Dec. 2, 1924.

1,517,971

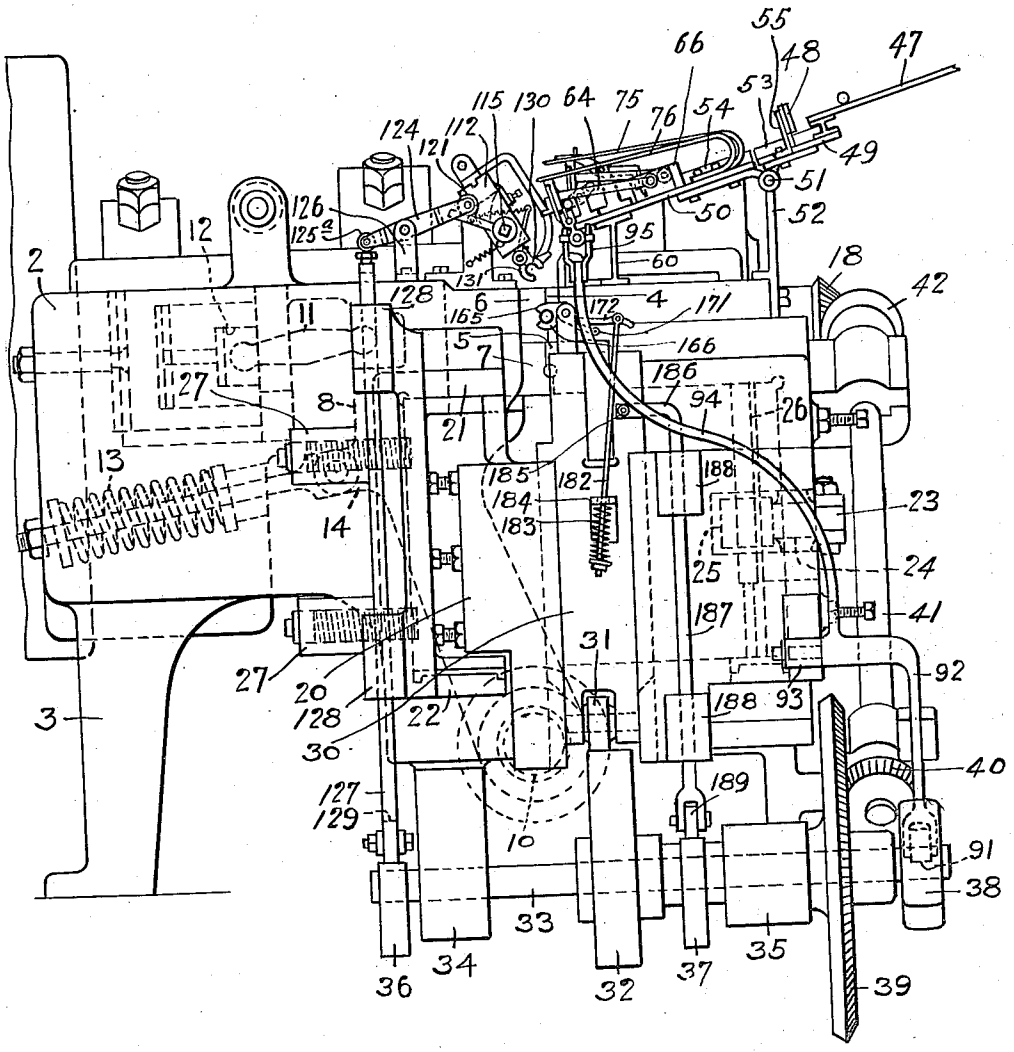
C. FASSINGER

BOLT HEADING MACHINE

Filed Sept. 7, 1923

3 Sheets-Sheet 1

FIG. 1



INVENTOR

Charles Fassinger

