March 23, 1937. R. L. WILCOX 2,074,679

OPEN DIE UPSETTING MACHINE

Filed Oct. 19, 1932 4 Sheets-Sheet 1

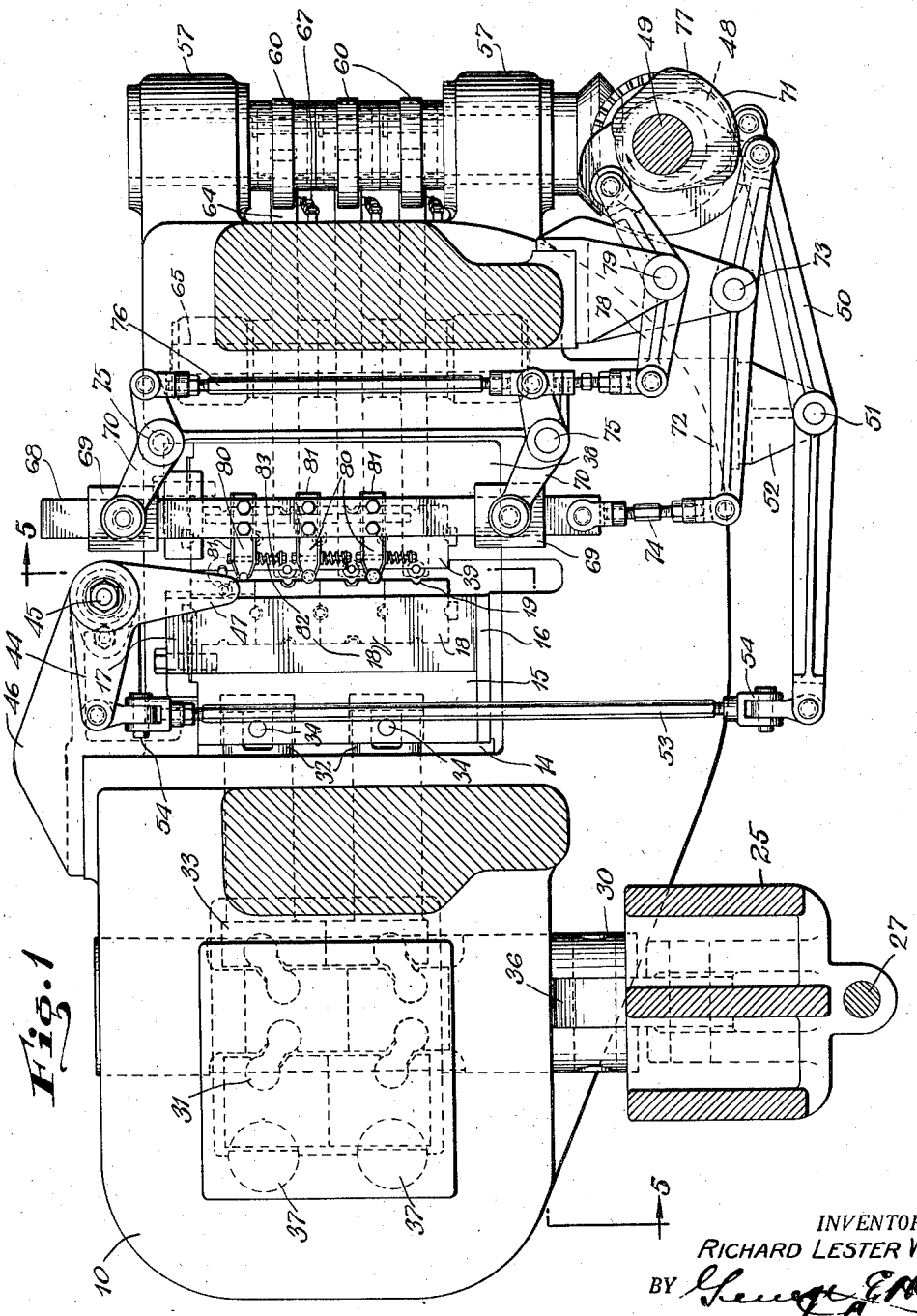


Fig. 1

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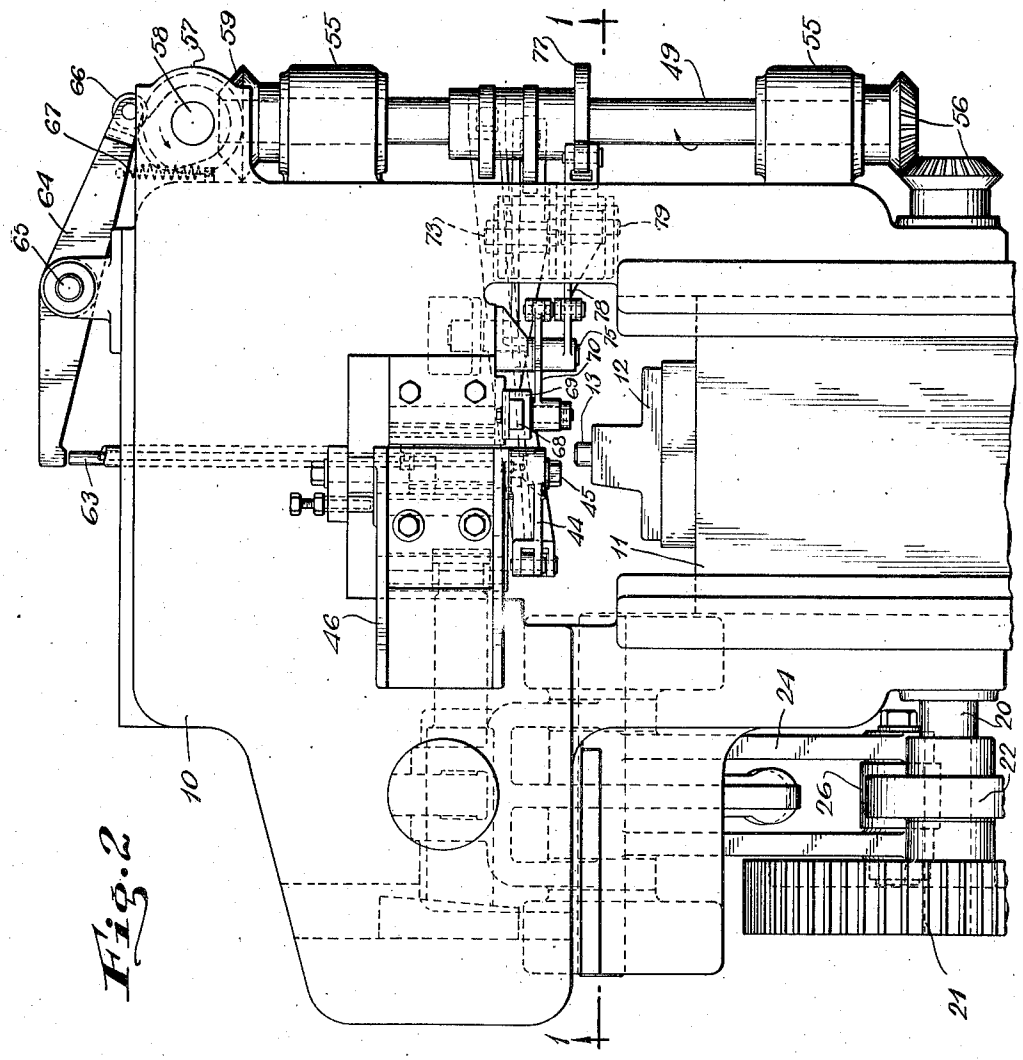


Fig. 2

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OPEN DIE UPSETTING MACHINE

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Fig. 6.

