

June 9, 1936.

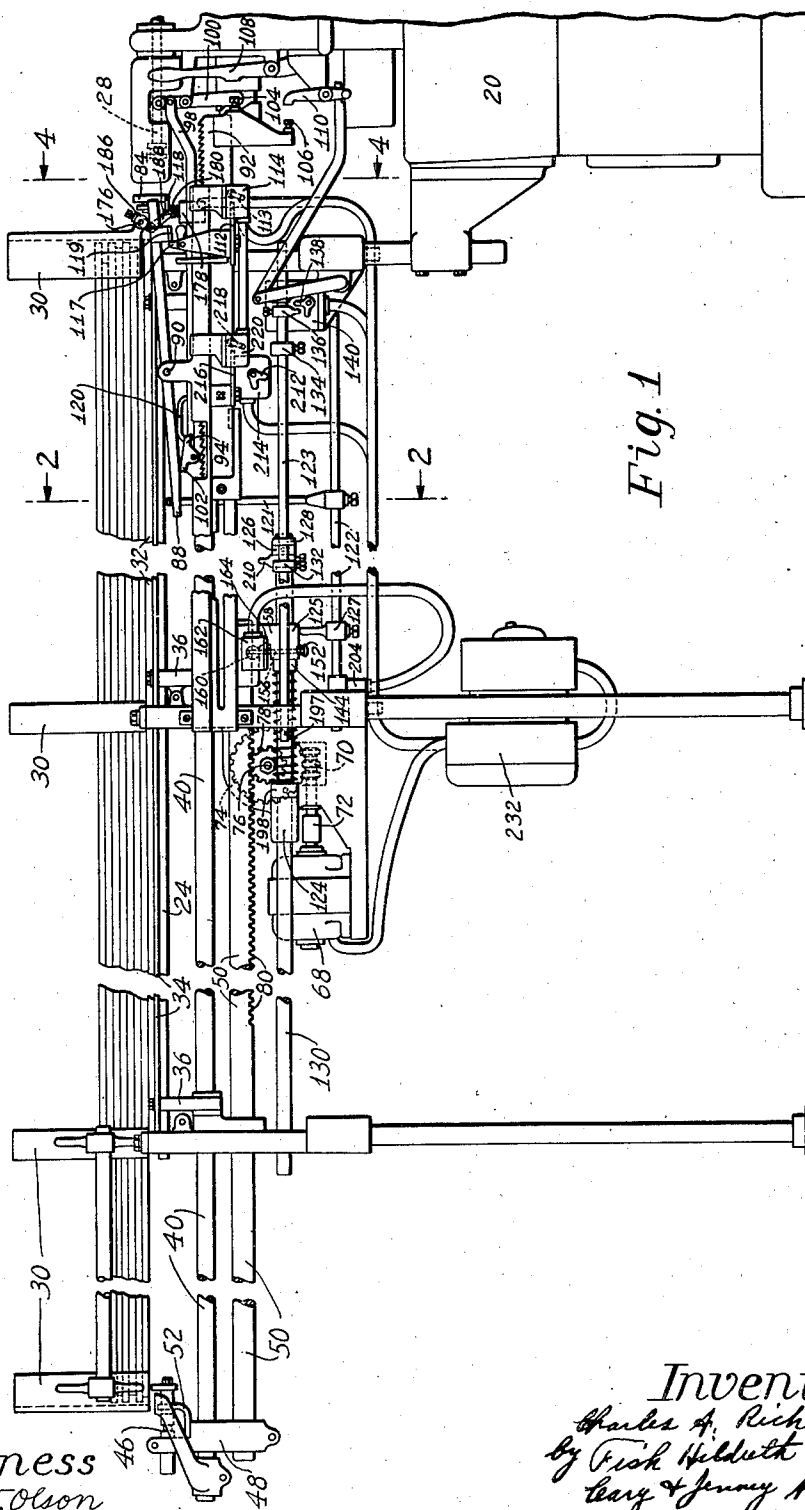
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2,043,772

MACHINE FOR FASHIONING ARTICLES SUCCESSIVELY FROM BAR STOCK

Filed Jan. 5, 1935

5 Sheets-Sheet 1



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5 Sheets-Sheet 2

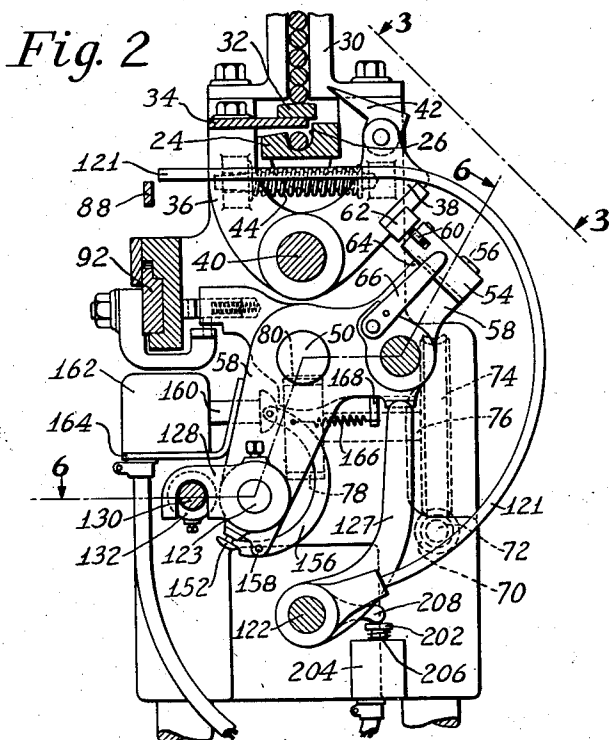


Fig. 3

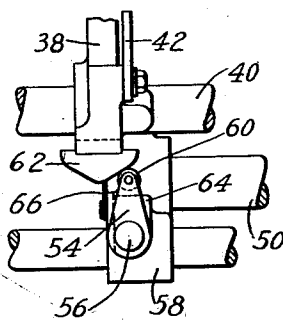
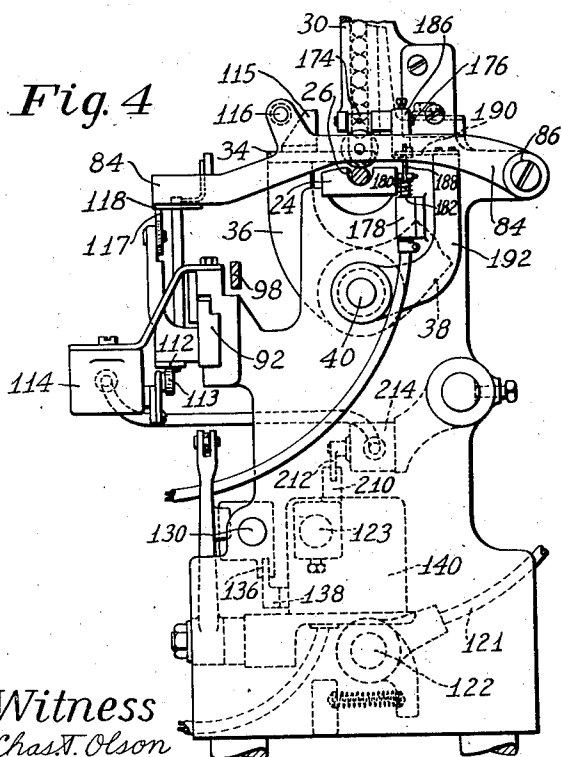
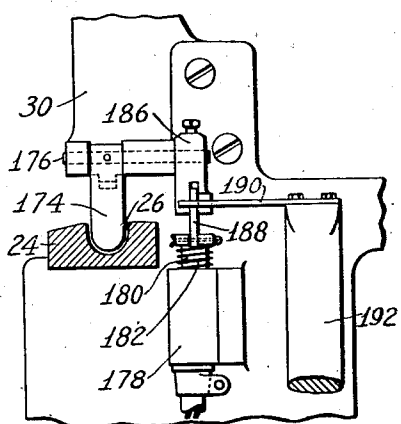


