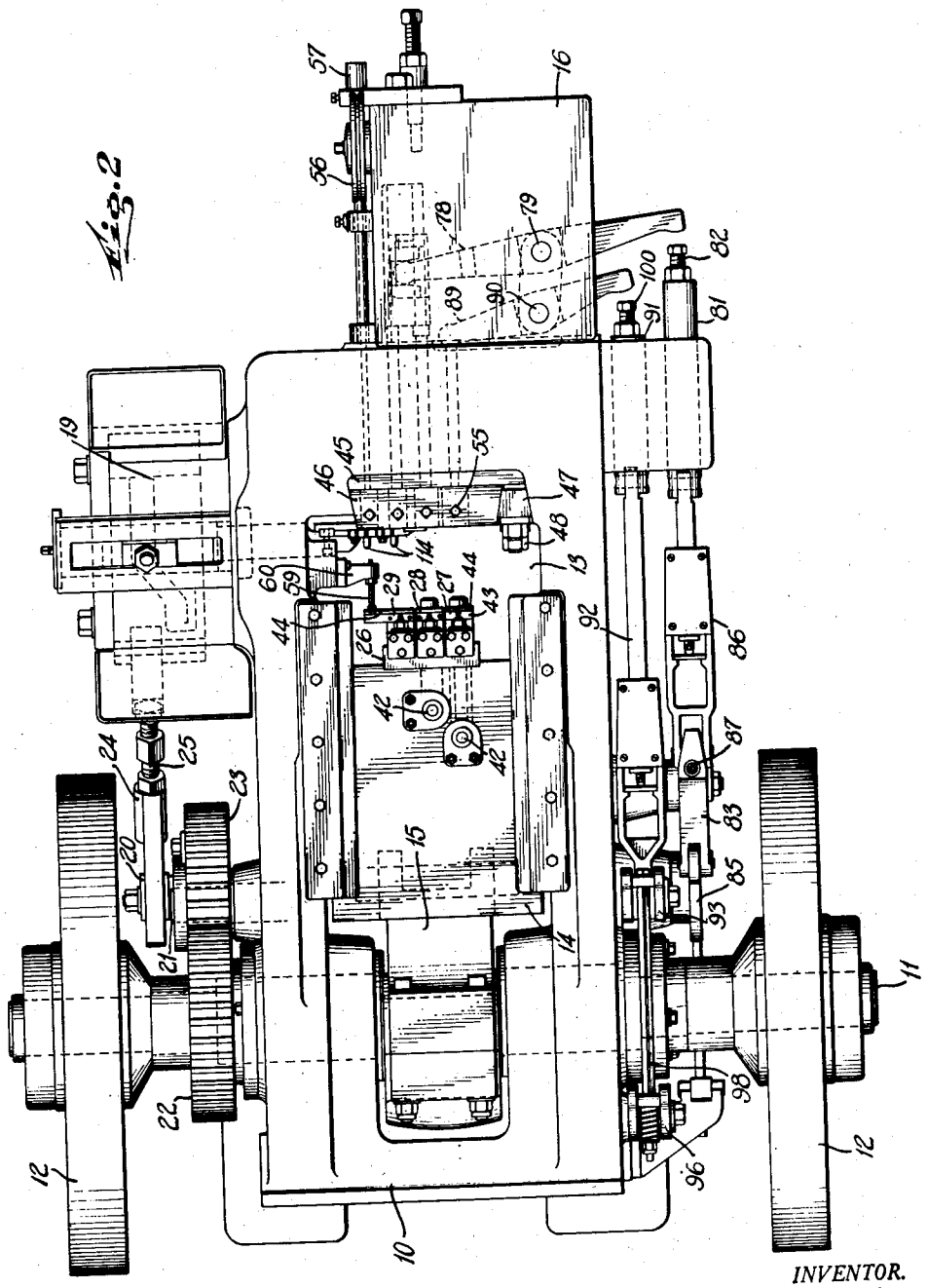
INVENTOR.
RICHARD LESTER WILCOX
BY George Yhall
ATTORNEY

