Nov. 27, 1934. H. H. RICHARDSON 1,982,352

DRAWING DIE

Filed July 23, 1934 2 Sheets-Sheet 1

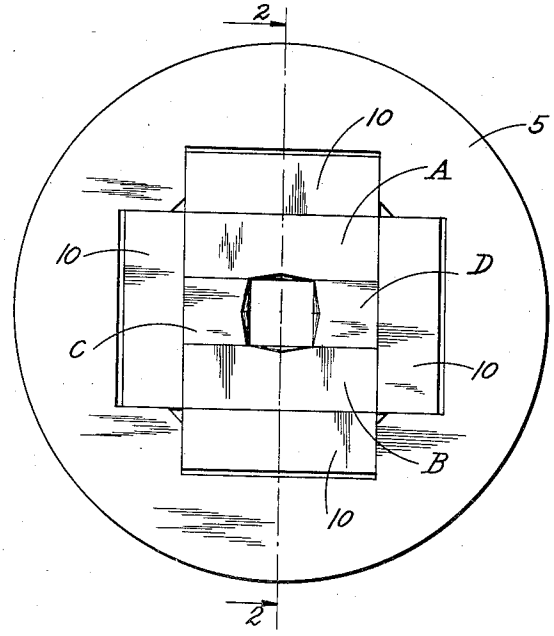


Fig. 1

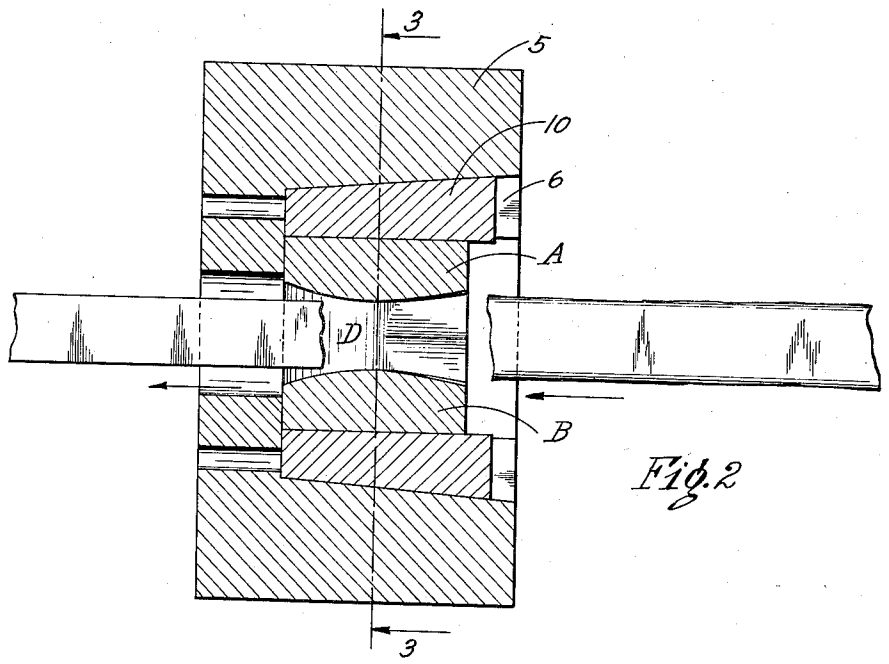


Fig. 2

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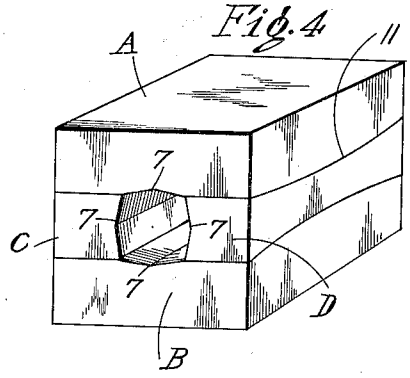
Attorneys