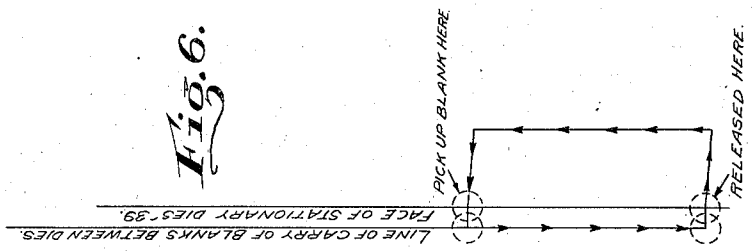


Fig. 3

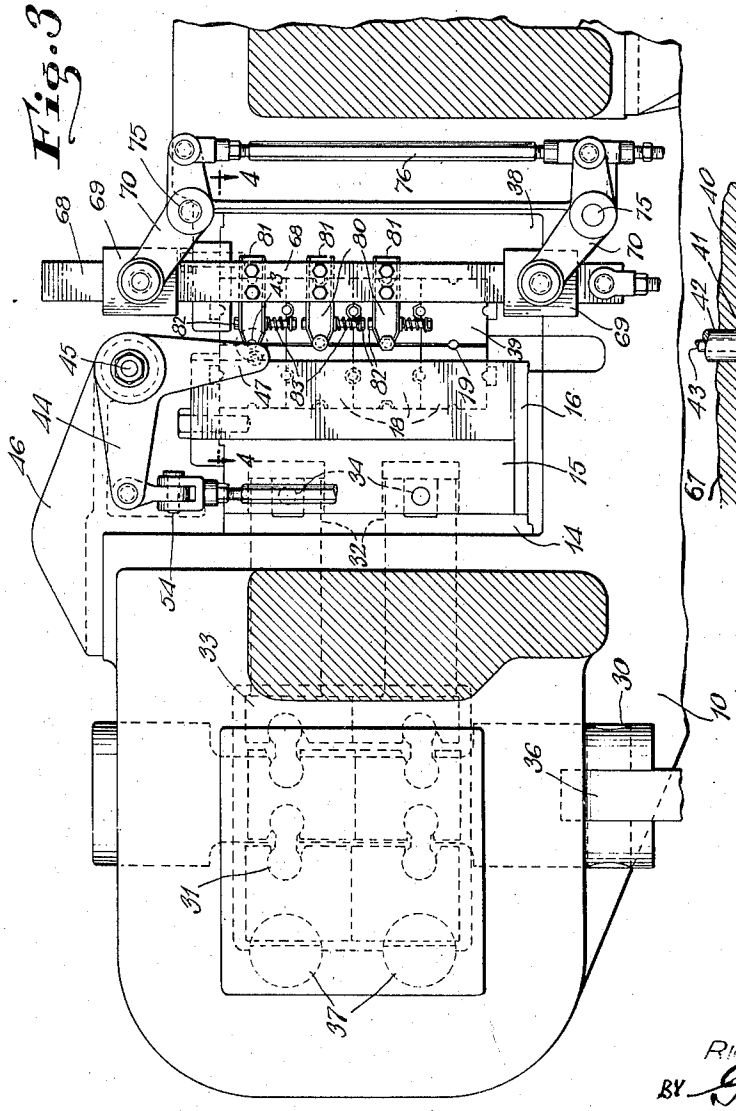
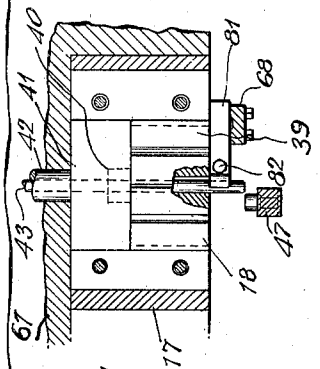


