March 22, 1927. 1,621,573

R. ARMOUR

FORGING TOOL

Filed July 21, 1923 2 Sheets-Sheet 1

Fig. 1.

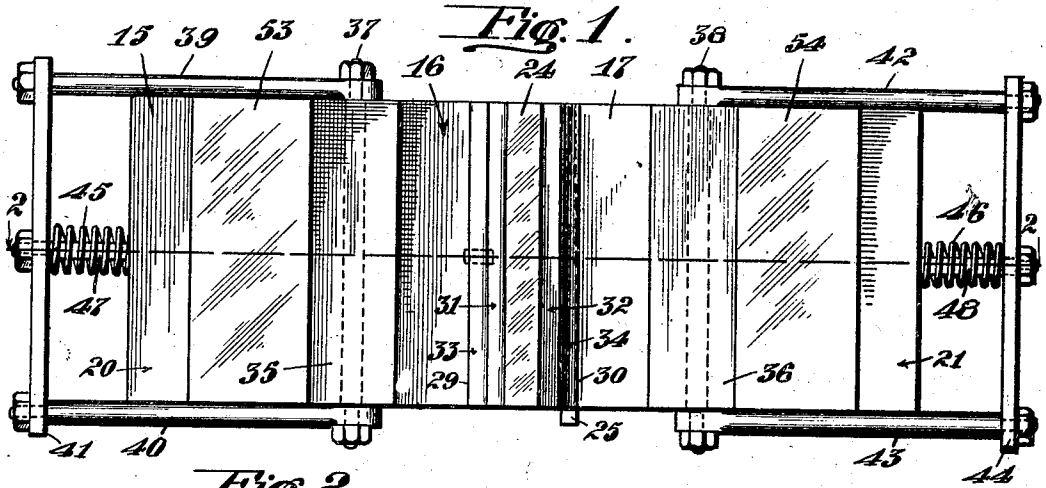


Fig. 2.

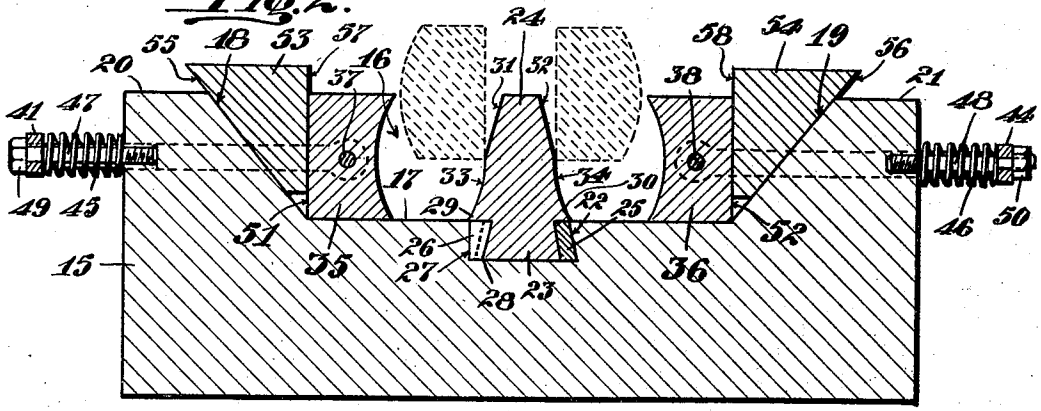


Fig. 3.

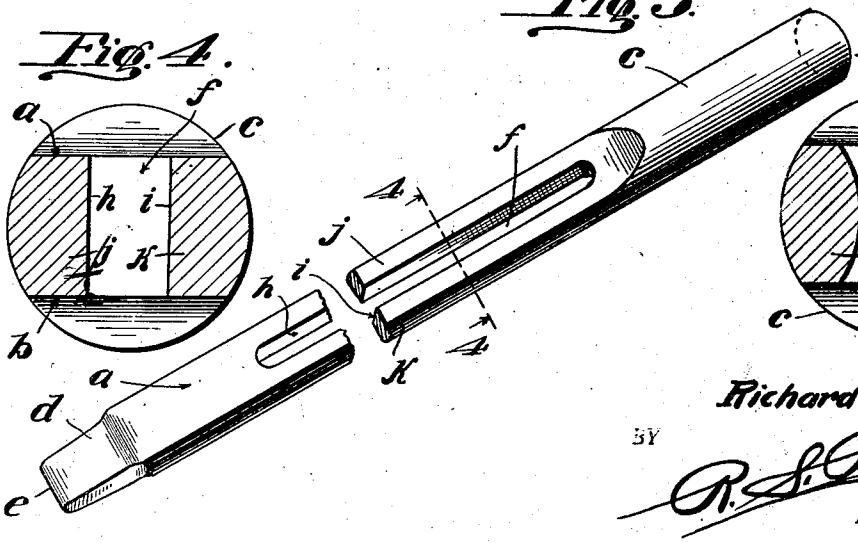
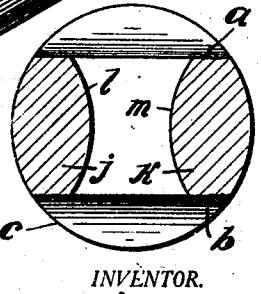


