Sept. 4, 1934. A. A. BYERLEIN 1,972,329

PRESS

Filed Jan. 27, 1933 6 Sheets-Sheet 1

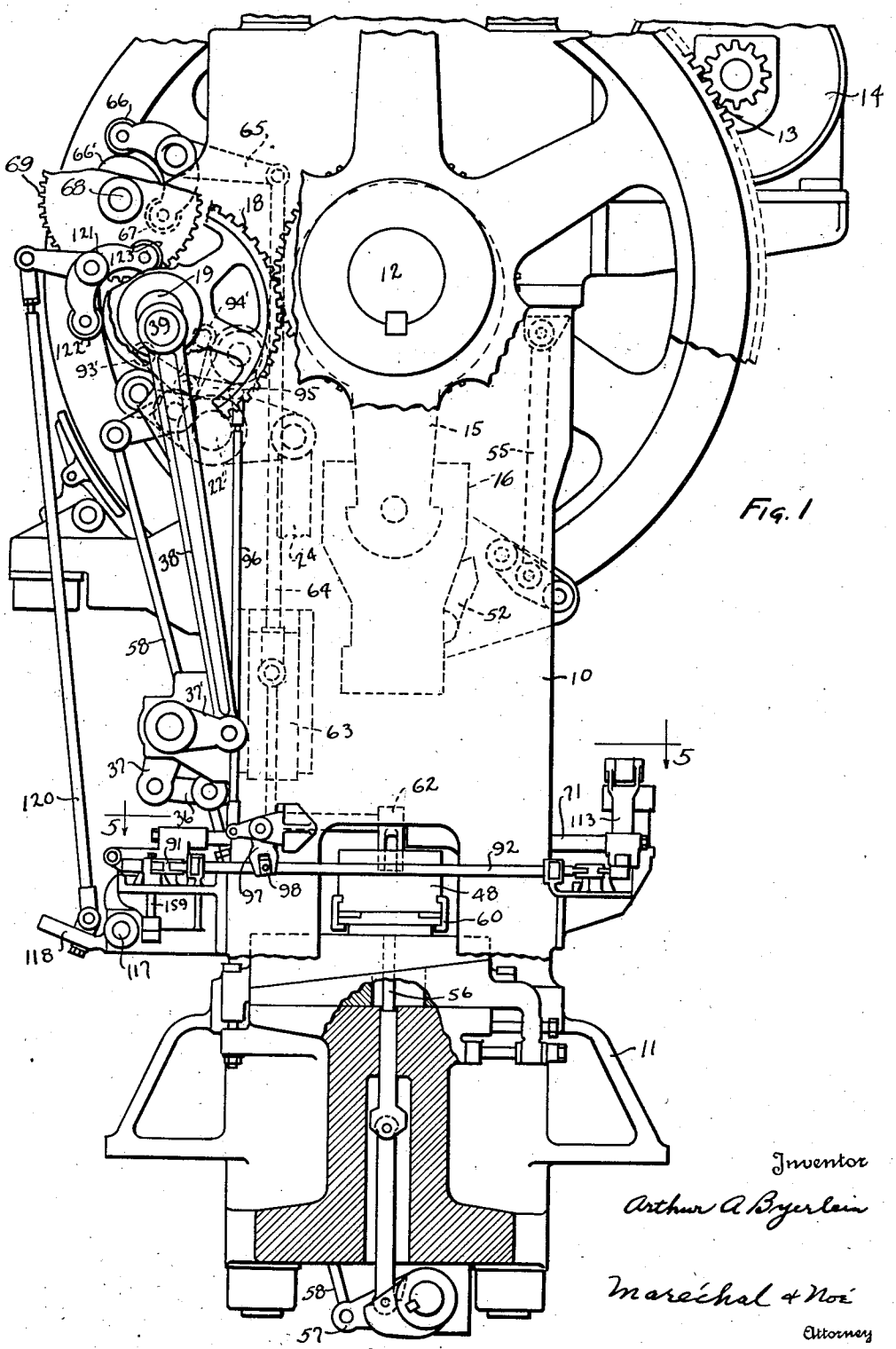


Fig. 1

Inventor

Arthur A Byerlein

Maréchal & Noé

Attorney

Sept. 4, 1934. A. A. BYERLEIN 1,972,329

PRESS

Filed Jan. 27, 1933 6 Sheets-Sheet 2

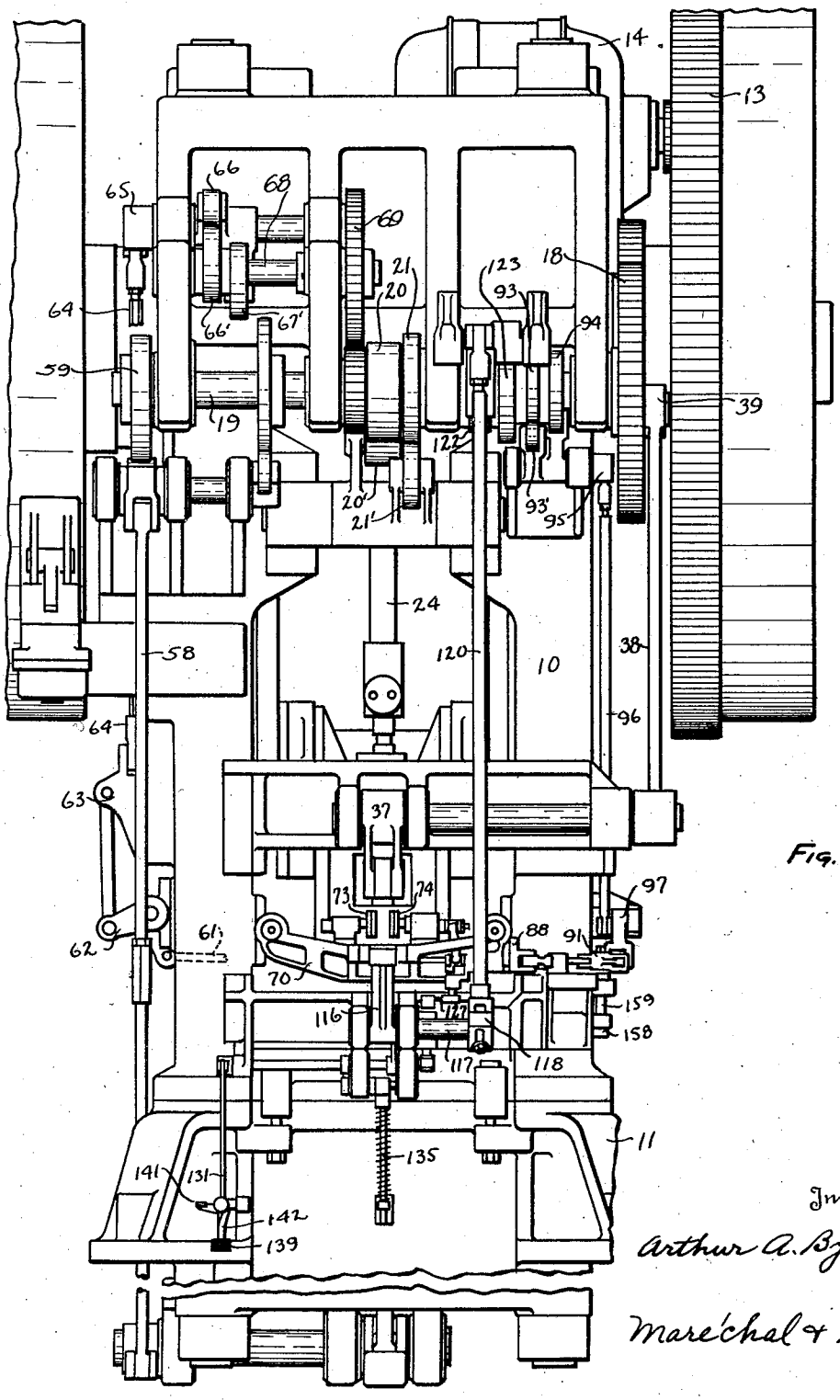


Fig. 2

Inventor
Arthur A. Byerlein

Maréchal & Noe
Attorney

Sept. 4, 1934. A. A. BYERLEIN 1,972,329

PRESS

Filed Jan. 27, 1933 6 Sheets-Sheet 3

