Oct. 27, 1936. F. J. LEHMAN 2,058,699

APPARATUS FOR FORGING AND SHAPING METAL ARTICLES

Filed June 14, 1935 7 Sheets-Sheet 1

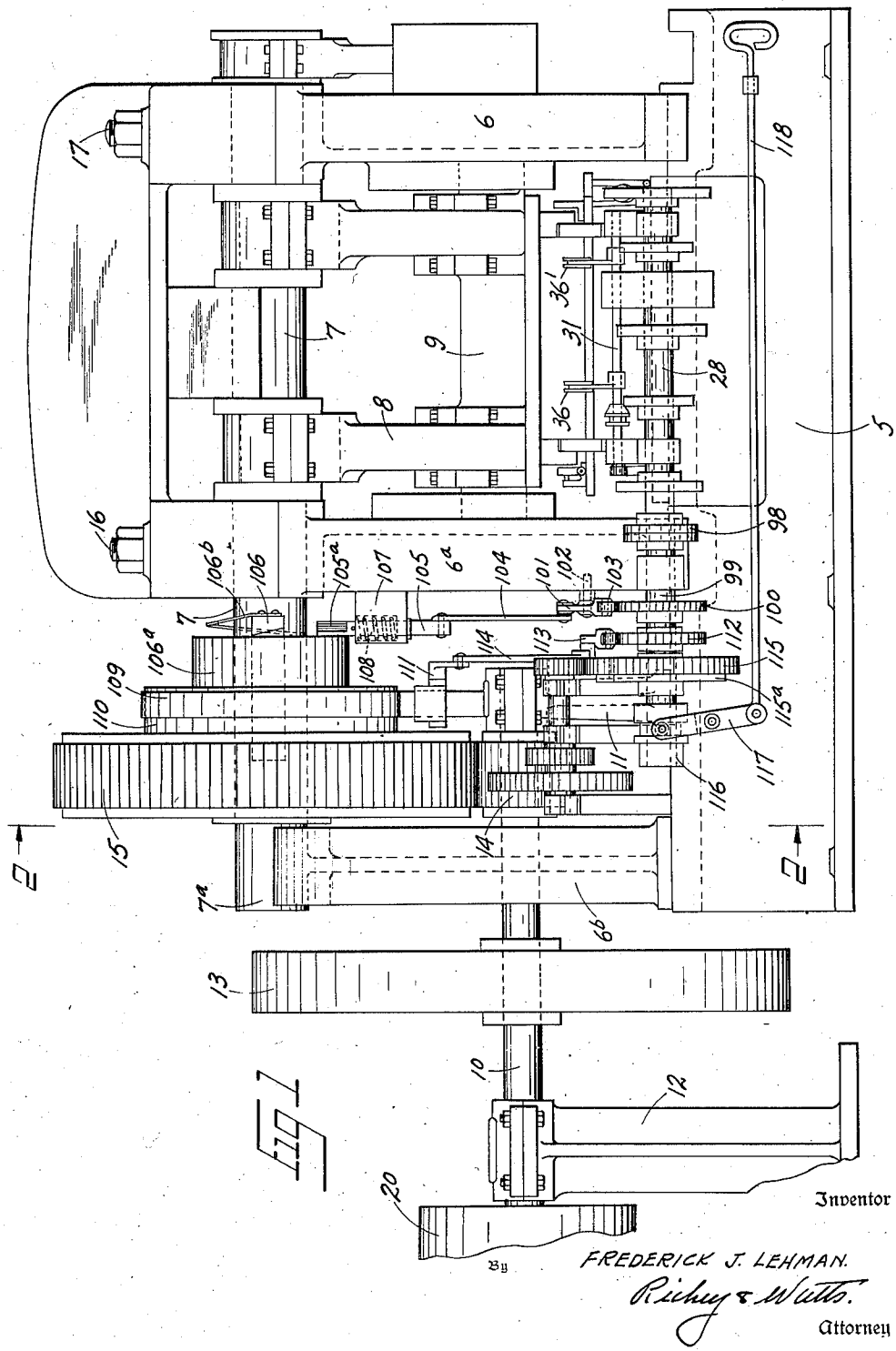



FIG. 1

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APPARATUS FOR FORGING AND SHAPING METAL ARTICLES

Filed June 14, 1935 7 Sheets-Sheet 2

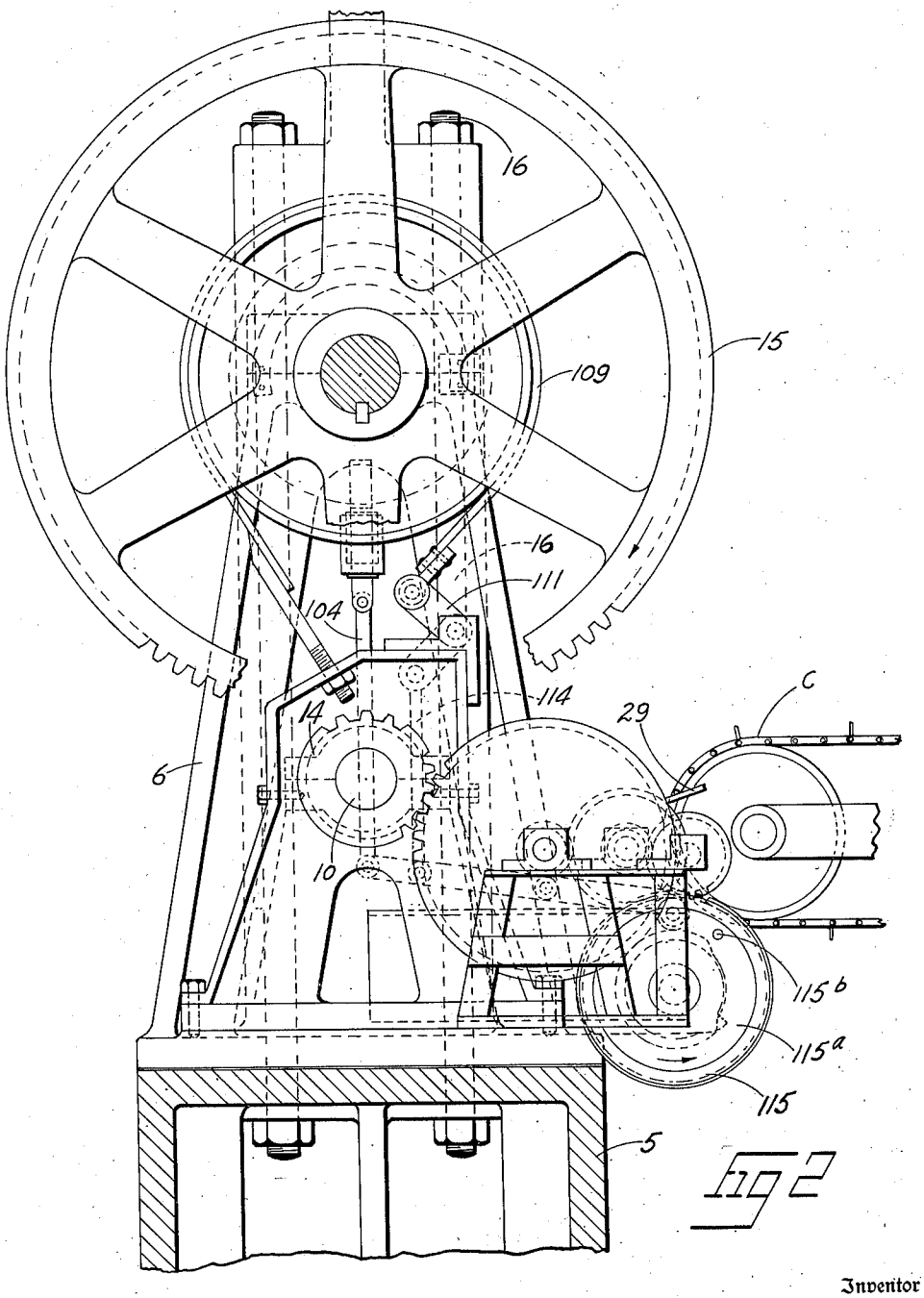



Fig 2

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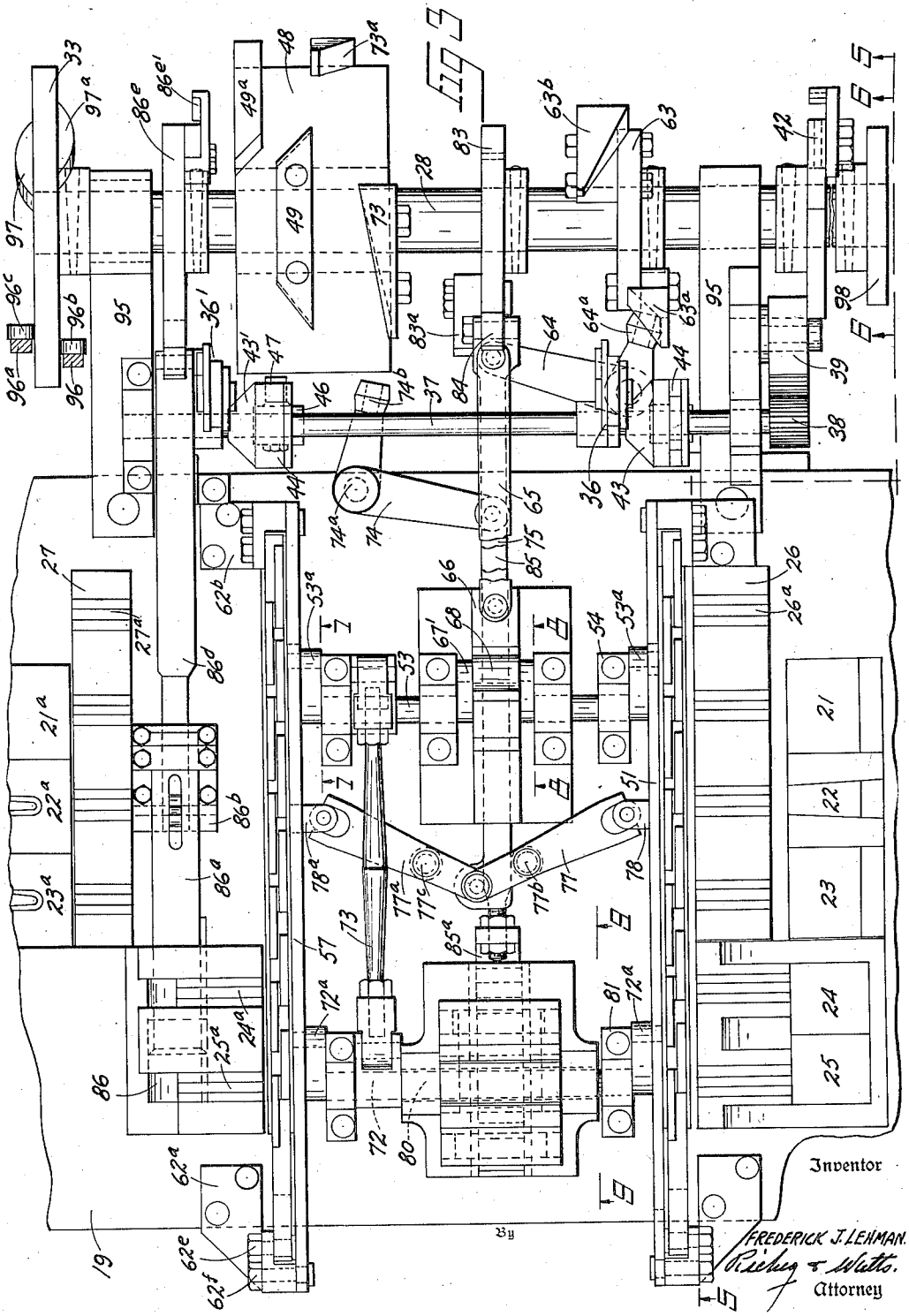
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APPARATUS FOR FORGING AND SHAPING METAL ARTICLES