Fig. 4



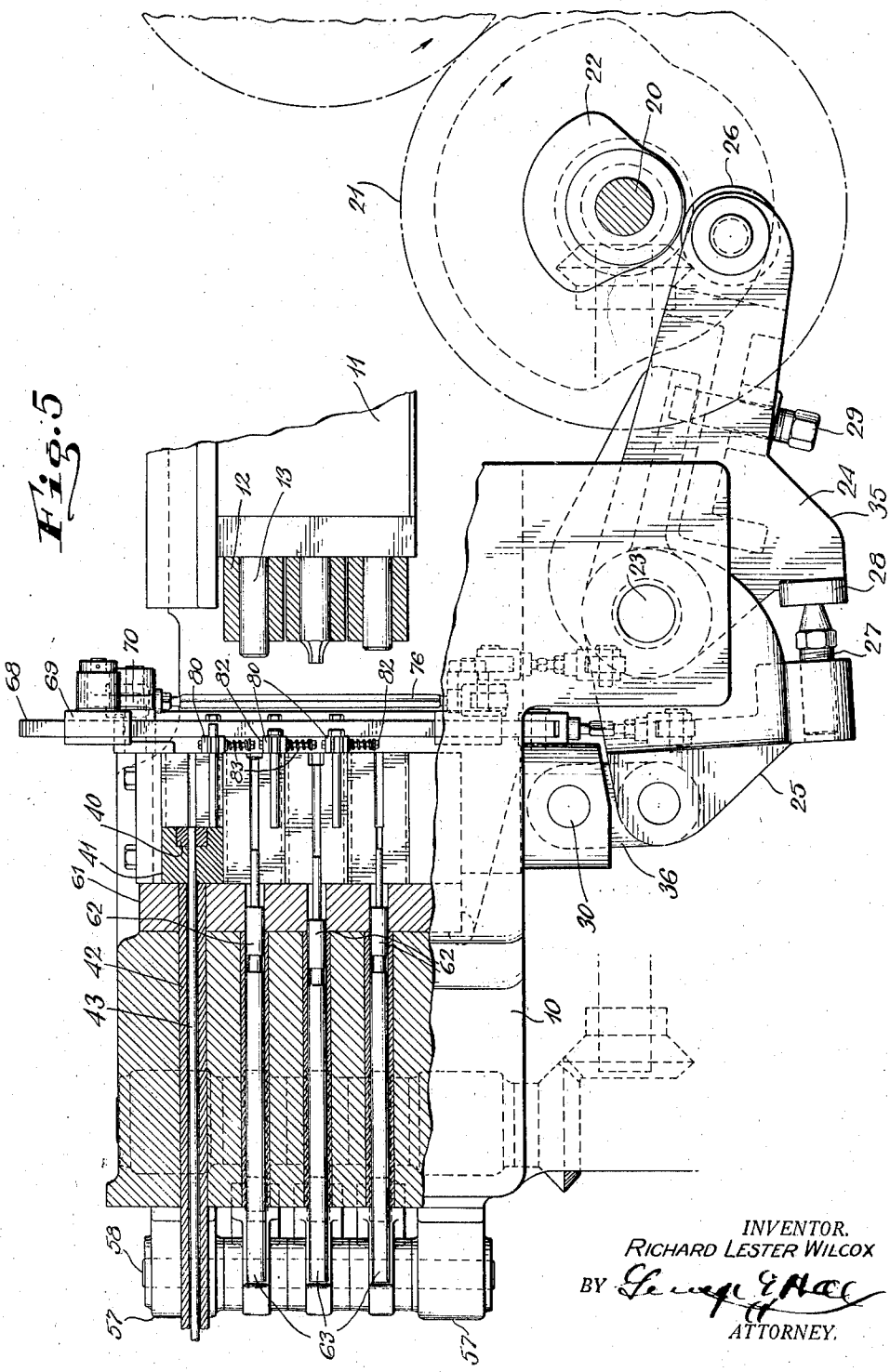
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Filed Oct. 19, 1932 4 Sheets-Sheet 4