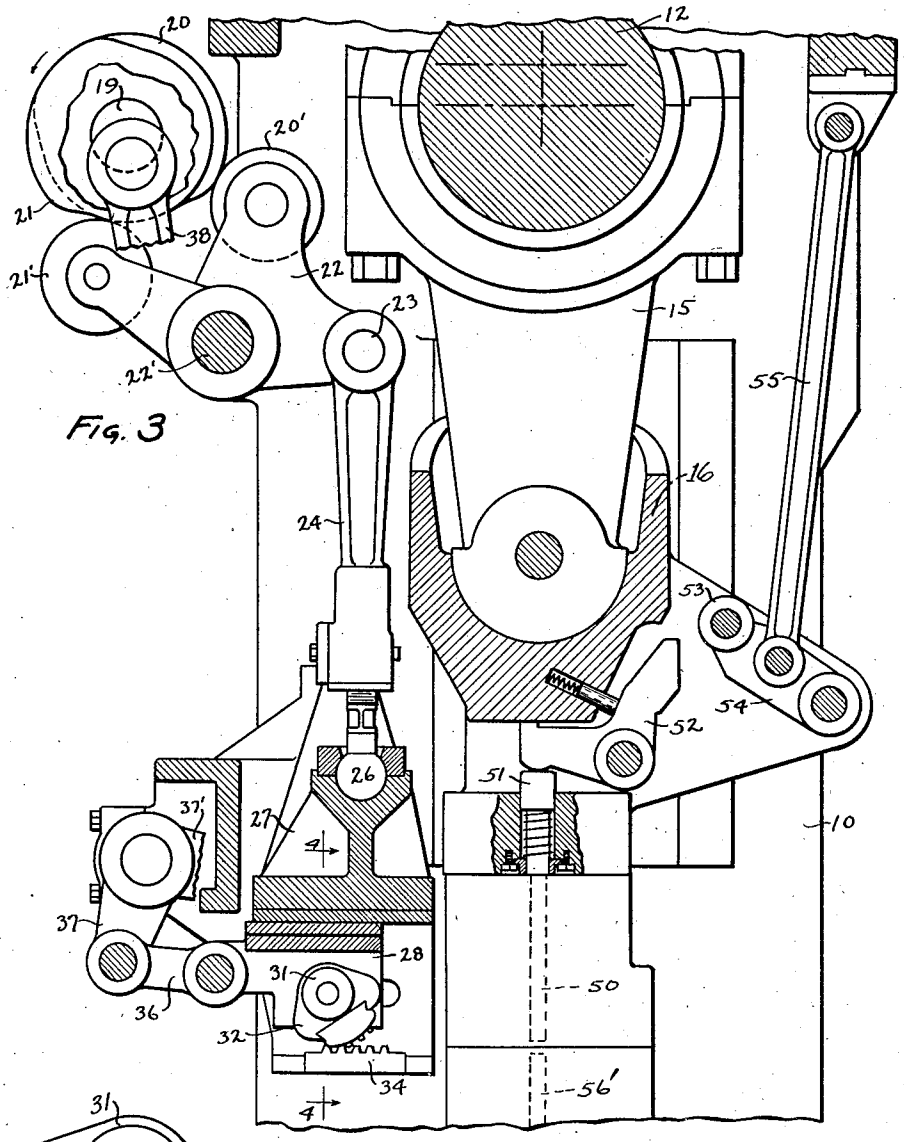


Fig. 3

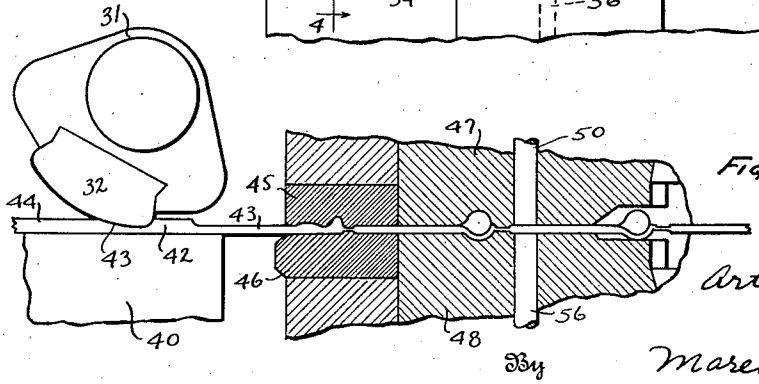


Fig. 10

Inventor

Arthur A Byerlein

By Marechal & Noe

Attorney

Sept. 4, 1934. A. A. BYERLEIN 1,972,329

PRESS

Filed Jan. 27, 1933 6 Sheets-Sheet 4

FIG. 7

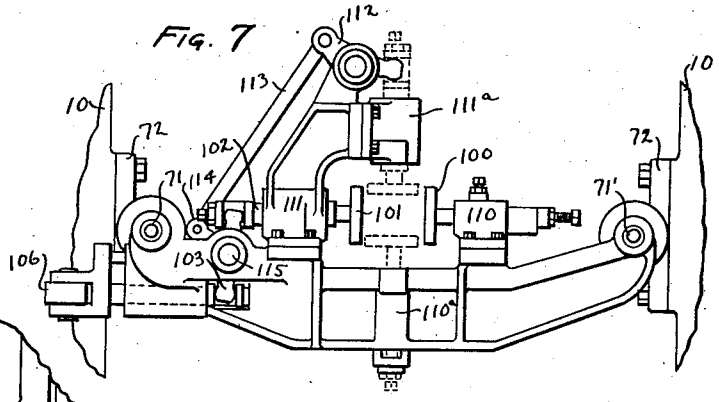


FIG. 4

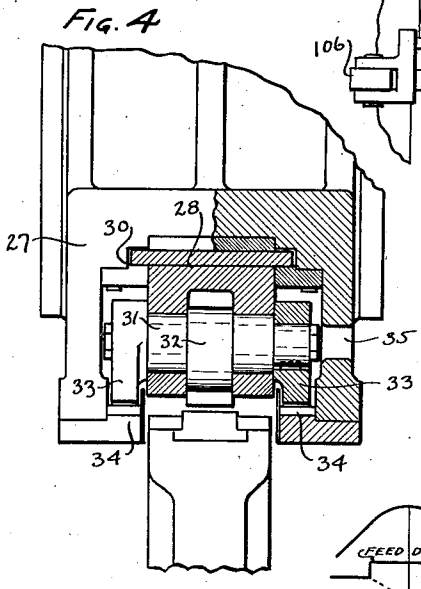


FIG. 11

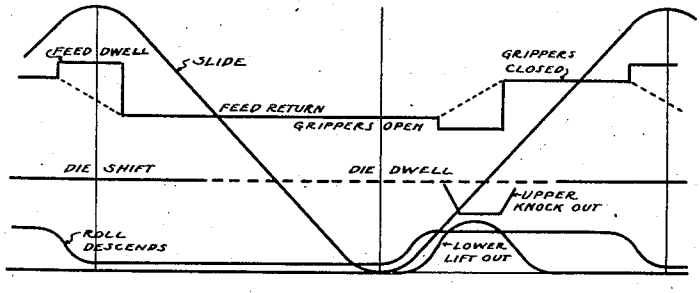
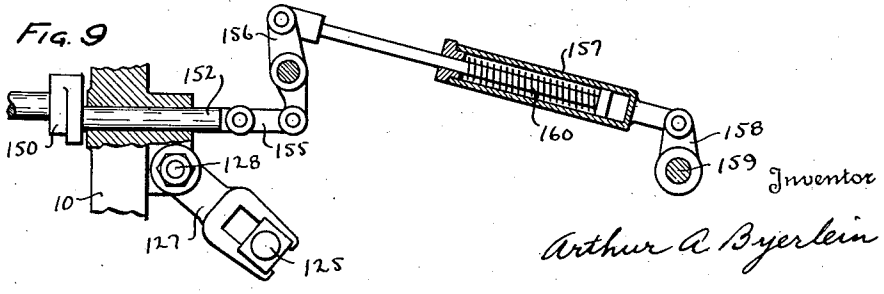