Filed June 14, 1935 7 Sheets-Sheet 3



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APPARATUS FOR FORGING AND SHAPING METAL ARTICLES

Filed June 14, 1935 7 Sheets-Sheet 4

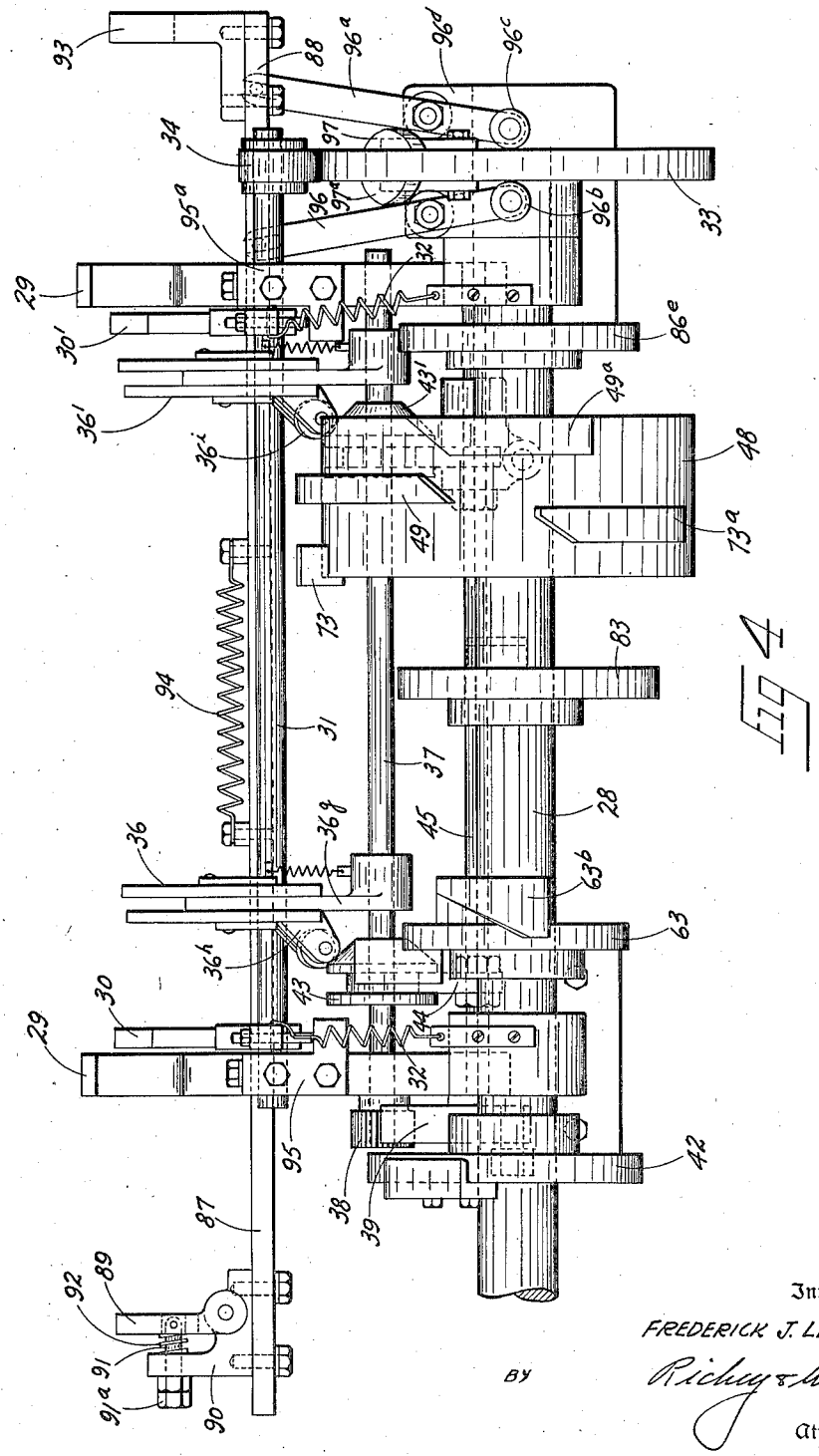


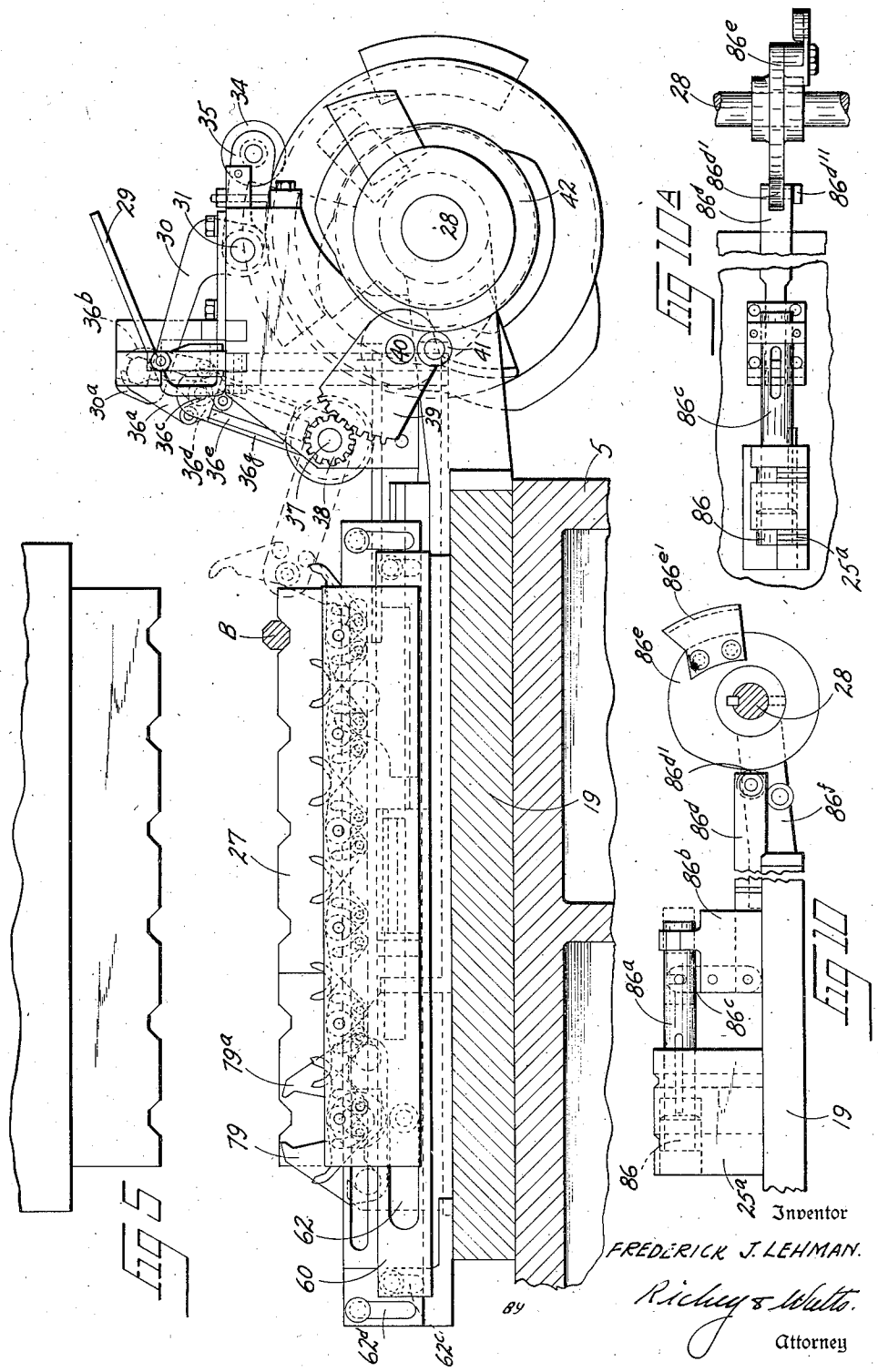

