Aug. 20, 1935. H. H. RICHARDSON 2,012,022

DRAWING DIE

Filed April 29, 1935 2 Sheets-Sheet 1

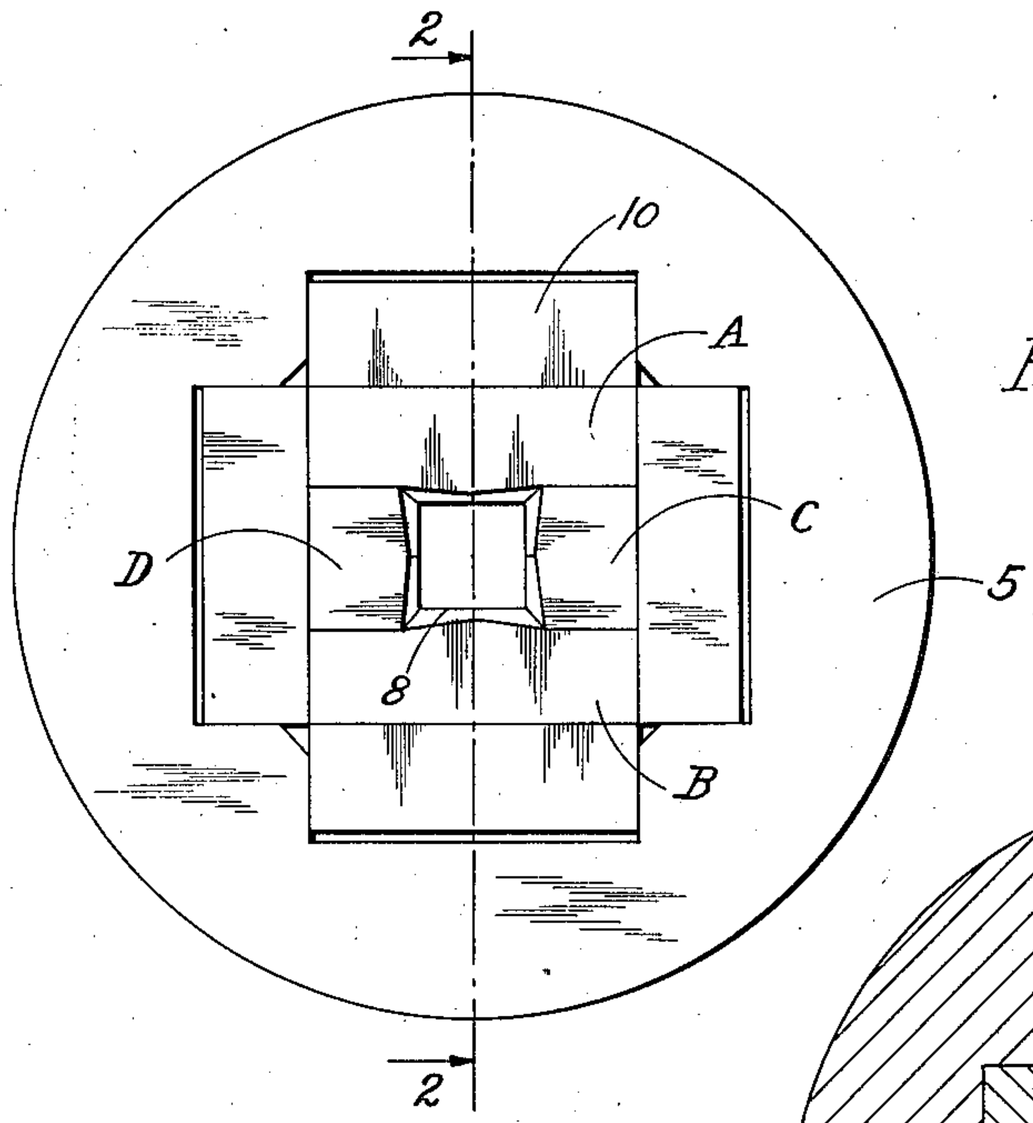

Fig. 1