By Kay, Tatlow & Brown

Attorneys

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FIG. 2

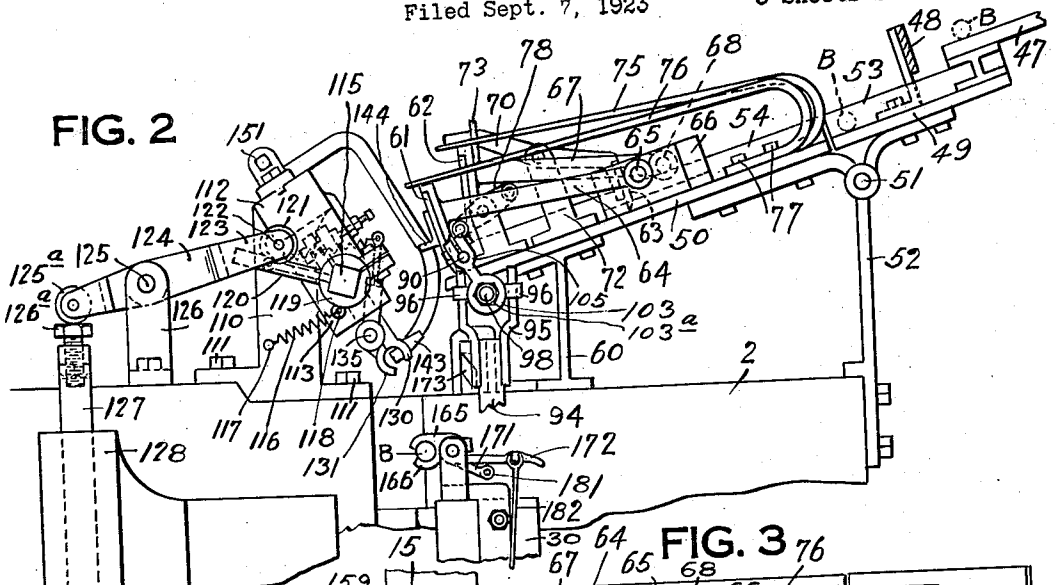
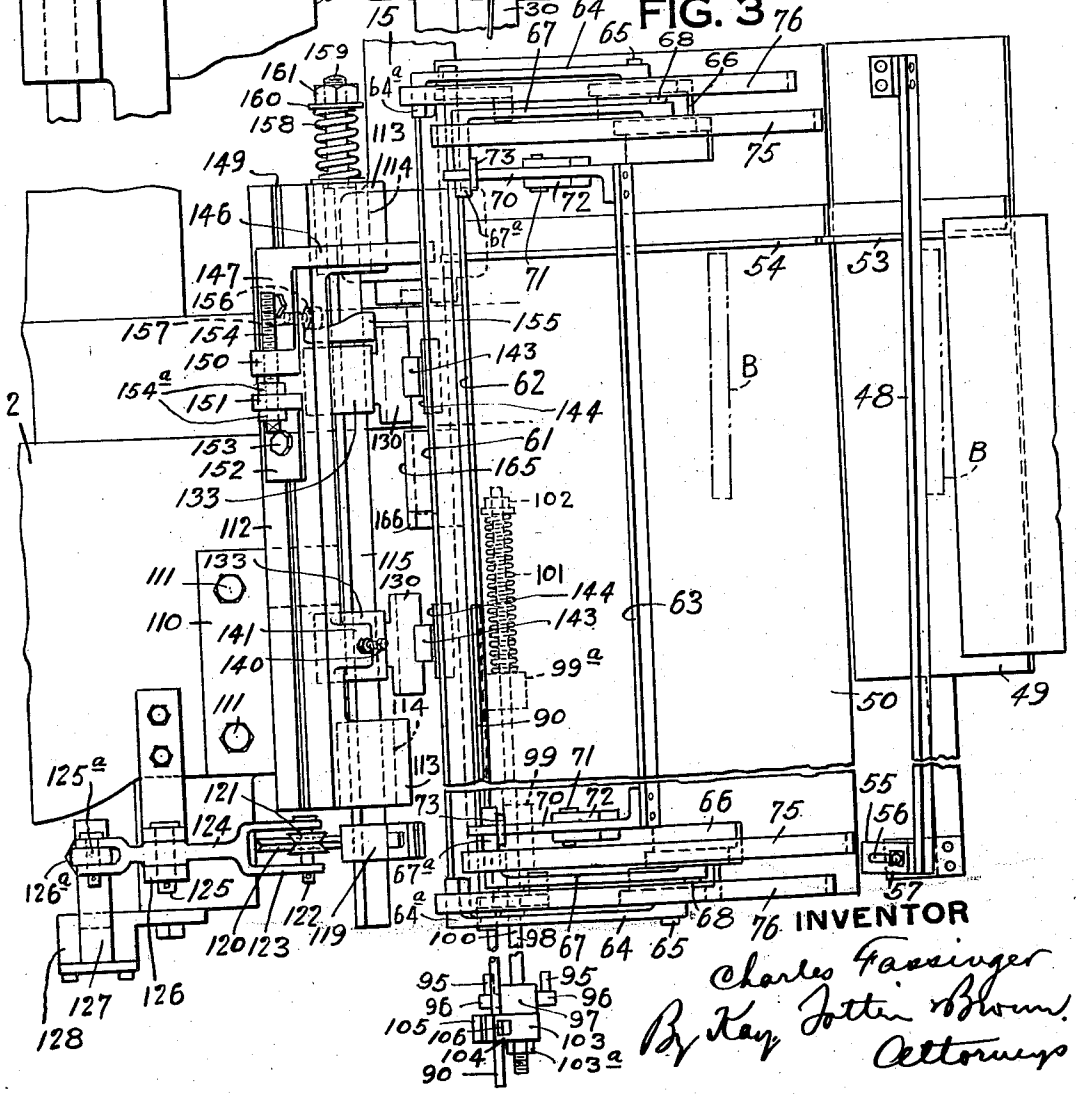


