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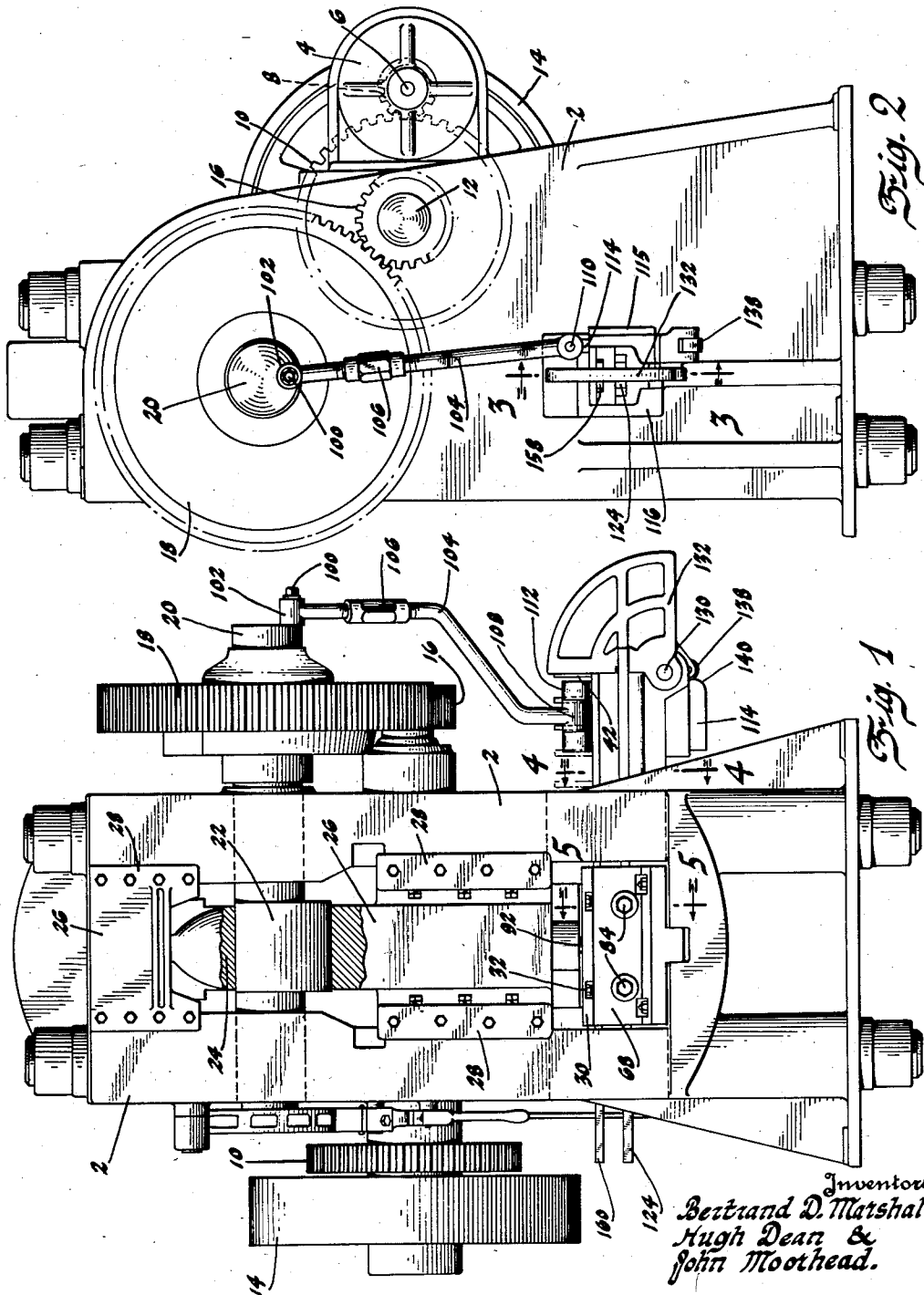
B. D. MARSHALL ET AL