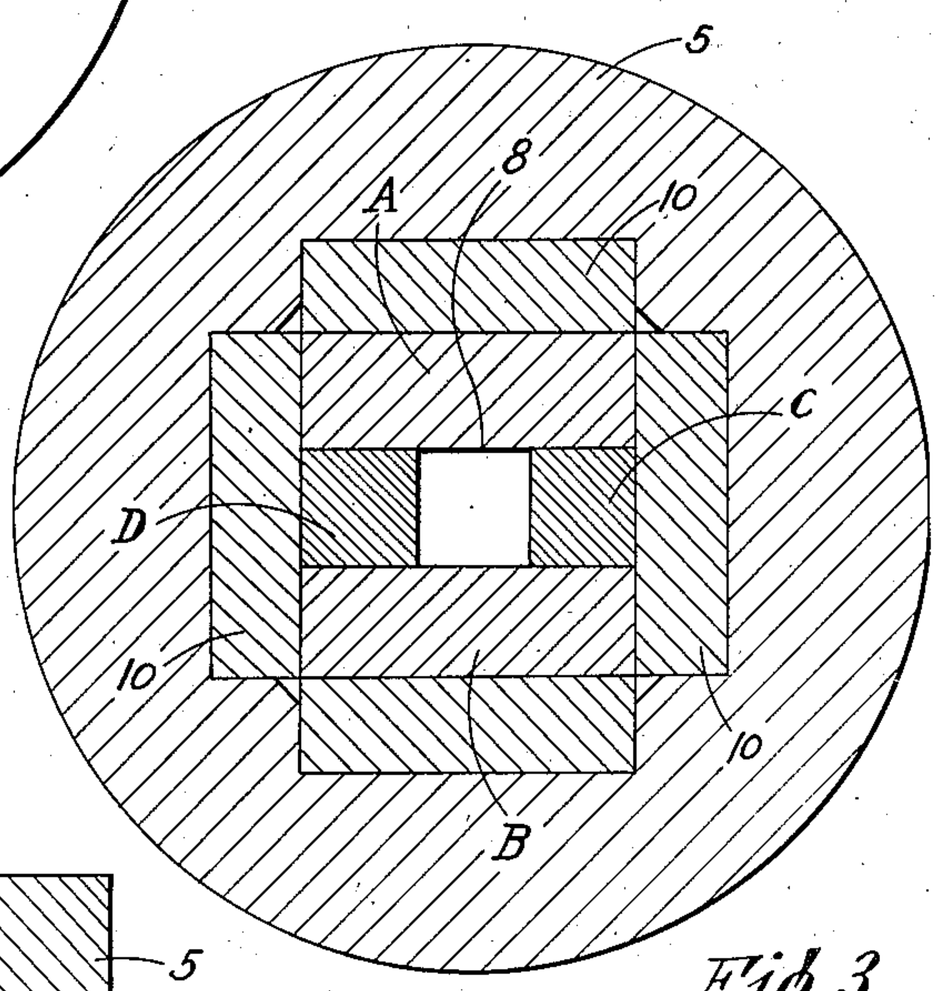

Fig. 3

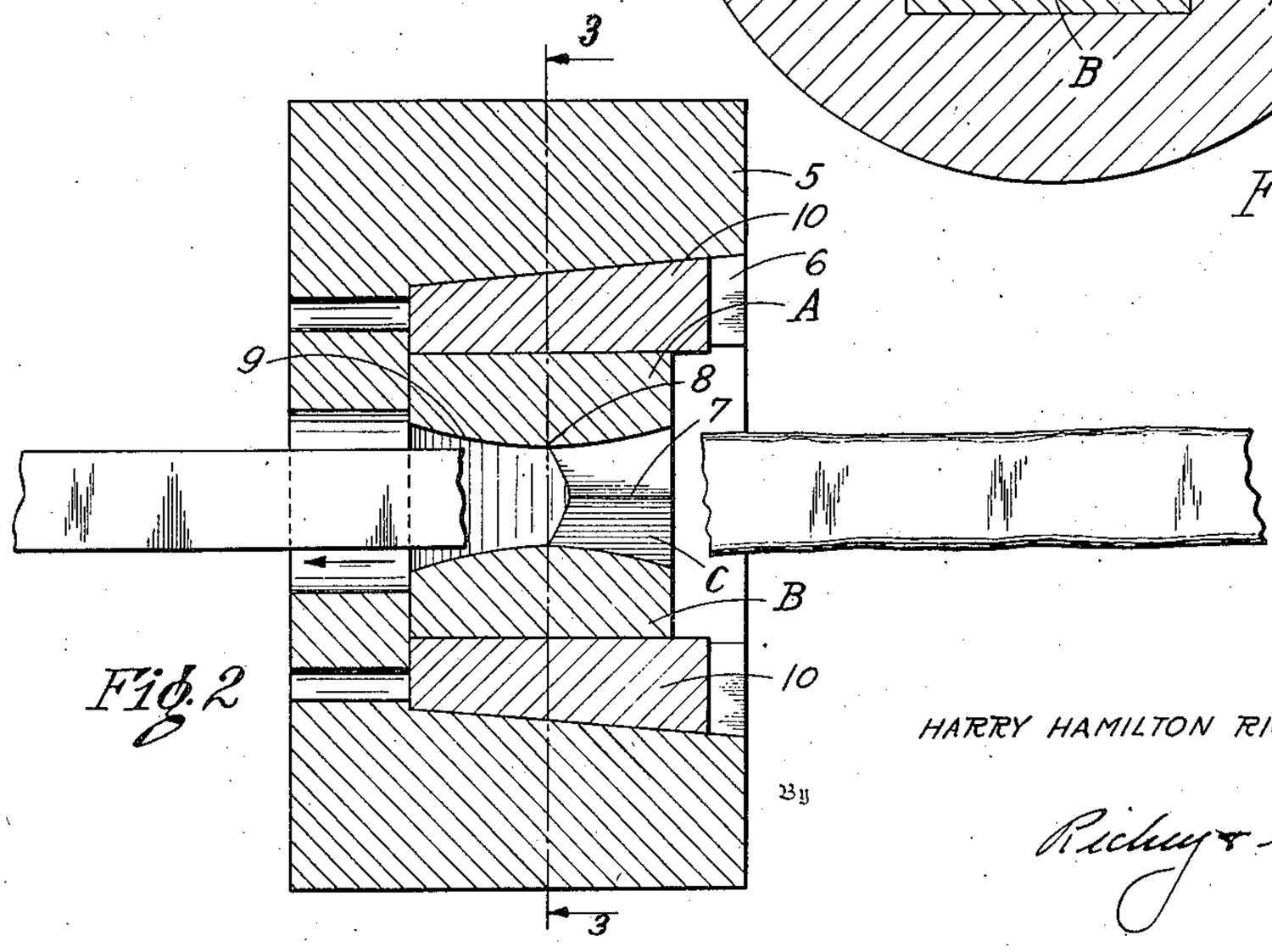

Fig. 2

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