FIG. 3



INVENTOR

Charles Fassinger

By Kay Lotten & Brown

Attorneys

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FIG. 4

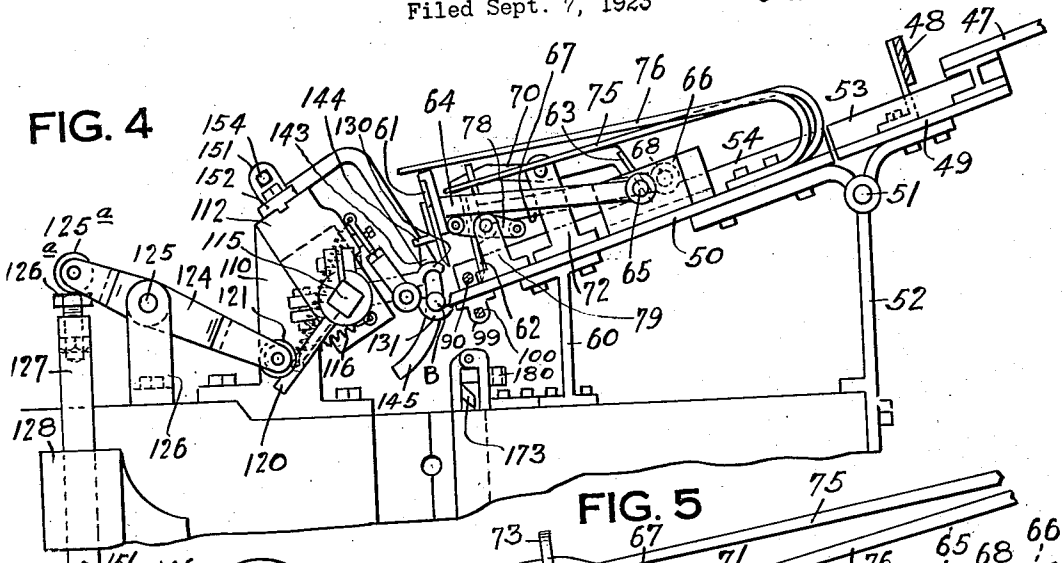


FIG. 5

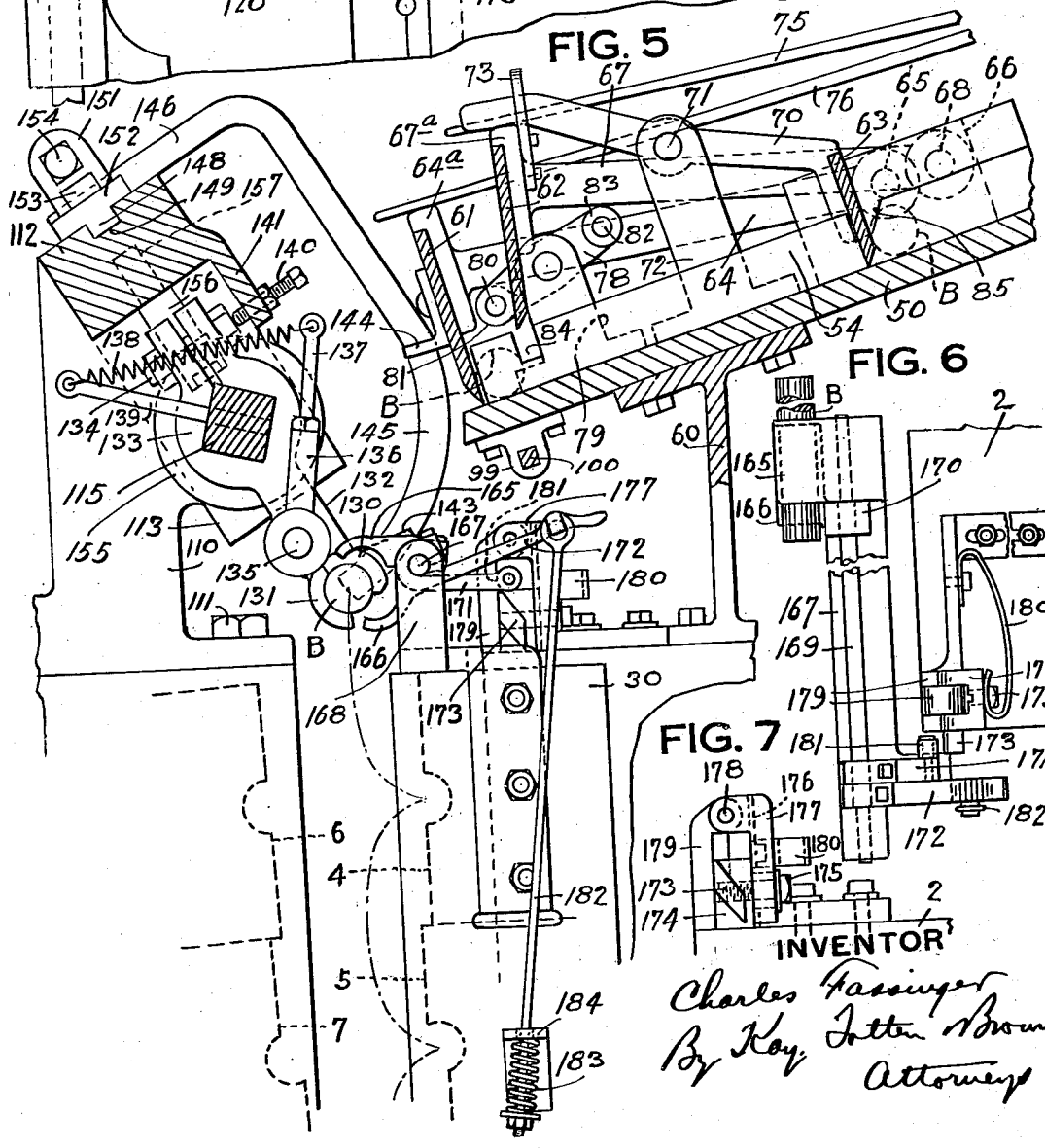


FIG. 6

FIG. 7

INVENTOR

Charles Fassinger

By Kay Totten Brown,

Attorneys

Patented Dec. 2, 1924. 1,517,971

UNITED STATES PATENT OFFICE.

CHARLES FASSINGER, OF CARRICK, PENNSYLVANIA, ASSIGNOR TO OLIVER IRON & STEEL CORPORATION, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

BOLT-HEADING MACHINE.

Application filed September 7, 1923. Serial No. 661,425.

To all whom it may concern:

Be it known that I, CHARLES FASSINGER, citizen of the United States, and resident of Carrick, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Bolt-Heading Machines; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to forging machines for forming heads on bolts or other headed metal bodies, or for performing other forging operations, and it has special reference to work-handling mechanism operating to present blanks in succession to the dies of a metal-heading or other forging machines, to carry the blanks to a plurality of successive passes when the machine has more than one pass, and to thereafter discharge the finished article.

One object of my invention is to provide mechanism of the character indicated which shall be simple and rugged in construction, and which shall operate automatically to bring blanks one by one into proper relation to the forging dies.

Another object of my invention is to provide mechanism of the character indicated which may be constructed as an independent unit, and may be readily applied to existing forging machines.

A further object of my invention is to provide improved means for positioning each blank both lengthwise and angularly in an accurate manner.