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4 Sheets-Sheet 1



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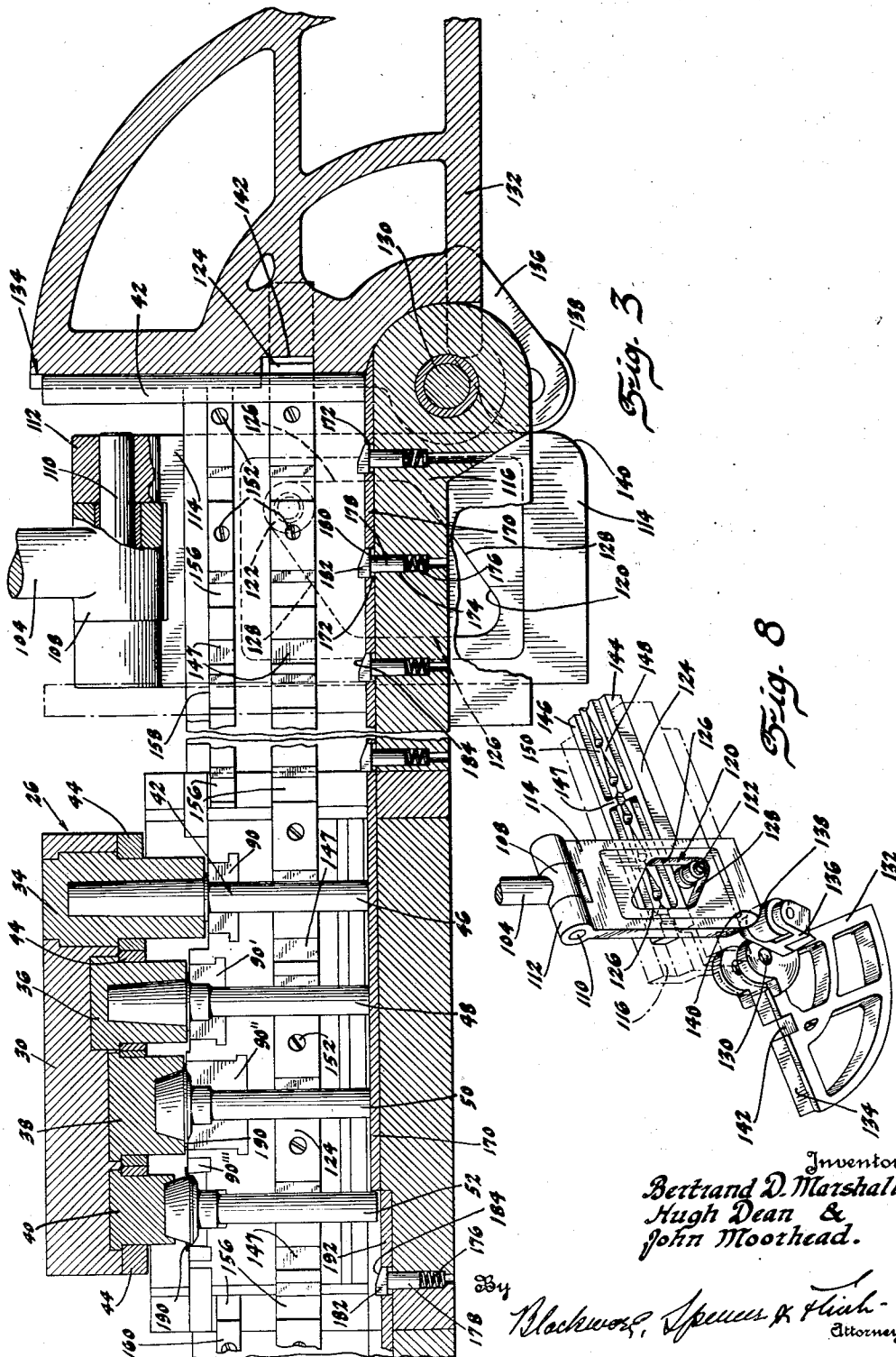