Fig. 5



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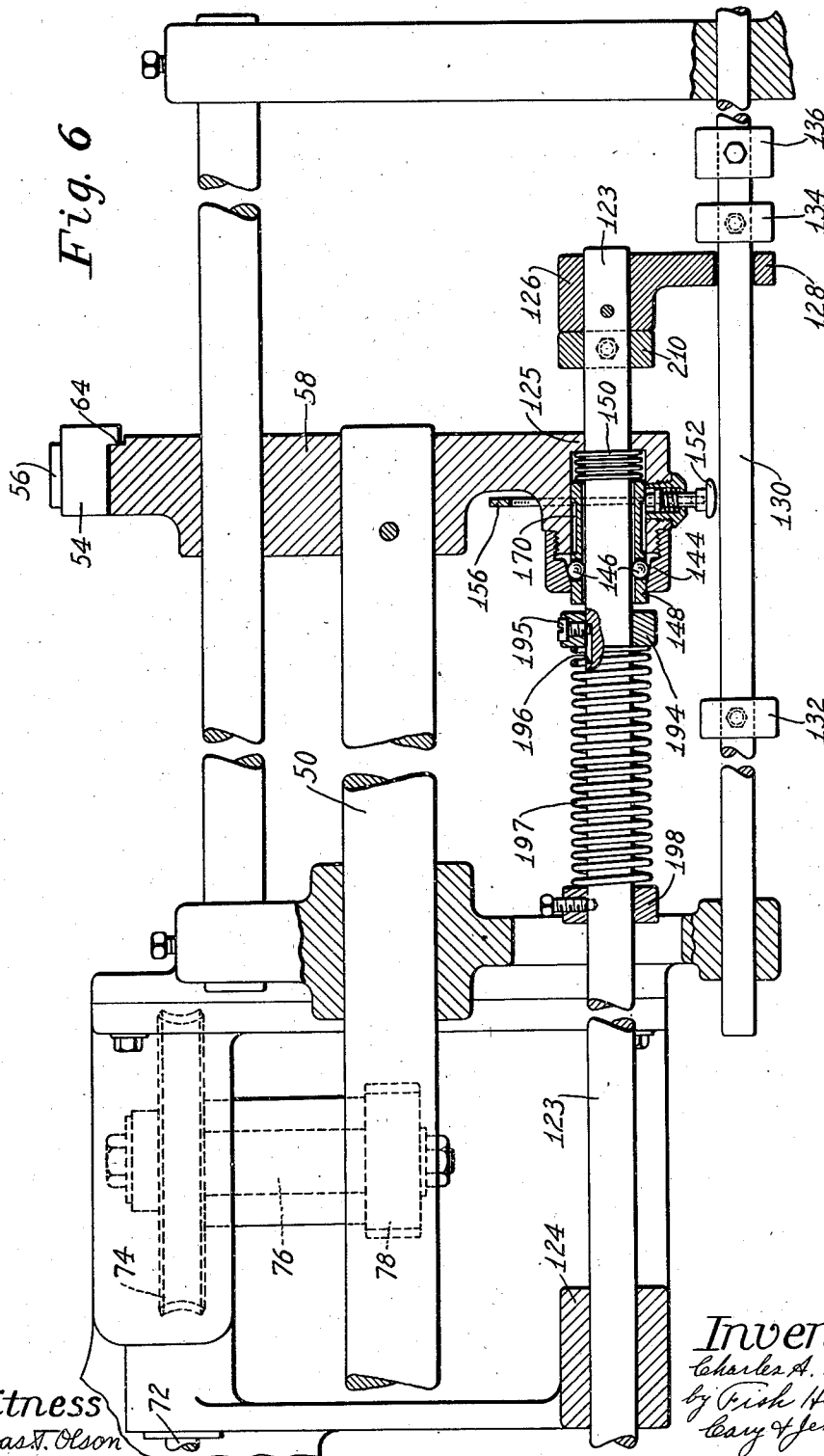
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MACHINE FOR FASHIONING ARTICLES SUCCESSIVELY FROM BAR STOCK

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5 Sheets-Sheet 3

Fig. 6



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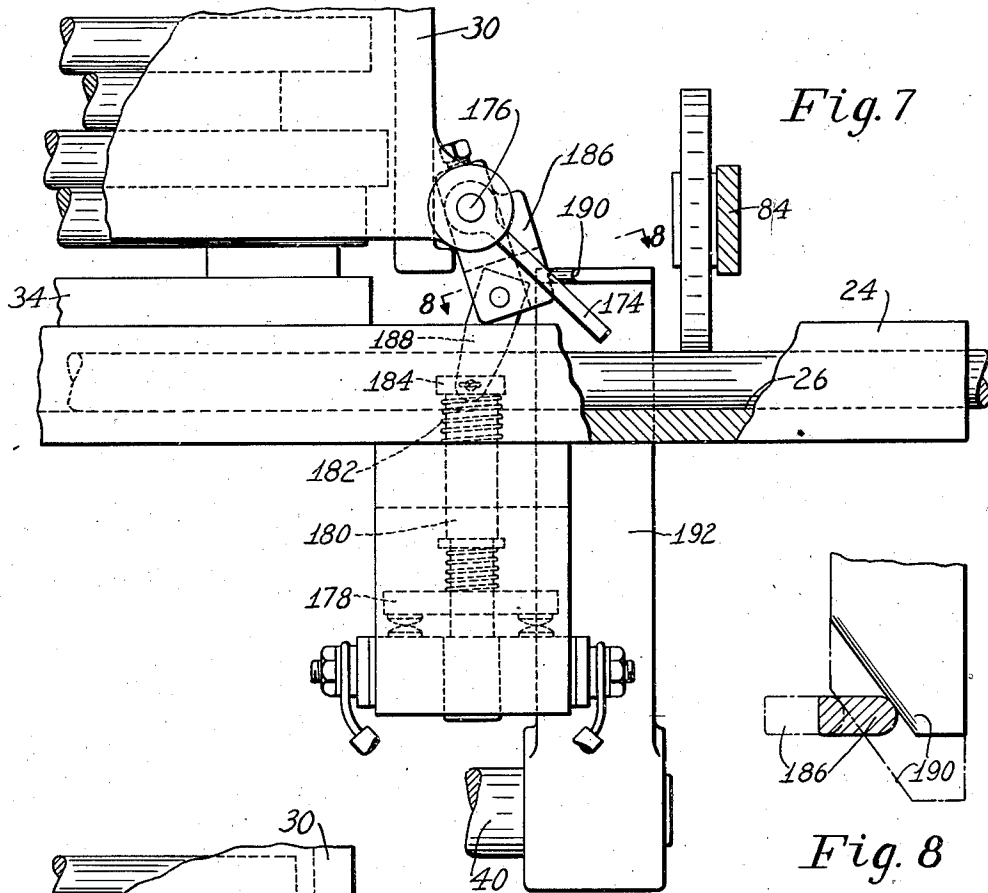
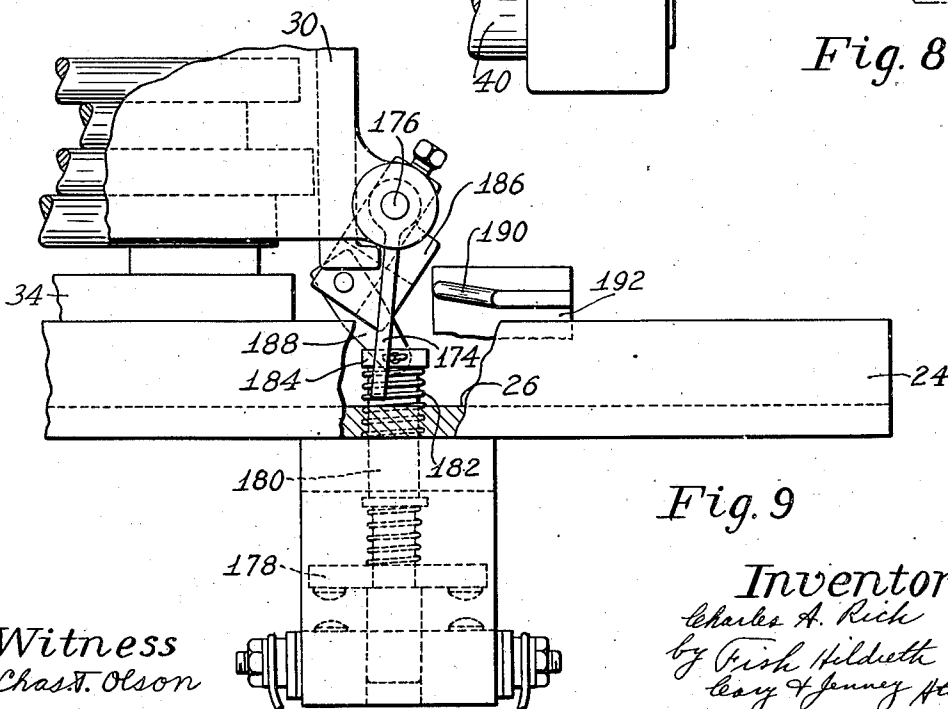
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MACHINE FOR FASHIONING ARTICLES SUCCESSIVELY FROM BAR STOCK