FIG. 4

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APPARATUS FOR FORGING AND SHAPING METAL ARTICLES

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Fig 6

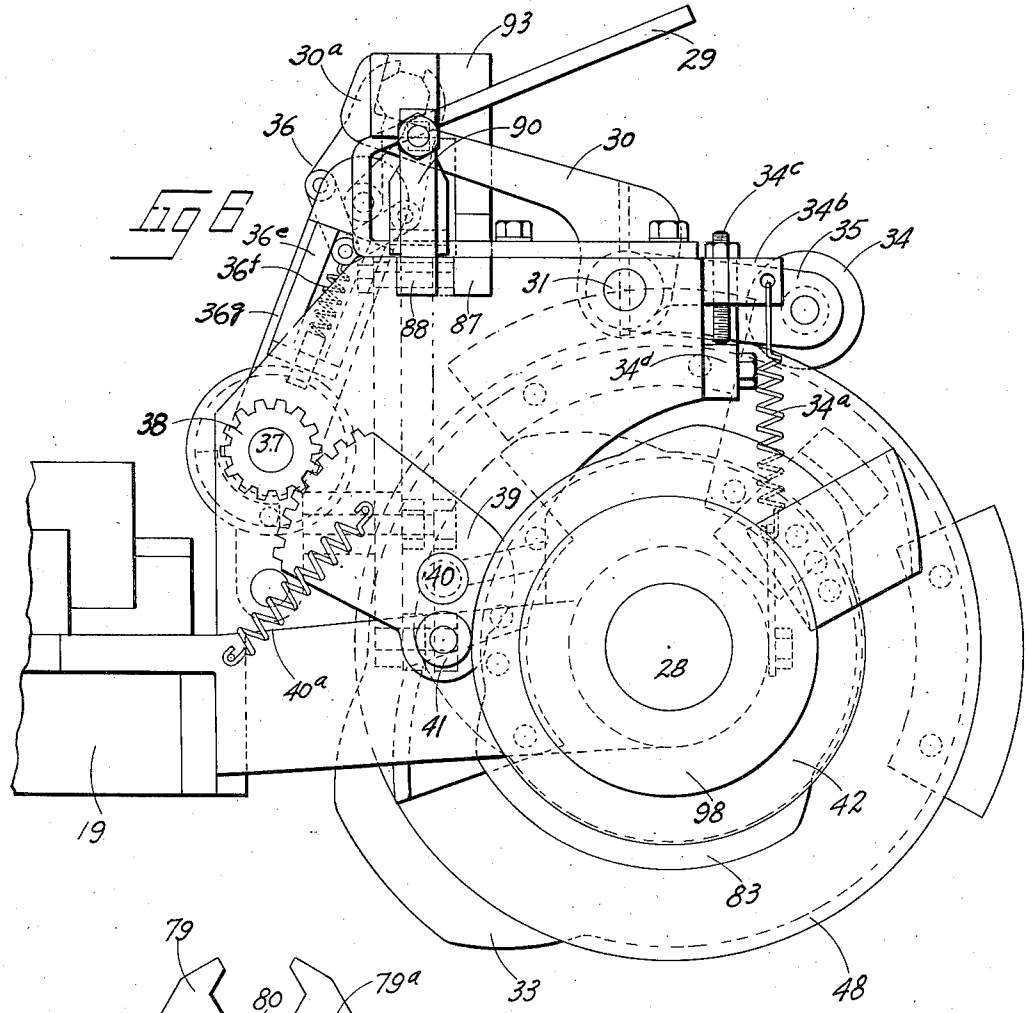
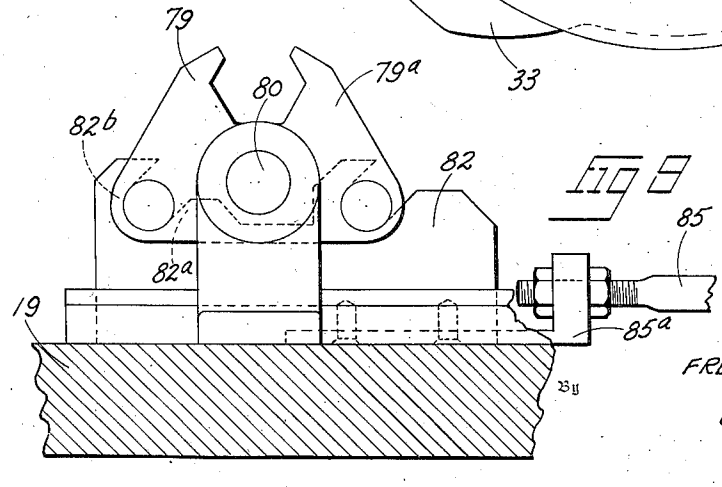