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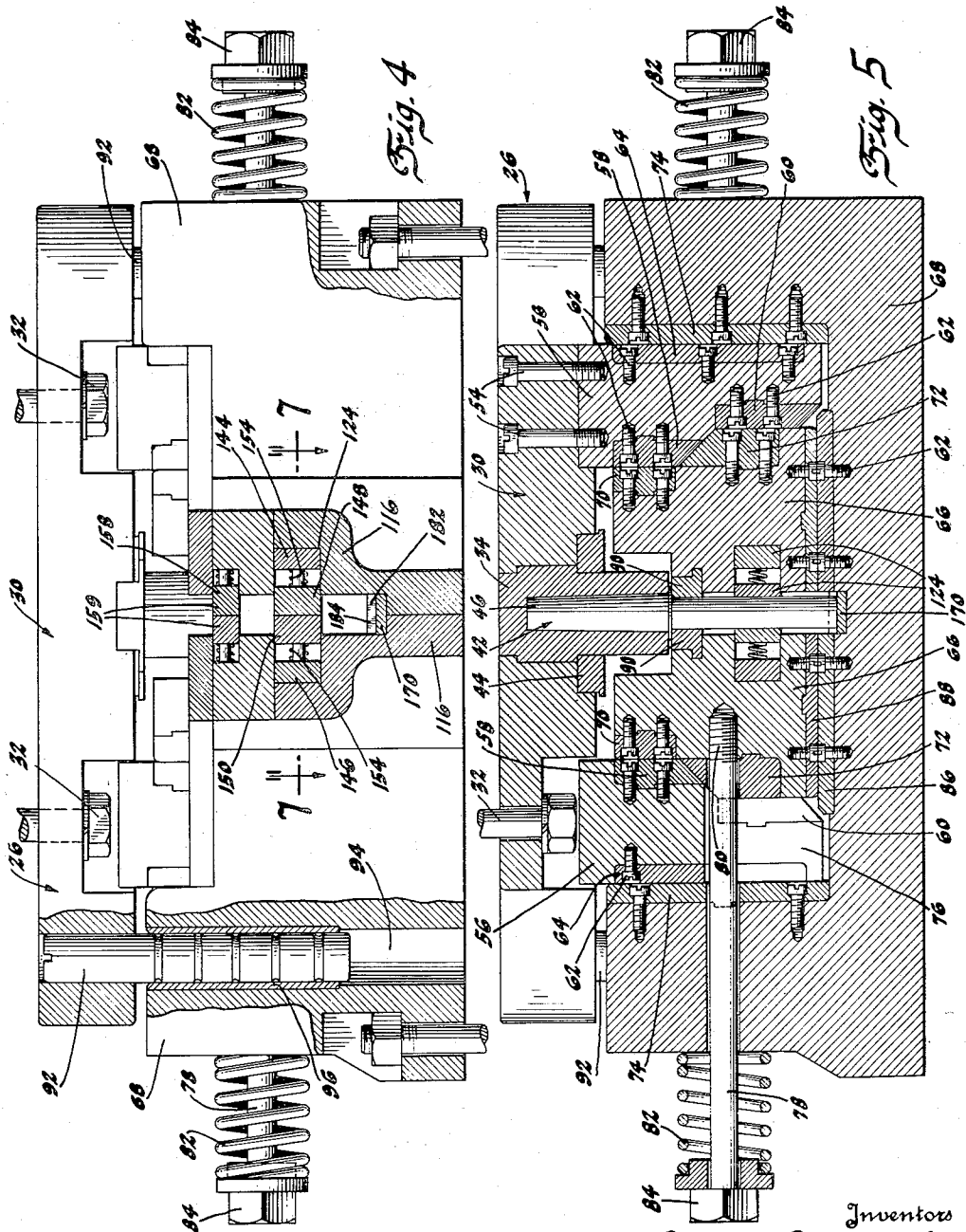
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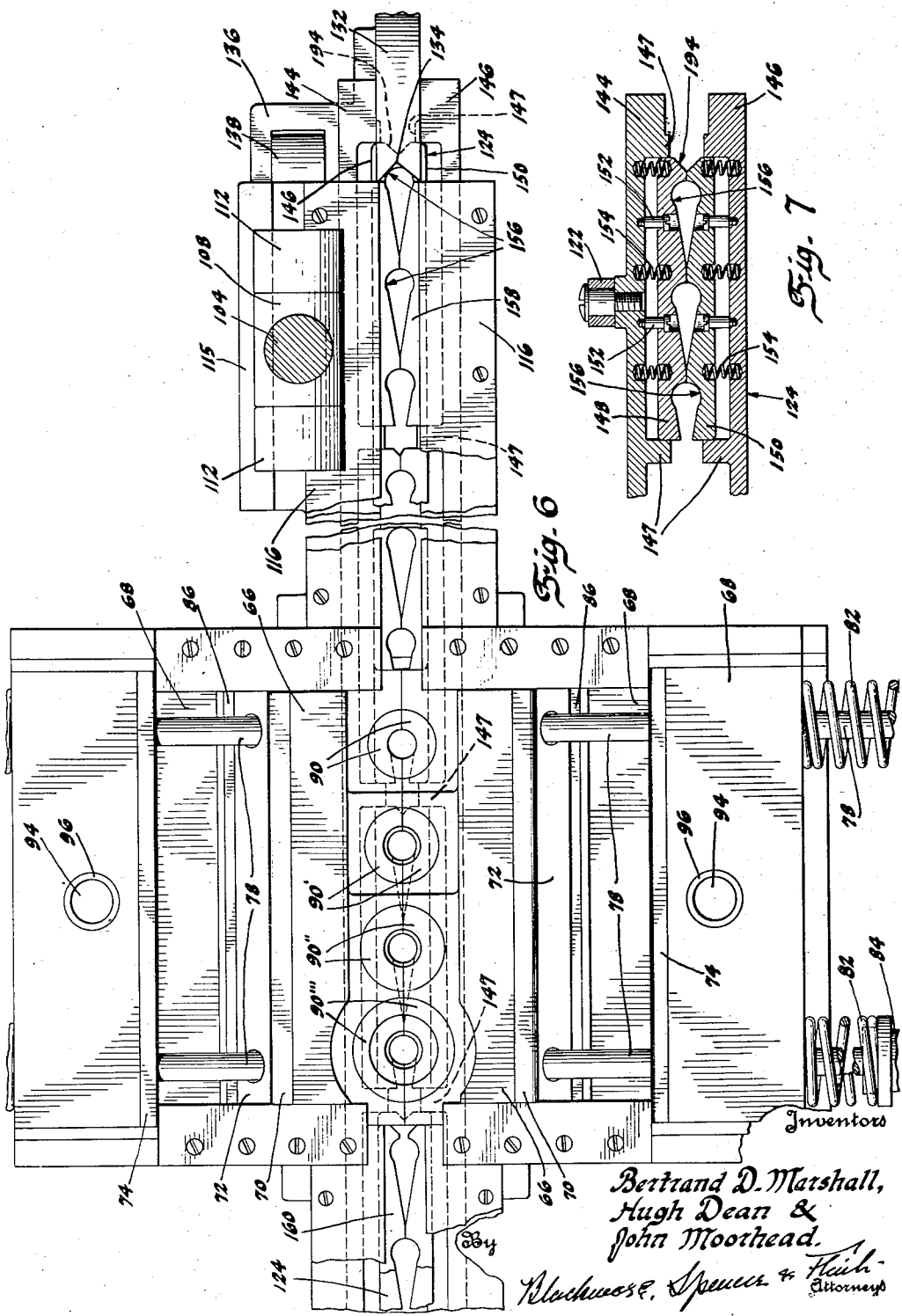