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June 9, 1936.

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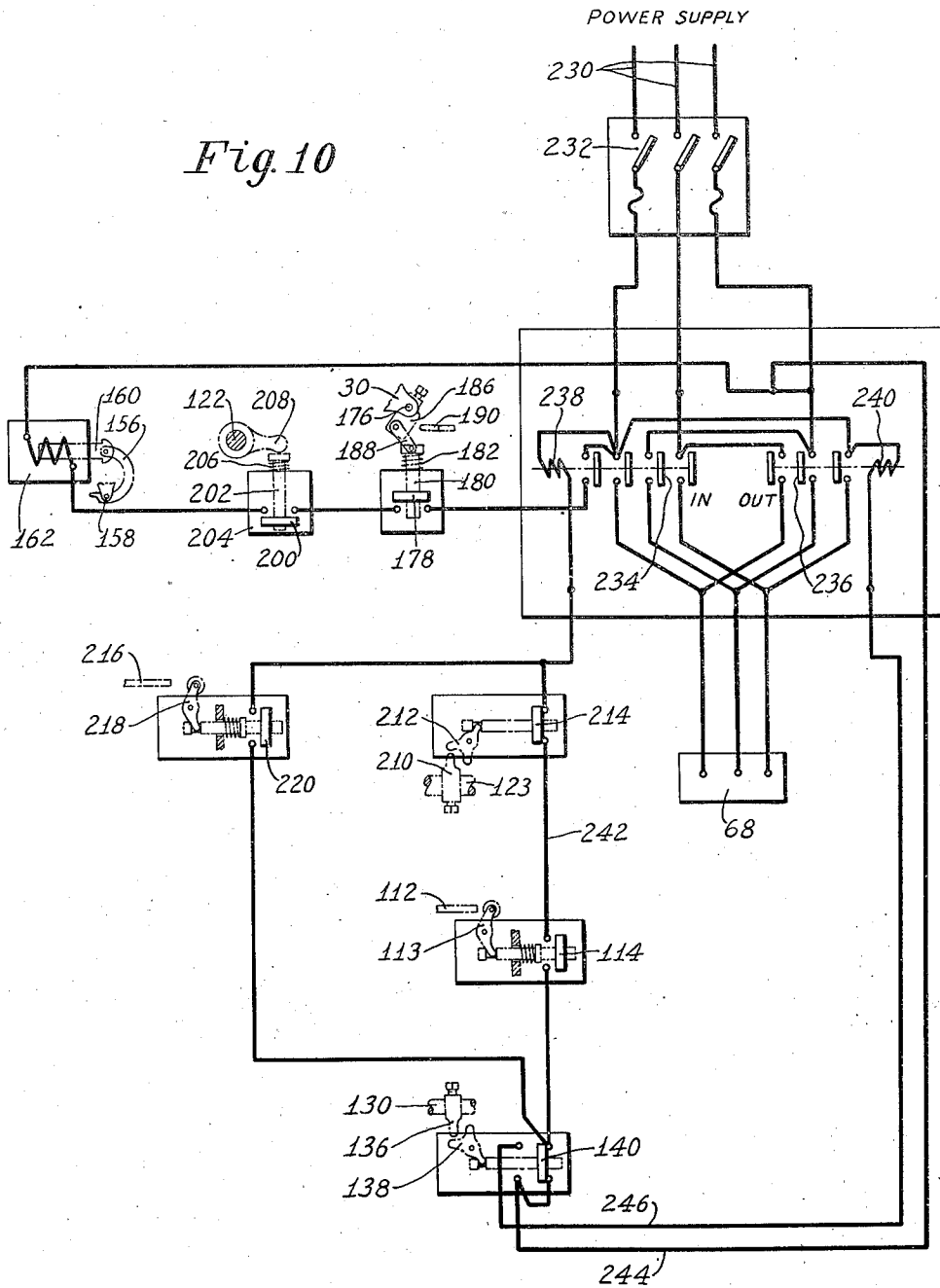
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MACHINE FOR FASHIONING ARTICLES SUCCESSIVELY FROM BAR STOCK

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Fig. 10



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UNITED STATES PATENT OFFICE

2,043,772

MACHINE FOR FASHIONING ARTICLES
SUCCESSIVELY FROM BAR STOCKCharles A. Rich, Providence, R. I., assignor to
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Application January 5, 1935, Serial No. 553

20 Claims. (Cl. 29—44)

The present invention relates to improvements in screw and similar machines for fashioning articles successively from metal bar stock, and more particularly to an improved mechanism for feeding a new bar of stock into position in the machine upon the exhaustion of an old bar.

The machine herein disclosed as embodying in a preferred form the several features of the present invention, comprises an automatic screw machine of the general type set forth in applicant's Patent No. 1,877,693, provided with a stock magazine and mechanism which is rendered operative upon the exhaustion of the bar feeding in the machine to interrupt the operation of the machine, select and feed a new bar into operating position, and thereafter to return the machine to active operation. This mechanism includes a guideway which is in axial alignment with the feed tube or collet of the machine, and a feed member in the form of a pusher which is arranged to engage with and advance the rear end of a new bar deposited in the guideway from the magazine.

It is a principal object of the present invention to provide electrically operated devices of novel and improved description for selecting and advancing a new bar into the machine, which are simple in construction and are readily controlled to operate certainly and accurately in timed relation to the several cooperating mechanisms of the machine.

It is a further object of the invention to provide novel and improved means for controlling the advancing movement of the feed devices to move the leading end of the new bar to an exactly determined operating position in the machine.

With these and other objects in view, as may hereinafter appear, one feature of the invention consists in the provision of a novel electrically operated control for the selecting and feeding devices including an electric motor and switch connections which are automatically controlled to position a new bar in operating position in the machine upon exhaustion of the old bar.

Another feature of the invention consists in the provision of means controlled through contact with the leading end of the advancing new bar to exactly determine the limit of the advancing movement of the new bar to cause the leading end thereof to be brought to an exactly determined operating position in the machine irrespective of variations in the length of the bar.

The several features of the invention consist also in the devices, combinations and arrangement of parts hereinafter described and claimed

which together with the advantages to be obtained thereby will be readily understood by one skilled in the art from the following description taken in connection with the accompanying drawings, in which Fig. 1 is a view in front elevation of an automatic screw machine provided with an automatic magazine feed, only so much of the machine being shown as is believed necessary to illustrate the connection of the present invention therewith; Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1, illustrating certain of the operating connections of the selecting and feeding mechanism of the magazine feed; Fig. 3 is a fragmentary detail view taken on the line 3—3 of Fig. 2; Fig. 4 is a sectional view taken on the line 4—4 of Fig. 1; Fig. 5 is a fragmentary sectional view on an enlarged scale taken substantially on the line 5—5 of Fig. 1, to illustrate particularly the controller member and toggle actuated switch; Fig. 6 is a sectional view taken on the line 6—6 of Fig. 2, to illustrate particularly the mechanism for controlling the limit of the advancing movement of the magazine feed and new bar; Fig. 7 is a fragmentary detail view in front elevation on an enlarged scale illustrating substantially the parts shown in Fig. 5; Fig. 8 is a detail sectional view taken on the line 8—8 of Fig. 7; Fig. 9 is a view similar to Fig. 7 with the parts shown in a different position prior to the engagement of the leading end of the new bar with the controller member; and Fig. 10 is an electrical diagram showing the electrical connections for controlling the operation of the bar selecting and feeding mechanism of the present machine.