Fig 9




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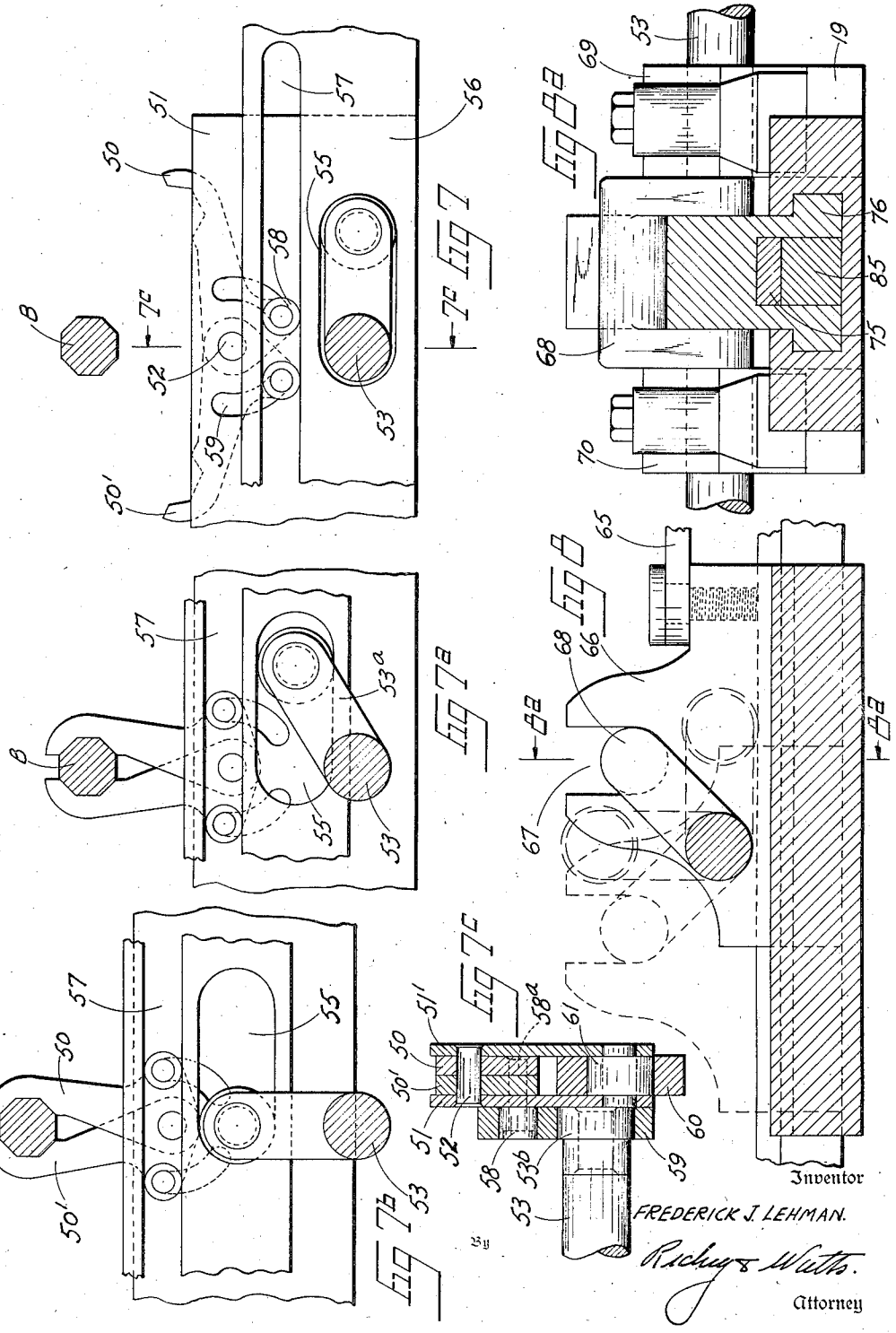
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Oct. 27, 1936. F. J. LEHMAN 2,058,699

APPARATUS FOR FORGING AND SHAPING METAL ARTICLES

Filed June 14, 1935 7 Sheets-Sheet 7



Patented Oct. 27, 1936 2,058,699

# UNITED STATES PATENT OFFICE

2,058,699

## APPARATUS FOR FORGING AND SHAPING METAL ARTICLES

Frederick J. Lehman, Leavittsburg, Ohio, assignor to Warren Tool Corporation, Warren, Ohio, a corporation of Ohio

Application June 14, 1935, Serial No. 26,633

9 Claims. (Cl. 29—34)

This invention relates to apparatus for forging and shaping metal articles from elongated bar stock, and the primary object of the same is to provide means whereby certain types of tools and metal articles may be made on a low cost volume production basis entirely automatically and of uniform construction and high quality throughout.

The present invention is concerned with a machine along the lines of that disclosed in my copending application Serial No. 740,263, filed August 17, 1934, and may therefore be considered either as an improved or as an alternative form of mechanism with respect to that disclosed in said application.

As in the machine of the above application, the article to be produced is a tool commonly known in the trade as a wrecking bar, it being understood that with certain modifications in parts, principally with respect to the dies and shaping units forming part of the apparatus, the machine may be adapted to the manufacture of numerous types of metal articles from elongated bar stock, not herein specified, within the scope of the invention as defined by the claims.

The objects of the present invention therefore are broadly those set forth in my copending application above noted. Additional and more specific objects are, to render certain operations more positive than is the case in the machine disclosed in my earlier application; to provide means for loading the bars onto the chucks and for transferring the bars from one set of dies to the other which will ensure against turning or misalignment of the bars; to provide a complete self-contained lower unit which carries all operating cams and coacting parts thereon and which may be removed from a conventional forging press or analogous machine and replaced at will; to provide improved coordination between the forging machine drive and unit comprising the assembly proper; and to provide other objects and advantageous structural features which will become apparent in view of the following description taken in conjunction with the drawings.