Fig. 4.

Fig. 5.



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Fig. 6.

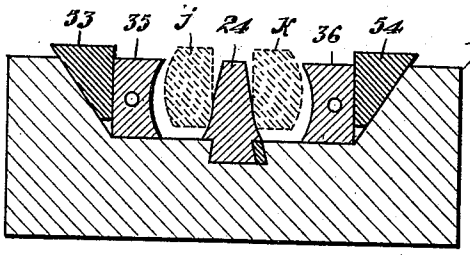


Fig. 7.

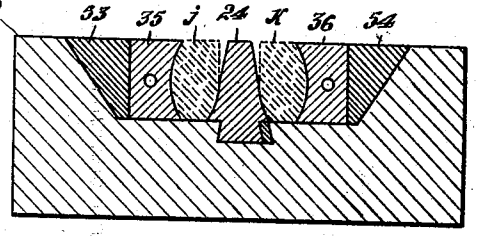


Fig. 8.

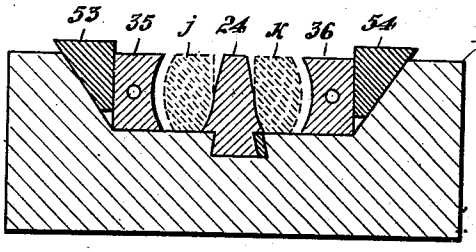


Fig. 9.

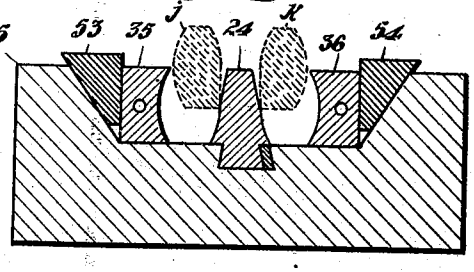


Fig. 10.

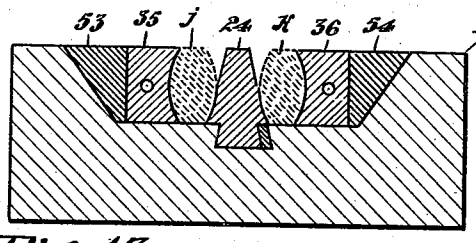


Fig. 11.

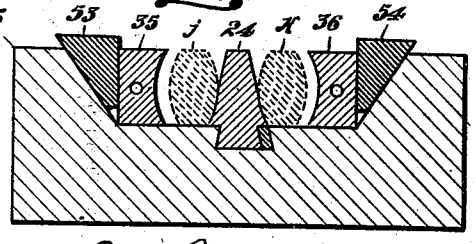


Fig. 13.

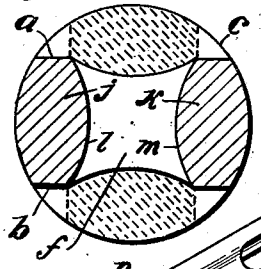
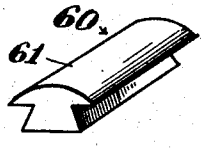


Fig. 12.

Fig. 14.



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UNITED STATES PATENT OFFICE.

RICHARD ARMOUR, OF LOS ANGELES, CALIFORNIA.

FORGING TOOL.

Application filed July 21, 1923. Serial No. 652,984.

This invention particularly pertains to a means and method for forging the side portions of link structures and which is especially adapted for use in forming the side members of the links or reins of well drill jars.

An object of my invention is to provide a means whereby the bearing surfaces of a jar rein may be readily forged and shaped preparatory to machining to a finished surface, and whereby the side portions of the rein may be accurately formed to size.

Another object is to provide a device of the above character which is so constructed as to endure and be subject to but little wear, and which embodies few parts of simple construction and arrangement.