The machine disclosed in the drawings as embodying in a preferred form the several features of the present invention, is an automatic screw machine of ordinary description which is provided with a magazine for storing additional stock, devices for selecting and advancing a new bar of stock into the machine, and a timing device including a timing rack bar which is controlled from the old bar and is arranged to act automatically upon the exhaustion of the old bar to set in operation the devices for selecting and positioning a new bar in the machine. Mechanism of this general character, as thus far described, is fully described and illustrated in the applicant's prior Patent No. 1,877,693, dated September 13, 1932, and copending application Serial No. 674,540, filed June 6, 1933.

In accordance with the present invention, a separate electric motor is provided for operating the new bar selecting and feeding devices, to-

gether with novel and improved control devices therefor which are arranged to secure a high degree of accuracy and precision in the operation of the replenishing mechanism upon the exhaustion of the old bar to advance the leading end of the new bar into operating position in the machine.

The motor control herein introduced is constructed and arranged to permit the elimination of the feed cam and clutching devices of the prior patent and application above referred to, and serves to greatly simplify and improve the operation of the device.

With the construction herein disclosed, the advance of the timing rack bar is arranged to close a starting switch for the motor, which in turn immediately starts the advance of the feeding device to advance a new bar into the machine. The advancing movement of the feed bar and pusher causes the selecting device to operate to position the new bar in the path of the pusher. With the present construction there is also provided a measuring device which is rendered operative by engagement with the leading end of the new bar and acts after the leading end of the new bar has been advanced to an exactly predetermined position in the machine, to reverse the motor, so that the feeding mechanism and associated parts including the timing rack bar are returned to their normal inoperative positions, when the motor is again stopped.

Referring specifically to the drawings, an automatic screw machine of ordinary description is generally indicated at 20 in Fig. 1. In order to permit new bars of stock to be fed automatically into the machine, a guideway comprising a long supporting member 24 having a groove 26 adapted to receive a single piece of stock is provided in alignment with the feed tube 28 of the machine. The magazine is mounted directly above the supporting member 24, and comprises a series of narrow frames 30 for supporting the bar stock along its length, which are adapted to hold a single series of bars one above the other. This column of reserve bars is supported by a long narrow plate 32 which normally closes the lower end of the magazine. The plate 32 is mounted on a flat bar 34 which is in turn secured to the corresponding arms 36 of a series of similar yokes 38 rigidly mounted on a rock shaft 40 beneath the supporting member 24, so that by rocking the shaft to the left as viewed in Fig. 2, the plate 32 may be removed to permit a new bar to drop into the guideway 26. At the same time the flanges 42 formed on the remaining arms of the yokes 38 are inserted between the lowest bar and the remaining bars in the magazine to support the column as the plate 32 is removed to release the bottom bar. A compression spring 44 supported at one end by the machine frame and at the other end against one of the yokes 38 tends to rock the shaft 40 to the right as illustrated in Fig. 2 to close the magazine.

The new bar is moved along the guideway 26 into operating position in the spindle by means of a feed pusher 46 which is rigidly secured to an arm 48 on the feed slide bar 50, and is adapted to engage with the rear end of a new piece of bar stock. An arm 52 provided with a slot to receive the bar is mounted on the feed slide 50 adjacent to the arm 48 to insure that the end of the bar registers with the feed pusher 46.

With the construction herein disclosed, the shaft 40 is rocked against the pressure of the spring 44 to cause a piece of stock to be selected

and dropped into the guideway 26 at the beginning of the advancing movement of the feed rod 50 by means of a dog 54 (see Fig. 3) which is pivotally supported at 56 on a cross head or bracket 58 on the forward end of the feed bar 50, and carries a cam roll 60 arranged for engagement with a cam 62 supported on one of the yokes 38. The dog 54 is normally held in an upright position against a fixed stop 64 by means of a spring 66 which is rigidly secured to the cross head 58 and is arranged to bear against the leading side of the dog 54. With this arrangement of parts it will readily be seen that the forward movement of the feed rod 50 and cross head 58 will cause the cam roll 60 to engage with the cam surface 62 to rock the shaft 40 and yokes 38 against the pressure of the spring 44 to select and position a new bar in the guideway 26. During the reverse movement of the feed rod 50 and cross head 58 to starting position, the dog 54 is permitted to swing about its pivot 56 against the pressure of the spring 66 to prevent a second rocking movement of the shaft 40 at this time.

With the construction herein disclosed, the advancing and return movement of the feed rod 50 and associated parts to position a new bar in the machine, are controlled by means of an electric motor 68 and associated driving connections including a worm 70 mounted on the armature shaft 72 of the motor 68, a worm gear 74 which is rigidly secured to a cross shaft 76 to mesh with the worm 70, and a pinion 78 also mounted on the cross shaft 76 to mesh to mesh with a rack 80 formed on the under side of the feed rod 50.

The replenishing mechanism herein disclosed is rendered operative upon the exhaustion of a bar feeding in the machine, to place a new bar in operating position by mechanism controlled from the old bar as in the applicant's patent and pending application above referred to, and comprising briefly a drop lever 84 which is pivotally mounted at 86 on the machine frame to extend across the bar in the machine at the rear end of the feed tube 28, and in turn supports one end of a lever 88 which extends at right angles to the drop lever 84, and is mounted on a fixed pivot 90. The downward movement of the drop lever 84 and the corresponding movement of the lever 88 about its pivot 90 as the end of the old bar passes from under the drop lever, is arranged to set in motion a timing rack bar 92, which is given a step-by-step advancing movement with the completion of each successive article from the old bar. The rack bar 92 is advanced by means of a pawl 94 which is pivoted to the end of a short vertically situated lever (not shown) connected by means of a link 98 to the chuck lever 100, so that the pawl is reciprocated with each reciprocating movement of the chuck lever 100 to clamp the stock in the spindle and to release it with each feeding movement.

During the normal operation of the machine, the drop lever 84 and the forward end of the lever 88 are held in raised position by engagement with the bar feeding in the machine, so that the rear end of the lever 88 is held in contact with the tail piece 102 on the reciprocating pawl 94 to hold it out of contact with the rack bar 92. As the end of the bar being fed into the machine passes from under the drop lever 84, the drop lever 84 and lever 88 are permitted to fall, thus raising the rear end of the lever 88, so that

the pawl 94 is engaged with and imparts a step-by-step movement to the rack bar 92.

The rack bar, as fully described in the prior patent referred to, is arranged to advance to a final limiting position in which the dogs 104 and 106 mounted on the rack bar will engage respectively with the starting and stopping lever 108 to disengage the machine clutch, and with a lever arm 110 to cause the stock stop for the machine to be held out of operating position to permit the ejection of the waste end of the old bar. There is also mounted on the rack bar 92 a dog 112 which is arranged as the rack bar 92 approaches the limit of its advancing movement to engage with and depress a control lever 113 to close a starting switch 114 for the motor 68 to start the advance of the feed bar 50 and pusher 46.

With the present construction, the timing rack bar 92 is arranged to set in operation the replenishing mechanism for selecting and advancing a new bar into the machine during the continued operation on the old bar, and more specifically to cause the leading end of the advancing new bar to be brought into engagement with and eject the waste end of the old bar immediately after the completion of the last operation thereon, to reduce so far as possible the amount of time lost in substituting one bar for another feeding in the machine. This mode of operation of the parts is substantially that of the mechanism disclosed in the applicant's copending application Serial No. 674,540, filed June 6, 1933.