The present improved apparatus, as in my earlier filed application, is arranged so that it may be installed in the conventional forging machine or press, or other machine having the proper operating characteristics and power available to carry out the various steps of the method.

In the drawings:

Figure 1 is a view in side elevation of a forging press having the present improved apparatus operatively associated therewith;

Figure 2 is a view in end elevation of Figure 1 with certain parts broken away to show the structure more clearly;

Figure 3 is a plan view of the bar transfer and gripping mechanism and coacting parts for operating the same;

Figure 4 is an enlarged detail view of the operating cams and certain coacting parts looking in toward the front of the machine at the lower right hand portion of Figure 1;

Figure 5 is a view in sectional side elevation taken substantially on the lines 5—5, Figure 3;

Figure 6 is an enlarged view in end elevation of the cam shaft and cams mounted thereon, as indicated by the line 6—6, Figure 3;

Figure 7 is an enlarged fragmentary view of the bar gripping fingers and coacting bar transfer mechanism taken substantially on the line 7—7, Figure 3; and Figures 7*a* and 7*b* are similar views showing the parts in different positions of operation;

Figure 7*c* is a section taken on the line 7*c*—7*c*, Figure 7;

Figure 8 is an enlarged fragmentary view in sectional side elevation taken substantially on the line 8—8, Figure 3, and alternate position of the parts being indicated in dotted lines;

Figure 8*a* is a section taken substantially on the line 8*a*—8*a*, Figure 8;

Figure 9 is a view in sectional side elevation taken substantially on the line 9—9, Figure 3;

Figures 10 and 10*a* are detail fragmentary views in side elevation and top plan of die block or bending pin actuating mechanism adapted to coact with the die for bending the claw end of a wrecking bar, the parts being shown on a reduced scale.

In the following description, certain of the parts which are duplicated in my copending application above noted will only be generally referred to, reference being had to said application to obtain a more detailed understanding of the construction and operation of such parts.

Referring to the drawings in detail, in Figures 1 and 2 a forging press is shown having a base frame 5 on which are mounted pedestal brackets or uprights 6, 6*a* and 6*b*. A crank shaft 7—7*a* is mounted for rotation in bearings on the upper ends of said brackets, said crank shaft being provided with suitable connecting rods 8 which carry a head plate 9. The shaft 7—7*a* may be driven through the medium of a drive shaft 10 which has bearing at opposite extremities in pedestal brackets 11 and 12; a flywheel 13 and a drive pinion 14 being mounted on said shaft 10, the drive pinion meshing with a gear 15 secured on

shaft 7a. Hold-down rods or bolts 16 and 17 are provided and extend through the frame of the machine to hold the frame parts in rigid association. A bed plate 19 is provided and is removably secured to the base frame 5, this plate forming a support for the entire operating assembly to be described. A drive pulley 20 is shown on the outer end of the drive shaft 10. The part 7a of the crank shaft connects with part 7 through the medium of a clutch which will be hereinafter more fully referred to.

The operation of machines of this type is well understood by those having a knowledge of the art. It will be understood that the particular construction of the forging press above generally described forms no part of the present invention except to provide in combination therewith a complete operative machine, an important feature of the present invention being the adaptability of the mechanism for use with any conventional forging press or analogous machine having the required capacity to carry out the forging and shaping operations.

The bar blanks are disposed on an inclined chute or like support and are taken from this support by transfer arms which place the bars in the first transversely-aligned notches of a gripping member in the form of spring pads or chucks, which notches may be considered the loading station. From this position the bars are transferred along a row of lower dies which are disposed in vertical alignment with upper dies carried by the head plate 9, these dies imparting the necessary shapes to the ends of the bar blanks. Since the dies of the present machine are substantially the same as those of the machine disclosed in my prior application, they are not shown or described in detail in the present instance.

Certain of the dies and shaping units are visible in Figure 3 and are designated at 21—21a, 22—22a, 23—23a, 24—24a and 25—25a. Adjacent these dies are the resiliently-mounted chucks or spring pads 26 and 27 which are provided with a series of transversely aligned notches 26a and 27a in which the bar blanks are disposed during the respective shaping operations.

All of the operating cams are mounted on a main cam shaft 28 and are easily accessible at one side of the machine, note particularly Figures 1, 3 and 4.

The bar stock or blanks B are loaded by a conveyor, a portion of which is shown at C, Figure 2, onto spaced downwardly-inclined chute bars 29, note particularly Figures 4 and 5, there being a pair of these bars in the example shown spaced such distance as to support opposite extremities of a bar blank. Adjacent the lower extremity of the chute bars, the blanks are stopped by a pair of trip arms 30 and 30' each having a hook-shaped end 30a, said arms being adjustably secured on a cross shaft 31 and being normally urged to a stop position by means such as springs 32. The arms 30, 30' are periodically tripped by means of a cam 33, which is secured on shaft 28 and is adapted to contact a roller 34 mounted on the one end of a trip arm 35 adjustably secured on cross shaft 31, note Figures 4 and 6. This feed mechanism is omitted from the plan view in Figure 3, since its inclusion in this figure would obscure parts therebelow. Return springs 34a are each connected to the one end of an arm 34b secured to or forming part of each lever 30 and together with the latter forming in effect a bell crank. Each arm 34b has an adjusting screw 34c therein and adapted to abut a limit stop or abutment bracket 34d to thereby adjust the return or receiving position of the hook ends of arms 30 and 30'.

The bar blanks are transferred from the lower ends of the chute bars 29 to the first notch of the chucks 26 and 27 by means of a pair of oscillating loading members or fingers generally indicated at 36 and 36', there being a finger arranged to engage the opposite extremities of each bar adjacent the hook end 30a of the trip arms 30. Each loading finger is preferably of identical construction, note Figure 5, and as shown comprises a pair of blank or bar-gripping fingers 36a and 36b which at their lower ends are pivoted to a common pivot pin 36c. A pair of toggle links 36d pivotally connect the fingers to a sliding block 36e which is normally urged to return position by a spring 36f. The assembly just described is carried by a frame member or arm 36g having a hub portion which is adjustably secured on a cross shaft 37, the block 36e being mounted to slide in said frame arm. The block 36e is provided with an outwardly projecting roller bracket 36h, note particularly Figure 4, which carries a cam roller 36i. When the block moves upwardly, the fingers are closed, and when the block is retracted, the fingers are opened.

The loading fingers 36, 36' are oscillated from the full line position shown in Figure 5 to the position shown in dotted lines by means of the following assembly: A gear 38 is secured on the one end of shaft 37 and has in continual mesh therewith a segmental gear 39 which is secured on a jack shaft 40 and is urged to retracted position by a spring 40a. The gear 39 carries an eccentrically-disposed cam roller 41 adapted to contact a cam 42 secured on shaft 28. It will be seen that as cam 42 revolves, it oscillates segmental gear 39, to thereby in turn oscillate shaft 37 and the loading fingers 36, 36' carried thereby.

The blank-gripping fingers 36a, 36b of the loading fingers 36, 36' are opened and closed by means of the following parts: A pair of sliding combined clutch and cam cones 43 and 43' are slidingly mounted on the cross shaft 37, said cones each being formed with cam faces adapted to engage the rollers 36i carried by the brackets 36h of the sliding block 36e of the loading fingers. The cones are moved back and forth on the shaft 37 by means of clutch fingers 44 which engage in an annular groove formed in each of said cones, the clutch fingers being secured on a transversely slidable shaft 45. The shaft 45 has attached thereto by means of a bracket 46 a cam roller 47, note particularly Figure 3. A rotating cam support or drum 48 is secured on the main cam shaft 28 and has connected thereto a series of cams 49 and 49a, which are arranged to contact the roller 47 and shift the clutch shaft 45 back and forth, thereby moving the cam faces of the cones 43 and 43' into and from engagement with the rollers 36i carried by the brackets 36h.

