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J. F. SHEA

2,494,970

METHOD OF RECONDITIONING FORGING DIES

Filed April 27, 1946

Fig. 1.

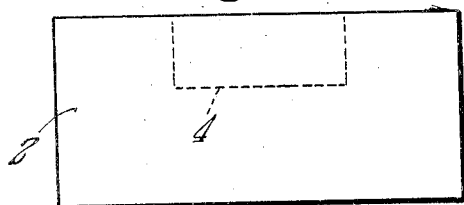


Fig. 2.

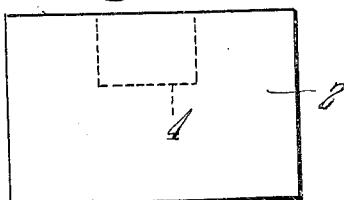


Fig. 3.

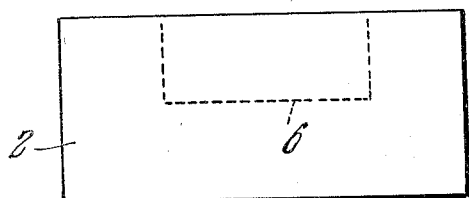


Fig. 4.

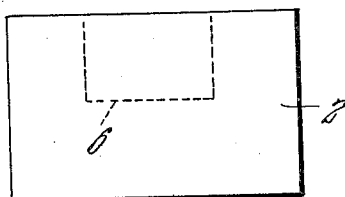


Fig. 5.

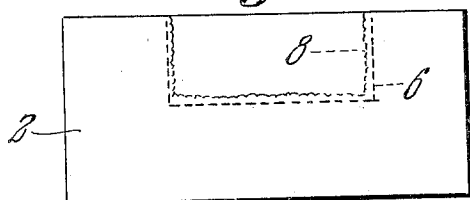


Fig. 6.

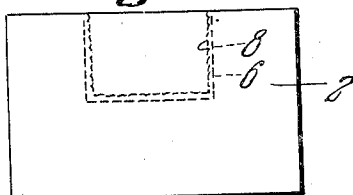


Fig. 7.

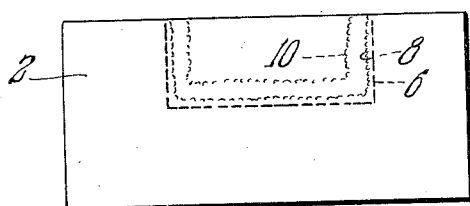
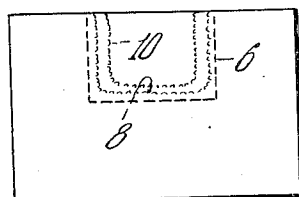


Fig. 8.



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METHOD OF RECONDITIONING
FORGING DIES

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1 Claim. (Cl. 76—107)

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This invention relates to improvements in dies for drop forging operations and is directed more particularly to improvements in the reforming of such dies.

The principal object of the invention is the provision of a method for reforming or reconstructing dies which are used in drop forging operations.

It is well known that dies used for drop forging become unsuitable for use due to wear, cracks and other causes so as to require replacement at great expense.

According to the novel features of this invention, a method is provided for reforming or reconditioning a die which has become unsuitable for use and is accomplished by machining away or hogging out that part of the die block adjacent the die impression or cavity, filling in the block by electrowelding and then remachining and reforming the cavity, all as will hereinafter appear. In this way the die block is salvaged and the impression or cavity which is formed is equal to if not superior to that in the block originally.

With the foregoing and various other novel features and advantages and other objects of my invention as will become more apparent as the description proceeds, the invention consists in certain novel features of construction and in the combination and arrangement of parts as will be hereinafter more particularly pointed out in the claims hereunto annexed and more fully described and referred to in connection with the accompanying drawings wherein:

Figs. 1 and 2 are side and end elevational views of a die block having a forging cavity therein;

Figs. 3 and 4 are similar side and end elevational views showing how the material has been removed around the cavity;

Figs. 5 and 6 are similar views showing a layer of material electrically welded to the walls of the cavity in the die block; and

Figs. 7 and 8 are similar views showing an inner layer of material applied to the cavity.

Referring now to the drawings more in detail, the invention will be fully described.

A die block is represented by 2 which may be one of a pair and it has a cavity 4 formed therein. The cavity will be of such form as to produce the particular piece by the usual forging operation.

The die block 2 may be made from such well known die block steels as Finkle or Hepenstahl or the like and the cavity 4 is formed by machining and die sinking operations in the ordinary manner.

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It is well known that the die becomes unserviceable for use due to various causes such as wear and the like and according to this invention the said die is reformed or reconditioned and made serviceable in an efficient and economical manner as will appear.