The mechanism for returning the drop lever 84 to its raised position to permit the passage of the new bar therein, and for moving the pawl 94 to inoperative position as the timing rack bar reaches the limit of its advancing movement, are substantially similar to those set forth in the applicant's copending application above referred to. There is formed on the drop lever 84, a pin 116 which is arranged in the path of a cam surface 115 formed on the arm 36 of one of the yokes 38 (see Fig. 4), so that the rocking movement of the shaft 40 and yokes 38 to select and place a new bar in the guideway 26, causes the drop lever 84 and lever 88 to be returned to their normal raised position, where they are held by engagement of a small pivoted support 117 with a laterally extending plate 118 on the drop lever 84. In order to prevent the disengagement of the pawl 94 until the timing rack bar 92 reaches the limit of its advancing movement, the lever 88 is mounted for lateral movement on its pivot 90, and is moved out of alignment with the tail 102 of the pawl 94, prior to the resetting of these parts, against the pressure of a small spring (not shown) by the engagement of the detent 117 on the advancing rack bar 92 with a cam-shaped plate 119 on the lever 88. The lever 88 is subsequently held out of alignment with the pawl 94 by the lateral engagement of the rear end of the lever with the tail of the pawl. In order to disengage the pawl as the rack bar reaches the limit of its advancing movement, there is also mounted integrally with the pawl 94, an arm 120 which is arranged for engagement with a plate (not shown) on the rack bar 92 as the rack bar reaches the limit of its advancing movement which rotates the pawl so that the lever 88 is permitted to return laterally to its normal position overlying the tail 102 of the pawl.

To further insure the maintenance of the drop lever 84 and lever arm 88 in their raised inoperative positions to permit the advance of a

new bar into the machine, and during the retracting movement of the timing rack bar 92 with the feed slide 50 to its normal inoperative position, an arm 121 is provided which is arranged to overlie the lever 88, and is secured at its lower end to a rock shaft 122. During the normal operation of the machine, the arm 121 is held out of contact with the lever arm 88 by the engagement of an upwardly extending cam lever 127 on the rock shaft 122 with a surface formed on the under side of the cross head 58. However, when the replenishing mechanism is thrown into operation, the advancing movement of the feed bar 50 and cross head 58 causes the cam lever 127 to ride out from under the cross head 58, so that the rock shaft 122 and arm 121 are permitted to rock in a counterclockwise direction as viewed in Fig. 2, to move the lever arm 121 into position over the rear end of the lever 88. The parts are maintained in this position during the subsequent advance and return of the feed bar 50 until the cam lever 127 is again engaged under the cross head 58 as the feed lever 50 and cross head return to their initial starting positions shown in Fig. 1.

In accordance with a principal feature of the present invention, mechanism is provided which is controlled by engagement with the leading end of the new bar, and operates to reverse the motor and return the feed bar 50 and pusher 46 to starting position when the leading end of the new bar has been advanced to an exactly predetermined operating position in the machine. This mechanism for controlling the advance of the new bar into the machine, comprises a control rod 123 which extends parallel to the feed rod 50, and is journaled to slide in a bearing 124 formed in the machine frame, and in a bearing 125 formed in the cross head or bracket 58. At its forward or right hand end as shown in Fig. 6, the control rod 123 is provided with a bracket 126 with a forked portion 128 which extends into engagement with an axially movable switch rod 130. The control rod 123 is arranged for axial movement through a predetermined length of travel between two limiting positions which are determined by the engagement of the fork 128 at one end of its travel with a motor switch reversing dog 134 supported on the switch rod 130 and at the other end of its travel with a motor switch stop dog 132 also mounted on the switch rod 130. During the normal operation of the machine the control rod 123 is maintained in a fully retracted position with the fork 128 in contact with the stop dog 132. There is also mounted on the switch control rod 130, a switch control member 136 which is arranged for engagement with one of two arms of a switch lever 138 of a reversing and stopping switch 140 for the electric motor 68. This mechanism is constructed and arranged so that an advancing movement of the control rod 123 to the right from the normal retracted position shown in Fig. 1, will bring the fork 128 into engagement with the dog 134, moving the switch rod 130 and dog 136 to the right, and causing the switch lever 138 to be shifted from its normal stop to reverse position. A subsequent return movement of the control rod 123 to the left will cause the fork 128 to engage with the dog 132 to move the switch control rod 130, so that the dog 136 is caused to engage with the other arm of the switch lever 138 to return the switch to its stop position.

In order to cause the motor 68 to be reversed when the leading end of the new bar has been advanced to a predetermined operating position

in the machine, mechanism is provided which is arranged during the advancing movement of the feed bar 50 and pusher 46 and when the leading end of the new bar has been advanced to a predetermined position, to connect the control rod 123 to move with the cross head 58, so that the reversing switch 140 will be actuated to reverse the direction of motor drive after a further predetermined advance of the feed rod 50, during which the control rod 123 will have been advanced through a distance which is substantially equal to the distance between the dogs 132 and 134 on the switch rod 130 to bring the fork 128 into engagement with the motor reversing dog 134.

The mechanism for locking the control rod 123 to move with the cross head 128 comprises a clutch member 144 in the form of a sleeve screw-threaded to the sleeve bearing 125 for the rod 123, and having formed thereon an internal cone-shaped cam clutching surface, clutch rolls 146 interposed between the clutch surface 144 and the rod 123, and a sleeve 148 loosely mounted on the shaft 123 within an enlarged portion of the bearing 125, and perforated to receive the clutch rolls 146. A compression spring 150 coiled about the control shaft 123 between a shoulder formed in the bearing 125 and one end of the sleeve 148, tends normally to force the clutch rolls 146 into clutching engagement between the clutch surface 144 and the periphery of the shaft 123. During the normal operation of the machine, the clutch sleeve 148 is held in an inoperative position to the right against the pressure of the spring 150, as shown in Fig. 6, by means of a spring-pressed detent pin 152 mounted in the cross head 58 and engaged by one arm of an arcuate-shaped lever 156 pivoted at 158 on the cross head 58. At its other end the lever 156 is pivotally connected to the armature 160 of a solenoid 162 supported on a bracket 164 on the cross head 58. A tension spring 166 connected at one end to the lever arm 156 and at its other end to a pin 168 on the under side of the cross head 58, tends normally to swing the lever 156 about its pivot to allow the detent pin 152 to remain in locking engagement with a groove 170 formed in the periphery of the clutch sleeve 148.

With this construction and arrangement of the parts as thus far described, it will be seen that the clutch sleeve 148 and rolls 146 are normally held in an inoperative position to permit a free sliding movement of the cross head 58 with relation to the control rod 123.

In order to connect the control rod 123 to move with the feed bar 50 and cross head 58 at a predetermined point in the advancing movement of the leading end of the new bar, a controller member 174 secured to a pivot shaft 176 on a stationary portion of the machine, is arranged to extend into the path of the leading end of the new bar, and is arranged upon engagement therewith to trip a toggle actuated switch 178 to close the circuit through the solenoid 162. The energizing of the solenoid 162 causes the armature shaft 160 to be moved to the left as shown in Fig. 2, to swing the lever 156 about its pivot and withdraw the detent pin 152 to permit the clutch sleeve 148 and clutch rolls 146 to move under the pressure of the spring 150 into locking position. The switch 178 comprises a contact member which is supported on an axially movable shaft 180 and is normally held in raised open position by means of a compression spring 182 coiled about the switch plunger 180 between a collar 184 on the plunger and the upper por-

tion of the switch casing. The position of the switch plunger 180 is controlled by means of a toggle connection including a link 186 secured to the pivot shaft 176 and a link 188 which is connected at one end to the link 186 and at its other end to the upper end of the plunger 180. From an inspection of Figs. 7 and 9, it will be seen that for the broken position of the toggle illustrated in Fig. 9, and with the controller member 174 in operating position in the path of the leading end of the new bar, the plunger 180 and switch contact arm 178 will be maintained in a raised inoperative position under the pressure of the spring 182. The engagement of the leading end of the new bar with the controller lever 174 will then operate to swing the controller member 174 and pivot shaft 176 in a counterclockwise direction to straighten the toggle into the position shown in Fig. 7 to close the switch contacts 178, at the same time swinging the controller member 174 out of the path of the new bar. The toggle is broken automatically during the operation of selecting and placing a new bar in the guideway 26, to swing the controller member 174 into operating position in the path of the leading end of the new bar and to open the switch 178, by means of a cam-shaped member 190 which is formed on an upwardly extending lever arm 192 rigidly secured to the forward end of the rock shaft 40 above described. The engagement of the dog 54 with the cam 62 to rock the yokes 38 and rock shaft 40 to select and place a new bar in the machine, causes the lever arm 192 to be moved in a counterclockwise direction as shown in Fig. 4, to engage the cam 190 with the toggle link 186 (see Fig. 8), to move the toggle to the broken position of Fig. 9. The lever arm 192 and cam 190 are then returned to the normal stationary position with the return movement of the rock shaft 40 and yokes 38.