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KNOCKOUT MECHANISM

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Fig. 2

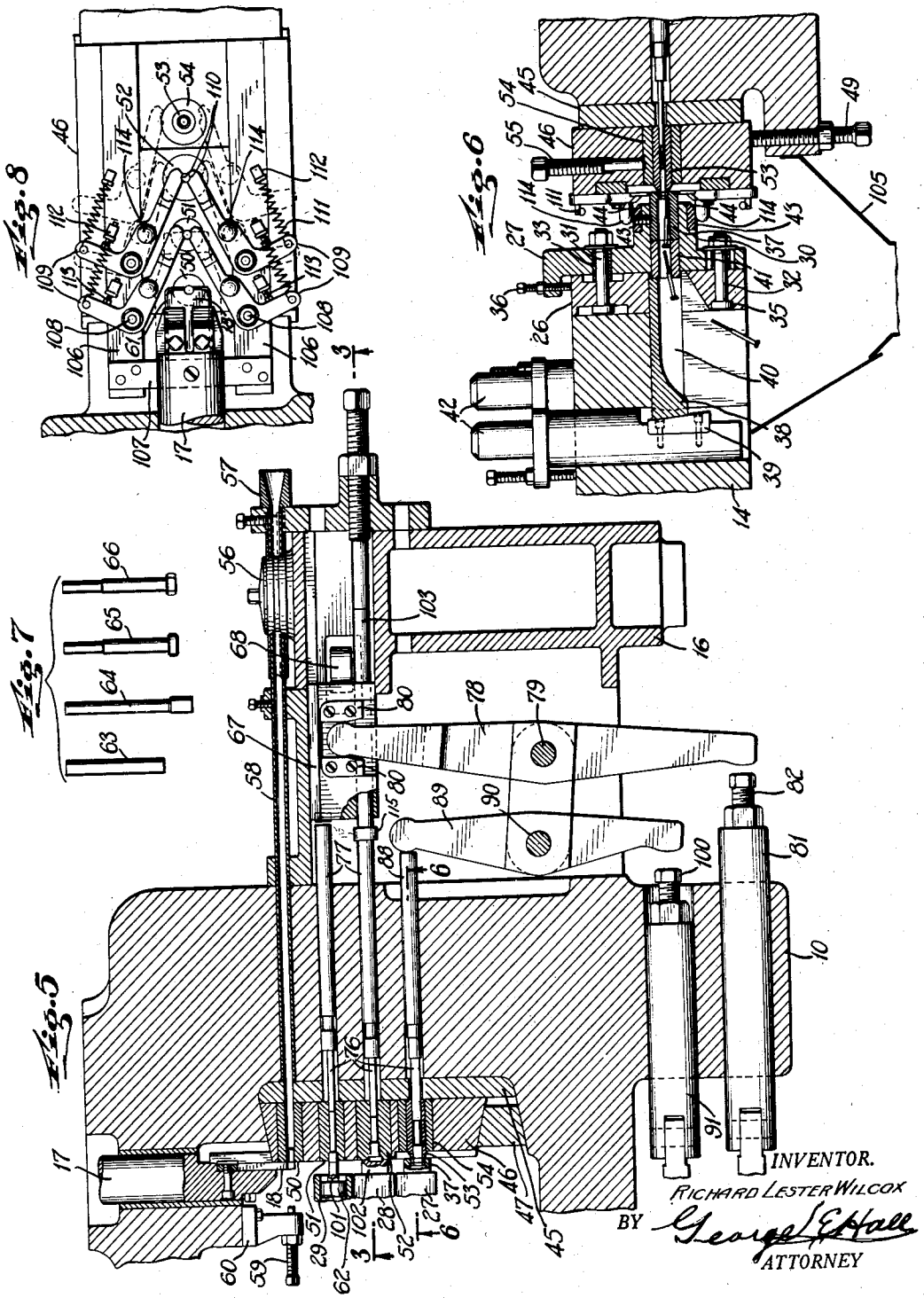


INVENTOR.
RICHARD LESTER WILCOX
BY George E. Hall
ATTORNEY

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KNOCKOUT MECHANISM

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INVENTOR.
RICHARD LESTER WILCOX
BY George E. Hall
ATTORNEY

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KNOCKOUT MECHANISM

Richard Lester Wilcox, Waterbury, Conn., assignor to The Waterbury Farrel Foundry and Machine Company, Waterbury, Conn., a corporation of Connecticut

Application January 26, 1932, Serial No. 588,860

16 Claims. (Cl. 10—12)

This invention relates to new and improved knockout mechanism, and is especially adapted for use with heading, upsetting machines and/or the like.