Fig. 6

Fig. 7

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UNITED STATES PATENT OFFICE

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4 Claims. (Cl. 78—99)

This invention relates to forging presses and has particular reference to a press adapted to work or operate on stock material to give thereto a definite form depending on the shape of the part desired.

In the past it has been the practice to roll or work the piece of stock while in a heated state to give thereto the shape desired. It has been found that by using the forging method disclosed in the press in the instant application that production was speeded, and the desired part obtained in better form and at less cost.

In the disclosure of the present invention, a stem pinion forging for use in automobile practice is made, but the machine is capable of making any suitable part by changing the punches so as to give to the part the desired shape.

The machine of the drawings comprises an upright frame in which there is reciprocally mounted a head containing a plurality of dies or punches which shape the work. A plurality of two part dies is positioned below the punches which dies are closed when the punches descend on the work. In their closed position, the dies rigidly hold the work so that the punches may give thereto a definite shape. The work, or bars of stock, is fed to the punches by means of a reciprocal rack which moves in unison with the reciprocation of the punches. A second stationary rack positioned over the first cooperates with the movable rack and compels the work to move in one direction only. The movable rack is reciprocated by a cam operating on a roller secured to the rack, the cam moving in unison with the punches. The cam has a second cam surface which operates a loader which feeds a bar of stock to the feed rack for each operation of the punches.

On the drawings:

Figure 1 is a front elevation of the machine with the bearing of the cam for operating the punch head shown in section.

Figure 2 is a side elevation of the structure of Figure 1 looking from the right.