The solenoid 162 is de-energized to release the detent pin 152 upon the reversal of the motor 68 through the operation of switch connections in the solenoid circuit hereinafter to be described. The clutch rolls 146, however, will tend to remain in gripping position during the return movement of the feed bar 50 and cross head 58 until further movement of the measuring rod 123 with the cross head 58 is checked by the engagement of the notched portion 128 of the bracket 126 with the stop dog 132 on the switch rod 130. The continued movement of the cross head 58 to the left as shown in Fig. 6 now causes the clutch sleeve 148 to move into engagement with a spring-pressed collar 194 supported on the shaft 123 to move the sleeve 148 against the pressure of its spring 150 so that the detent pin 152 is again permitted to move into locking engagement with the groove 170. The collar 194 is slidably mounted on the shaft 123 for axial movement between limits determined by the engagement of a stop screw 195 on the collar 194 with a slot 196 in the shaft 123. A compression spring 197 coiled about the shaft 123 between the collar 194 and a collar 198 rigidly secured to the shaft, tends normally to maintain the collar 194 in the advanced position illustrated in Fig. 6, and serves as a buffer to delay and to cushion the operation of the control rod 123 and bracket 126 to actuate the stop dog 132 during the continued travel of the feed bar 50 and cross head 58 to their initial starting position.

It will be seen from the foregoing description, that the switch 178 is normally closed, being moved to open position only prior to the beginning

of the operation of placing a new bar in the machine, and thereafter being again closed to energize the solenoid 162 upon the engagement of the leading end of the new bar with the controller member 174. Cooperating with the switch 178 and connected in series therewith is a second switch 200, which is maintained in open position during the normal operation of the machine to wholly disconnect the solenoid circuit, and is closed only at the beginning of the advancing movement of the feed bar 50 after the toggle switch 178 has been moved to open position, so that the subsequent closing of the switch 178 by the engagement of the controller member 174 with the leading end of the new bar can operate to energize the solenoid 162. The operation of the switch 200 is controlled by the rocking movement of the shaft 122 above described during the advancing and retracting movements of the feed bar 50. The switch 200 comprises a contact member which is mounted on an axially movable plunger 202 supported in a switch casing 204. A compression spring 206 coiled about the plunger between a collar on the upper end thereof and the switch casing 204, tends to maintain the plunger 202 and the switch member 200 in a raised closed position. During the normal operation of the machine, the switch 200 is maintained in a depressed open position against the pressure of its spring 206 by the engagement of an arm 208 on the rock shaft 122 with the upper end of the plunger 202. Upon the beginning of the advancing movement of the feed bar 50 and cross head 58, the rocking movement of the shaft 122 in a counterclockwise direction when the cross head passes out of engagement with the cam lever 127, permits the plunger 202 and switch 200 to be raised under the pressure of its spring 206 to engage the switch which is then maintained in closed position during the advancing and retracting movement of the feed bar 50 until the cross head 58 upon its return movement is again moved into engagement with and depresses the lever arm 127.

The operation of the replenishing mechanism above set forth, to place a new bar in operating position in the machine, may be best explained in connection with the diagram of the electrical connections (Fig. 10). As shown in the diagram, power is supplied to the motor 68 through a three phase power line 230 and a main power switch 232. The motor may be driven in reverse directions by means of a main reversing switch which comprises feed switch contactors 234 marked with the word "In" on the diagram, and connected to operate as a unit under the influence of a coil 238, and reversing or return switch contactors 236 designated on the diagram by the word "Out", and connected to operate as a unit under the influence of a coil 240. The operation of the main reversing switch is in turn controlled through an electrical circuit which includes the starting switch 114 and the reversing and stopping switch 140 above referred to, together with two auxiliary stopping and restarting switches 214 and 220 hereinafter more fully to be described. The starting switch 114 and auxiliary stop switch 214 are connected in series to the coil 238 for the In switch, and to one terminal of the reversing and stopping switch 140. The restarting switch 220 is connected in parallel to switches 114 and 214 between the same points. Another terminal of the reversing and stopping switch 140, is connected through a lead 246 to the coil 240 of the main Out switch 236. The electrical diagram also includes a control cir-

cuit for the solenoid 162 which is connected across one of the contactors of the feeding or In switch 230, so that this circuit will be rendered operative only upon the closing of the feeding or In switch 234, and will be automatically disconnected when the relay coil 238 for the switch 234 is de-energized.

During the normal operation of the machine the main power switch 232 will be closed, the remaining switches of the electrical circuits illustrated, however, being in the normally inoperative positions shown in Fig. 10, with both of the coils 238 and 240 de-energized to disconnect the motor 68.

The passing of the old bar from under the drop lever 84 operates to release the reciprocating pawl 94 and to start the advance of the timing rack bar 92 as in the applicant's prior patent above referred to. After a predetermined additional number of operations to cut off finished articles from the old bar, the advancing movement of the timing rack bar 92 will cause the abutment 112 to engage with and trip the switch lever 113 to close the starting switch 114, thus completing a circuit through the coil 238 to close the switch contactors 234 and set the replenishing mechanism in operation. The contactor 234 in the circuit for the solenoid 162 is closed, but the solenoid is not at this time energized since the switch 200 is still open.

At this point it may be pointed out that the advance of the timing rack bar 92 is continued, during the operation of the replenishing mechanism to select and advance a new bar, until the abutments 104 and 106 thereon are brought into engagement respectively with the starting and stopping lever 108 and arm 110 to stop the machine and to hold the stock stop in raised inoperative position. With the present construction, these operations are timed so that the last article will have been completed and the machine stopped before the leading end of the new bar is brought into engagement with and ejects the waste end of the old bar. This mode of operation is similar to that set forth in applicant's copending application Serial No. 674,540, above referred to.

The starting of the motor 68 causes the feed bar 50 carrying with it the pusher member 46 and cross head 58 immediately to begin its advancing movement, so that the roll 60 on the lever arm 54 is brought into engagement with the cam 62 to rock the shaft 40 and yokes 38 to select and place a new bar in the guideway 26 in the path of the advancing pusher 46. The rocking of the shaft 40 also acts through the engagement of the cam-shaped member 190 on the lever arm 192 with the toggle link 186 to straighten the toggle and open the switch 178 in the circuit to the solenoid 162, and at the same time to position the controller member 174 in the path of the advancing new bar. The continued advancing movement of the feed bar 50 now causes the upper end of the cam lever 127 to ride out from under the cross head 58, causing the shaft 122 to be rocked in a counterclockwise direction as shown in Figs. 2 and 10, raising the switch lever 208 to permit the closing of the switch 200 in the solenoid circuit. As previously pointed out, the rocking of the shaft 122 acts also to position the detent lever arm 120 over the rear end of the pawl control lever 88 to maintain the rear end of this lever arm in a depressed position during the advancing and retracting movement of the feed bar 50 to position a new bar in the machine and to return the timing feed rack 92 to its initial starting position.