Fig. 5



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UNITED STATES PATENT OFFICE

2,074,679

OPEN DIE UPSETTING MACHINE

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

Application October 19, 1932, Serial No. 638,653

23 Claims. (Cl. 10—12)

This invention relates to new and useful improvements in open die upsetting machines or the like.

It is the object of this invention, among other things, to provide in mechanism of this character a plurality of pairs of dies, so arranged that an operation will be performed on each blank in each of the dies at each working stroke of the punches and to cut off from a rod length or the like a portion thereof and automatically carry such portion, now a blank, successively from one set of dies to the next succeeding set. In the carry movement the blanks travel with a portion thereof between the dies.

The above, and other advantageous results, which will appear from the following description and the drawings forming part of this application, are accomplished in this invention.

To these and other ends, this invention consists of the open die upsetting machine, having certain details of construction and combinations of parts, as will be hereinafter described, and more particularly pointed out in the claims.

In the drawings, which illustrate one form of the embodiment of this invention, and wherein like characters of reference indicate like parts in the several figures;

Figure 1 is a fragmentary portion of an upsetting machine looking toward the face of the dies, the parts in section being taken generally upon line 1—1 of Figure 2;

Figure 2 is a plan view of that portion of the machine adjacent to the punch and dies;

Figure 3 is a view similar to that shown in Figure 1 with the dies and the transfer mechanism in a different relative position, the transfer mechanism being now in engagement with the several blanks;

Figure 4 is a plan view of the upper set of dies and adjacent mechanism, the parts in section, other than the dies, being taken generally upon line 4—4 of Figure 3;

Figure 5 is a fragmentary side elevation of the machine, the parts in section being taken generally upon line 5—5 of Figure 1; and

Figure 6 is a diagrammatic view illustrating the path of movement of each of the sets of transfer fingers.

In the present invention there are a plurality of pairs of dies so arranged that a blank is held in each pair of dies, shown herein as four in number. The blanks in each of these pairs of dies, after being subjected to a pressure operation, are only ejected therefrom a distance sufficient to enable the transfer fingers to grasp the same adjacent to the upset portion. The fingers, in front of and adjacent to the face of the dies, now move toward the blanks, and snap over and hold the same rigid, further movement of the fingers stripping the blanks from the stationary dies and releasing them from the dies between the opposing faces thereof, and while so positioned travel therebetween to the next succeeding stations.

In the embodiment of the invention disclosed herein, 10 designates the body of the machine, which may be of any conventional form, and movably mounted thereon is a gate 11 having a punch holder 12 thereon, carrying a plurality of punches 13, there being one of these punches for each upsetting operation on the blank.

Within a pocket 14 in the body member is a movable die holder 15, which rides upon a suitable liner plate 16, and secured therein by a clamp 17 or the like, are a plurality of dies 18. These dies are of the conventional form, having longitudinal recesses 19 in the side walls thereof, the size and shape of which depend upon the size and shape of the rod and the upset portion of the blank at the station where the dies are located.

Fixed in the pocket 14 is a stationary die holder 38, in which is mounted a plurality of dies 39, corresponding in number and structure with the dies 18.

A single die or a number less than as herein disclosed may be substituted for those shown within this invention. While it is preferable that the die holder 38 should be stationary, if desired, it may be made movable like the die holder 15.

Journaled in the body member 10, or suitable parts associated therewith, is a shaft 20 that is driven by a spur gear 21, which is actuated by any convenient power source, and upon which is a cam 22.

A rock lever 35 has two parts which are severally designated 24 and 25 and both journaled on a stationary stud 23. The former of these parts carries a cam roll 26, which rides on the face of the cam 22 and the other part carries a breaker pin 27, which abuts against a breaker plate 28 in the lever part 24. The lever parts are held by the screw 29 so as to make a unitary structure, substantially as shown in Figure 5, with the breaker pin 27 against the breaker plate 28.

Mounted to reciprocate within the body member 10 is a slide 30, connected by a link 36 with the rock lever part 25, and with which is associated a toggle mechanism 31 of a well known type.