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Fig. 4



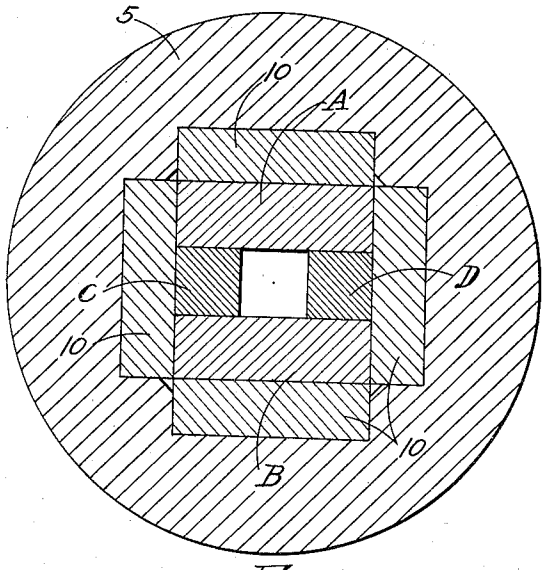


Fig. 3

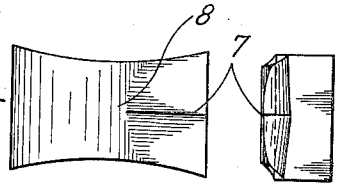


Fig. 5

Fig. 6

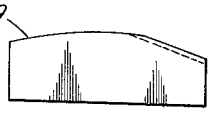


Fig. 7

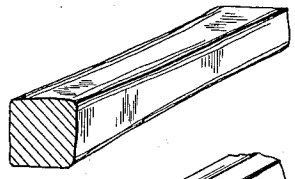


Fig. 8

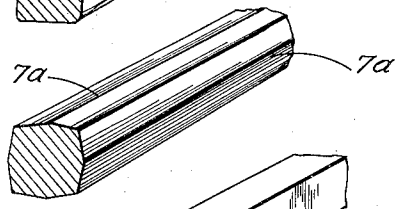


Fig. 9

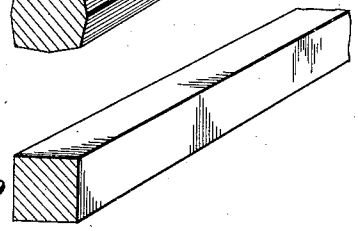


Fig. 10

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Patented Nov. 27, 1934 1,982,352

UNITED STATES PATENT OFFICE

1,982,352

DRAWING DIE

Harry Hamilton Richardson, Hamilton, Ontario, Canada, assignor to Union Drawn Steel Company, Massillon, Ohio, a corporation of Pennsylvania

Application July 23, 1934, Serial No. 736,485

7 Claims. (Cl. 205—26)

This invention relates to a drawing die for forming or reforming elongated polygonal metal shapes, such as hot-rolled bar stock, and the primary object of the same is to provide an improved die for use in drawing or shaping metal bar or rod stock to obtain a true square, hexagonal or like polygonal shape in cross section having well-filled, relatively sharp corners.

An example of one of the uses to which the improved die has been applied to advantage is in the salvaging of defective flats and hexagons from the hot mill. Generally, a certain portion or percentage of such stock has rounded and/or unfilled corners which render it defective from a commercial standpoint, and by subjecting this defective stock to the action of the improved die, it is placed in good salable condition.

The design of the die is such that it subjects the metal of the bar to a method of working whereby an equal distribution of the metal throughout the entire cross-section of the bar is obtained, viz: the metal is first gathered or drawn into an axial ridge or hump along each face of the polygonal bar as the latter is drawn through the mouth of the die and then worked back into the bar and/or extruded equally throughout all portions of the die opening proper to form a substantially true polygonal section having well-filled, sharply-defined corners.

Other objects, advantages and uses of the improved die will become apparent in view of the following description taken in conjunction with the drawings, wherein:

Figure 1 is a view in end elevation looking towards the inlet end of the die;

Figure 2 is a central longitudinal sectional view taken substantially on the line 2—2, Figure 1;

Figure 3 is a substantially central transverse sectional view taken on the line 3—3, Figure 2;

Figure 4 is a perspective view of the die segments or blocks in assembled relation;

Figures 5, 6 and 7 are detail views in plan, end and side elevation, respectively, of one of the die segments or blocks;

Figures 8, 9 and 10 are perspective views of pieces of bar stock showing the latter in various stages of working when subjected to the action of the improved die.

A support or housing is shown at 5 having a suitable opening 6 therein in which the die segments or blocks which make up the die assembly are positioned. These die blocks or segments are preferably arranged so that there is one segment or block for each side of the bar to be formed or shaped. Thus where the shape to be given the bar is square, there will be four die segments or blocks, as is shown in the example used for illustrative purposes in the drawings.