Figure 3 is a section on the line 3—3 of Figure 2.

Figure 4 is a section on the line 4—4 of Figure 1.

Figure 5 is a section on the line 5—5 of Figure 1.

Figure 6 is a plan view of the feeding mechanism.

Figure 7 is a sectional view taken substantially on the line 7—7 of Figure 4.

Figure 8 is a perspective view of the loader and the cam for operating the feed rack.

On the drawings, the numeral 2 indicates the upright frame of the press. The press has

mounted at the rear thereof the electric motor 4 on the shaft 6 of which there is secured the pinion 8 which drives the gear 10 secured to a shaft 12 having the flywheel 14 mounted on one end thereof. The shaft extends through the rear of the frame 2 and has the pinion 16 secured to its other end. The pinion 16 meshes with the gear wheel 18 to drive the same. The gear 18 is secured to a shaft 20 which is mounted in the bearings in the machine and has the cam 22 thereon, operating in a bearing 24 formed in the reciprocal head 26, having the guides 28 secured thereto. The guides fit on the corresponding parts of the frame 2 and guide the head 26 in the upward and downward movement caused by the rotation of the cam 22.

At the lower portion of the head 26 there is rigidly secured the block 30 secured thereto by the bolts 32. The block 30 has rigidly and permanently mounted thereon the punches 34, 36, 38 and 40 each of which gives to the stock or work 42 a definite shape. The punches 34 to 40 are held on the block 30 by means of the retainers 44 secured to the block in any suitable way. As the head 26 reciprocates it will cause the punches 34 to 40, inclusive, to give to the pieces of stock or work 42 the shapes shown at 46, 48, 50 and 52 (Figure 3).

Secured to each side of the block 30 by means of machine screws 54 are the die operating cam blocks 56. Each block 56 has the hardened cam members 58 and 60 secured thereto by machine screws 62, and the hardened members 64 secured thereto by similar machine screws 62. The cam blocks 56 operate on die cam blocks 66 positioned below the punches 34 to 40. The die cam blocks 66 are slidably positioned in the bed plate 68 and have the hardened cam members 70 and 72 which cooperate with the hardened cam members 58 and 60 of the cams 56. The bed plate 68 has the hardened members 74 which cooperate with the hardened members 64 to reduce wear on the parts. Each cam block 66 has a slot 76 therein to accommodate a bolt 78, screw-threaded as at 80 into the cam block 66, and extending outside the bed 68 and having a coil spring 82 between its head 84 and the outer surface of the bottom plate 68. The coil springs 82 normally urge the cam blocks 66 away from the work or toward the ends of the bottom plate when considering the structure of Figure 5.

The bottom plate also has the hardened member 86 mounted at the bottom thereof which cooperates with hardened members 88 on the bottom of the die cam blocks 66.

The innermost portion of the die cam blocks 66 has mounted therein the two part dies which grasp or hold the work 42 when they are pushed together by the die cam blocks 66 as shown in Figure 5. When the head 26 and the block 30 rise, the cam operating blocks 56 will leave the die cam blocks 66 to permit the springs 82 to pull the cam block 66 and dies 90 away from the work. The purpose of this structure later will be described.

The block 30 has secured thereto the guiding rods 92 which operate in openings 94 in the bed plate 68. The openings 94 have the bushing 96 therein to reduce the wear. The guide rods 92 will guide the block 30 with reference to the bed plate 68 in the reciprocating movements of the head 26.

By referring to Figures 1 and 2, it will be noted that the shaft 20 has eccentrically mounted on the end thereof the pin 100 on which there is journaled the bearing 102 of a rod 104 having the adjustment or turnbuckle 106 intermediate its ends. The rod 104 is curved as best shown in Figure 1 and has a journal 108 at its end for receiving a pin 110 which passes through the fork 112 of a cam plate 114. A cam plate 114 is slidably mounted in a retaining member 115 on an extension frame 116 extending away from the frame 2 of the press. The cam plate has the cam opening 120 therein in which there is received a roller 122 permanently secured to a feed rack 124 reciprocably slidable in the extension frame 116. The opening 120 has the parallel vertical sides 126 and the inclined upper and lower sides 128 which act to reciprocate the feed rack 124. On the downward movement of the cam plate 114 (Figure 8) the roller and cam will give no movement to the rack 124 while the roller is passing over the sides 126. As soon as the roller strikes the end of the sides 126, the upper side of the cam plate 114 will force the roller 122 and rack 124 to the left where it will remain until the vertical side 126 at the opposite side of the plate rides over the roller. When the roller strikes the lower inclined surface 128, the cam plate 114 will force the roller and rack 124 to the right. An upward and downward movement of the cam plate 114 will therefore give a reciprocatory movement to the feed rack 124.