A still further object of my invention is to provide improved gripper means for carrying blanks to a series of dies in succession.

A still further object of my invention is to provide a blank-feeding and carrying mechanism with safety means for preventing damage to the machine in case the machinery should be reversed.

Other objects and advantages of my invention will appear from the following description, taken in connection with the accompanying drawings wherein my invention is illustrated as applied to a bolt-heading machine having a roughing pass and a finishing pass. It will be understood that my invention is not restricted to this particular type of forging machine but may be applied equally well to other machines for upsetting blanks or for performing other forging operations.

In the drawings, Fig. 1 is a front elevational view of a bolt-heading machine equipped with my improved feeding and work-handling mechanism; Fig. 2 is an enlarged side elevational view of the feed table, the carrier and the gripper; Fig. 3 is a plan view of the structure shown in Fig. 2; Fig. 4 is a side elevational view similar to Fig. 2 with the parts in another operating position; Fig. 5 is a still further enlargement, partly in side elevation and partly in section on the line 5—5, Fig. 3; Fig. 6 is a plan view of the gripper-opening cam and a portion of the gripper mechanism, and Fig. 7 is a side elevational view of the gripper-opening cam mechanism.

In my application for Letters Patent filed Sept. 23, 1920, Serial No. 412,231, I have described and claimed a machine wherein a blank is automatically brought to a succession of passes by means of a set of grippers which are given a combined vertical and horizontal movement produced by an arrangement of vertical and horizontal slides. The mechanism shown in the present application resembles in many respects the apparatus of my prior application mentioned above, together with improvements and additions not shown in my prior application. These improvements and additions relate particularly to the manner in which the blanks are fed in succession to the machine and are delivered by a transfer mechanism to the grippers which carry them to the forging passes.

In the drawings I have shown, for the purpose of illustrating my invention, the essential parts of a machine which is similar in its construction to existing two-pass bolt-heading machines, and which comprises a frame 2 mounted on suitable standards 3 and provided with a fixed roughing die block 4, a fixed finishing die block 5, a movable roughing die block 6, and a movable finishing die block 7. The movable die blocks 6 and 7 are carried by a die carrier 8 on an arm 9 which rocks upon a horizontal shaft 10. The arm 9 is rocked upon the shaft 10 to reciprocate the die blocks 6 and 7 toward and away from the fixed

blocks 4 and 5 by means of toggles 11 that are operated by means of a slide 12 which is reciprocated by a cam carried by a power shaft, not shown. A spring 13 is connected to a lug 14 on the arm 9 and to a stationary portion of the machine frame and tends to pull the arm 9 to the left as shown in Fig. 1.

The power shaft also carries a crank for reciprocating a heading block 15 which, as shown in Fig. 3, is disposed in line with the dies described above and carries corresponding upsetting dies. The power shaft of the machine also carries a bevel gear wheel 18, Fig. 1, which is employed to actuate a portion of the slide mechanism to be described below.

In order to feed the stock to the machine and to carry the stock through the forging passes, I provide an automatic feeding device, a carrier mechanism, and a gripper mechanism which receives each blank from the carrier and presents the blanks in succession to the dies. The gripper mechanism is somewhat similar to that shown in my prior application for Letters Patent mentioned above and is operated by means of a horizontally movable slide 20 mounted in upper and lower guides 21 and 22 at the front of the machine, this slide being moved horizontally at intervals by means of a bell crank lever composed of arms 23 and 24, this bell crank lever being operated by power derived from the main power shaft of the machine. The arm 24 of the bell crank lever engages a roller 25 carried by a vertical rod 26 which is secured to the slide 20. Two springs are received in stationary seats 27 in the machine frame and bear against the slide 20, tending to force it to the right, Fig. 1, while the bell crank lever 23—24 acts to move the slide 20 to the left, Fig. 1.

The slide 20 carries a vertically movable slide 30 on which is mounted the gripper mechanism which will be described below. The vertical slide 30 is provided at its lower end with a cam roller 31 which rides upon the periphery of a cam 32 secured to a horizontal cam shaft 33 which is mounted in bearings 34 and 35, and which carries, in addition to the cam 32, a carrier-operating cam 36, a gripper-opening cam 37, and another cam 38 which operates a pusher rod for positioning the blanks on the feed table. The cam shaft 33 also carries a bevel gear wheel 39 meshing with a bevel pinion 40 on an inclined shaft 41 which carries at its upper end a bevel gear 42 meshing with the bevel gear 18 which, as stated above, is carried by the main power shaft of the machine. The several mechanisms actuated by the crank shaft 33 will be described in their turn, following the movement of a blank through the machine.

The blanks may be fed to the machine automatically or by hand. In either case, each blank is placed upon an inclined plate 47, rolls down this plate, and strikes a stationary stop plate 48 which is adjustably spaced above an inclined upper feed table section 49. The stop plate 48 serves to check the movement of the blank and causes the blank to fall upon the upper section 49 of a feed table 50, whereupon the blank passes beneath the stop plate 48 and rolls down the feed table section 49, from which it passes to the main feed table 50. The feed table sections 49 and 50 are mounted on a horizontal bar 51 that is carried by a standard 52 secured to the machine frame.

The feed table sections are provided with alined gaging strips 53 and 54 which may guide the movement of the blanks as they pass down the feed tables. As shown on Fig. 3, the stop plate 48 is slightly inclined so as to give the blanks a tendency to roll toward the gaging strips 53 and 54, which assists in bringing the blanks to the proper position at the lower end of the feed table. The stop plate 48 may be set perpendicular to the gaging strips or may, if desired, be so adjusted as to cause the blanks to roll somewhat away from the gaging strips. In order to adjust the angular position of the stop plate 48, the bracket 55, which supports this stop plate at the front of the machine, is provided with a slot 56 surrounding a bolt 57 which clamps the stop plate 48 to the feed table 49 in its adjusted position.