As the bar blanks are loaded onto the first notch of the spring pads or chucks 26 and 27, they are transferred, six at a time in the present instance, along the notches of said pads by means of transfer finger and slide mechanism, a description of which follows:

A plurality of sets of transfer fingers 50, 50' are each pivotally connected to pairs of spaced elongated plates 51 and 51', note particularly Figures 7 to 7c, by means of a pivot pin 52, there

being a pair of these plates in each slide assembly. A crank shaft 53 is mounted in bearings 54 on the bed plate 19 and extends transversely between the transfer finger assembly, and at its opposite ends said shaft is provided with cranks 53a each having a roller 53b thereon adapted to engage in a slot 55 formed in a side plate 56 which is slidable with respect to plate 51. This plate 56 is also formed with an elongated slot 57, and the fingers 50, 50' are provided with rollers 58 at their lower ends adapted to engage in said slot, each roller 58 being mounted on a pin 58a which is secured to one of the transfer fingers, the plate 51 being arcuately slotted as at 59 to accommodate arcuate movement of the pins 58a.

Each transfer finger and slide assembly just described is movably anchored and steadied by means of a track rail 60, note particularly Figure 7b in conjunction with Figure 5, the plates 51 and 51' being provided at their opposite ends with rollers 61 which are adapted to ride in longitudinal slots 62 formed in the track rail 60. The rail 60 and side plate 56 are both anchored for limited vertical movement at opposite ends to brackets 62a and 62b, note Figures 3 and 5, the rail and plate being respectively slotted vertically at 62c and 62d through which headed pins or bolts 62e and 62f project. It will thus be seen that the plates 51, 51' may move both vertically and longitudinally while the side plate 56 and rail 60 may only move vertically. When the crank shaft 53 is oscillated in a manner to be described, the rollers 53b on the cranks 53a engaging in the slots 55 of the side plates 56, raise the slide assembly vertically from the position shown in Figure 7 to those shown in Figures 7a and 7b, the plates 51, 51' and fingers carried thereby then being shifted horizontally to the left by means shortly to be described. Since the side plate 56 is slidably mounted with respect to the plates 51 and 51', when the assembly is raised, relative vertical movement ensues between the plate 56 and the plates 51 and 51', which causes the rollers 58 in the slot 57 to spread, thereby closing the fingers on the bar blanks B, the gravitational weight of the plates 51, 51' being such as to cause the fingers to close and grip the blanks with sufficient carrying pressure. In Figure 7, the transfer fingers 50, 50a are shown fully open. In Figure 7a the fingers have been closed on the bar which at that time would be in one of the notches of the spring pads or chucks 26 and 27; and in Figure 7b, the bar has been raised vertically from said notch and is ready to be moved horizontally to the next succeeding notch. The cranks 53a turn only through an arc of 90°, bar 56 moving vertically but not longitudinally.

The crank shaft 53 is oscillated through the medium of cams 63a and 63b which are carried by a supporting drum or disk 63 mounted on the main crank shaft 28. Cams 63a and 63b are adapted to actuate a bell crank lever 64 which is fulcrumed to the bed plate 19 and is provided at one end with a cam roller 64a and at its opposite end is pivotally connected to a connecting rod 65, the opposite end of said rod being connected to a sliding block 66 which at an intermediate point is slotted as at 67, note particularly Figures 8 and 8a, to receive a crank 68 formed at an intermediate point on the crank shaft 53. Figure 8a shows the bearing blocks 69 and 70 for the crank shaft 63 on opposite sides of the central crank 68.

The crank shaft 53 is connected to a rear crank shaft 72 by means of a connecting rod 73, and this crank shaft is provided at opposite extremities with cranks 72a which function in the same manner as the cranks 53a and act on the rear of the transfer finger slide assembly in the same manner that the cranks 53a act on the front portion thereof.

When the slide assembly has been raised vertically by the cranks 53a, 72a to the position shown in Figure 7b, the plates 51 and 51' with the transfer fingers carried thereby are shifted horizontally, to the left as shown in Figure 7b, by means of cams 73 and 73a which are mounted on the cam drum 48, said cams acting on a bell crank lever 74 pivoted as at 74a to the bed plate 19, the one end of said lever being provided with a cam roller 74b which is engaged by the cams 73 and 73a, and the opposite end of said lever engaging a connecting rod or slide member 75 which projects through guide block 76 and extends rearwardly and has pivotally connected thereto levers 77 and 77a, the latter being fulcrumed at 77b and 77c to the bed plate 19 and having the outer ends thereof forked and engaging brackets 78 and 78a which are connected to the plates 51.

When the transfer finger and slide assembly has reached the position shown in Figure 7b, cam 73 contacts roller 74b and turns bell crank lever 74, thereby retracting the connecting or slide rod 75, the latter acting on the levers 77 and 77a and shifting the plates 51 and 51' together with the transfer fingers carried thereby rearwardly to bring the bar blanks B carried by the transfer fingers into registration with the next succeeding transversely- aligned set of notches of the spring pads or chuck members 26 and 27. Cam 63b acting on bell crank 64 then retracts the connecting rod 65 and the crank 68 of the shaft 53, the cranks 53a and 72a then being returned to the position shown in Figure 7, thereby lowering the transfer slide assembly and the fingers carried thereby and depositing the bar blanks onto the spring pads. When the slide assembly is lowered, relative movement again takes place between the side plate 56 and the adjacent plates 51 and 51', and the transfer fingers are opened as shown in Figure 7. About this time, cam 73a engages roller 74b and the rod 75 is shifted to the left as viewed in Figure 3, thereby shifting the plates 51 and 51' and the transfer fingers carried thereby back to their original position ready to repeat the cycle.

To hold the bar blanks firmly against movement during bending of the end portions thereof, gripping jaws 79 and 79a, note particularly Figures 5 and 9, are provided and are rotatably mounted or journalled on a jack shaft 80 at the rear of the machine, the shaft 80 being mounted in bearings 81. A sliding cam 82 is provided and is formed with cam portions 82a and 82b, note Figure 5, adapted to engage coacting cam portions formed on the jaws 79 and 79a and open and close the latter. This bar-gripping assembly just described is substantially the same as that disclosed in my copending application heretofore noted, the difference in the present instance being in the construction of the cam 82, which acts positively to open as well as close the jaws, and in the means for actuating or reciprocating the cam 82. The said latter means comprises a cam 83 having connected thereto a cam member 83a which defines an arcuate cam track adapted to engage a cam roller 84 mounted on the one end of a connecting or slide rod 85 which projects forwardly in substantially parallel relation to the connecting or slide rod 75, note Figure 8a, and

is connected at its rear end with a bracket 85a connected to the cam 82. When cam shaft 28 revolves, cam 83 engages cam roller 84 and reciprocates the connecting or slide rod 85, which in turn reciprocates cam 82, thereby causing jaws 79 and 79a to open and close. When the jaws are closed, they grip the intermediate portion of the bar blank and hold it firmly against displacement while it is being acted upon by upper and lower bending units, for an understanding of which reference is had to my prior application above noted, the lower units being shown at 24, 24a and 25, 25a.