At the end of the extension frame 116 there is pivoted at 130 a segment or loader member 132. The segment has the groove 134 at its face which is adapted to receive the work or bar of stock 42 from a suitable V-shaped hopper having inclined sides and through an opening in the bottom of which the segment 132 operates. The segment has an arm 136 the end of which is forked to receive a roller 138. The roller 138 cooperates with a cam surface 140 on the cam plate 114. As the cam plate descends from the position shown in Figure 3 to that shown in Figure 3, the cam plate 114 and cam surface 140 will strike the roller and cause the segment to be swung on its pivot 130 from the position of Figure 3 to the position of Figure 3. The bar of stock 42 which was taken from the hopper in the groove 134 of the segment will therefore be raised to the upright position shown in Figure 3 in which position it is taken by the feed rack and pulled toward the punches. Segment 132 has the recess or cut out portion 142 to permit the feed rack 124 to grip around the bar of stock 42, in a manner later to be described.

Referring to Figures 6 and 7, the feed rack 124 comprises the two side or external bars 144 and

146 which have the inwardly extending projections 147 at suitably spaced intervals. Between the side bars 144 and 146 and the projections 147, there are positioned the internal bars 148 and 150 secured to the bars 144 and 146 by means of studs 152. The studs 152 are screw-threaded to the bars 144 and 146 and have heads which are slidably received in suitable openings in the bars 148 and 150. Coil springs 154 resiliently urge the bars 148 and 150 toward each other and away from the bars 144 and 146. The inner bars 148 and 150 are formed to a configuration shown at 156, the shape of which will depend on the shape of the blank or bar of stock which is used. In the present invention, a cylindrical bar of stock is shown and the shape 156 will therefore be generally of conical form with a cylinder at the large end of the cone. The bar of stock is received in the large or cylindrical portion of the cone-shape.

Immediately above the feed rack 124, there is positioned a second rack 158 which has two bars 159, in all respects similar to the bars 148, 150 of the rack 124. The rack 158 also terminates immediately upon reaching the block 30 and a similar rack 160 is provided at the other end of the machine.

The segment 132 raises the piece of work or bar of stock 42 to a position where it may be taken by the rack 124 and places it on the end of a plate 170 over which the work rides when it is moved by the rack 124. In the plate 170 there is provided a plurality of rectangular openings 172 and in the frame 116, immediately below the plate, there are mating but smaller openings 174. In the bottom of the openings 174, there are positioned the coil springs 176 which press upwardly on the end of the shank 178 of the bolt 180, having a rectangular head 182 fitting the openings 172. The springs 176 project the heads 182 a little above the surface of the plate 176 as shown in Figure 3. The side of the head 182 toward the segment 132 has the inclined surface 184 which permits the stock readily to ride thereover. The springs 176 are rather weak and only sufficient to force the heads 182 to the position shown in Figure 3. When the bar of stock reaches the inclined portion 184, the weight thereof will depress the head and the opening 172 so that the bar of stock 42 will ride past the head. When the rack 124 is reciprocated to the right in Figure 3, the projecting portion of the head 184 and the rack 158 will prevent the rearward movement of the bar of stock 42; however, when the feed rack 124 is moved to the left (Figure 3) the bar of stock in the cylindrical portion of the configuration 156 will be pulled forward to the next position.

The feed rack 124 extends entirely through the machine from the segment 132 to the opposite end of the machine below the stationary rack 160.

Referring to Figure 3, it will be seen that the first punch 34 gives to the bar of stock 42 the shape shown at 46. The die 90, of course, cooperates with the punch to give the desired shape. The second operation on the bar of stock is by the punch 36 in cooperation with the die 90, and gives to the bar of stock the shape shown at 48. The third operation on the piece of stock is performed by the punch 38 in cooperation with the die 90 to give the piece of work the shape shown at 50. In the form shown, the article produced is a stem pinion.