Movable in the body 10 at an angle to the slide 30 are the two plungers 32, which at one end engage the toggle plate 33 and at the other end are each connected with the movable die holder 15 by the pins 34.

The movement of the slide 30 actuates the toggle mechanism and through the plungers 32 the die holder 15 is moved toward and away from the fixed dies. In their inner position, the dies 18 and 39 are in contact with each other.

A variation of the gripping pressure of the dies 18 and the position of the movable die holder 15 is obtained through the wedges 37 in a manner well known in the art.

Within the die holder 41 in rear of the top die 18 is a cut-off die 40, and concentric therewith is a quill 42, through which the rod 43 is fed by any one of many devices well known in the art, and not shown herein. The position of the cut-off die relative to the upper die 39 is such that the opening in the cut-off die is not in register with the recess in the die 39, but somewhat nearer to the movable dies when in their out position, as shown in Figure 1. Stop means limit the inward movement of the rod 43, and comprises in part a rock member 44, mounted upon a stud 45 in a fixed bracket 46.

The rock member 44 is actuated from a cam 48 on a shaft 49 through a rock lever 50 journaled at 51 in a fixed bracket 52, through a connecting rod 53, having a universal joint coupling 54 at each end, of any well known construction.

The shaft 49 is journaled in parts 55 connected with the body member 10 and driven from the shaft 20 through gears 56.

The arm 47 of the rock member 44 moves into and out of line with the feed of the rod 43, and when in line therewith limits the extent of movement thereof.

Connected with the body member 10 is a shaft 58 which is journaled in the parts 57 and rotated through the gears 59 from the shaft 49. On this shaft are a plurality of knockout cams 60.

Projecting through a backing plate 61 and in the same plane as the recesses in the three lower dies 18 and 39 are the knockout pins 62, which are moved in one direction by knockout rods 63. These knockout rods 63 are intermittently actuated in timed relation with other parts through the knockout levers 64, which are fulcrumed upon pins 65 in a fixed part and carry the cam rolls 66 which ride and are held against the face of the cams 60 by the springs 67.

The numeral 68 designates the transfer slide, which is mounted in guide blocks 69 pivotally connected with rock levers 70. A reciprocating movement is imparted to this slide by a cam 71 on the shaft 49 through a rock lever 72 fulcrumed on a fixed bracket 73, and having an adjustable connection with the slide by the turnbuckle 74. The rock levers 70 are fulcrumed on a fixed part 75 and are operatively connected with each other by an adjustable connection 76. These rock levers 75 derive motion from a cam 77 on the shaft 49, through a rock lever 78 fulcrumed at 79 to a fixed bracket.

Fixed to the transfer slides 68 are a plurality of blocks 80, in this case three in number, which project laterally upon one side thereof and have associated therewith spring fingers 81 which are held in closed position against the sides of the blocks by studs 82 and springs 83 in a well known manner. These fingers are movable close to and across the face of the dies, traveling in a path substantially as outlined in Figure 6, through the action of the slide 68 which reciprocates by the action of the cam 71 and moves laterally through the action of the rock lever 70. The parts are so actuated that during the lateral movement of the fingers there is no reciprocation of the slide 68.

In operation the rod is fed through the quill 42 and cut-off die 40 until it engages the movable stop which is then in line therewith. During this movement of the rod there is an open space between the dies, substantially as shown in Figure 1. The moving dies now travel toward the fixed dies and the upper of the dies 18 cuts off that portion of the rod projecting beyond the face of the cut-off die 40 and the feed stop swings to one side out of line with the rod. The cut-off portion of the rod, now a blank, is projected by the die 18, with which it is in contact, into the recess in the upper of the dies 39. The movable dies are now moved away from the fixed dies slightly, thus releasing their grip on the cut-off portion of the rod, now a blank. This movement permits the blanks between each of the dies, to be partially ejected so that a portion of each of the blanks is in front of the dies.

After the feed stop is out of alignment with the rod, the gate 11 moves forward, and the punches 13 engage and upset the blank in a well known manner, and then returns to its retracted position. The movable dies now release the grip of the dies upon the blanks and the knockout mechanism ejects the blank therefrom a sufficient distance to permit the fingers 81 to engage the blank adjacent to the face of the dies and underneath the upset portion, without entirely freeing the blank from the dies thereby to dislodge the same. The blank between the upper pair of dies is ejected by the next inward movement of the rod through the cut-off die, the inner end of which contacts with the rear end of the blank, this movement of the rod being timed to substantially correspond with that of the knockout mechanism at the other dies. This inward movement of the rod is only sufficient to project the predetermined portion of the blank in front of the dies. The spring fingers then move laterally toward the blanks and snap over the same in front of the dies and thereby take a rigid hold thereof. The movable dies then move away from the fixed dies and the fingers continue their lateral movement a sufficient distance to free the blanks from the stationary and fixed dies. The transfer slide 68 is now reciprocated and the blanks are carried by the fingers through this open space and into register with the recesses of the next lower set of dies and the operations are again repeated, that is, the movable dies closing with the fixed dies and grasping the blanks therebetween. When the blanks are so held between the dies, the spring fingers are again moved laterally in a direction opposite to that above described and withdrawn from the blanks. The punches now move forward and engage the several blanks and perform their operations thereon, the first portion of the motion of the punch in contact with the blanks being to move the same into the dies until the inner ends thereof engage the knockout pins. The completed blanks are released from the lower set of dies by any means well known in the art into a receptacle conveniently arranged to receive them. If perchance a blank should become lodged between the dies in an incorrect position, the breaker plate 28 will be fractured by the breaker pin 27 and disconnect the parts of