The lower bending unit or die 25a is used for bending the claw end of each wrecking bar into final form, and this die has coacting therewith a movable die block or what may be termed a "bending pin" 86 which, after the claw has been bent partly therearound, is retracted to clear the claw. While this die block is shown and described in my prior application, the mechanism for actuating the same has been changed in the present instance to ensure a more positive operation. By referring to Figures 10 and 10a in conjunction with Figure 3, it will be seen that the die block 86 is adjustably connected to the one end of a slide rod 86a, the opposite end of said rod being mounted for limited sliding movement in a pedestal bracket 86b which in turn is mounted on bed plate 19. An arm or link 86c is fulcrumed to the bracket 86b, its upper end being loosely pivoted to rod 86a and its lower end being pivotally connected to a connecting rod 86d which extends back to a point adjacent cam shaft 28 and is adapted to be reciprocated by a cam 86e mounted on said shaft. Rod 86d may be steadied and supported by a bracket 86f connected to plate 19. Cam 86e is a positively-acting cam and has an adjustable groove or track member 86e' secured thereon which could if desired be made integral therewith, the cam 86e and cam member 86e' being adapted to act on rollers 86d' and 86d'' mounted on rod 86d. Bending block or pin 86 is slidingly mounted in an arcuate groove or recess formed in the bending die 25a.

The die block or bending pin is shown in advanced or bending position in Figures 10 and 10a. In this position the claw end of a bar blank is bent over or around the pin when an upper die, not herein shown, moves down into operative position with respect to die 25a. After the claw-bending operation is completed, cam 86e engages cam roller 86d' and pushes rod 86d forward, thereby retracting rod 86a and the block or pin 86 mounted on the end thereof, thus permitting removal or transfer of the formed bar from die 25a. When cam member 86e' engages roller 86d'', the die block or bending pin 86 is moved forward or back into operative position in die 25a.

When the bar blanks are loaded into the machine, it is desirable that they be accurately centered transversely. One means for accomplishing this result is to provide a pair of coacting slide bars 87 and 88 having secured to the outer ends thereof centering devices, the device on one side consisting of a resiliently mounted end contact plate 89 which is pivotally secured to a carrying bracket 90 which in turn is secured to the rod 87, the plate 89 having pivotally connected thereto a guide pin 91 which extends through a portion of the bracket 90 and is provided with locking and adjusting nuts 91a. A spring 92 encircles the pin 91 and normally urges the centering plate 89 inwardly. On the opposite side of the mechanism, the bar 88 has mounted thereon a centering plate 93 which coacts with the plate 89 to contact the opposite end of a bar blank, it not being necessary to give both plates 89 and 93 a resilient mounting.

The bars 87 and 88 are normally urged outwardly or away from bar centering position by means of a spring 94 which is connected at opposite ends to said bars, the bars being slidingly mounted in brackets 95 and 95a. To move the end-contacting or centering plates 89 and 93 towards one another or into bar centering position, levers 96 and 96a are provided and are connected at their upper ends to said bars and at their lower ends are provided with cam rollers 96b and 96c. At an intermediate point, the levers 96, 96a are fulcrumed to brackets 96d. The cam 33 has secured on the opposed sides thereof cams 97 and 97a which are adapted to engage the rollers 96b and 96c and thereby actuate the levers 96 and 96a and move the bars 87 and 88 and the parts carried thereby toward one another. It will be seen that as each bar is deposited on the ends of the trip arms 30 and 30', the centering plates 89 and 93 move against opposed ends of the bar blank and always insure an accurately centered position.

The cam shaft 28 is detachably coupled at 98 to a shaft 99, and by uncoupling the shafts from one another and detaching the bed plate 19, the latter together with the entire assembly carried thereby may be removed and replaced at will.

It is preferred to actuate the head plate 9 and the upper forging and shaping units carried thereby intermittently instead of continuously, and accordingly the shaft 99 is provided with a cam 100 adapted to act on a crank lever 101 which is fulcrumed as at 102 to the adjacent frame structure and is provided with a cam roller 103. A link 104 connects the lever 101 with a clutch member 105 having a cam-shaped portion 105a adapted to engage an outwardly projecting clutch member 106 forming part of a clutch assembly generally indicated at 106a, the clutch member 106 being normally urged to the left or towards engaging position by means of a spring 106b. The clutch assembly 106a is adapted to intermittently set up a driving connection between part 7a of the main crank shaft and part 7.

The member 105 is slidably mounted in a bracket 107 and is pulled downwardly against the pressure of a spring 108 which is housed in said bracket.

It will be seen that as cam 100 revolves, it periodically retracts or pulls downwardly on the member 105 thereby retracting the cam portion 105a thereof clear of the coacting portion of the clutch member 106, permitting the spring 106b to move the clutch into engaging position. When the cam 100 permits the spring 108 to push or drive the cam member 105 upwardly, the member 106 is retracted, thereby releasing the clutch. Since clutch assemblies of the spring-pressed type are common and well known in the various arts and may be purchased in the open market, it is not considered necessary to show the same in detail.

To prevent overrunning of the crank shaft 7, 7a and the upper head 9, a brake mechanism is provided and consists of a brake band 109 which is arranged over a drum 110, the one end of the band or strap 109 being connected to a crank lever 111, note particularly Figure 2. A brake cam 112 is mounted on shaft 99 and is adapted to

actuate a lever 113 which is connected to the lever 111 through the medium of a link 114.

The cam 112 is timed to apply the brake upon retraction of the clutch member 106 to thereby prevent overrunning of the shaft 7 and head 9 and the parts carried thereby.

The drive on the shaft 99 is preferably continuous and may be taken from the shaft 10 through the medium of drive pinion 14 and transmitted through suitable reduction gears to a gear 115 having a floating mounting on the shaft 99, note particularly Figure 1. Gear 115 has a drive connection with shaft 99 through the medium of a drive plate 115*a* and a safety connection or pin 115*b*, the plate being keyed to the shaft and the pin connecting the gear with the plate. Should the driving torque on shaft 28 exceed a predetermined load, pin 115*b* will shear, preventing damage to the mechanism. To disconnect the drive on the forging mechanism whenever desired, a clutch assembly generally indicated at 116 is provided on the outer extremity of the shaft 99 and is adapted to be actuated through the medium of a lever 117 and a hand rod 118.

For a complete understanding of the operation of the machine, reference is had to my copending application heretofore noted, wherein the various operations on a wrecking bar are clearly brought out, and the dies and bending units for performing such operations are more clearly shown than in the present instance.

Since the present machine deals principally with the loading of the bars and the transfer thereof from one position to another with respect to the forging dies and shaping units, a description of such operations only should be necessary in the present instance. The bar blanks B are loaded onto the chute bars 29 and move by gravity down to the ends of the trip levers 30. When the bar blanks reach the ends of the trip levers 30, they are accurately centered transversely through the medium of the centering or end contact plates 89 and 93 which are moved toward one another through the medium of the cams 97, 97*a*. Cam 42 then acts on roller 41 to rotate the segmental gear 39 and swing the loading fingers 36 and 36′ to the left to the dotted line position shown in Figure 5, thereby transferring the bar blank from the ends of the trip members 30 the first notch of the spring pads 26 and 27, cam 33 having tripped the arms 30 just prior to transfer movement of the said loading fingers. As the loading fingers swing to the left or to the dotted line position above noted, the cone cams or members 43 and 43′ are shifted to the right as shown in Figure 4, thereby opening the said fingers and releasing the bar blank just as it is being deposited on the first notch of the spring pads 26 and 27. From the first notch of the spring pads or clutch members 26 and 27, the bar blanks are transferred along said clutch members or pads through the medium of the transfer slide and finger assembly whose structure and operation has heretofore been described in detail, the cranks 53*a* and 72*a* on the opposite ends of the crank shaft 53 raising the said assembly from the position shown in Figure 7 to the position shown in Figure 7*b*, at which point the assembly consisting of the side plates 51, 51′ and transfer fingers 50, 50′ is shifted rearwardly through the medium of the arms 77 and 77*a* which are actuated primarily through the medium of the cams 73 and 73*a*. When the bar blanks reach a point in vertical alignment with the next succeeding notches, the cranks 53*a* and 72*a* are oscillated back to the position shown in Figure 7, thereby lowering the plates 51, 51′ and the fingers carried thereby, depositing a bar blank in said notches. The plates 51, 51′ and transfer fingers are then moved back to their original position by reverse action of the arms 77 and 77*a*.