Another object is to provide a forging tool whereby the inner surfaces of the side members of a link may be formed without distorting the external contour of the link side members.

Another object is to provide a rein-forming tool adapted to be operated to form a rein by a steam hammer or the like, in which the metal being worked will be maintained in proper dimensions in cross section during the forming operation.

With the foregoing objects in view together with such other objects and advantages as may subsequently appear, my invention resides in the parts and in the construction, combination and arrangement of parts or their equivalents, as hereinafter described and claimed and illustrated by way of example in the accompanying drawings, in which—

Figure 1 is a plan view of the forging tool.

Figure 2 is a view in longitudinal section as seen on the line 2—2 of Figure 1.

Fig. 3 is a detail in perspective illustrating the rein blank as formed, in readiness to be operated on by the tool.

Figure 4 is a detail in section of the rein blank as seen on the line 4—4 of Figure 3.

Figure 5 is a detail in section, showing the rein as formed by means of the tool.

Figures 6, 7, 8, 9, 10 and 11 are diagrams illustrating the operation of the tool.

Figure 12 is a detail in perspective illustrating the rein as formed by the tool.

Figure 13 is a detail in cross section showing the manner in which a pair of reins are linked together.

Figure 14 is a detail in perspective of a supplemental mandrel adapted to be used in the tool.

More specifically, 15 indicates a base block which is preferably rectangular and is formed on its upper face with a transverse channel 16 which opens at the sides of the block and is formed with a flat bottom wall 17 extending throughout the width of the base block and which channel has oppositely inclined end walls 18 and 19. The upper faces 20 and 21 at the end portion of the base block are flat and extend on a plane parallel with the plane of the bottom wall 17 of the channel 16. The bottom wall 17 of the channel is formed with a central longitudinally extending dove-tail channel 22 adapted to receive a dove-tail flange 23 on the under side of a mandrel 24, which mandrel is adapted to be set in the channel and secured to the base block by a key 25 extending longitudinally between one side wall of the channel 22 and the dove-tail flange 23, which key cooperates with a transverse key or gib 26 engaging opposite recesses 27 and 28 formed in the sides of the channel and flange opposite the key 25 to automatically lock the mandrel 24 in place. The mandrel 24 is formed with projecting side flanges 29 and 30 which extend over the keys 25 and 26. The upper face of the mandrel 24 extends on a plane with the top faces 20 and 21 of the base block, and the opposite sides 31 and 32 of the mandrel are inclined outwardly from the upper face thereof to a point midway between the bottom wall 17 of the channel 16 and the top face of the mandrel, thereby forming the mandrel with a tapered cross section on its upper portion as shown in Figure 2, whereby it is adapted to be introduced between the side members of a link or rein of a jar to be placed astride thereof. The sides 33 and 34 of the mandrel extending between the inclined sides 31 and 32 and the bottom wall 17 of the channel are concave throughout the length of the mandrel, being curved on a radius struck from a center on a line extending midway of the depth of the channel 16, which radius corresponds in length to one-half the diameter of the jar.

Mounted on the channel 16 and bearing on the bottom wall 17 is a pair of slide blocks 35 and 36 spaced from the opposite sides of the mandrel 24, which slide blocks are formed with their upper faces extending on the plane of the top faces 20 and 21 of

the base block, and have their inner side faces concave throughout their lengths and height, which faces are curved on a radius struck from a center located on a line extending midway between the bottom of the channel and the top of the side blocks which radius is of a length equal to one-half the diameter of the jar. Extending longitudinally through the slide blocks 35 and 36 are rods 37 and 38 which project beyond the end faces of the slide blocks, which end faces extend flush with the side faces of the base block. The ends of the rod 37 connect with a pair of horizontally extending bars 39 and 40, the outer ends of which connect with a cross head 41, spaced from one end of the base block, and the rod 38 connects with a pair of horizontally extending bars 42 and 43, connecting with a cross head 44 spaced from the other end of the base block. Coiled springs 45 and 46 bear between the ends of the base block and the cross heads 41 and 44 and act to normally maintain the slide blocks 35 and 36 in retracted position. The springs 45 and 46 are wound around bolts 47 and 48 screwed into the ends of the base block and which bolts slidably extend through the cross heads 41 and 44 and have nuts 49 and 50 screwed in their outer ends which serve to limit the outward movement of the cross heads 41 and 44 and thereby limit the retractive movement of the slide blocks 35 and 36. The slide blocks 35 and 36 are formed with vertically extending rear walls 51 and 52 which are arranged so that when the slide blocks are moved into their retracted position the lower rear corners of the slide blocks will be disposed at the juncture of the inclined walls 18 and 19 of the channel 16 with the bottom wall 17 of the channel, as shown in Figure 2.