the two-part rock lever 35. This will stop the movement of the slide 30 and the movable die holder 15.

The embodiment of the invention herein discloses a vertical open space between the dies. This is desirable because dirt and scale will drop by gravity through such open space and prevent an accumulation thereof. I do not, however, limit myself to such a structure, as the mechanism will operate if the open space is in a horizontal plane and the dirt and scale, if any, released by other well known means.

While it will be apparent that the illustrated embodiment of the invention herein disclosed is well calculated to adequately fulfill the objects and advantages primarily stated, it is to be understood that the invention is susceptible to variation, modification and changes within the spirit and scope of the subjoined claims.

Having described the invention, what I claim is:—

1. In a machine of the character described; a gate; fixed open dies; a fixed cut-off die; a die holder; open dies corresponding in number with the fixed dies secured in the die holder; means for imparting movement to the die holder, whereby the faces of the dies in the die holder are moved into contact with the faces of the fixed dies and away therefrom by an intermittent movement and during such into contact movement one of the dies in the die holder will cross the face of the cut-off die and sever a portion of a rod projecting therethrough, such severed portion then becoming a blank; means for partially ejecting the blanks from the dies after the movable dies have released their pressure upon the blanks, and whereby a portion of the blanks will be in front of the dies; means operating between the gate and dies for grasping that portion of the blanks in front of the dies and successively transferring them from one set of fixed and movable dies to the next succeeding set of fixed and movable dies and then returning for another series of blanks, a portion of each of the blanks, during such transfer, travelling in the open space between the said dies when separated; and punches carried by the gate co-operating with said dies for operations on said blanks when held in said dies.

2. In a machine of the character described; a gate; a plurality of open dies held in a fixed position; a die holder; a plurality of dies corresponding in number with the aforesaid dies, secured in the die holder; positive means for imparting a reciprocatory movement to the die holder, whereby the faces of the dies in the die holder are moved into and out of contact with the faces of the fixed dies, the out of contact movement being intermittent; punches movable with the gate and cooperating with said dies for upsetting blanks therein; means operating between the gate and dies for synchronously presenting blanks successively to each of the sets of fixed and movable dies, the blanks before presentation traveling in the open space between the fixed and movable dies when separated from each other; and means for partially ejecting the blanks from the dies after the movable dies have released their pressure upon the blanks.

3. In a machine of the character described; a gate; a plurality of open dies held in a fixed position; a die holder; a plurality of dies corresponding in number with the aforesaid dies, secured in the die holder; means for imparting a reciprocatory movement to the die holder, whereby the faces of the dies in the die holder are moved into and out of contact with the faces of the fixed dies, the out of contact movement being intermittent; punches movable with the gate and co-operating with said dies for upsetting blanks therein; means operating between the gate and dies for synchronously presenting blanks successively to each of the sets of fixed and movable dies whereby a blank is held in each die as the movable and fixed dies are brought into contact with each other, the blanks before each presentation traveling in the open space between the fixed and movable dies when separated from each other; and means for partially ejecting the blanks from the dies after the movable dies have released their pressure upon the blanks.

4. In a machine of the character described; a reciprocating gate; a plurality of tools therein; a plurality of open dies, a portion of which are fixed and a portion intermittently movable; means for causing the movable dies to travel toward and away from the fixed dies and in their away position leaving an open space therebetween; means operating between the gate and dies that grasp the blanks in front of the dies and transfer them from one die to another die with a portion of the shank of the blanks in the said open space; and means for partially ejecting the blanks from the dies after the movable dies have released their pressure upon the blanks.

5. In a machine of the character described; a gate; a plurality of open dies; punches co-operating with said dies for upsetting the blanks therein; means operating between the gate and die for carrying the blanks successively from one of said dies to another of said dies and between the opposing faces thereof, comprising in part a slide; a movable support for the slide that imparts lateral movement to the slide; a plurality of blank engaging fingers connected and movable with the slide, corresponding in number with the number of pairs of upsetting dies, said fingers being so arranged that they snap on and off that portion of the blanks that are in front of the dies; and means for partially ejecting the blanks from the dies after the movable dies have released their pressure upon the blanks whereby a portion of said blanks will be in front of said dies.