FIG. 9



Inventor

Arthur A Byerlein

By Maréchal & Noe

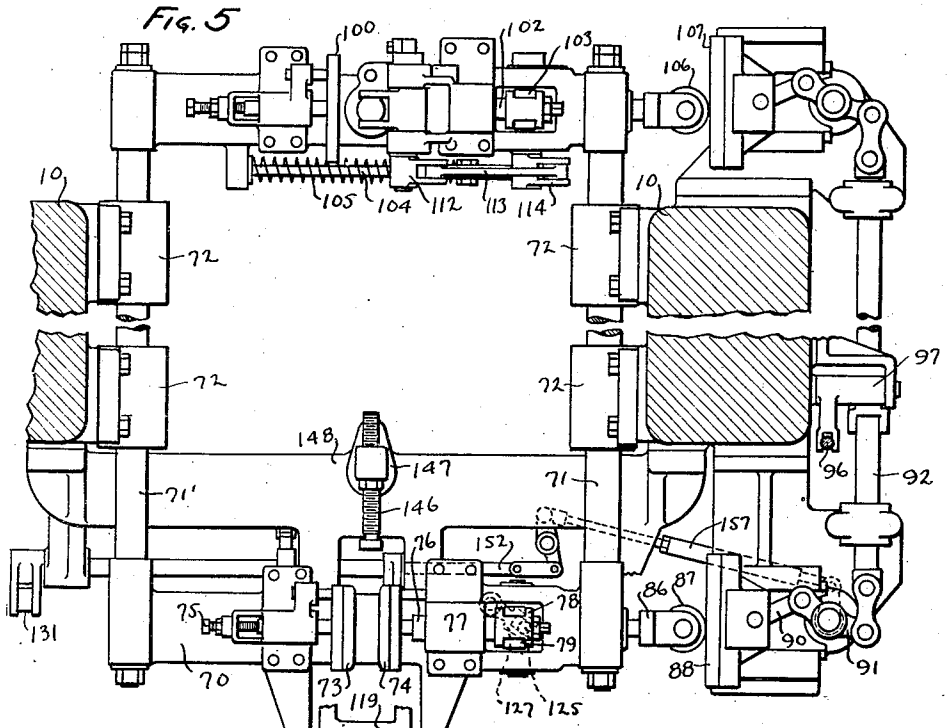
Attorneys

Sept. 4, 1934. A. A. BYERLEIN 1,972,329

PRESS

Filed Jan. 27, 1933 6 Sheets-Sheet 5

Fig. 5



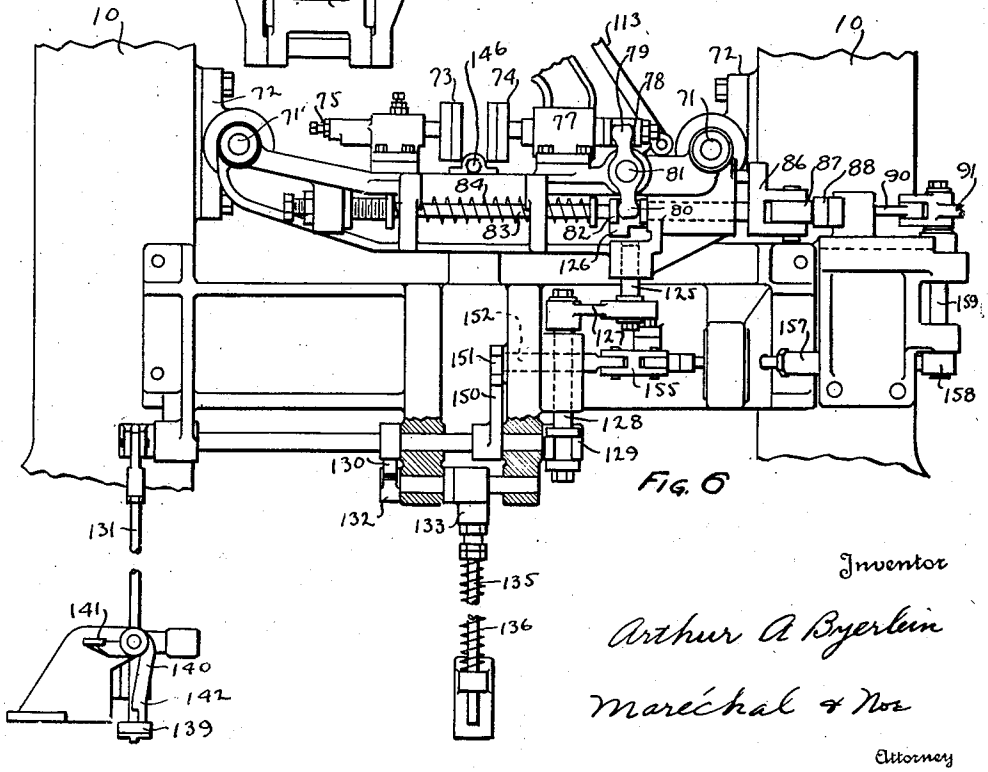


Fig. 6

Inventor

Arthur A Byerlein

Maréchal & Nox

Attorney

Sept. 4, 1934. A. A. BYERLEIN 1,972,329

PRESS

Filed Jan. 27, 1933 6 Sheets-Sheet 6

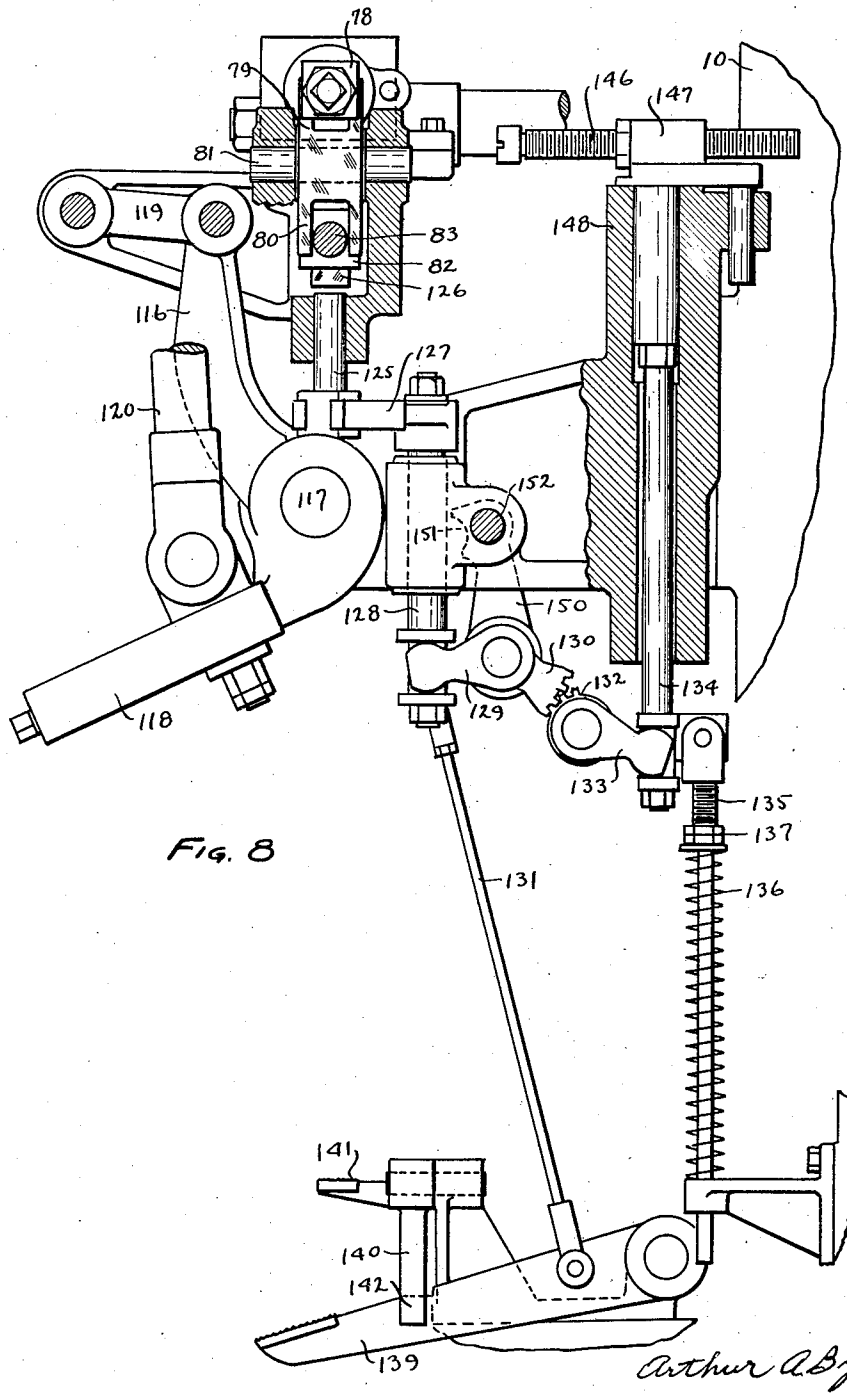


FIG. 8

Inventor

Arthur A Byerlein

By Maréchal & Noe

Attorneys

Patented Sept. 4, 1934 1,972,329

UNITED STATES PATENT OFFICE

1,972,329

PRESS

Arthur A. Byerlein, Detroit, Mich., assignor to General Machinery Corporation, Hamilton, Ohio, a corporation of Delaware

Application January 27, 1933, Serial No. 653,781

16 Claims. (Cl. 78—13)

This invention relates to the working or forming of metal, or the like.

One object of the invention is the provision of a method of forming a continuous bar or work piece into a series of similar objects of a desired form in which successive portions of the work piece are operated upon by a roller to give a preliminary rolling operation before the work is formed between cooperating dies.

Another object of the invention is the provision of a press adapted for the formation of metal into a desired shape, the press having a roller which is operated towards and away from the work piece with a dwell in its movements, means being provided for moving the roller along the work during the dwell period to give a preliminary forming action on the work.

Another object of the invention is the provision of a press adapted to operate on a continuous hot bar of metal which is fed forwardly step by step so as to be formed between cooperating forming or forging dies, the press embodying a roller adapted to give a preliminary rolling operation on the bar of metal before it is engaged between the dies.