The continued advance of the feed bar 50 causes the pusher 46 to be brought into engagement with the rear end of the new bar to start the advance thereof into the machine. The leading end of the new bar now moves into contact with the controller member 174, causing the toggle links 186 and 188 to be straightened, and closing the toggle actuated switch 178 to complete an electrical circuit through the solenoid 162. The energizing of the solenoid 162 in turn acts to withdraw the detent pin 152 to permit the clutching of the timing rod 123 to move with the cross head 58 as above described. The continued advance of the feed bar 50 and cross head 58 carrying with it the timing rod 123, will now cause the forked portion 128 on the timing rod 123 to be brought into engagement with the switch dog 134 to move the switch 140 to reverse position, and to start the return movement of the feeding devices after the leading end of the new bar has been advanced through a predetermined distance from the point of contact with the controller member 174. Referring again to the electrical diagram (Fig. 10), the movement of the switch 140 to reverse position, disconnects the circuit through the coil 238, and at the same time connects an alternative circuit through the coil 230 to close the contactors 236, and thus to reverse the direction of drive of the motor 68. The disconnecting of the In switch contactors 234 acts automatically to break the circuit to the solenoid 162.

During the return movement of the feed rod 50 to its original position, the timing rack bar 92 is also withdrawn to its initial starting position by means of a latch mechanism which is not here shown, inasmuch as this is substantially similar to that shown in the applicant's prior patent above referred to. The retracting movement of the rack bar 92 carrying with it the abutment 112, releases the lever arm 113 to permit the disengagement of the switch 114.

During the return movement of the feed bar 50 and cross head 58, the measuring rod 123 is carried therewith by the frictional engagement of the clutch balls 146 with the rod 123 under the pressure of their spring 150 until further movement of the rod 123 is checked by the engagement of the forked portion 128 of the bracket 126 with the stop dog 132 on the switch control rod 123. At this point the continued movement of the cross head 58 causes the clutch sleeve 148 to move into engagement with the spring-pressed collar 194 on the timing rod 123, causing the clutch sleeve 148 and clutch balls 146 to be moved relatively to the right as shown in Fig. 6, against the pressure of their spring 150, so that the detent pin 152 is permitted to drop into locking engagement with the recess 170 in the clutch sleeve 148, to lock the clutch out of operation. The continued movement of the feed bar 50 and cross head 58 serves to compress the spring 197, while at the same time the movement of the switch rod 130 to the left with the stop dog 132 moves the reversing and stopping switch 140 back to its initial stop position, as shown in Fig. 10, to de-energize the coil 240 and disengage the out-switch contactors 236. Inasmuch as the switch 114 has previously been disengaged, the coil 238 is not again energized, and the motor 68 is left in stop position.

As the feed bar 50 and cross head 58 near the limit of their retracting movement, the rock shaft 122 is again moved in a clockwise direction as shown in Figs. 2 and 10, by the engagement of the

arm 127 with the under side of the cross head 58 to depress the switch arm 208, and return the switch 200 of the solenoid circuit to its normally inoperative open position.

In order to provide for an operating condition where the time required to select and advance a new bar into operating position in the machine is less than that required for the fashioning and cutting off of a single article on the bar, an alternative set of controls are provided for starting and stopping the motor, which are arranged to stop the motor when the leading end of the new bar has been advanced to a position adjacent the end of the old bar, and again to start the motor to complete the advancing movement after the completion and cutting off of the last article from the old bar. To this end the switch 214 is provided in series with the switch 114 in the circuit to the coil 238, and a second switch 220 is connected in parallel. During the normal operation of the machine the switch 214 is closed and the switch 220 is in the open position illustrated in Fig. 10. When it is desired to stop and then to continue the advance of the new bar into operating position in the machine, as above described, an upwardly extending switch dog 210 (see Figs. 1, 6 and 10) is mounted in operating position on the control rod 123, and is arranged as the leading end of the new bar reaches a predetermined position adjacent the old bar, to engage with and rock a switch arm 212 which in turn operates to move the switch 214 into open position to de-energize the coil 238 and permit the movement of the In switch contactors 234 to off position, thus stopping the motor 68. The continued advance of the timing rack bar 92 to its extreme forward position to stop the machine and move the stock stop out of operative position, then causes a plate 216 secured to the rack bar to engage with and rock a switch arm 218, thus again energizing the coil 238 through a parallel circuit. The In switch contactors 234 now close to start the motor and continue the feeding of the new bar into operating position, when the motor is reversed and the parts returned to their initial starting position as above described. It may be noted that the retracting movement of the measuring rod 123 causes the dog 210 to again engage with and rock the switch arm 212, thus returning the switch 214 to its normal closed position. Similarly, the retracting movement of the timing rack rod 92 causes the plate 216 to ride out of engagement with the switch 218, permitting return of the switch 220 to open position under the pressure of its spring.

The invention having been described, what is claimed is:—

1. In a machine for fashioning articles successively from bar stock, the combination with means for feeding bar stock to present successive portions to the work engaging tools, of a replenishing mechanism including a feed member for advancing a new bar into operating position in the machine, means for actuating said feed member to advance a new bar, control means actuated by the leading end of the new bar upon movement thereof past a predetermined point in the machine, and connections controlled thereby for arresting the operation of said actuating means and feed member upon movement of the leading end of the new bar to a predetermined operating position in the machine.

2. In a machine for fashioning articles successively from bar stock, the combination with

means for feeding bar stock to present successive portions to the work engaging tools, of a replenishing mechanism including a feed member for advancing a new bar into operating position in the machine, electrical devices for actuating said feed member to advance a new bar into the machine, control means actuated by the leading end of the new bar upon movement thereof past a predetermined point in the machine, and connections controlled thereby for controlling the operation of said electrical devices to arrest the advancing movement of said feed member upon movement of the leading end of the new bar to a predetermined operating position in the machine.

3. In a machine for fashioning articles successively from bar stock, the combination with means for feeding bar stock to present successive portions to the work engaging tools, of a replenishing mechanism including a feed member for advancing a new bar into operating position in the machine, means for actuating said feed member to advance a new bar, a controller member arranged to engage with the leading end of the advancing new bar, and means controlled by the operation of said controller member for arresting the advance of the feed member upon movement of the leading end of the new bar to a predetermined operating position in the machine.

4. In a machine for fashioning articles successively from bar stock, the combination with means for feeding bar stock to present successive portions to the work engaging tool, of a replenishing mechanism including a feed member for advancing a new bar into operating position in the machine, electrical devices for actuating said feed member to advance a new bar into the machine, a controller member arranged to engage with the leading end of the advancing new bar, and means actuated by the operation of said controller member for controlling the operation of said electrical devices to arrest the advancing movement of said feed member upon movement of the leading end of the new bar to a predetermined operating position in the machine.

5. In a machine for fashioning articles successively from bar stock, the combination with means for feeding bar stock to present successive portions to the work engaging tools, of a replenishing mechanism including a feed member for advancing a new bar into operating position in the machine, mechanism for actuating said feed member to advance a new bar into the machine, a controller member arranged to engage with the leading end of the advancing new bar, and means controlled by the operation of said controller member to arrest the operation of said mechanism and feed member upon movement of the feed member and leading end of the new bar engaged thereby through a predetermined distance beyond the point of engagement of the bar with said trip member.

6. In a machine for fashioning articles successively from bar stock, the combination with means for feeding bar stock to present successive portions to the work engaging tools, of a replenishing mechanism including a feed member for advancing a new bar into operating position in the machine, electrically operated devices for actuating said feed member to advance a new bar into the machine, a controller member actuated by engagement with the leading end of the new bar during said advancing movement, and means controlled by the operation of said controller member for controlling the operation of said elec-

trical devices to arrest the advancing movement of the new bar and feed member upon movement of the leading end of the new bar a predetermined distance beyond the point of engagement with the controller member.

7. In a machine for fashioning articles successively from bar stock, the combination with means for feeding bar stock to present successive portions to the work engaging tool, of a replenishing mechanism including a feed member for advancing a new bar into operating position in the machine, a controller member arranged to engage with the leading end of the advancing new bar, a measuring device rendered operative by the engagement of said controller member with the leading end of the new bar to arrest the advance of said feed member and new bar upon movement of the leading end of the new bar a predetermined distance beyond the point of engagement of the controller member therewith.