The final operation is performed by the punch 40 and die 90 but the form of the work is not changed. At this station, indicated at 52, there is

removed from the pinion the flash 190 which is shorn from the work by the die 90''. It will be noted that at the station giving the form 52 to the piece of work, the plate 170 stops and there is a drop and a second plate 192 now carries the work. The purpose of the drop between the plates 170 and 192 is to allow the punch 40 to press the stem pinion through the die 90'' to shear off the flash 190.

The operation of the press is as follows: The rotation of the cam 22 will reciprocate the head 26 and block 30 secured thereto to cause the punches 34 to 40 successively to act on the piece of work 42 so that the work will leave the machine in the form shown at 52 in Figure 3. Simultaneously with the rotation of the shaft 20 carrying the cam 22 the eccentric 100 will operate the rod 104 and cam plate 114. When the cam 22 is operating to force the punches downward, the eccentric 102 is substantially at its uppermost position and will begin to move the cam plate 114 downward. During the first position of the downward movement of the cam plate 114, the roller will travel up the right hand vertical side 126 (Figure 8) of the cam opening 120. This will produce no movement in the rack 124. The inclined side 128 at the upper portion of the cam opening 120 will finally strike the roller. The continued downward movement of the cam plate will cause the upper side 128 to force the roller 122 and its rack 124 to the left in Figure 8 or to the right in Figure 3. This movement of the rack will continue until the roller strikes the vertical left hand face 126, at which time the eccentric 102 is in its lowermost position. The eccentric now starts to raise the cam plate and the roller will travel on the left hand face 126 of the cam (Figure 8) to produce no movement of the rack. When the roller has traveled the length of the left hand face 126, the cam 22 will have withdrawn the punches and separated the dies 90, 90', 90'' and 90''' from the work. As the roller travels over the lower face 128, it will push the rack 124 to the right in Figure 8 or to the left in Figure 3. At the same time that the cam plate 114 descends to move the rack 124 to the rear, the cam edge 140 will strike the roller 138 to swing the segment upward to bring a heated bar of stock 42 to the position shown in Figure 3. The end of the rack at the middle is tapered as shown at 194 in Figure 7. This tapered portion will strike the work 42 and cause the inner bar members 148 and 150 to spread against the tension of the springs, the bar being finally received within the cylindrical portion of the formation 156. When the rack moves to the left in Figure 3, it will pull the bar from the segment 132. The repeated reciprocation of the feed rack 124 will move the stock step by step through the

machine. When the feed rack 124 moves to the right in Figure 3, the bar of stock will be held by the upper stationary rack 158 and the heads 182 of the bolts 178. The inner rack bars 148 and 150 will separate to allow the movement of the rack. Similarly, the bars 159 spread on the movement of the rack 124 toward the machine. At the left hand side of the machine (Figure 1) the feeding rack 124 will finally pull the work entirely from the machine where it will fall to a suitable receptacle.

We claim:

1. In a forging press, a plurality of punches for operating on the work, a feed rack for feeding unformed work to the punches, means for reciprocating said rack, a second rack cooperating with the first to cause the work to move in one direction only, a plurality of dies to hold the work while the punches are operating thereon, means to operate the dies to move them to and from the work, and means to reciprocate the punches to cause them to operate on the work, each punch operating on a different piece of work and giving a definite shape thereto.

2. In a forging press, a plurality of punches for operating on the work, a feed rack for feeding unformed work to the punches, means for reciprocating said rack, a second rack cooperating with the first to cause the work to move in one direction only, a plurality of two-part dies to hold the work while the punches are operating thereon, means to reciprocate the two parts to and from the work to cause the two parts to become engaged to hold the work or disengaged to release the work, means to reciprocate the punches to cause them to operate on the work, each punch operating on a different piece of work and giving a definite shape thereto.

3. In a rack for moving the work into a press, a pair of side bars, a pair of bars between said side bars, resilient means between the interior and exterior bars urging said interior bars toward each other, and means on the interior bars to grip the work.

4. In a forging press, a plurality of punches for operating on the work, a feed rack for moving the work in a vertical position to the punches, a stationary plate beneath the rack and on which the work rides in a vertical position in its passage through the machine, means on the plate operative to prevent return movement of the work but permitting forward movement thereof, a second rack cooperating with the first rack and with said means to cause the work to move in one direction only.

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