Another object of the invention is the provision of a machine having a metal forming device adapted to operate on a continuous bar of metal which is fed along step by step, the machine having gripping means automatically engageable with and disengageable from the bar, the construction being such that the gripping means may be locked out of effective operation and a bar may be inserted in the grippers in proper predetermined relation with respect to the metal forming device without stopping the machine.

Another object of the invention is the provision of a machine adapted for forming metal, having an automatic feeding and gripping mechanism so arranged that the formed work can be gripped and held either by a gripper which is movable up and down or by a gripper which is movable transversely, as desired.

Other objects and advantages of the invention will be apparent from the following description, the appended claims, and the accompanying drawings, in which,—

Fig. 1 is a side elevation of a press embodying the present invention;

Fig. 2 is a front elevation of the press shown in Fig. 1;

Fig. 3 is a vertical section through a central portion of the press showing the operating mechanism for the roller;

Fig. 4 is a vertical section taken through the roller on the line 4—4 of Fig. 3;

Fig. 5 is a top view of the feeding frame taken on line 5—5 of Fig. 1;

Fig. 6 is a front elevation of the feeding frame showing the front grippers and the controlling mechanism;

Fig. 7 is a rear elevation of the feeding frame showing the rear grippers;

Fig. 8 is a side elevational view partly in section showing part of the feeding and lockout mechanism of the press;

Fig. 9 is a detail, shown partly in section, of part of the control mechanism shown in Fig. 5;

Fig. 10 is a longitudinal sectional view taken through the dies; and

Fig. 11 is a diagrammatic representation showing the relative timing of the various press parts.

As herein shown, the invention takes the form of a press provided with cooperating dies arranged for relative movement toward and away from one another and adapted to operate on the advancing end of a hot bar of metal, which is fed along step by step. The dies, as illustrated, are adapted for example to form a series of similar door hinges. Before the bar or work piece is engaged between the forming dies, it is given a preliminary rolling operation which elongates the metal in the direction of its length without greatly increasing the width, and which is so arranged as to roll only a portion of each length of bar required for a complete hinge. This leaves a thicker portion of metal at the end of each rolled portion from which the curved or pin engaging portion of the hinge may be formed. By rolling out portions of the metal before the work is engaged by the forming dies there is a material saving in scrap losses, as the metal otherwise would be forced out laterally to a very material extent during the die forging operation and form a very large flash.

The roller is operated in timed relation with the plunger, which operates the movable die. This roller is caused to move down into the bar and then dwell for a period of time so far as its downward motion is concerned and is then moved horizontally or in the direction of the length of the work to produce a flattened portion on the work piece, rolling the leaf portion of the hinge or other object produced. The bar is then fed along and a preliminary forging operation takes place between preliminary dies which form the metal into the general shape desired, and during this preliminary forging operation on a particular part of the metal, the next succeeding por-

tion of the bar is being operated on by the roller as previously described. The bar or work piece is then advanced again and the preliminary forging is made into a final forging by cooperating dies of the desired formation, while the roller and the preliminary dies are effective on the succeeding portions of the bar advanced to their respective positions. Thus the bar emerges at the rear of the machine completely forged into attached hinges with a comparatively small flash or trimmed scrap loss.

The movable dies, which are the upper dies in the form of the invention herein set forth, are operated from a plunger which is connected to an upper crank shaft. This crank shaft also operates the roller through a suitable cam connection which provides the required dwell, and through an eccentric connection which produces the longitudinal movement of the roller.

The crank shaft is also connected to a feeding frame provided with grippers which are automatically engageable with and disengageable from the metal bar at the proper time in the sequence of operation. At the front of the press and engageable with the unformed bar is one set of gripping devices, and at the rear of the press are additional gripping devices arranged for engagement with either the upper and lower sides of the formed hinges or else for engagement with the sides of the hinges, for holding the series of hinges against longitudinal movement during the forming operations, but causing the advance of the series of hinges at the proper time after the forming dies have been separated.

The bar feeding mechanism operates step by step during the entire press operation, and in order to permit a heated bar to be inserted into the front feeding grippers and in proper relation with the forging dies without stopping the machine a lockout is provided adapted for operation at a predetermined time in the sequence of press operations but under the manual control of the operator, whereby the front grippers can be held apart to provide for the insertion of the heated bar, the construction also being such that a locating screw is raised into the proper position for locating the end of the work bar so that it will have the proper relation to the roller and forging dies at the time it is engaged by the grippers.

Referring now more particularly to the drawings by reference numerals, 10 represents the frame, 11 the stationary bed, and 12 the main crank shaft of a press. Power is supplied to the crank shaft 12 through suitable gearing 13 from an electric motor 14, the crank shaft being connected through the connecting rod 15 to cause vertical reciprocatory movements of the upper die supporting member 16 which is suitably guided in the press frame.

The crank shaft 12 is connected by gears 18 to a horizontal shaft 19 on which are cams 20 and 21, see Figs. 2 and 3. The cam 20 is engaged by a roller 20' while roller 21' engages cam 21. The rollers 20' and 21' are rotatably carried on a frame 22 which is oscillatably or pivotally mounted on an axis 22'. The frame 22 is also pivotally connected at 23 to a link 24. The construction just described is such that as the cams 20 and 21 are rotated counter-clockwise as shown in Fig. 3, at the same speed as the crank shaft, the frame 22 is rotatably oscillated under the positive control of the two cams and the two rollers, producing a positive vertical reciprocatory movement of the link 24.

The lower end of the link 24 is pivotally connected as by a ball and socket joint 26 to the roller carrier 27 which is slidably guided for vertical movement on the front side of the press frame. As shown in Figs. 3 and 4, the roller carrier 27 movably supports the slide 28 for horizontal motion therein, the slide and the roller carrier having cooperating guide or slide surfaces 30. The slide 28 is symmetrical in form, as shown in Fig. 4. In it is rotatably mounted the shaft 31 of the roller segment 32. Keyed to the shaft 31 is a rack segment 33 engageable with rack teeth 34 on the roller carrier. A slot 35 is preferably provided in the side of the roller carrier to facilitate lubrication of the parts. It will be understood that a segment gear and rack are provided at each side of the roller, causing the roller to move rotationally on its axis when the slide is pushed or pulled horizontally.

The slide is horizontally moved in the roller carrier by links 36, relatively fixed arms 37 and 37' and a link 38 which is pivotally connected to the end of the arm 37' and which is operated at its upper end by means of an eccentric 39 on the shaft 19. The relationship of the parts shown in Fig. 3 is such that with the plunger down and ready to ascend, the roller is at the left-hand end of its stroke and in a depressed or dwelling position but ready to start moving upwardly.