6. In a machine of the character described; a reciprocating gate; a plurality of open dies; punches movable with the gate and co-operating with said dies for upsetting the blanks therein; means operating between the gate and die for carrying the blanks synchronously and successively from one of said dies to another of said dies and between the opposing faces thereof, comprising in part spaced rock members; a movable support mounted on each rock member; a slide within said movable supports; means for imparting a reciprocatory movement to the slide within said movable supports, between movements of the rock members; and a plurality of blank engaging fingers connected with the slide.

7. In a machine of the character described; a gate; a plurality of open dies; punches movable with the gate and co-operating with said dies for upsetting the blanks therein; and means for carrying the blanks synchronously and successively from one of said dies to another of said dies and between the opposing faces thereof, comprising in part a reciprocatory slide, rock members, blocks pivotally mounted thereon, and in which the slide is movably mounted, and means for imparting movement to said rock members whereby a lateral movement is imparted to the slide.

8. In a machine of the character described; a gate; a plurality of open dies; punches co-operating with said dies for upsetting the blanks therein; means in rear of the dies for partially ejecting the blanks after the movable dies have released their pressure upon the blanks; whereby a portion of said blanks will be in front of said dies; means operating between the gate and dies for synchronously gripping the blanks at each of said dies and carrying them successively from one die to another die and between the opposing faces thereof, and releasing its grip thereon at said latter die, comprising in part a reciprocating slide; a movable support for the slide; a plurality of sets of blank engaging fingers connected and movable with the slide; and means for actuating said movable support, whereby said slide and fingers will move in a path at an angle to its reciprocatory path and at the approximate limits thereof.

9. In a machine of the character described; a plurality of open dies; means for opening said dies by an intermittent movement; punches co-operating with said dies for upsetting the blanks therein; means for carrying the blanks successively from one of said dies to another of said dies and between the opposing faces thereof, comprising in part a slide; an oscillating support for the slide; a plurality of sets of blank engaging fingers connected and movable with the slide; and means for partially ejecting the blanks from the dies after the movable dies have released their pressure upon the blanks.

10. In a machine of the character described; a gate; a plurality of pairs of open dies that are opened by an intermittent movement; punches movable with the gate and co-operating with said dies for performing successive upsetting operations upon the same blank, which may be shorter than the die; means, in part in rear of the dies, operating after the movable dies have released their pressure upon the blanks for partially ejecting the blanks from the dies after the upsetting operation in timed relation with the action of the punches so that a portion of the blanks will be in front of the dies; and fingers which snap over and grip said blanks at that portion thereof projecting beyond the face of the dies and carry the blanks from their then position to a position in register with the next set of dies and then snap off the blanks leaving a portion thereof projecting beyond the face of the dies, said blanks being thereafter pushed between the dies by the punches until they engage said ejecting means.

11. In a machine of the character described; a plurality of open dies arranged in the same plane; a cut-off die fixed adjacent to the dies at one end of said plurality of dies; means for opening said dies by an intermittent movement; a reciprocating gate; punches mounted on the gate and co-operating with said dies for upsetting blanks therein; means for intermittently feeding a rod through said cut-off die and between the open dies adjacent thereto, said projecting portion being severed from the rod by one of said dies during the closing thereof; means for engaging that portion of the rods projecting beyond the front face of the dies and securely holding the same, which means will carry the said cut-off portion between the opposing faces of said dies to the next pair of dies; similar means for synchronously and successively carrying the blank from each of the dies to the next succeeding die with a portion thereof projecting beyond the faces of the dies and a portion thereof between the opposing faces of the dies and means, for partially ejecting the blanks from the dies other than at the cut-off die, after the movable dies have released their pressure upon the blanks so that a portion thereof will project beyond the face of the dies.

12. In a machine of the character described; a plurality of open dies; means for opening said dies by an intermittent movement; punches co-operating with said dies for upsetting the blanks therein; means for carrying blanks that are no longer than the die successively from one of said dies to another of said dies and between the opposing faces thereof; and means for partially ejecting the blanks from the dies after the movable dies have released their pressure upon the blanks.

13. In a machine of the character described; a plurality of open dies; means for opening said dies by an intermittent movement; means for transferring a blank that is no longer than the length of the die, from one of said dies to another of said dies between the opposing faces thereof; and means for partially ejecting the blanks from the dies after the movable dies have released their pressure upon the blanks.

14. In a machine of the character described; a plurality of open dies held in a fixed position; a die holder; a plurality of dies corresponding in number with the aforesaid dies, secured in the die holder; means for imparting a reciprocatory movement to the die holder, whereby the faces of the dies in the die holder are moved into and out of contact with the faces of the fixed dies; punches co-operating with the said dies for upsetting blanks therein; and means for presenting blanks successively to each of the sets of fixed and movable dies, the blanks before each presentation traveling in the open space between the fixed and movable dies when separated from each other, comprising in part a slide, an oscillatory support for the slide, a plurality of sets of fingers connected with the slide, and means for imparting an independent endwise movement to the slide in said support.

