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LIFTING TOOL

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Fig. 1

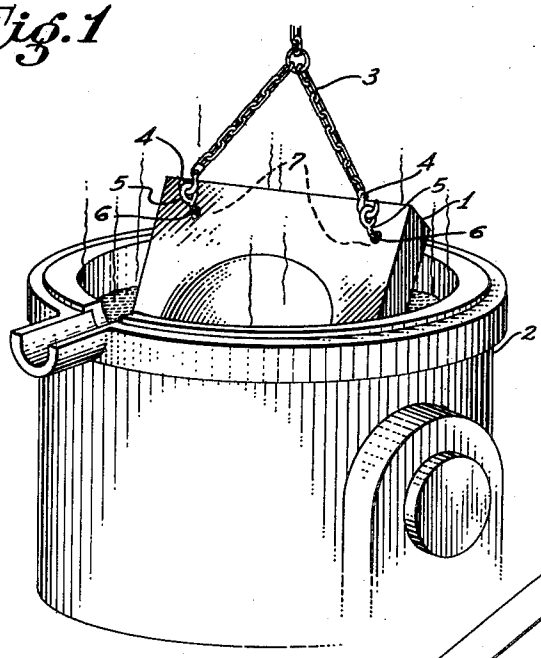
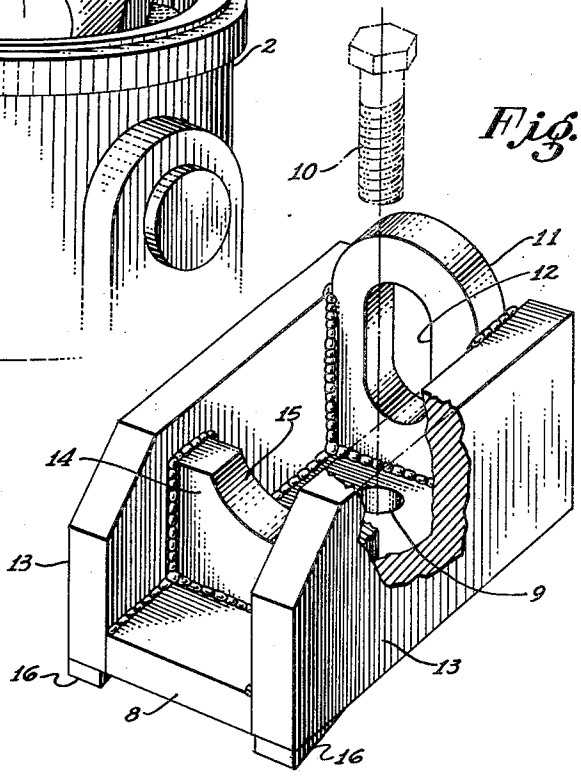


Fig. 2



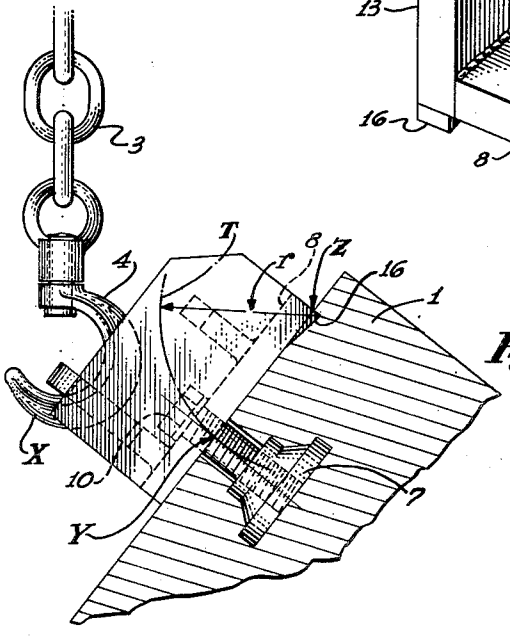


Fig. 3

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LIFTING TOOL

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This invention relates to lifting tools and more particularly to lifting tools for handling heavy forming dies.

Forming dies, as used in the manufacture of aircraft parts for example, are often made from relatively low melting point metals, as compared with iron or steel. These dies eventually become obsolete and are melted down so that the metal can be re-used. The operations necessary for this process are usually performed in a foundry room where melting pots are provided for the melting operations.