The feed table 50 is supported near its lower end upon a stationary bracket 60 and carries three gates, 61, 62 and 63 which are reciprocated above the feed table in proper timed relation to deliver the blanks from the lower end of the feed table one by one and at the proper time to be received by the blank carrier. The lower gate 61 insures that the blank will not roll from the feed table until the carrier is ready to receive it; the second gate 62 insures that only one blank at a time can be delivered from the feed table, and the upper gate 63 insures that all of the blanks will be stopped by the gate 62 before they are allowed to pass to the lower gate 61. These gates are so interconnected that when the lower gate 61 is down, the second gate 62 is raised and the upper gate 63 is down, and that when the lower gate 61 is raised, the second gate 62 is down and the upper gate 63 is raised.

The gates are raised and lowered by means of the swinging blank carrier described below, this carrier being arranged to lift the lower gate 61 when it rises to take a blank from the feed table, and to then release the gate 61 when the carrier swings down and away from the feed table. The carrier is the sole means for operating the several gates. The lower gate 61 is secured to the ends of two swinging arms 64 which are arranged at opposite sides of the feed table

and are loosely pivoted at their upper ends upon pins 65 carried by brackets 66. The gate 62 is similarly carried at the ends of pivoted arms 67, the opposite ends of which are loosely pivoted upon pins 68 carried by the brackets 66. The upper gate 63 is carried by two swinging arms 70 pivotally mounted between their ends upon pins 71 carried by brackets 72. The arms 70 extend above and beyond the intermediate gate 62 and rest upon the enlargements 67[a] of the arms 67 to which the gate 62 is attached. Yokes 73, carried by the intermediate gate 62, surround the arms 70 and insure that the movement of the intermediate gate 62 shall be communicated to the upper gate 63 so that when one of these gates rises, the other will descend, and vice versa.

Two springs 75 and 76 are secured at each side of the feed table 50 by means of bolts 77. The springs 76 rest upon the enlargements 64[a] of the arms 64 which carry the lower gate 61, while the springs 75 similarly rest upon the enlargements 67[a] which carry the intermediate gate 62, and the springs thus tend to hold the gates in their lower positions. The springs 76 should be stronger than the springs 75 because they are required not only to depress the lower gate 61, but to raise the intermediate gate 62 against the pressure of the springs 75.

For the purpose of interconnecting the arms 64 and 67 so as to move simultaneously in opposite directions, I provide at each side of the feed table a two-armed lever 78 which is pivoted midway between its ends on a bracket 79. Each of the levers 78 carries at one of its ends a pin 80 on which is mounted a roller 81 which engages beneath the adjacent arm 64. Each of the levers 78 also carries at its opposite end a pin 82 extending in the opposite direction with respect to the pin 80 and carrying a roller 83 which engages beneath the adjacent arm 67. It will thus be apparent when the lower gate 61 is lifted, its supporting arms 64 will be rocked on their pivots 65 against the pressure of the springs 76, and that the springs 75 will thus be able to depress the intermediate gate 62 toward the feed table thereby rocking the levers 78 upon their pivots, and also raising the upper gate 63. When the lower gate is released, the springs 76 will lower this gate toward the feed table and this movement will be communicated through the arms 64 and the levers 78 to raise the arms 67, thereby raising the intermediate gate 62 and lowering the upper gate 63.

As shown on Fig. 5, the gage 54 on the feed table 50 is provided with notches 84 and 85 to admit the gates 62 and 63, and these gates are also provided with corresponding notches to enable the gates to descend to the surface of the feed table 50.

Each blank B rolls down the feed table 50, and if the rear gate 63 is down, the blank will be stopped at this gate as shown in Fig. 5. If the rear gate 63 should be raised and the intermediate gate 62 is lowered, the blank will pass under the rear gate 63 without touching it and will be stopped by the gate 62. In either case the blank cannot reach the lower gate 61 without first being stopped by the gate 62 because as soon as the rear gate 63 is raised any blank that may have been held by this gate will roll into contact with the gate 62 which has been lowered at the same time that the upper gate 63 is raised. While the blank is resting against the lower gate 61 it is moved lengthwise toward the gage 54 of the feed table by means of a pusher rod 90 which is reciprocated just above the feed table and near its lower end by means of the cam 38 carried by the cam shaft 33. This reciprocating movement of the pusher rod 90 is produced through a cam roller 91 carried by the lower end of a bent arm 92 which is pivotally mounted in a bearing 93 secured to the machine frame and which carries a curved arm 94 that extends upwardly and laterally, and is provided at its upper end with a fork 95. The two arms of the fork 95 are disposed in front of rollers 96 which are carried by pins extending from a collar 97 secured to a horizontal rod 98 which is slidably mounted in bearings 99 and 99[a] secured beneath the feed table 50. The portion 100 of the rod 98 which slides through the first bearing 99 is preferably made square, and the front bearing 99 is similarly shaped so as to prevent lateral movement of the pusher rod 90. The remainder of the rod 98 is preferably round. A spring 101 surrounds the rod 98 between the rear bearing 99[a] and a nut 102 carried by the rod 98, and this spring tends to move the rod 98 inwardly while the fork 95 acts to move the rod 98 outwardly. The spring 101 may be replaced by a weight connected to the inner end of the rod 98 by means of a suitable cord and pulley.

The collar 97 is secured on the rod 98 by means of a collar 103 and a nut 103[a]. An arm 104 is secured to or made integral with the collar 97 and is provided with a split clamp 105 in which the pusher rod 90 is adjustably secured by means of a clamping bolt 106.