The bar blanks upon reaching the last notch of the group on the spring pads 26 and 27, and which is the bending station for the ends of the bars, are gripped by the jaws 79 and 79*a*, the cam 82 being moved rearwardly to close the jaws on the bar blank.

While the operating parts of the present machine have been described and shown more or less in detail, it will be understood that such detailed disclosure is not to be construed as a limitation but that certain modifications and changes in design may be adopted within the scope of the invention as defined by the appended claims.

I claim:

1. In a machine for forging and shaping elongated metal articles from lengths of bar stock, a series of dies arranged longitudinally and in transversely spaced and aligned relation to effect in sequential order forging and bending operations on opposite extremities of the bars, and means for transferring simultaneously a plurality of bars along said dies; said means comprising a plurality of sets of transfer fingers, a pair of plates on which said fingers are pivoted, a slide plate mounted adjacent said first-named plates and having an elongated slot therein, said fingers being provided with actuating rollers adapted to engage in said slot, and means for raising and lowering said slide plate to thereby impart relative movement between the same and the first-named plates to open and close said fingers.

2. In combination with a forging machine having a bed frame, a unit for forging and shaping elongated metal articles from lengths of bar stock comprising a bed plate, a series of dies arranged longitudinally in sequence and in transversely spaced and aligned relation on said plate, chucks mounted adjacent the dies for holding the bars while being subjected to the action of the dies, means for loading the bars on the chucks comprising an oscillating arm, fingers on said arm, a toggle connected to said finger, a cam coordinated with said toggle and adapted to close said fingers when said arm is oscillated in its uppermost position and open said fingers when said arm is lowered, means for transferring the bars along said chucks comprising plates, fingers pivoted thereon, slides contiguous said plates, means for raising and lowering said slides and means coordinated with said slides to open and close said fingers upon movement of said slides.

3. In combination with a forging machine having a bed frame and a reciprocating head plate and a drive shaft for reciprocating said plate, a unit for forging and shaping elongated metal articles from lengths of bar stock comprising a bed plate, a series of dies arranged longitudinally in sequence and in transversely spaced and aligned relation on said plate, chucks mounted adjacent the dies for holding the bars while being subjected to the action of the dies, means for loading the bars on the chucks, comprising oscillating arms, gripping fingers thereon, means for transferring the bars along the chucks to successive operating positions with respect to the dies, comprising slides, gripping fingers coordinated therewith, a shaft gearing thereon for

actuating the bar loading arms, cones on said shaft for actuating said gripping fingers on the bar loading arms, a cam shaft and cams thereon for actuating the bar transfer slides the bar loading arm gearing and bar loading gripping finger cones in timed order of operation.

4. In combination with a forging machine having a bed frame and a reciprocating head plate and a drive shaft for reciprocating said plate, a unit for forging and shaping elongated metal articles from lengths of bar stock comprising a bed plate, a series of dies arranged longitudinally in sequence and in transversely spaced and aligned relation on said plate, chucks mounted adjacent the dies for holding the bars while being operated on by the dies, arms for loading the bars on the chuck, plates for transferring the bars along the chucks in successive operating positions relative to said dies, a cam shaft, cams thereon for actuating said plates, a shaft, gearing thereon for actuating the bar loading arms, and a second cam on said cam shaft for operating the bar loading arm gearing in timed relation with the movement of said plates.

5. In a machine for forging and shaping elongated metal articles from lengths of bar stock, a series of dies arranged longitudinally and in transversely spaced and aligned relation to effect in sequential order forging and bending operations on the bars, chucks mounted adjacent the dies for holding the bars while being operated on by the dies, a support on which the bars are placed preparatory to being loaded on the chucks, means for successively transferring the bars from said support to said chucks, comprising a pair of oscillating arms, gripping fingers thereon, mechanism for oscillating said arm mechanism for opening and closing said gripping fingers, mechanism for transferring the bars progressively from one set of dies to the next succeeding set of dies, a rotatable cam shaft common to mechanism for oscillating said arms, opening and closing the gripping fingers and progressively transferring the bars relative to the dies whereby the timed order of operation of each of said mechanisms is maintained.

6. In a machine for forging and shaping elongated metal articles from lengths of bar stock, a series of dies arranged longitudinally and in transversely spaced and aligned relation to effect in sequential order forging and bending operations on the bars, chucks mounted adjacent the dies for holding the bars while being operated on by the dies, a support on which the bars are placed preparatory to being loaded on the chucks, an arm mounted to oscillate intermediate said support and said chucks, mechanism for oscillating said arm bar, gripping fingers thereon, mechanism to close said fingers when said arm is oscillated adjacent said support and to open said fingers when said arm is oscillated adjacent said chucks, said arm oscillating mechanism and said finger opening and closing mechanism being operatively controlled from single driving medium.

7. In a machine for forging and shaping elongated metal articles from lengths of bar stock, a series of dies arranged longitudinally and in transversely spaced and aligned relation to effect in sequential order forging and bending operations on the bars, an inclined support on which the bars are placed preparatory to being operated on by the machine, means for successively releasing the bars from said support, comprising a pair of arms having hooks in the ends thereof adapted to engage a bar, a cam shaft, cams thereon for oscillating said arms into and out of hook engaging position, a second pair of arms, gripping fingers thereon, a second set of cams on said cam shaft for oscillating said second named arms in timed relation with said first named arms and a third set of arms on said cam shaft for opening and closing said gripping fingers in timed relation with the movement of said first and second named arms.

8. In a machine for forging and shaping elongated metal articles from lengths of bar stock, a pair of dies arranged longitudinally and in transversely spaced and aligned relation to effect in sequential order forging and bending operations on opposite extremities of the bars, and means for transferring simultaneously a plurality of bars along said dies, said means comprising a plurality of sets of transfer fingers, a bodily-movable support on which said fingers are pivoted, a slide plate adjacent said support, means for raising and lowering said plate, imparting thereby relative movement between said plate and said support and connections between said plate and each set of said fingers to open said fingers when said plate is lowered and close said fingers when said plate is raised.

9. In a machine for forging and shaping elongated metal articles from lengths of bar stock, a series of dies arranged longitudinally and in transversely spaced and aligned relation to effect in sequential order forging and bending operations on opposite extremities of the bars, and means for transferring simultaneously a plurality of bars along said dies; said means comprising a plurality of sets of transfer fingers, a supporting plate on which said fingers are pivotally mounted, a slide plate mounted adjacent said supporting plate, said slide plate having a slot therein, rollers mounted on said fingers and engaged in said slot, means for raising, lowering and moving said plates and said fingers horizontally to advance the bars respectively to the next adjacent set of dies, the movement of said plates imparting relative movement between said supporting plate and said slide plate whereby said rollers operating in said slot will open and close said fingers simultaneous the vertical movement of said plates.

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