Forming die blocks, some of which exceed 20,000 pounds in weight, are ordinarily handled by overhead crane hoists and are usually attached to the chain sling and hook of the crane hoist by means of two attachment bolts projecting through a shackle fitting for example, and screwed into one of the numerous flanged anchor nuts which are embedded in and adjacent one surface of the die block. These flanged anchor nuts generally are of a standard size irrespective of the size of the die block and are usually dispersed around one surface thereof to receive the standard sized bolts which support the forming die blocks in direct tension when installed in stamping machines, such as drop hammers.

The operation of melting includes the step of hoisting the forming die to a point above a melting pot, suspending the die block over and partially into the melting pot and gradually lowering the die thereinto until the die has been entirely melted. A number of conventional lifting devices are in current use and create a common problem, i. e., bending of the attachment bolts with the consequent high cost of replacement.

Inasmuch as many die blocks are of lengths greater than the diameter of the melting pots, conventional lifting fittings are attached to attachment bolts screwed into the embedded anchor nuts, usually at two points at one end of a die block, and, when lifted by a hoist under these conditions, the die block is suspended at a substantially acute angle therefrom. When heavy blocks are lifted in this manner the stresses exerted upon the shank of the attachment bolts may drastically bend the shank thereof and render the bolts unfit for further service. Under certain circumstances the lifting stresses could cause complete structural failure of the

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bolts, possibly dropping the die block into a pot of molten metal, spattering the metal in all directions with probable injury to workmen thereabout.

It is, therefore, one of the objects of this invention to provide a safe and economical means for handling heavy die blocks and the like. Other objects will become apparent as this specification continues.

One form this invention may take is that of a lever plate having a bore between the ends thereof; this bore being of sufficient diameter to receive and preferably provide a loose fit with an attachment bolt of the standard size, screwing into the embedded anchor nuts of die blocks. The lever plate has an upright end at right angles to and adjacent one end of the lever plate adjacent the bore, this upright end having a central elongated aperture to receive a lifting hook. A number of hardened metal spurs are provided on the underside of the other end of the lever plate for the purpose of digging into the die block surface upon contact therewith. Means are provided for laterally and longitudinally stiffening the lever plate.

In use, the lever plate is positioned on a surface of a die block with the hardened metal spurs above the attachment bolt which passes through the lever plate bore. This attachment bolt is screwed into an embedded anchor nut adjacent the surface of the die block. The lifting hook, or the like, is engaged in the central aperture of the upright end, adjacent and below the attachment bolt. The fulcruming of the lever plate on the hardened metal spurs causes the lifting stress to be applied to the attachment bolt substantially entirely in tension.

The present invention will be more clearly understood by reference to the accompanying drawings wherein:

Figure 1 shows a perspective view of a known method of handling lead top forming dies.

Figure 2 shows a perspective view of one preferred embodiment of the present invention.

Figure 3 is a view, partly in section and partly in elevation, illustrating the application of the device in Figure 2 to a die block.

In Figure 1 a lead top forming die block 1 is shown as angularly suspended above and into a melting pot 2 by means of a chain sling 3 and

lifting hooks 4 of an overhead chain hoist (not shown). Each lifting hook 4 is engaged with the eye of an eye bolt 5. Each eye bolt 5 is screwed into one of the customary embedded anchor nuts 7 (see Figure 3), cast into the die block 1 and adjacent one surface thereof. The die block 1 is usually rectangular in form as shown, and is suspended at a substantially acute angle due to the end position of the eye bolts 5. This position is necessary in order to be able to feed all of the die block 1 into the melting pot 2 by degrees, gradually lowering the die block 1 until the complete melting is achieved. Under these conditions the full weight of the die block 1 exerts a shearing stress against the shank 6 of the eye bolts 5 and bending of the shank 6 of these bolts 5 is a common occurrence. Costs of handling heavy die blocks by the old methods are unnecessarily high due to the necessity of frequent replacement of the eye bolts. Furthermore the danger of complete failure of the eye bolts is ever present.

One embodiment of the present invention is shown in Figure 2. Here, a lever plate 8 of substantially rectangular form has a bore 9 intermediate the ends thereof of sufficient diameter to provide a loose fit with a standard type hexagon head attachment bolt 10 sized to screw into the standard flanged anchor nuts 7 (see Figure 3) embedded in the die blocks. Bore 9 is preferably located adjacent one end of the lever plate. This end will be the lower end in use. An upright end plate 11 abuts and stands at substantially right angles below bore 9, and is welded to the top surface of the lever plate 8 adjacent the bore 9.