As shown herein the knockout mechanism is illustrated as associated with a heading or upsetting machine arranged for making bolts, screws, blanks or the like. While thus disclosed and illustrated, this is, of course, for such purpose solely and is not intended as a limitation upon its application and/or use, or to its adaptability for other forms and shapes of products.

This knockout mechanism is used with a form of transfer mechanism wherein it is essential and desirable that the blank at one or more of the stations should be so far ejected from the die that any head or collar thereon will pass beyond the transfer fingers before the same are released to engage the shank, and thereafter, this blank is further projected while held by the transfer fingers so that the end of the blank clears the face of the die and the knockout mechanism will not project beyond such face to interfere with a transverse movement of the blank.

As blanks of various sizes are operated on in machines of this character, it is desirable that the knockout mechanism should be adjustable accordingly. In addition to this the length of the blank differs at one or more of the stations, thus necessitating varying lengths of strokes of the knockout mechanism at different stations.

This is provided for by a succession of independent movements of the knockout mechanism, the first to move the blank within the die so that the head will pass beyond the transfer fingers, and a subsequent movement thereof will project the blank so that the end thereof is clear of the face of the dies. This is accomplished by unique and novel mechanism, and to these and other ends, my invention consists in the knockout mechanism, having certain details of construction and combinations of parts as will be hereinafter described and more particularly pointed out in the claims.

Referring to the drawings, in which like numerals of reference designate like parts in the several figures;

Figures 1 and 2 are views of an upsetting or heading machine of a conventional type with the mechanisms herein set forth associated therewith;

Figure 3 is an enlarged fragmentary sectional view, with the parts in section being taken generally upon line 3—3 of Figure 5;

Figure 4 is a view similar to that shown in Figure 3, the parts being arranged, however, for a different length blank;

Figure 5 is a view of the knockout rods and associated parts, the parts in section being taken generally upon line 5—5 of Figure 1;

Figure 6 is a view of that portion of the machine adjacent to the tools, the parts in section being taken generally upon line 6—6 of Figure 5;

Figure 7 is a view of one form of a bolt blank illustrated in its several shapes, after the successive operations from the time it is cut off from a rod length until it is ejected from the machine as a completed product; and

Figure 8 is a view of one form of transfer mechanism.

In the embodiment of the invention as shown herein, 10 represents the body of the machine, having a pocket or opening 13 therethrough; 11 a crank shaft, having driving wheels 12 thereon; 14 a gate slidably mounted in the body 10 and connected by a pitman 15 with the crank shaft.

On one side of the body is a cut-off mechanism, comprising essentially a cutter bar 17 carrying a knife 18 at its inner end and associated with a cam plate 19 that is actuated from a crank 20 on the shaft 21 through a pitman 24 and turn buckle connection 25. The shaft 21 is driven from the crank shaft through the gear 22 and pinion 23. The cut-off mechanism shown and described is of the conventional type and constitutes no part of the present invention.

Fixed on the forward end of the gate is a backing block 26 and adjustable thereon are the punch holders 27, 28 and 29, each being provided with a forwardly projecting lug 30.

Associated with each punch holdler are the bolts 31 and 32, the former of which is encircled by a block 33 slidable in a slot in the punch holder, and the latter being adjustable within a slot 35 in the backing block 26. By this mechanism a limited variable adjustment of the punch holder relative to the gate is permissible and its several adjusted positions are maintained by the nuts upon the bolts 31 and 32, as well as the screw 36, threaded through the punch holder and impinging against a stationary part. In each punch holder is mounted an operating tool, those shown being designed for the manufacture of an extruded bolt from a rod length and trimming the head thereof.

In the punch holder 29 is a pressure punch 101 in the punch holder 28, an upsetting punch 102, and in the punch holdler 27 a trimming die 37. One or more of these punches, especially those requiring slight adjustment, and the trimming die

are reinforced by backing plugs 38, which abut against a wedge 39 associated with a wedge block 42 that is adjustable vertically in a well known manner. The backing plug associated with the punch holdler 27 is cut away at its underside at 40 and between the ends thereof and the rear of the punch 37, is a backing block 41.