Disposed in the spaces between the back walls of the slide blocks 35 and 36 are wedge blocks 53 and 54 having inclined faces 55 and 56 which slidably seat on the inclined walls 18 and 19, and which have vertical front faces 57 and 58 which slidably bear against the outer vertical faces 51 and 52 of the slide blocks. The wedge blocks are normally disposed with their upper faces projecting above the top faces 20 and 21 of the base block and with their lower edges spaced from the bottom wall 17 of the channel, as particularly shown in Figure 2, so that the wedge blocks may be moved downwardly to a position so that their top faces will extend flush with the top faces of the base block, the wedge blocks serving as a means for advancing the slide blocks in opposition to the springs 47 and 48, as will be later described.

The mandrel 24, slide blocks 35 and 36, and wedge blocks 53 and 54, correspond in length to the width of the base block so that their ends will extend flush with the sides of the base block, as shown in Figure 1; and the bars 39, 40, 42 and 43 extend in slidable contact with the said faces of the base block, thereby serving to hold the slide blocks and wedge blocks against longitudinal movement on the base block.

The rein or link to be operated on by the tool is illustrated in Figures 3 and 4, which show a rein as blanked in readiness to be operated on by the tool, which blanked rein comprises a cylindrical bar of metal having a major portion of its length formed with flat faces *a* and *b* on opposite sides thereof, which are continued into a cylindrical shank portion *c* of the bar, as shown in Figure 3. The end of the bar opposite the shank *c* is shaped to form the head portion *d* of the jar, which head portion is tapered from the faces *a* and *b* and terminates in a rounded end *e*, which extends transversely of the bar. A longitudinally extending slot *f* is formed in the flanged portion of the bar, as by punching, which slot has parallel side walls *h* and *i* forming the inner faces of the side members *j* and *k*, constituting the link portion of the rein, which side portions have an outside curvature formed in continuation of the shank portion *c*. The rein blank is thus formed with a uniform transverse diameter between the outer end of the shank *c* and the head, and is formed of decreased thickness between the faces *a* and *b*.

In carrying out my invention the concave faces 33 and 34 on the mandrel and the concave faces on the slide blocks 35 and 36 are formed with curvatures corresponding to the curved periphery of the link blank, and the mandrel 24 is formed of a width between the upper end of the concave faces 33 and 34 at the juncture of the inclined faces 31 and 32, substantially corresponding to the width of the slot *f* in the link blank, the depth of the slot 16 and the height of the mandrel and slide blocks corresponding in distance to the thickness of the link blank between the flat faces *a* and *b*.

The primary purpose of the invention is to provide a means for forging the side members *j* and *k* of the blank, so as to form the inner faces *h* and *i* thereof convex on curvatures corresponding to the outside curvature of the blank, as indicated at *l* and *m* in Figure 5.

In the operation of the invention the rein blank, previously heated to a suitable degree of softness, is initially positioned to extend transversely of the base block 15 with the tapered portion of the mandrel 24 extending into the slot *f*. When thus positioned the inside faces *h* and *i* of the rein side portions *j* and *k* will extend vertically from the point of inclination of the inclined and concave faces of the mandrel, as shown in Figure 2. The upper face *a* of the rein blank will then be disposed on a plane above the

plane of the top faces of the wedge blocks 53 and 54.