By means of the roller operating mechanism as just described it will be apparent that the roller may be forced down into the heated bar of metal which rests on the fixed base 40 ahead of the die position, dwelling in its down position for about 180° movement of the crank shaft during which movement the arm 38 is operated through its eccentric driving connection with the cam shaft to force the roller to the left as viewed in Fig. 3. The roller segment 32 is so timed, and its stroke is such, that the bar will be very materially reduced in thickness throughout a substantial portion of a length although not throughout the entire length required for a complete hinge. This leaves an unrolled end portion 42 followed by a flattened portion 43 on the bar or work piece 44, see Fig. 10.

The bar is then fed along into position for engagement between the preliminary forming dies 45 and 46 which partially form the length of bar including the unrolled portion 42 into a shape approximating the desired final shape. During the time the preliminary dies 45 and 46 are effective on the work, the roller 32 is completing the rolling of another flattened portion on the succeeding length of work. The bar is then fed forwardly again between the finishing dies 47 and 48 which produce the final shape desired. The dies 45 and 47 are movable together and are both attached to the lower side of the press plunger. The lower dies 46 and 48 are held on the press bed. A knockout bar 50 is preferably provided in the upper die and arranged to be forced downwardly for ejecting the formed article from the upper die by means of a pin 51 provided in the plunger and moved downwardly shortly after the plunger starts to rise by a bell-crank lever 52 which is engaged by a roller 53 on arm 54 which is connected to a fixed point in the press frame by link 55.

An ejector or knockout pin section 56' may be provided in the lower die 48, operated by the upper end of pin 56 which is reciprocated by an arm 57 connected to link 58 adapted to be reciprocated at the proper time in the sequence of operations by roller and cam means designated generally 59, see Figs. 1 and 2. The upper end

of the pin 56 is normally flush with the bottom of the lower die 48.

As herein shown, the lower dies 46 and 48 are provided on a slide block 60, see Fig. 1, so that they may be moved laterally to bring a second duplicate set of lower dies 46 and 48 into line with the upper dies for the successive down stroke of the plunger. Both sets of lower dies 46 and 48 are of identical form and construction but are adapted for successive cooperation with the upper dies in order that the lower dies may be kept cool. The means for reciprocating the die carrying block 60 comprises a link 61, bell-crank 62, slide 63, link 64, arm 65, and rollers 66, 67 engageable respectively with cams 66' and 67' on a shaft 68, which is connected by gearing 69 to the cam shaft 19, the construction being such that for each revolution of the crank shaft one set of roller dies will remain fixed in position and the dies will then be shifted to bring the other pair of lower dies into proper alignment with the upper dies while the plunger is in an upper position.

Referring now more particularly to Figs. 1 and 5, the feeding means by which the bar is advanced in a step by step manner comprises a feeding frame 70 embodying laterally spaced bars 71 and 71' guided for longitudinal movements in bearing brackets 72 on the press frame. At the front end of the bars 71, 71' are the front grippers 73, 74 which are arranged for engagement with the sides of the heated bar. The gripping device 73 is detachably set in a desired position by means of the adjusting screw 75. The opposite gripping device 74 is adjustably secured on a plunger 76 which is guided in the carrier 77 for horizontal sliding movement. The outwardly extending end of the plunger 76 is provided with projections 78 between which is arranged an arm 79 fixed to an oppositely projecting arm 80 and pivotally supported on the axis 81. The arm 80 is adapted to be operated by projections 82 on a spring pressed bar 83. The operating spring 84 for the bar 83 yieldingly urges the bar 83 toward the right as viewed in Fig. 6 thus tending to yieldingly hold the gripping device 74 against the work. The bar 83 is rigid with a roller carrier 86 on which a roller 87 is rotatably mounted. This roller 87 operates on a flat plate 88 which is shown in its retracted position in Fig. 5, but which is adapted to be moved to the left at the proper time in each cycle of operations of the press in order to release the gripping device 74 from the work. When the plate 88 is moved to the left the roller 87 and the bar 83 are forced to the left against the action of the spring 84, thus positively pulling the gripping device 74 toward the right and releasing the work. It will be understood that the entire feeding frame and gripping device are moved constantly back and forth during press operations, the roller 87 operating on the plate 88 which is arranged parallel to the path of movement of the feeding device so that feeding movements of the frame are without effect on the grippers.

The plate 88 is slidably guided on the press frame for horizontal reciprocatory movements. A link 90 is pivotally connected to the plate 88 and to a double armed lever 91 which is pivotally connected to a reciprocatory bar 92. When this bar 92 moves horizontally in one direction (upwardly as viewed in Fig. 5) the plate 88 is moved to the left. The bar 92 is moved in the direction of its length by means of cams 93 and 94 on the cam shaft 19 engaged by cam rollers 93' and 94' carried by arms both of which are fixed to the rock arm 95 which is pivotally connected to a link 96 as shown in Figs. 1 and 2. The lower end of the link 96 pivotally connects to a bell-crank lever 97, the lower end of which is provided with a bifurcated slide guide embracing the block 98 which is suitably held on the bar or rod 92. The cams 93 and 94 are so formed as to provide a positive movement of the bar 92 in both directions and at the proper time in the sequence of press operations so that the gripping device 74 is released from the work when the feeding frame moves forwardly but is engaged with the work during the rearward or feeding movement of the feeding frame in order to cause the work to move with the feeding frame throughout a complete feeding stroke. This, as shown in Fig. 11, is at a time when the roller 32 and the upper dies 45 and 47 are raised. It will be seen from the figure mentioned that the point in the cycle of press operations at which the feeding movement takes place is just before the plunger descends, the grippers being open during the time the roller is flattening out the work piece.