Slightly raising or lowering the wedge block 42 varies the position of the backing plugs 38 and thus permits ready adjustment of an operating tool. The gate and wedge blocks and wedges are of the conventional type and operate in a well known manner.

On opposite sides of the lug 30 are secured the cam plates 43, upon each of which is a cam face 44. The cam plate associated with the punch holder 29 extends laterally thereof, substantially as shown in Figure 2.

Mounted in a wall of the opening 13 opposite the gate is a backing plate 45 and associated therewith is a die holder 46, which is locked in position and against movement by a wedge 47 secured by a bolt 48 in a well known manner.

Within the die holder 46 are a plurality of dies or tools that are positioned, except the cut-off die, concentric with the tools in the punch holders, this adjustment and positioning being assisted by the screw 49.

A sectional view of the tools in the die block is illustrated in Figure 5 and these comprise a cut-off die 50, an extruding die 51, an upsetting die 52 and a trimming punch 53, each of which is shown as abutting against the face of the backing plate 45.

The trimming punch 53 is held within a bushing 54, secured by the screws 55 or the like.

The rod length is projected through the quills 57 and 58 by the feed rolls 56, mounted on shafts in the feed bracket 16, until the inner end contacts with the stop screw 59 supported in the bracket 60. Immediately thereafter the cutter bar 17 is moved and the knife 18 travels across the face of the cut-off die 50 and severs that portion of the rod length projecting beyond the face of the die. The blank as cut from the rod length is substantially as shown in Figure 7 and therein designated 63. By means of transfer fingers 61, this blank is transferred into line with the extruding die 51 and punch 62 in the punch holder 29. The blank 63 is forced into the extruding die 51, which reduces and lengthens one end thereof until it appears substantially as illustrated by the numeral 64 in Figure 7.

The larger diameter of the blank 64 is the same as the diameter of the blank 63. At the next station the outer end of the blank 64 is upset to form a head thereon and the inner end of the shank is extruded. The blank after this operation is designated 65, in Figure 7, the body of which has substantially the same diameter as the blank 64. The outer end is extruded to a diameter that will enable a thread to be rolled thereon and the outer diameter thereof be substantially the same as or at least not exceeding the diameter of the body member, and the head is enlarged and thinner because of the pressure to which it has been subjected.

The blank 65 is then transferred to the last station where the head is trimmed and the finished bolt ejected from the machine. The bolt 66, as completed, is illustrated in Figure 7.

So far as at present advised, no one has heretofore in a single stroke and/or solid die header, produced a finished bolt of plural diameters with a trimmed and finished head.

While the operations described require four complete reciprocating movements of the gate after the first bolt is made, a finished bolt is thereafter produced at each stroke of the gate.

This mechanism does away with the present requirement of additional machines for extruding and trimming and is adapted for use in the production of many shapes, types and character of products other than the bolt herein disclosed, which is used for illustration purposes only.

The transfer mechanism that carries the blank from one station to another may be of any preferred form. As shown, it is associated with the cutter bar and moves therewith. It comprises in part two slide members 106, which move within grooves in the face of the die holder 46, and are connected with each other and with the cutter bar by the cross bar 107.

Fixed in each slide member is a plurality of studs 108, upon each of which is rotatably mounted a transfer finger 109, the inner ends 110 of which are suitably shaped to grasp the blank at one of the stations and carry it to the next station. The transfer fingers are moved toward each other by the springs 111 connected at one end with the fingers and at the other end to the fixed stops 112, in each of which is an adjustable stop screw 113, which limits to predetermined positions the inward position of the gripping end of the fingers. On each finger between its fulcrum point on the stud 108 and the gripping end thereof, is a rounded end stud 114, which projects into the path of the cam faces 44 on the cam plates 43.

When the gate is in its rear position, that is, away from the face of the dies, the springs 111 will hold the fingers in their innermost position, with their inner ends 110 substantially in the position shown in Figure 8. As the gate moves forward the cam plates 43 engage the rounded ends of the studs 114 and force the fingers outwardly. Their extreme outward position is shown by broken lines in Figure 8. The extent of the opening is determined by the cam face 44 on the cam plate when in engagement with the stud 114. It comprises a plurality of separate and independent fingers that grasp the blank at each station and advance it to the next, the transfer movement being derived from the cutter bar with which the transfer mechanism is associated.