15. In a machine of the character described; a gate; a plurality of tools therein; open dies; means for opening said dies a limited distance and thereafter a greater distance; a fixed cut-off die, one of said open dies while being closed crossing the face of the cut-off die and severing a portion of a rod projecting therethrough, such severed portion then becoming a blank; means for partially ejecting the blanks from the dies when the latter have been opened said limited distance and whereby a portion of the blanks will be projected in front of the dies; means, operating between the gate and dies, for grasping that portion of the blanks in front of the dies and successively transferring them from one set of dies to another set of dies and then returning for another series of blanks, a portion of each of the blanks during such transfer traveling in the open space between the said dies when separated more than said limited distance; and punches carried by the gate co-operating with said dies for operations on said blanks when held in said dies.

16. In a machine of the character described; a plurality of open dies; means for opening said dies by an intermittent movement with a dwell between each of said movements; punches co-operating with said dies for upsetting the blanks therein; means for partially ejecting the blanks after the movable dies have released their pres-

sure upon the blanks, so that a portion thereof will be in front of said dies; means for carrying the blanks successively from one of said dies to another of said dies and between the opposing faces thereof, comprising in part a slide; an oscillating support for the slide; and a plurality of sets of blank engaging fingers connected and movable with the slide.

17. In a machine of the character described; open dies; means for imparting plural movements thereto while opening said dies and whereby during said movements the open space between said dies is varied; means for presenting a workpiece to said dies; tools for performing operations upon said workpiece while held in said dies; means for partially ejecting the blanks from the dies after the first of said plural movements; and means for grasping the blank after such partial ejection and transferring it to a position to be received by another of said dies before the same are returned to their closed position.

18. In a machine of the character described; open dies; means for imparting plural movements thereto while opening said dies and whereby during said movements the open space between said dies is varied, said plural movements being separated by a dwell of the dies; means for presenting a workpiece to said dies; tools for performing operations upon said workpiece while held in said dies; means for partially ejecting the blanks from the dies after the first of said plural movements; and means for grasping the blank after such partial ejection and transferring it to a position to be received by another of said dies before the same are returned to their closed position.

19. In a machine of the character described; open dies; means for imparting plural movements thereto while opening said dies and whereby during said movements the open space between said dies is varied; means for presenting a workpiece to said dies; tools for performing operations upon said workpiece while held in said dies; knockout mechanism for imparting movement to a blank between said dies operable at the conclusion of one of the plural movements of the dies; and means for grasping the blank after such partial ejection and transferring it to a position to be received by another of said dies before the same are returned to their closed position.

20. The combination with a pair of dies having a plurality of die stages, the die stages being disposed substantially in the same plane, one of said dies being movable between open and closed positions in a plane extending substantially perpendicular to the plane in which the die stages are disposed, means for feeding bar or rod stock to said dies at a point remote from said first-named plane, means whereby the stock is cut off to form work blanks, means to transfer said blanks from said remote point to one of said die stages, and transfer fingers adapted to transfer said blanks from one of said die stages to another when the dies are in their open position.

21. The combination with a pair of dies having a plurality of die stages, the die stages being disposed substantially in the same plane, one of said dies being movable between open and closed positions in a plane extending substantially perpendicular to the plane in which the die stages are disposed, means for feeding bar or rod stock to said dies at a point remote from said first-named plane, one of said dies being adapted to cut off a portion of said stock to form a work blank when the die is moved from the open position to the closed position, means to transfer said blanks from said remote point to one of said die stages, and transfer fingers adapted to transfer said blanks from one of said die stages to another when the dies are in their open position.

22. The combination with relatively movable upsetting dies having a plurality of die stages, of feeding means adapted to feed bar or rod stock endwise to said dies, means whereby said stock is cut off to form work pieces, transfer fingers adapted to grip a work piece when said dies are in their closed position and to transfer said work piece from one to another of said die stages when said dies are in their open position, and an ejector adapted to eject said work piece from said last mentioned die stage simultaneously with the feeding of a new work piece to said dies.

23. The combination with a pair of dies having a plurality of die stages, the die stages being disposed substantially in the same plane, one of said dies being movable between open and closed positions in a plane extending substantially perpendicular to the plane in which the die stages are disposed, means for feeding bar or rod stock to said dies at a point remote from said first-named plane, means whereby the stock is cut off to form work blanks, means to transfer said blanks from said remote point to one of said die stages, and transfer fingers adapted to transfer said blanks from one of said die stages to another when the dies are in their open position, the transfer fingers comprising a pair of fingers extending generally parallel to the plane in which the die stages are disposed, the fingers being movable relative to each other in a plane generally perpendicular to the plane in which the die stages are arranged in order to grip and release a blank to be transferred, the fingers being movable in a plane generally parallel to the plane in which the die stages are disposed to effect transfer of a blank from one die stage to another.

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