It will be seen that when the fork 95 moves away from the feed table 50 it will draw with it the pusher rod 90, and that when the fork moves toward the feed table, the pusher rod will be drawn inwardly by the spring 101 or by the equivalent weight, and will engage the end of a blank resting against the lower gate 61, forcing the opposite end of the blank against the gage 54 if it is not already there. Since this gaging

movement of the pusher rod is produced by a spring or by a weight, no damage will result if the blank should be longer than the normal length, or if the blanks should for any reason become twisted or piled so as to stop the pusher rod short of its normal stroke.

The adjustable mounting of the pusher rod 90 may be readily changed for operating upon blanks of different lengths, and the maximum length of stock that can be handled in this machine is limited only by the width of the feed table 50.

The blank carrier or transfer mechanism which receives the blank from the feed table and delivers it to the gripper mechanism will now be described. This transfer mechanism is mounted upon a standard 110 secured to the top of the machine frame 2 by means of bolts 111. The standard 110 carries an elongated horizontal head 112 which is provided at its ends with downwardly inclined portions 113. Bearings are formed in the projecting end portions 113 to receive circular bushings 114 in which is mounted a square shaft 115. The shaft 115 is mounted for rocking movement and also for a limited amount of lengthwise reciprocating movement by which the blanks are finally gaged, the length of such reciprocating movement being suitably a quarter of an inch.

The rocking movement of the square shaft 115 is produced in one direction by means of gravity assisted by a spring 116 connected between a fixed stud 117 and a ring 118 carried by a split collar 119 which is clamped upon the square shaft 115. The spring 116 insures that the moving parts of the carrier will operate properly and without chattering. Rocking movement of the square shaft in the other direction is produced by means of a lever arm 120 carried by the split collar 119. A grooved roller 121 rides upon the lever arm 120 and is mounted loosely upon a pin 122 which is carried by a fork 123 on the end of a lever 124 that is mounted on a stationary pivot pin 125 carried by a stationary bracket 126. The rear end of the lever 124 is provided with a roller 125^a that rests upon an adjustable bearing screw 126^a which is screwed into the upper end of a rod 127. The rod 127 is mounted slidably in stationary bearings 128 and carries at its lower end a cam roller 129 which runs upon the periphery of the cam 36. Through the mechanism just described, the cam 36 depresses the lever 120 once during each revolution of the cam shaft 33 and rocks the square shaft 115 in a counter clock-wise direction, Figs. 1, 2, 4 and 5, after which the lever 120 is released and the weight of the parts carried by the square shaft 115, assisted by the spring 116, rocks the square shaft back in a clock-wise direction.

This rocking movement of the square shaft 115 swings two sets of carrier jaws between an upper receiving position adjacent to the lower end of the feed table 50, as shown in Fig. 4, and a lower discharging position shown in Figs. 2 and 5, where the blank taken by the carrier from the feed table is delivered to the gripper mechanism.

Each of the carriers carried by the shaft 115 is constructed as best shown in Fig. 5, and includes two relatively movable jaw members 130 and 131. The jaw member 130 is carried by an arm 132 that is formed integral with a split clamp 133 which surrounds the square shaft 115 and is secured thereto by means of a bolt 134. The jaw member 131 is pivotally mounted on a pin 135 carried by the arm 132 of the jaw member 130. The jaw member 131 also carries an arm 136 in which is adjustably screwed a rod 137. A spring 138 is connected between the upper end of the rod 137 and the outer end of another rod 139 which is fixed in an opening in the square shaft 115. The spring 138 thus tends to rock the jaw member 131 to its closed position with relation to the jaw member 130.

The downward rocking movement of the carriers is limited by means of a stop screw 140 which extends through a member 141 that projects from the head 112 opposite to one of the sets of carrier jaws and bears against the clamping screw 134 of this set of jaws.

When the square shaft 115 is rocked to raise the carrier jaws toward the feed table, the end of the pivoted jaw member 131 engages the lower edge of the feed table 50, as shown in Fig. 4, and prevents this jaw member from rising farther. The rocking movement of the shaft 115 continues to an elevation suited to the diameter of the blanks B, this elevation being changed, when desired, by adjusting the screw 126^a which operates the lever 124. The opening of the carrier jaws is accompanied by the lifting of the lower gate 61, which allows a blank B to roll into the carrier jaws as shown in Fig. 4. This lifting of the gate 61, accompanied by corresponding movements of the gates 62 and 63 is produced by means of lugs 143 which are carried on the upper sides of the carrier jaw members 130, and which engage beneath small angle pieces 144 that are secured to the outer surface of the lower gate 61 of the feed table. This method of raising the lower gate insures the proper timed relation between the raising of the gate and the opening of the carriers at the feed table. When long blanks are being handled, both of the carriers carried by the square shaft 115 are employed to receive and convey the blank, but for shorter blanks only the carrier nearest the die is needed, and this is the

condition illustrated in Fig. 3 where the blanks B are not long enough to engage both of the sets of carrier jaws.

The carrier jaws remain open in the position of Fig. 4 only long enough to receive the blank and are then rocked down to the position of Figs. 2 and 5. During this downward rocking movement, the end of the blank that is to be upset is wiped against a stationary curved gage 145 which insures that this end of the blank shall be in exactly the correct position when it is placed in the upsetting die. The gage 145 is adjustably carried by the stationary head 112, and for this purpose is provided with a bent upper portion 146 that is formed integral with or attached to a slide 147 which has a tongue 148 received in a groove 149 which is formed in the upper surface of the head 112. The slide 147 has an upstanding lug 150 in line with a similar lug 151 on a plate 152 which is also arranged to slide in the groove 149 and is clamped in position by means of a screw bolt 153. An adjusting screw 154 extends through a threaded opening in the lug 150 and through an unthreaded opening in the lug 151. The screw 154 is prevented from moving lengthwise through the lug 151 by means of set collars 154[a] and by turning the screw 154 the position of the gage 145 may be accurately adjusted.