The transfer fingers are opened by a part connected with the gate engaging parts associated with the transfer fingers, the result being that when the gate is in its extreme forward position the transfer fingers are moved outwardly to a non-gripping position. As there is an enlarged portion of the blank at the outer end thereof at some of the stations it is desirable that the fingers do not come to their closed position until after this enlarged portion has passed thereby. Therefore, the knockout mechanism is timed so that the blank at the several stations is ejected therefrom at substantially the same time as the gate begins to recede; in fact, follows the gate for a limited distance. By this means, the enlarged portion of the blank is beyond the transfer fingers before the same are moved into gripping position and when so released the fingers engage and grip the shank underneath the head thereof.

For relatively short blanks, say for illustration, blanks ⅞ inch long, it is only required that there be a single movement of the knockout mechanism because at such length the end of the shank will clear the face of the several dies.

This knockout mechanism comprises a slide 67

movably mounted in the feed bracket 16, which is moved toward the dies by a lever 68, fulcrumed on a pin 69 and receives an oscillating movement from a rock lever 70 pivotally mounted on the body 10 and connected with the rock lever by a link 71 having a threaded stud 72 at its outer end carrying nuts 73, by means of which the relative position of the rock lever 68 may be varied.

Motion is imparted to the rock lever 70 by a cam 74 on the shaft 21 through the cam roll 75. The timing of this cam is such that immediately the gate begins to withdraw the lever 68 is actuated and the upper end engages the slide 67 and moves it toward the tools.

In each die is a knockout pin 76 and between such pins in the dies 51 and 52 and the slide 67 are the knockout rods 77, upon the latter of which is a collar 115. The rear ends of these rods are engaged by the slide 67. As the slide moves forward the knockout rods 77 are moved against the head of the knockout pins 76, the forward ends of which engage the shank of the blank within the die and move the same outwardly, until the end of such blanks are flush with the face of the dies.

As the extent of entrance of the blank in the several dies varies, and the knockout pins are actuated from the slide 67, such variation in length is accommodated by such an arrangement of the parts that the slide will first engage the knockout rod 77 associated with the die having the longest length of blank therein, followed then by the knockout rod associated with the die having the next longest blank therein. Thus, at the completion of the stroke of the slide 67 the outer ends of all of the knockout pins are substantially flush with the face of the dies, irrespective of the length of the blank ejected thereby.

As the length of the blank in the extruding die 51 (Figure 5) is greater than that of the blank in the upsetting die 52, the ejection of the former blank begins before the latter. This is accomplished by arranging the knockout rod associated with the die 51 so that it is engaged by the slide 67 prior to its engagement with the collar 115 upon the knockout rod associated with the die 52.

As the blank enters the dies it engages the knockout pins, which are thrust rearwardly, as also the knockout rods. These latter, by their engagement with the slide 67, also return the latter, as well as the rock lever 68, to their former positions. A thrust rod 103, in the slide 67, abuts against the stop screw 104 when the knockout rods are in their rearmost position.

In Figure 4 the two positions of the rock lever 68 are shown by full and dotted lines and the thrust rod 103 against the stop screw 104, when adjusted for short length blanks.

If the bolts are longer than the suggested length, that is 7/8 inch, it is essential that a second or supplemental movement of the knockout mechanism be provided. In such cases, the supplemental movement is derived through mechanism, which comprises in part a rock lever 78, which is journaled in the bracket 16 upon stud 79, the inner end of which is projected into the open space between the plates 80 on the slide 67. This lever is actuated in timed relation with other parts through a slide 81 in the body 10, having a screw 82 in its outer end, whereby the relative point of contact therebetween and the lever may be varied.

A rock arm 83 is rotatably mounted upon the stud 84 in the body 10 and actuated by a cam 85 on the shaft 21. A connection 86 joins the slide 81 and the rock arm 83, being so associated with the latter that its position of engagement may be varied through manipulation of the screw 87 to provide for various lengths of movement of the slide 67 and accommodate blanks of different lengths.

The means for adjustably securing the connection with the rock lever is well known in the art and constitutes no part of the present invention.