As a first step the metal of the die block around the cavity 4 is hogged out or removed or the cavity is enlarged by any well known machining operations. This provides what may be called an enlarged cavity 6 as shown in Figs. 3 and 4. Sufficient metal is removed to eliminate cracks and other imperfections.

The shape of the cavity 6 will depend somewhat on the shape of the cavity 4 and other conditions but will be formed to the shape and dimensions to best facilitate the subsequent steps of the method.

Over the walls of the cavity 6 a first layer of metal 8 is applied by electro-welding. The welding rod will preferably be of steel of the stainless type known as eighteen and eight stainless and the entire surface of the cavity walls will have the welding rod metal attached thereto. The layer by the welding operation becomes a part of the die block and is to be distinguished from an operation where a layer of material is applied to an object and is capable of separation therefrom.

Subsequent to the application of the first layer of metal 8 a second or inner layer 10 is similarly applied to the layer 8 by the use of a welding rod of steel having as principal constituents chromium about five percent and molybdenum about one-half of one percent.

The cavity 6 is made of such size and the layers 8 and 10 are of such relative thickness that the forging impression or cavity to be sunk therein and agreeing with the original cavity 4 will be formed or disposed in the layer 10.

It is preferable to maintain a temperature of about 800 degrees Fah. during the welding operations thereby to provide an inner layer which is not only suitable for machining as in a die sinking operation but heat treatment of the block is unnecessary and when a cavity has been formed in the inner layer the walls of the impression will have a hardness suitable for the size of the forging and the forging operation.

With the layers 8 and 10 applied as aforesaid, there is a very efficient bonding of the layers and of the layer 8 with the block so that the layers become an integral part of the die block.

An impression or cavity corresponding to the original cavity 4 is formed in the layer 10 by any

suitable die sinking operation and the surfaces of the cavity will have all of the characteristics which are desirable and equal to if not superior to those of the original cavity.

The layer 8 provides a sufficiently ductile or resilient backing for the layer 10 so that the latter in which the cavity is formed is capable of withstanding the shocks and strains which a die is subjected to in drop forging operations.

In another way after the block has been machined or hogged out around the cavity 4, the enlarged cavity is entirely filled by electro-welding. In this case the welding rod is of steel of the type known as four to six chromium with molybdenum.

During the application of the steel to the enlarged cavity the temperature of the block is maintained at about 800 degrees Fah. and on completion of the welding the block is subjected to annealing at a temperature of about 1550 degrees Fah.

When the steel filling the cavity has been annealed the impression agreeing with the original impression is formed by the usual die sinking operations.

Subsequent to the impression forming operation, the block is subjected to a temperature of say 1700 degrees Fah. and then quenched in still air at room temperature to provide the desired hardness.

A final heating of the block to about 950 degrees Fah. over a period of a few hours depending on the dimensions of the block will draw the temper and toughen the steel.

As will be observed, a die block which is unfit for forging operations is reconditioned in an economical manner not only resulting in saving the block but producing an impression which is equal to but in many cases much superior to the original impression. In many cases where the original impression became unserviceable after fifty to sixty thousand forgings the reconditioned impression has withstood the forging of more than one hundred thousand impressions.

It will be understood that the die block is machined or hogged out around the impression sufficiently to eliminate all cracks and the like which extend into the die block from the impression and make it possible to provide sufficient steel for the new impression.

It is not intended that the welding rod applied to the enlarged cavity provide a layer merely. Sufficient metal will be applied to form a body in which the new impression is sunk, so that the impression will initially at least withstand the shocks and pressures thereby to obtain all the advantages which the impression formed in the welded steel provides.

The invention may be embodied in other specific forms without departing from the essential characteristics thereof. Hence, the present embodiments are therefore to be considered in all respects merely as being illustrative and not as being restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all modifications and variations as fall within the meaning and purview and range of equivalency of the appended claim are therefore intended to be embraced therein.

What it is desired to claim and secure by Letters Patent of the United States is:

15 The method of reconditioning the cavity of a steel die block adapted for drop forging operations which consists in, removing portions of the block around the cavity forming an enlarged cavity, maintaining said block at a temperature of approximately 800 degrees Fah. while electro-welding and uniting a first layer of steel to the walls of the enlarged cavity and electrowelding and uniting a second layer of steel to the first layer, and finally in forming a cavity for forging 20 in said second layer, said first layer including stainless steel of the eighteen and eight type, said second layer including steel including about five per cent chromium and about one-half of one percent molybdenum, and said cavity being 30 wholly formed in said second layer.

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