An elongated aperture 12 is centrally located in the end plate 11 and is of sufficient size to easily receive the crane hoist lifting hook 4. Substantially rectangular side plates 13 abut each side of the lever plate 8 and the end plate 11, and are welded into place for longitudinal stiffening and strengthening of the tool. An upright partition plate 14 bridges the side plates 13 on the other side of bore 9 from end plate 11 and is welded into place for lateral support and strengthening. A section 15 is removed from the top edge of the partition plate 14 to allow easy engagement and disengagement of the crane hoist hook 4.

Hardened metal spurs 16, of tungsten carbide for example, are welded to opposite corners of the underside of the lever plate 8 adjacent the upper end thereof. These spurs 16 dig into the soft lead surface of the die block 1 as the lever plate 8 is brought into close contact therewith and fastened down by screwing the attachment bolt 10 to the flange anchor nut 7 through bore 9, as shown in Figure 3. The spurs 16 prevent the lifting tool from sliding upwardly or rotating around the attachment bolts 10 during handling operations. The penetration of the spurs 16 into the surface of the die block 1 is increased by the lifting force.

It should be noted that in the tool of the present invention the principles of leverage are applied in the following manner: X is the power or lifting point, Y is the point at which the weight is suspended, and Z is the point of fulcrum. The attachment bolts 10 are thereby placed in direct tension as demonstrated by arc T and radius line r as shown in Figure 3.

Inasmuch as the lifting of heavy weights by projecting bolts is common in industry as a whole, the present invention can be made in many forms to suit specific problems.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute, the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise a preferred form of putting the invention into effect, and the invention is, therefore, claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

What is claimed is:

1. In combination with a block of material to be lifted, having internal anchor nuts embedded in said block adjacent an upper edge near one end of said block, a lifting assembly comprising a lever having a bore between the ends thereof and a bolt passing through said bore and screwed into one of said anchor nuts, said bolt extending perpendicularly up from the top of said block and securing said lever to said block with one end of said lever toward the end of said block, hardened spur means on said one end of said lever in contact with said block, said spur means being sharpened and pointed in the direction of said block end to prevent slipping of said lever in up-ended positions of said block when lifted, and means adjacent the other end of said lever having an aperture therein for connection of a lifting hook, whereby said block can be lifted from a horizontal position to an up-ended position supported only at the attachment of said lever while maintaining substantially only tensile stresses in the shank of said bolt.

2. Means for lifting a weight to be handled in various off-center angular positions, comprising a lever member having a flat surface to contact a face of said weight, said flat surface having a bore perpendicularly therethrough between the ends of said lever member, hardened spur means on two corners of said flat surface at one end of said lever member, said spur means protruding outwardly from said flat surface and in a direction away from said bore, and means for engaging a lifting hook at the other end of said lever member on the opposite side of said flat surface from said spur means, and means securing said lever member to said weight.

3. Means for lifting a weight having a hole directed perpendicularly inwardly from a face of said weight by a bolt positioned in said hole and engaged with said weight to prevent said bolt being pulled therefrom, which comprises a lever member having a flat surface to contact said face of said weight, said lever having a bore perpendicularly through said flat surface between the ends of said lever, said bore fitting said bolt, spur means on two corners of said flat surface at one end of said lever, said spur means protruding outwardly from said flat surface and in a direction away from said bore, and means for engaging a lifting hook at the other end of said lever on the opposite side of said flat surface from said spur means.

4. In combination with a die block, a plurality of internal anchor nuts embedded therein for insertion of attachment bolts in proper locations to tensionally support said die block in a forming machine, a lifting lever having a flat surface contacting a face of said die block, a lifting bolt through said flat surface and into one of said anchor nuts near one edge of said die block to secure said lifting lever to said block, spur means on the end of said lifting lever nearest said block edge, said spur means being dug into said block to prevent slipping of said lever in upended suspended positions of said block, and

means on the other end of said lever, beyond said lifting bolt, adapted to receive a lifting hook of a hoist line, whereby said die block can be lifted at one edge thereof without bending the lifting bolts.

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