All of the parts through which the lever 78 is actuated are so timed and adjusted that after the knockout pins 76 have been advanced through the action of the lever 68, the movement thereof is continued until the ends of said knockout pins 76 are substantially flush with the face of the dies. During this last movement the blanks slide through the transfer fingers which have a hold thereon, as above described. The next blank projected into the dies returns the knockout pins and rods to their former positions.

Figure 3 illustrates similarly to Figure 4 the two positions of the rock lever 68 by full and dotted lines and the thrust rod 103 against the stop screw 104, when adjusted for longer length blanks.

The head of the blank is trimmed in the trimming die 37, and the knockout mechanism associated with the punch 53 projects the same therethrough substantially as shown in Figure 6. The action of this latter knockout mechanism begins just before the gate arrives at its most forward position and is completed immediately thereafter. This knockout mechanism is actuated independently of those in the other dies and comprises a knockout rod 88, a rock lever 89, which is journaled on a stud 90 in the bracket 16, and a knockout slide 91 movable in the bed 10. This latter slide derives a reciprocating motion through a connection 92, pivotally connected to a rock lever 93 journaled on the body 10 and carrying a roll 94 in contact with the face of a cam 95 upon the crank shaft 11. A similar rock arm 96 also journaled on the body 10 carries a cam roll 97 which rides against the face of the same cam and is connected with the lever 93 through the link 98, having a spring 99 thereon. This spring insures a constant contact of the rolls 94 and 97 with the cam 95. The screw 100 threaded in the end of the slide 91 provides means whereby the relative point of contact with the lever 89 may be varied.

The blank after being trimmed is projected through the trimming die 37, backing block 41 and the opening 40 in the backing plug 38, substantially as shown in Figure 6, and escapes through the chute 105 into a conveniently placed receptacle.

Having thus described one embodiment of the invention, it is obvious that numerous and extensive departures may be made therefrom without departing from the spirit of my invention, and within the scope of the appended claims.

What I claim as new is:

1. In a knockout mechanism of the character described, the combination with knockout rods; of an element for moving the same; means for imparting variable movement to said element for a predetermined distance; and other means for imparting additional variable movement thereto in the same direction.

2. In a knockout mechanism of the character described, the combination with a plurality of knockout rods; of means for imparting plural movements thereto; comprising in part a slide movable in a path substantially parallel with the knockout rods; and lever means for imparting independent movements to the slide.

3. In mechanism of the character described, the combination with a plurality of dies that successively receive the same blank the extent of entrance of which varies in the several dies; and means for ejecting the blanks in the several dies so that the inner ends of the blanks will be substantially flush with the face of the dies at substantially one and the same time comprising in part, knockout elements, and a member that successively engages the knockout elements.

4. In mechanism of the character described, the combination with a plurality of dies that successively receive the same blank, the extent of entrance of which varies in the several dies; means for ejecting the blanks in the several dies so that the inner ends of the blanks will be substantially flush with the face of the dies at substantially one and the same time, comprising in part, knockout elements, and a member that successively engages the knockout elements; and means for imparting plural independent movements to the member.

5. In mechanism of the character described, the combination with a plurality of dies that successively receive the same blank the extent of entrance of which varies in the several dies; means for ejecting the blanks in the several dies so that the inner ends of the blanks will be substantially flush with the face of the dies at substantially one and the same time comprising in part, knockout elements, a member that successively engages the knockout elements; and lever means for imparting two successive independent movements to the member.

6. In mechanism of the character described, a plurality of dies; co-operating punches, the action of which on a blank varies the length thereof in the several dies; knockout devices for ejecting the several blanks from the dies so that the inner ends thereof are substantially flush with the face of the dies at substantially one and the same time irrespective of the length thereof; and means for actuating the knockout devices, which successively engage therewith and then move the same synchronously.

7. In mechanism having a plurality of dies and co-operating punches which successively operate upon a blank and during such operations the length thereof is changed, and whereby some of the several blanks in the dies are of unequal length; knockout devices for ejecting the blanks from the several dies so that they are all completely ejected at substantially one and the same time irrespective of the length thereof, comprising in part a power element, a part for each die that projects into the opening thereof and located in the path of said element, so arranged that motion will be imparted to those several parts successively by the said element.