The advancing end of the formed work is also adapted to be held during feeding movements by suitable gripping devices so that the bar is pulled as well as being pushed in a step by step manner. The rear gripping devices which are adapted for engagement with the formed hinges are shown in Fig. 7 and at the upper portion of Fig. 5. The rear gripping devices are so arranged that the work may be held either at the sides or at the top and bottom as desired, as it will be readily understood that with an article such as a hinge having substantially constant width and having a thickness which varies at different portions of the hinge it will be advantageous to grip the formed articles on the sides although other articles of a different form might better be gripped at the top and bottom. The two grippers 100 and 101 are therefore provided at the rear of the feeding frame, gripping device 100 being adjustably secured in support 110 while gripping device 101 is adjustably held in a reciprocating plunger 102, reciprocally mounted in support 111, in substantially the same manner as has previously been described with reference to the forward gripping devices. The plunger 102 is operated by a double armed lever 103, which is controlled by the bar 104 influenced by a spring 105 which normally tends to urge the gripping device 101 away from the work in the same manner as has previously been described with reference to the forward grippers. The bar 104 is controlled by a roller 106 operating on a flat plate 107 which is controlled by the rod 92 so as to move simultaneously with and in the same direction as the plate 88 so that the rear grippers will be engaged with the work or disengaged from the work at the same time the front grippers are correspondingly moved. In the solid line position shown in Fig. 7, the grippers 100 and 101 are engageable with the sides of the work. However these grippers are readily removable from the supporting parts 110 and 111 and are adapted for mounting in similar support parts 110a and 111a arranged below and above the work. In this position, shown in dotted lines, they are engageable with the lower and upper sides of the formed hinges. The plunger 102 of gripper 101 is then operated by means of a double armed lever 112 connected to a link 113 and arm 114 to the shaft 115 on which the double armed lever 103 is secured, so that the gripper 101 will be moved toward or into engagement with the work at the proper time in either a vertical or horizontal direction depend-

ent on its position in either the support 110 or support 110a. Both grippers 100 and 101 may be so adjusted with respect to its holding or operating means that it advances far enough toward the work for effective gripping action.

The feeding frame including the side bars 71, 71' and the end frame members at the front and rear of the press which support the grippers is bodily movable in a reciprocatory manner, being pivotally connected to a link member 119, see Figs. 5 and 8, the rear portion of the link member 119 being pivoted to an arm 116 which is secured on the oscillatory shaft 117. An operating element 118 is fixed to the shaft 117 and to the arm 116 and is pivotally connected to the feed operating link 120 which extends upwardly to link 121, operated by cams 122 and 123 engaged by rollers 122' and 123' on arms rigid with the link 121. The cams 122 and 123 are provided on the cam shaft 19 so that for each revolution of the crank shaft the link 120 will be given a complete downward and upward movement producing a complete forward and backward oscillation of the feed frame.

While the feed frame moves back and forth continuously during the press operations, the forward grippers may be locked out so that they cannot engage the work, in order that a new bar can be inserted between the front grippers without stopping the press. This lockout is under the manual control of the operator, the construction being shown more clearly in Figs. 2, 6, 8 and 9. At the proper time in the sequence of operations a pin 125 may be raised vertically upwardly so as to come into the path of movement of a lug 126 provided on the bar 83 of the gripper operating mechanism, at a time when the gripper 74 is released from the work. Then after the plates 88 and 107 are moved to retracted positions the bar 83 will be prevented from returning and the grippers will be held open. This pin 125 is provided on an arm 127 secured to the upper end of a bar 128. The lower end of the bar 128 is controlled by an arm 129 to which is secured a gear segment 130 and to which is also secured a lever pivoted to the upper end of a release link 131. The gear segment 130 is in engagement with a gear segment 132 fixed with relation to arm 133, arm 133 engaging the lower end of a bar 134 which is fixed to a threaded rod 135 normally urged upwardly under the control of the spring 136. The spring tension may be adjusted by means of the nuts 137 on rod 135. This spring tends to move the plunger 134 upwardly and to move the control link 131 upwardly although normally the control link 131 is held in a lowered position by the foot bar 139 having a gravity actuating lock 140 which normally holds the foot bar 139 in a depressed position as shown in Fig. 6. However, when the step 141 of the gravity lock is depressed, the depending arm 142 is moved away from over the foot bar 139 permitting the latter to be moved up under the action of the spring 136. When the bar 139 is moved up under the action of the spring the pin 125 is projected so as to hold the front grippers open ready for the insertion of a bar. Such raising action of the bar 139, however, can only take place after the lug 126 is moved out of the path of the pin 125, the foot bar 139 being held down until the lug 126 moves clear of the pin and opens the front grippers.

At the same time the pin 125 is raised to lock out the front grippers, a locating screw 146 (Fig. 8) is elevated. The head of the screw forms an abutment for the advancing end of the work thus locating the work in the proper position with respect to the feeding and gripping mechanism at the time the closing of the front grippers takes place. The locating screw 146 is adjustably threaded in a frame 147 carried for vertical sliding movement in a bracket 148 on the press frame. The frame 147 is secured to the upper end of plunger 134 so that as the plunger 134 moves up the locating screw will be moved up from a normally retracted position below the path of the bar, see Fig. 8, into the path of movement of the front end of the work bar.

The locating screw 146 is moved to a retracted position at the same time the lockout pin 125 is retracted, since these two devices are interconnected by the mechanism previously described including the rack segments 130 and 132. After a new bar is inserted between the front grippers with its advancing end against the locating screw, and the operator desires to have the front grippers close and the locating screw move down, he presses on the foot bar 139, thus moving the lockout pin 125 down so that the front grippers can be closed and also pulling down or retracting the locating screw. Such movements, however, of the pin 125 and locating screw can only take place at the proper time in the sequence of operations, because the bar 139 is held in its upper position after having moved to that position, by means of a holding lever 150 fixed with respect to the arm 129 and gear segment 130, see Fig. 8. This lever 150 is provided with a curved seat 151 which is adapted to be engaged by the side of a plunger 152 after the lever 150 has been swung to the right from its normal position due to the upward movement of the foot bar 139. The pin 152, shown in Figs. 5 and 9, is slidably guided so as to be projected into the return path of movement of lever 150, being operated by link connections 155, 156 and 157 to an arm 158 provided on a shaft 159 which is controlled by the bar 92, it being remembered that the bar 92 is moved endwise by cams operated from the crank shaft to cause the engagement and disengagement of the grippers. When the arm 158 is moved over to the right from the position shown in Fig. 9, the pin or plunger 152 tends to be projected into the path of movement of the lever 150, but if the lever 150 is in front of the plunger, a spring 160 provided on the link 157 is compressed so that the plunger 152 can be projected subsequent to the raising of the foot bar 139. When the foot bar 139 is in its depressed position and the gripping as well as the feeding devices are operatively associated with the press mechanism, the compression spring 160 is operated without causing the projection of the holding plunger 152.

It will, therefore, be apparent that without stopping the operation of the plunger and without stopping the reciprocatory feeding operations of the feeding frame, the front grippers may be held open and the locating screw may be raised so that the bar can be inserted between the moving grippers, and at the proper time in the sequence of operations the operator is enabled to press the foot bar 139 down against the action of the spring 136 and move the lockout pin 125 so as to permit the normal functioning of the front grippers, this action also retracting the locating screw out of the advancing path of movement of the bar of work. Then when the grippers move the work forwardly the end of the work piece will be in a proper position with

respect to the roller so that there will be no waste or scrap loss of the first article formed.