8. In a machine for fashioning articles successively from bar stock, the combination with means for feeding bar stock to present successive portions to the work engaging tool, of a replenishing mechanism including a feed member for advancing a new bar into operating position in the machine, electrically operated devices for actuating said feed member to advance a new bar into the machine, a controller member arranged to engage with the leading end of the advancing new bar, a trip member, a control member rendered operative by the engagement of said controller member with the leading end of the new bar to advance with said feed member and bar, and means rendered operative upon movement of said control member through a predetermined distance for controlling the operation of said electrical devices to arrest the advancing movement of the feed member and new bar.

9. In a machine for fashioning articles successively from bar stock, the combination with means for feeding bar stock to present successive portions to the work engaging tools, of a replenishing mechanism including a feed member for advancing a new bar into operating position in the machine, devices including an electric motor for actuating said feed member to advance a new bar into the machine, mechanism rendered operative upon the exhaustion of the old bar feeding in the machine to start said motor, a control member movable through a predetermined distance to arrest the operation of said motor to stop the advance of the feed member and new bar, a controller member arranged to engage with the leading end of the advancing new bar, and means rendered operative by the engagement of said controller member with the new bar to connect said control member to advance with the feed member.

10. In a machine for fashioning articles successively from bar stock, the combination with means for feeding bar stock to present successive portions to the work engaging tools, of a replenishing mechanism including a feed member for advancing a new bar into operating position in the machine, devices including an electric motor for actuating said feed member to advance a new bar into the machine, mechanism rendered operative upon the exhaustion of the old bar feeding in the machine to start said motor, a control member movable through a predetermined distance to arrest the operation of said motor to stop the advance of the feed member and new bar, a toggle switch arranged to be closed by the engagement

of the leading end of the advancing new bar therewith, and a solenoid energized by the operation of said toggle switch to connect the control member to advance with the feed member.

11. In a machine for fashioning articles successively from bar stock, the combination with means for feeding bar stock to present successive portions to the work engaging tools, of a replenishing mechanism including a feed member for advancing a new bar into operating position in the machine, devices including an electric motor for actuating said feed member to advance a new bar into the machine, mechanism controlled from the old bar feeding in the machine to start said motor, and connections including a toggle operated switch arranged to engage with the leading end of the advancing new bar to arrest the operation of said motor to stop the advance of the feed member and new bar upon movement of the leading end of the new bar to a predetermined operating position in the machine.

12. In a machine for fashioning articles successively from bar stock, the combination with means for feeding bar stock to present successive portions to the work engaging tools, of a replenishing mechanism including a feed member for advancing a new bar into operating position in the machine, devices including an electric motor for actuating said feed member to advance a new bar into the machine, mechanism rendered operative upon the exhaustion of the old bar feeding in the machine to start said motor, a reversing switch for the motor, a control member movable through a predetermined distance to engage with and trip said reversing switch, a controller member arranged to engage with the leading end of the advancing new bar, and means rendered operative by the engagement of said controller member with the new bar to connect said control member to advance with the feed member.

13. In a machine for fashioning articles successively from bar stock, the combination with means for feeding bar stock to present successive portions to the work engaging tools, of a replenishing mechanism including a feed member for advancing a new bar into operating position in the machine, devices including an electric motor for actuating said feed member to advance a new bar into the machine, mechanism rendered operative upon the exhaustion of the old bar feeding in the machine to start said motor, a control member having a predetermined rest position and arranged for movement therefrom through a predetermined position, means rendered operative upon movement of the leading end of the new bar past a predetermined point to connect said control member to move with the feed member and advancing new bar, and means actuated by the movement of said control member to the end of said predetermined distance to arrest the operation of said motor to stop the advance of the feed member and new bar.

14. In a machine for fashioning articles successively from bar stock, the combination with means for feeding bar stock to present successive portions to the work engaging tools, of a replenishing mechanism including a feed member for advancing a new bar into operating position in the machine, devices including an electric motor for actuating said feed member to advance a new bar into the machine, mechanism rendered operative upon the exhaustion of the old bar feeding in the machine to start said motor, a control member having a predetermined rest position and arranged for movement therefrom through

a predetermined position, means rendered operative upon movement of the leading end of the new bar past a predetermined point to connect said control member to move with the feed member and advancing new bar, a reversing switch rendered operative by the movement of said control member to the end of said predetermined distance to reverse said motor to retract said feed member and control member, and a stop switch actuated by the return of said feed member to starting position to disconnect the motor.

15. In a machine for fashioning articles successively from bar stock, the combination with means for feeding bar stock to present successive portions to the work engaging tools, of a replenishing mechanism including a feed member for advancing a new bar into operating position in the machine, devices including an electric motor for actuating said feed member to advance a new bar into the machine, mechanism rendered operative upon the exhaustion of the old bar feeding in the machine to start said motor, a reversing switch for the motor, a control member movable through a predetermined distance to engage with and trip said reversing switch, means rendered operative by the advance of the leading end of the new bar past a predetermined point in the machine to connect said control member to move with the feed member, and means acting during the return movement of the feed member to return said control member to starting position.

16. In a machine for fashioning articles successively from bar stock, the combination with means for feeding bar stock to present successive portions to the work engaging tools, of a replenishing mechanism including a feed bar, a pusher member secured thereto, an electric motor connected to advance and return said feed bar, mechanism rendered operative upon the exhaustion of the old bar feeding in the machine to start said motor, a reversing and stopping switch control rod, a reversing dog on said rod, a motor stop dog on said rod, a control member to engage said reversing dog, means rendered operative by the advance of the leading end of the new bar past a predetermined point in the machine to connect said control member to advance with the feed rod, and an abutment movable with said feed rod to engage said stop dog upon return of said feed rod to starting position.

17. In a machine for fashioning articles successively from bar stock, the combination with means for feeding bar stock to present successive portions to the work engaging tools, of a replenishing mechanism including a feed member for advancing a new bar into operating position in the machine, devices including an electric motor for actuating said feed member to advance a new bar into the machine, mechanism controlled from the bar being operated upon to start said motor, a switch connection actuated by the advance of the feed member to stop the motor prior to the engagement of the leading end of the new bar with the old bar, a switch connection actuated by said mechanism controlled from the feeding bar to start the motor after the completion of the last article from the old bar, and switch connections for reversing the motor upon movement of the leading end of the new bar into operating position.

18. In a machine for fashioning articles successively from bar stock, the combination with means for feeding bar stock to present successive portions to the work engaging tools, of a replenishing mechanism including a feed member for

advancing a new bar into operating position in the machine, a reversible electric motor connected to drive said feed member, and control means rendered operative by the exhaustion of a bar feeding in the machine for actuating said motor to advance said feed member to position a new bar in operating position in the machine, and thereafter to return the feed member to starting position.

10 19. In a machine for fashioning articles successively from bar stock, the combination with means for feeding bar stock to present successive portions to the work engaging tools, of replenishing mechanism including a feed member for
15 advancing a new bar into operating position in the machine, a reversible electric motor connected to drive said feed member, a magazine, a selecting device, means actuated by the advance of said feed member to select and locate a new
20 bar under the control of said feed member, and control means rendered operative by the exhaustion of a bar feeding in the machine for actuating said motor to advance said feed member to

position a new bar in operating position in the machine.

20. In a machine for fashioning articles successively from bar stock, the combination with means for feeding bar stock to present successive 5 portions to the work engaging tools, of replenishing mechanism including a feed member for advancing a new bar into operating position in the machine, a magazine for storing additional stock, a selector mechanism to select from the 10 magazine and locate a new bar under the control of the feed member, an actuating element for the selector mechanism supported to move with said feed member and rendered operative
15 by the advancing movement of the feed member to select and locate a new bar under the control of said feed member, and means rendered operative by the exhaustion of a bar feeding in the machine for advancing said feed member to position a new bar in operating position in the 20 machine.

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