For the purpose of insuring that each blank is brought into engagement with the gage 145 before entering the upsetting dies, the square shaft 115 is given the sliding lengthwise movement already referred to, this movement taking place in the direction toward the gage while the carriers are being swung down from the feed table. This lengthwise reciprocating movement is produced by means of a cam 155 secured to the square shaft 115 adjacent to a cam roller 156 that is carried by a pin 157 which hangs from the under side of the stationary head 112. The cam 155 is so shaped that when the shaft 115 rocks to raise the carriers to the feed table, the shaft 115 is moved outwardly as seen in Figs. 1, 2, 4 and 5, and downwardly as seen in Fig. 3. This movement of the shaft compresses a spring 158 which surrounds an extension 159 of the shaft 115, between the head 112 and a washer 160. The tension of the spring 158 is regulated by means of a nut 161 secured on the outer end of the shaft extension 159. When the shaft 115 rocks to lower the carriers away from the feed table, the spring 158 moves the shaft 115 inwardly as seen in Figs. 1, 2, and 4, and upwardly as seen in Fig. 3. As stated above, the length of this movement of the shaft 115 may suitably be one-quarter of an inch.

If the blank has been properly positioned by the pusher rod 90 on the feed table, its end engages the gage 145 immediately when the blank is seized by the carriers, and when the carriers descend the blank is allowed to slide in the carriers, thus maintaining its properly gaged position. If, however, the blank is not exactly in its proper position when it is seized by the carriers, the slight lengthwise movement of the carrier shaft will bring its end into engagement with the gage 145 during the descent of the carriers, and this insures that the blanks will always be in proper position on entering the dies.

When the transfer carriers reach their lower position as shown in Figs. 2 and 6, the gripper mechanism removes the blank from the transfer carriers. This gripper mechanism is best shown in Figs. 5, 6 and 7, and includes a fixed jaw 165, and a movable jaw 166, both of these jaws being carried by a bracket 167 which is mounted for horizontal adjustment on the upper end of the vertical slide 30, and is provided at its upper end with a vertical extension 168 which carries the fixed jaw member 165 and also carries bearings for the ends of a rod 169. The lower movable jaw member 166 is carried by a collar 170 that is keyed to the rod 169. This rod also carries adjustably two arms 171 and 172. The arm 171 is employed for opening the jaws 165 and 166 to receive the blanks from the transfer mechanism, while the other arm 172 is employed to close the jaws after they have received the blank, and to thereafter open the jaws during the forging operation, and after the article has been finished.

For the purpose of causing the arm 172 to rock the rod 169 and open the tongs to receive the blanks from the carrier mechanism, I provide a cam 173 which, as shown in Fig. 7, is carried by a member 174 that is adjustably mounted by means of a bolt 175 in a slot 176 formed in a vertical plate 177 that is pivoted at 178 to a fixed bracket 179 carried by the machine frame 2. A leaf spring 180 bears against the outer surface of the pivoted plate 177 as best shown in Fig. 6. The arm 171 carries a cam roller 181. When the slide 30 carried by the horizontally movable slide 20 rises and then moves to the left as seen in Fig. 5, the cam roller 181 rides over the upper surface of the cam 173, thereby rocking the rod 167 and moving the jaw 166 away from the jaw 165. The position of the parts at this time is shown in Fig. 5. During the opening movement of the jaw 166, the arm 172 is also rocked with the rod 167. This movement acts through a rod 182 to compress a spring 183 which surrounds the rod 182 between a fixed bracket 184 and a washer and nut secured to the lower end of this rod. When the roller 181 passes beyond the cam 173, the spring 183 acts through the rod

182 and the arm 172 to snap the jaw back to the closed position.

The construction of the cam 173 is such that if the machine should be reversed so that the arm 171 or the roller 181 strikes the lower surface of the cam 173, no damage will be done, but the cam will merely rock away from the bracket 179 and when released will be returned to its normal position by means of the spring 180. Other safety connections may be provided wherever desired to prevent injury to the machine in case blanks should become jammed or in case other accidents should occur.

The arms 171 and the cam roller 181 are utilized not only for opening the gripper jaws to receive a blank from the carrier in the manner described above, but also for the purpose of opening the gripper jaws momentarily while the blank is in the finishing pass of the machine, and thereafter for opening the jaws to discharge the finished bolt. For the purpose of operating the jaws in this manner, I provide a roller 185 carried by the horizontal portion 186 of a vertical rod 187 that is slidably mounted in bearings 188. The rod 187 is provided at its lower end with a cam roller 189 which runs upon the periphery of the cam 37 described above. The cam 37 acts to raise the arm 187 when the vertical slide is raised by the cam 32. Thereafter the rod 187 is held stationary for a time, and when the slide 30 descends to bring the blank in the gripper to the finishing pass, that is, between the dies 5 and 7, the cam 37 gives the rod 187 a slight upward impulse which causes the cam roller 185 to engage the roller 181 carried by the arm 171 so as to momentarily open the gripper jaws to a slight extent and permit the blank to be moved lengthwise in the dies in the manner described in my prior application mentioned above. The rod 187 then descends to the proper point to again engage the cam roller 181 when the slide 30 descends to bring the gripper jaws to the bolt-discharging position, at which time the roller 185 again operates through the roller 181 and the arm 171 to open the gripper jaws and discharge the bolt.