8. In mechanism of the character described, having a plurality of dies and punches co-operating therewith and means for cutting a blank from a rod length and transferring it successively to each of the dies, in combination therewith; of a knockout rod for each die, and a member that first imparts movement to some of said rods, then moves all of said rods simultaneously, these movements being in timed relation with that of the transfer means and whereby the blank will be engaged thereby before being ejected from the dies.

9. In mechanism of the character described, having a plurality of dies and punches co-operating therewith and means for cutting a blank from a rod length and transferring it successively to each of the dies, in combination therewith; of a knockout rod for each die, a member that first imparts movement to some of said rods, then moves all of said rods simultaneously, these movements being in timed relation with that of the transfer means and whereby the blank will be engaged thereby before being ejected from the dies, and adjustable means for limiting the outward movement of one of the knockout rods.

10. In mechanism of the character described, wherein there are a plurality of dies that receive blanks and which require varying lengths of strokes of the knockout mechanism to eject the same, the combination with a knockout rod for each of the dies; a movable member, which in one of its positions is out of contact with a portion of the knockout rods; and means for imparting successive movements to the movable member, whereby a portion of said knockout rods will begin the ejection of some blanks prior to the beginning of the ejection of other blanks and at the completion of such movement the inner ends of all of said blanks will be substantially flush with the outer face of the dies.

11. In mechanism of the character described; a plurality of dies and punches co-operating therewith; means for cutting a blank from a rod length and transferring it successively to each of the dies, in combination therewith a part fixed in relation to the dies, a knockout rod for each die, a slide movable in the fixed part toward and away from the knockout rods and in a plane substantially parallel with the knockout rods, and means for actuating the slide, whereby it will first impart movement to some of the knockout rods, then move all of said knockout rods simultaneously, these movements being in timed relation with the transfer means, and whereby the blank will be engaged thereby before being ejected from the dies.

12. In mechanism of the character described; a machine body; a feed bracket or the like connected with the machine body; a slide movably mounted in the feed bracket; a plurality of dies and punches co-operating therewith; means for cutting a blank from a rod length and transferring it successively to each of the dies; a knockout rod for each die; means for actuating the slide, whereby it will first impart movement to some of the knockout rods, then move all of said knockout rods simultaneously, these movements being in timed relation with the transfer means, and whereby the blank will be engaged thereby before being ejected from the dies.

13. In mechanism of the character described; a machine body; a feed bracket or the like connected with the machine body; a slide movably mounted in the feed bracket; a plurality of dies and punches co-operating therewith; means for cutting a blank from a rod length and transferring it successively to each of the dies; a knockout rod for each die, some of which vary in length; means for actuating the slide, whereby it will first impart movement to some of the knockout rods, then move all of said knockout rods simultaneously, these movements being in timed relation with the transfer means, and whereby the blank will be engaged thereby before being ejected from the dies.

14. In mechanism of the character described; a plurality of dies and punches co-operating therewith; means for cutting a blank from a rod length and transferring it successively to each of the dies, in combination therewith a part fixed in relation to the dies, a knockout rod for each die, a slide movable in the fixed part toward and away from the knockout rods and in a plane substantially parallel with the knockout rod; independent means

for imparting two successive movements to said slide, these movements being in timed relation with the transfer means, and whereby the blank will be engaged thereby before being ejected from the dies.

15. In mechanism of the character described; a plurality of dies and punches co-operating therewith; means for cutting a blank from a rod length and transferring it successively to each of the dies, in combination therewith a part fixed in relation to the dies, a knockout rod for each die, a slide movable in the fixed part toward and away from the knockout rods and in a plane substantially parallel with the knockout rods; independent means for imparting two successive movements to said slide; and means for varying the relative timing and extent of movement of said slide.

16. In mechanism of the character described; a plurality of dies and punches co-operating therewith; means for cutting a blank from a rod length and transferring it successively to each of the dies, in combination therewith a part fixed in relation to the dies, a knockout rod for each die, a slide movable in the fixed part toward and away from the knockout rods and in a plane substantially parallel with the knockout rod; and means for actuating the slide, whereby it will first impart movement to some of the knockout rods, then move all of said knockout rods simultaneously, these movements being in timed relation with the transfer means, and whereby the blank will be engaged thereby before being ejected from the dies; and adjustable means for limiting the movement of one of the knockout rods in one direction.

RICHARD LESTER WILCOX.