A steam hammer or the like is employed for effecting the forging operation; the tool being positioned beneath the hammer head, which hammer head has a flat under face and substantially conforms in outline to the margin of the base block 15. When the link blank is positioned on the tool, as shown in Figure 2, the hammer head is dropped so as to drive the link blank into the space between the mandrel and the slide blocks, and also drive the wedge blocks downwardly to their lowermost position on the inclined faces of the base block channel. The upper face *a* of the link blank in projecting above the upper face of the wedge blocks will initially receive the blow of the hammer which will drive the link blank downwardly on opposite sides of the mandrel; the link blank moving well into the space between the slide blocks before the hammer strikes the wedge blocks. The relative positions of the link blank and the parts of the tool at this moment, is illustrated in Figure 6. On initial downward movement of the link blank, the curved faces of the mandrel will operate to slightly curve the lower portions of the inside faces *h* and *i* of the side members *j* and *k*. Continued movement of the hammer will cause it to impact on the wedge blocks and move the latter downward and thereby cause the slide blocks to advance with the continued downward movement of the link blank, so as to position the parts as shown in Figure 7; the bottom face *b* of the link blank then bearing on the flat face 17 of the base block and the outer curved faces of the side members bearing against the curved faces of the slide blocks. The lower portion of the inner faces *h* and *i* of the side members *j* and *k* will then be curved as shown in Figure 7. In this operation a portion of the metal of the link blank is displaced but is caused to manually run into the length of the blank. On lifting the hammer head, the springs 45 and 46 will retract the slide blocks 35 and 36 and thereby restore the wedge blocks to their elevated position, as shown in Figure 8. The link blank is then lifted from its position on the tool, and after being inverted is replaced astride the mandrel as shown in Figure 9; whereupon the hammer is again operated so as to drive the link blank and the wedge blocks downwardly into the position shown in Figure 10, thereby rounding the other half of the flat faces *h* and *i*. On again retracting the hammer head the slide blocks will be withdrawn out of contact with the side faces of the link blank, as shown in Figure 11, whereupon the blank may be removed.

The side members *j* and *k* of the link portion of the blank will then be formed with the convex faces *l* and *m* as shown in Figure 5.

The link blank may be of any desired length with the slot therein of greater length than the width of the tool, in which event the blank is worked from one end of the machine to the other by advancing the blank step by step after each operation on each side thereof. It may be necessary in order to form the blank true that the blank be reworked in the tool.

After the side members *j* and *k* have been given the proper formation, the socket and head portions of the link may be formed as desired.

The faces *a* and *b* of the blank may be formed with longitudinal concave depressions *n* extending between the head *d* and the end of the slot *f*, as shown in Figure 12, by means of my forging tool, by removing the mandrel 24 and replacing it with a mandrel 60, such as shown in Figure 14, which mandrel has a convex head portion 61 adapted to project above the bottom wall 27 of the base block so that on inserting the flattened end portion of the blank in the tool and delivering a blow thereon, the channel *n* will be formed in the blank by the mandrel 60.

While I have herein described a specific embodiment of my invention and the particular application thereof, I do not limit myself to the exact details of construction and arrangement shown, but may employ such changes and modifications as come within the scope of the appended claims.

I claim—

1. A tool for forming the side members of a link, comprising a base block formed with a transverse channel having inclined end walls, a forming mandrel carried on said base block within the channel, a pair of slide blocks arranged between the mandrel and the inclined walls of the channel, wedge blocks interposed between the slide blocks and the inclined walls normally projecting above the upper face of the base block and adapted on being driven downwardly to advance the slide blocks, cross heads at the end of the base block, bars connecting the cross heads to the slide blocks, and springs bearing on said cross heads operable to retract the slide blocks.

2. In a tool for forming the side members of a link the combination of a base block formed with a transverse channel having fixed inclined end walls, a forming mandrel carried on said base block within the channel, a sliding block resiliently secured to each of said end walls, and a wedge shaped member between each of said sliding blocks and its corresponding end wall for forcing said sliding block towards said mandrel.

3. A forging tool for forming the side members of links, comprising a base block formed with a channel having a flat bottom wall and inclined end walls, a forming mandrel projecting upwardly from the bottom of said channel, a pair of slide blocks arranged on the opposite sides of the mandrel and slidably bearing on the bottom wall of the channel, spring means for normally maintaining said slide blocks in a retracted position against the end walls of the channel, and a pair of wedge blocks seating on the inclined end walls of the channel adapted on being driven downwardly to advance said slide blocks toward each other against the opposite sides of a link.

4. A tool for forming the side members of a link comprising a base block formed with a transverse channel having inclined end walls, a forming mandrel carried on said base block within the channel, a pair of slide blocks arranged between the mandrel and the inclined walls of the channel, wedge blocks interposed between the slide blocks and the inclined walls normally projecting above the upper face of the base block and adapted on being driven downwardly to advance the slide blocks, cross heads at the end of the base block and bars connecting the cross heads to the slide blocks.

5. A tool for forming the side members of a link comprising a base block formed with a transverse channel having inclined end walls, a forming mandrel carried on said base block within the channel, a pair of slide blocks arranged between the mandrel and the inclined walls of the channel, wedge blocks interposed between the slide blocks and the inclined walls normally projecting above the upper face of the base block and adapted on being driven downwardly to advance the slide blocks, cross heads at the end of the base block, and bars connecting the cross heads to the slide blocks, means bearing on said cross heads operable to retract the slide blocks.

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