While the die blocks are given different overall dimensions to accommodate their securement in the die housing, the working face of each block is the same, as will be noted from Figures 5, 6 and 7. The upper and lower blocks are indicated at A and B and the two side blocks at C and D. In the detail view, that portion of the working face of each die block which defines the mouth of the die is formed with a tapered axial depression or concavity 7 which preferably reaches its maximum depth at the axial center of the block, said depression becoming shallower or tapering until it merges into a plane or flat surface at 8, at which point a perfect square is formed by the four die segments, defining the die opening proper. The rear extremity of each die segment or block is preferably tapered or flared as at 9, so that when the dies are arranged in assembled relation, the outlet of the die flares outwardly to provide clearance for the metal during the drawing operation. As shown the blocks are backed by wedges 10 or other suitable means to hold them in position in the die housing 5, although it is to be understood that the manner of locking the die blocks in the holder is merely illustrative herein and other forms of anchorage may be employed without departing from the spirit of the present invention. To insure against displacement of the blocks when in assembled position, the side blocks C and D are preferably given a concave formation lengthwise, as at 11, while the upper and lower blocks are convexed so that they engage the side blocks and wedge the latter therebetween.

Referring to Figures 1, 2 and 3, the shape of the die opening defined by the die segments or blocks will be readily apparent. The mouth of the die is flared and in the present instance is in effect octagonal, since in this instance the die is used to shape or draw a square or four sided bar. As the working faces of the mouth approach the center or die opening proper, they gradually merge into a substantially perfect square as shown in Figure 3, after which the faces or surfaces diverge outwardly to clear the bar, as will be noted by observing Figure 2.

Figure 8 shows a piece of bar stock from the hot mill, the stock having rounded and unfilled corners and being otherwise more or less deformed. In Figure 9, the piece of stock is shown just after passing into the mouth of the die, its shape in cross section being substantially similar to the

mouth of the die as shown in Figures 1 and 4. At this point, the metal is gathered or cold-drawn into what is in effect an axial ridge or hump 7*a* on each face of the bar, and the latter assumes a substantially octagonal shape in cross section. Figure 10 shows the stock after passing through the die, the metal gathered into the ridge 7*a* being worked or, in effect, extruded back into the bar and equally throughout all portions of the face of the latter, thereby forming a well filled bar having sharp well-defined corners.

While in the example illustrated in the drawings, the stock is shown as being square in cross section, it is obvious that the same could be hexagonal or even octagonal, the only change necessary in such instances being an increase in the number of acting surfaces of the die similar to that shown on the face of the block in Figure 5.

It is also conceivable that the bar could be satisfactorily rectified or worked by a die assembly wherein die blocks having plane or flat working faces are used for opposed sides of the bar and my improved die blocks used for the remaining surfaces.

While I have given my theory of operation of the improved die with respect to the working of the metal, I wish it to be understood that such theory is not to be considered as a limitation, since it is given from impressions received upon viewing the die in operation and the resultant product, and not from careful examination of sections or etchings of the metal during the various phases of working.

It should also be understood that certain minor changes may be adopted within the scope of the invention as defined by the appended claims.

I claim:

1. A die for drawing elongated metal sections, such as bar stock, having a flared mouth with a working face for each face of the bar to be drawn formed with an axial depression which gradually merges or tapers into a flat surface as it approaches the die opening proper.

2. A die for drawing polygonal shaped elongated metal sections, such as bar stock, having a flared mouth with a working face for each face of the bar formed with an axial concavity which merges into a plane surface as it approaches the die opening proper.

3. A die for drawing polygonal shaped elongated metal sections, such as hot-rolled bar stock, having a bell-shaped mouth defined by a plurality of working faces each of which is formed with a metal-gathering depression extending axially of the face, said depression reaching its maximum depth at the mouth entrance and gradually becoming shallower as it approaches the die opening proper where it merges into a plane surface and together with the remaining die surfaces defining a substantially true polygon.

4. A die for drawing polygonal shaped elongated metal sections, such as bar stock, having a bell-shaped inlet, said inlet being defined by a plurality of working faces, one for each face of the polygon, each face being formed with an axial concavity at the die inlet which gradually merges into a plane surface defining one side of the polygon at the center of the die.

5. In a drawing die for shaping flat-sided, elongated metal sections, such as hot-rolled bar stock, means at the mouth of the die for gathering the metal along each face of the section into the form of an axial ridge or hump, and means for working the metal so gathered back into the section and effecting extrusion into the corners of the die, to thereby completely fill out the section and form a substantially true bar in cross section having well-filled sharply-defined corners.

6. The method of cold-drawing elongated polygonal metal sections, such as hot-rolled bar stock, which consists in first gathering the metal along each flat face of the section into the form of an axial ridge or hump and then working the metal so gathered back into the bar to completely fill out the section.

7. The method of reforming defective elongated metal shapes, such as hot-rolled bar stock, which consists in cold-drawing a certain portion of the metal along each face of the section into an axial ridge or hump and then extruding the metal so drawn equally and uniformly back into the section and throughout the width of said face.

H. H. RICHARDSON.