While the method herein described, and the form of apparatus for carrying this method into effect, constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to this precise method and form of apparatus, and that changes may be made in either without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A press of the character described comprising upper and lower die members movable toward and away from one another for forming a work piece, operating means for relatively moving said die members, a roller for giving a preliminary rolling operation on the work piece, means operated in timed relation to said operating means for moving said roller along the work piece while the work piece is stationary, and means for intermittently feeding the work piece after the roller has completed its operation on the work piece.

2. A machine of the character described comprising work feeding means for moving a work piece step by step, a work forming device operable on the work between feeding steps, operating means therefor, and mechanism operated in timed relation to said operating means for giving a preliminary rolling operation on the work piece between feeding steps.

3. In a machine of the character described, a pair of die members adapted to cooperate to form a work piece, operating means for relatively moving said die members toward and away from one another, a roll adapted for a preliminary roll operation on the work piece and provided ahead of the die members, mechanism operated in timed relation to said operating means for bodily moving said roller to and from the work piece, and mechanism operated in timed relation to said operating means for rolling the roller along the work piece while the work piece is stationary.

4. A machine of the character described comprising upper and lower die members, operating means for relatively moving said members toward and away from one another for operation on a work piece, a roller adapted for a preliminary rolling operation on the work piece, mechanism operated in timed relation to said operating means for raising and lowering said roller and holding the roller lowered for a dwell period, and mechanism for positively rotating and bodily moving said roller along the work piece during said dwell period.

5. A machine of the character described comprising upper and lower die members, operating means for relatively moving said members toward and away from one another for operation on a work piece, feeding means operated in timed relation with respect to said operating means for advancing the work piece step by step to said die members, a roller adapted for a preliminary rolling operation on the work piece, mechanism operated in timed relation to said operating means for raising and lowering said roller and holding the roller lowered for a dwell period, and mechanism for positively rotating and bodily moving said roller along the work piece during said dwell period.

6. A press of the character described comprising upper and lower forging die members movable toward and from one another, operating means for moving one of said die members toward the other for forming a work piece, feeding means operated in timed relation with said operating means and adapted to feed a work piece step by step to said die members whereby the advancing end of the work piece is formed thereby, and mechanism operated in timed relation with said operating means for rolling and flattening said work piece ahead of the die members between each feeding movement of the work piece.

7. The method of forming a continuous bar of metal into a series of similar articles comprising feeding the bar step by step in the direction of its length, rolling out successive portions of the bar between successive feeding steps and while the bar is stationary, and subsequently die forming successive lengths of the bar to a desired formation between successive feeding steps.

8. The method of forging a continuous bar into a series of similar articles comprising heating a bar, feeding the bar in the direction of its length, rolling out successive portions of the bar, and die forging successive portions of the bar to a desired formation, the die forging operation being carried out while a preceding portion of the bar is being rolled out.

9. A press of the character described comprising cooperating die members, operating means for moving one of said die members with respect to the other for cooperation with a work piece, step by step feeding mechanism for feeding the work piece to the dies and operated in timed relation with respect to said operating means, said feeding mechanism comprising gripping means arranged ahead of the dies for holding and releasing the work, additional gripping means arranged beyond the dies for holding and releasing the formed work, a manually controlled means, control mechanism operated thereby for rendering said gripping means operative, and means operated in timed relation with said operating means for automatically holding and releasing the said control mechanism at predetermined times in the sequence of operation of the press.

10. A press of the character described comprising cooperating die members, operating means for moving one of said die members with respect to the other for cooperation with a work piece, step by step feeding mechanism for feeding the work piece to the dies and operated in timed relation with respect to said operating means, said feeding mechanism comprising a feeding frame adapted for reciprocatory movement in the direction of the length of the work piece, means for reciprocating said frame, a gripping device carried by said frame and engageable with the work piece, means synchronized with said operating means for releasing and engaging the gripping device with the work at predetermined times in the sequence of operation, a lockout means operable to hold said gripping device disengaged from the work, and manually controlled means for controlling said lockout means.

11. A press of the character described comprising cooperating die members, operating means for moving one of said die members with respect to the other for cooperation with a work piece, step by step feeding mechanism for feeding the work piece to the dies and operated in timed relation with respect to said operating means, said feeding mechanism comprising a feeding frame adapted for reciprocatory movement in the direction of the length of the work piece, means for reciprocating said frame, a grip-

ping device carried by said frame and engageable with the work piece, means synchronized with said operating means for releasing and engaging the gripping device with the work at predetermined times in the sequence of operation, a lockout means operable to hold said gripping device disengaged from the work, locating means movable to position an end of the work and connected with said lockout means for movement therewith, and manually controlled means for controlling said lockout means.

12. In a machine of the character described, a work forming member, operating means for moving said member into engagement with a work piece, means for feeding said work piece step by step to said member and comprising a frame, means for moving said frame back and forth, gripping means on said frame engageable with the work ahead of the forming member, means for opening and closing the gripping means at predetermined times in the sequence of operations of said frame, locating means for locating the advancing end of the work piece a predetermined distance from said forming member, control means for moving said locating means into the path of movement of the work piece and simultaneously locking out the said opening and closing means to maintain the gripping means open during continued movement of the frame, and means for automatically controlling the time of operation of said control means in the sequence of operations of said frame.

13. In a machine of the character described for working metal, a frame, a reciprocable slide movable rectilinearly on said frame toward and away from a work piece, a second slide carried by said first slide and movable thereon in a direction substantially transverse to the direction of movement of said first slide, a roll journalled on said second slide, operating means for reciprocating said first slide, and means operable in timed relation with said operating means for reciprocating said second slide and for moving said roll about its axis for a rolling operation on a work piece.

14. In a machine of the character described for working metal, a frame, a pair of slides one reciprocably mounted on said frame and the other reciprocably mounted on the first slide, means for operating one of said slides toward a work piece, means reciprocably operating said other slide in a direction substantially perpendicular to the movements of said first slide, and a roller adapted for a rolling operation on a work piece and carried by one of said slides.

15. In a press of the character described for working metal, a frame, a crank shaft rotatably journalled therein, a reciprocably operable die supporting member, a crank connection between said member and said crank shaft, a work engaging roller, a roller supporting slide, a second slide supporting said roller supporting slide for reciprocatory movement, and means operated in timed relation with said crank shaft for moving said roller supporting slide and said second slide.

16. A press of the character described comprising upper and lower forging die members, operating means for moving one of said die members toward the other, a work engaging roll adapted for rolling engagement with a work piece before the work is forged in said die forging members, a roll supporting member, means operated in timed relation with said operating means for moving said roll supporting member along the work, and means operating in timed relation with said operating means for moving said roll supporting member toward and away from the work.

ARTHUR A. BYERLEIN.