In the operation of the machine described above, the blanks B are placed one by one on the inclined plate 47, and each blank as it rolls from the plate 47 strikes the stop plate 48 and is alined in the desired position with relation to the gage 54. The blank then passes under the stop plate 48 and rolls down the feed table 50. The blank is stopped either by the upper gate 63 or by the intermediate gate 62, and if the blanks are fed faster than the dies can operate upon them, the blanks will accumulate in a row above the gate 62. At each reciprocation of the gates 61 and 62 a single blank is allowed to escape below the gate 61, and the gate 62 at the same time descends so as to retain any other blanks that may be upon the feed table. This movement of the gates is produced by the lug 143 which is swung up with the jaws of the carrier and engages beneath the angle pieces 144. During this same upward movement of the carrier jaws, the lower jaw 131 strikes beneath the lower edge of the feed table 50 and the carrier jaws are thus opened to receive the blank B which escapes beneath the gate 61. The carrier immediately descends, the carrier jaws being closed by the spring 138 as soon as the lower jaw 131 is free from the lower end of the feed table 50.

The slide 30 carrying the gripper jaws is lifted by the cam 32 to bring the cam rollers 181 to the level of the stationary cam 173. Immediately thereafter the slide 20 moves to the left, Figs. 1 and 5, thereby carrying the cam roller 181 over the cam 173 and opening the gripper jaws. The movements of the parts are so timed that when the gripper jaws and the carrier jaws are at the position shown in Fig. 5, a slight further movement of the slide 20 to the left causes the gripper jaws to close around the blank, and the slide 30 immediately begins to descend and carries the blank in the path indicated in dotted lines on Fig. 5, the movements of the slides 20 and 30 being timed to produce this movement of the blank in the proper relation to the movement of the dies. When the blank is in the finishing pass the gripper jaws are released momentarily in the manner described above so as to enable the blank to be moved lengthwise in the die. When the dies are again opened, the vertical slide 30 again descends and moves to the left, thereby bringing the blank to the discharging position, where the grippers are again opened and the blank is discharged into a suitable receiver.

It is a special advantage of the machine described above that the blanks are accurately and positively gaged before they are brought to the forging passes. There are four points at which the movement and position of each blank are controlled, namely, at the stop plate 48, at the upper gate 63 or the intermediate gate 62, at the lower gate 61 where the blank is pushed against the gage 54 by the pusher rod 90, and at the gage 145 against which the end of the blank is wiped during the descent of the carrier jaws. The position of the final gage 145 determines the amount of stock that will be upset to form the head of the finished article, and the adjustment of this gage upon the carrier head 112 provides a convenient means for changing at will the size of the upset head.

If the forging machine is provided with three or more passes or sets of dies, the gripper mechanism may be readily arranged

to bring the blanks to each of the dies successively, the only modification required being the proper designing of the cams which operate the slides and the carrier. The apparatus may also be adapted for use with a machine having only a single pass, by similar modification of the operating cams. It will be understood that my invention includes all such modifications in the construction and arrangement of parts as fall within the scope of the appended claims.

I claim as my invention:

1. A forging machine comprising a plurality of sets of co-operating dies, gripper mechanism for presenting blanks to said dies successively, and a carrier for delivering blanks to said gripper mechanism.

2. A forging machine comprising a plurality of sets of co-operating dies, gripper mechanism for presenting blanks to said sets of dies successively, a feed table, and a carrier for receiving blanks from said feed table and for delivering said blanks to said gripper mechanism.

3. A forging machine comprising a plurality of sets of co-operating dies, gripper mechanism for presenting blanks to said sets of dies successively, means for imparting combined vertical and horizontal movements to said gripper mechanism to bring the said gripper mechanism to said dies in succession, an inclined feed table down which blanks may roll by gravity, and a carrier for receiving blanks from the lower end of said feed table and for delivering said blanks to said gripper mechanism.

4. A forging machine comprising a set of co-operating dies, vertically movable gripper mechanism for presenting blanks to said dies, a feed table, and carrier jaws mounted to swing between said feed table and an inclined position where said gripper mechanism engage a blank in said jaws and remove the blank during movement of said mechanism from its upper position to a position adjacent to said dies.

5. A forging machine comprising a set of co-operating dies, gripper mechanism for presenting blanks to said dies and comprising relatively movable jaws, a feed table, a pivotally mounted carrier adapted to receive blanks from said feed table and having relatively movable jaws, means actuated by movement of said carrier for opening the jaws thereof and to cause a discharge of blanks thereto from said feed table, and means for opening the jaws of said gripper mechanism and for causing said gripper jaws to seize and remove a blank carried by said carrier.

6. A forging machine comprising a plurality of superposed sets of co-operating dies, an inclined feed table above said dies, a swinging carrier mounted on a horizontal pivot and arranged to receive blanks from the lower end of said feed table, and a vertically movable gripper mechanism adapted to receive blanks from said carrier and to present said blanks to said sets of dies in succession.

7. A forging machine comprising a plurality of superposed sets of co-operating dies, an inclined feed table above said dies, a swinging carrier mounted on a horizontal pivot and arranged to receive blanks from the lower end of said feed table, a gripper mechanism adapted to receive blanks from said carrier, and means for moving said gripper mechanism both vertically and horizontally to present said blanks to said sets of dies in succession.

8. A forging machine comprising a set of co-operating dies, gripper mechanism for presenting blanks to said dies and comprising relatively movable jaws, a feed table, a carrier adapted to receive blanks from said feed table and having relatively movable jaws, means actuated by movement of said carrier for opening the jaws thereof and to cause a discharge of blanks thereto from said feed table, and means for actuating the jaws of said gripper mechanism to remove a blank carried by said carrier.

In testimony whereof I, the said CHARLES FASSINGER have hereunto set my hand.

CHARLES FASSINGER.