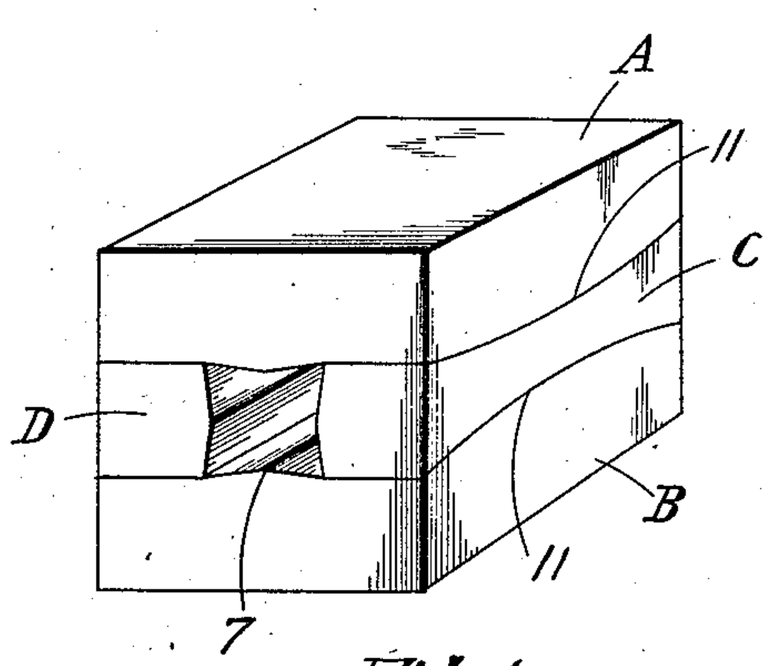

Fig. 4

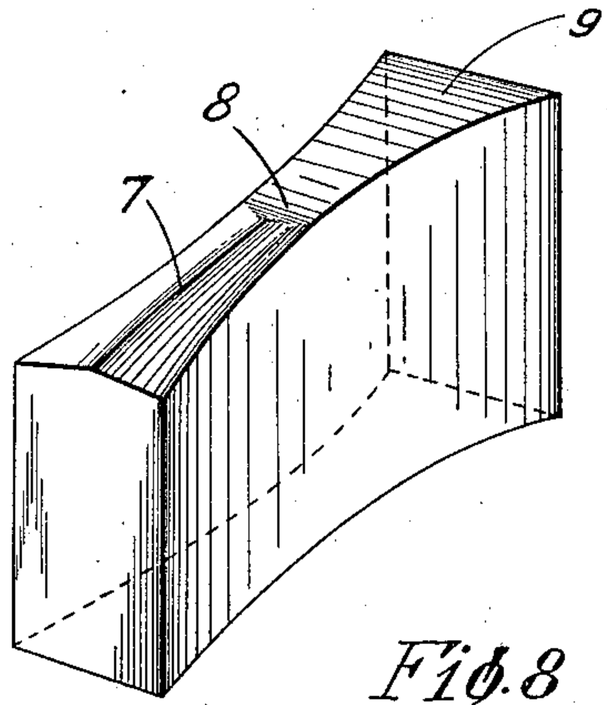

Fig. 8

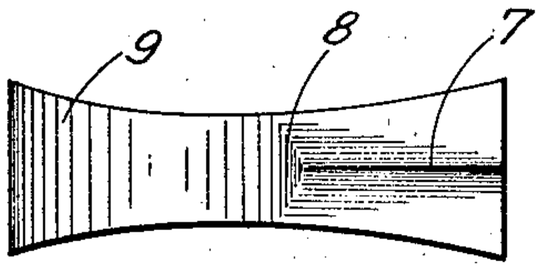

Fig. 5

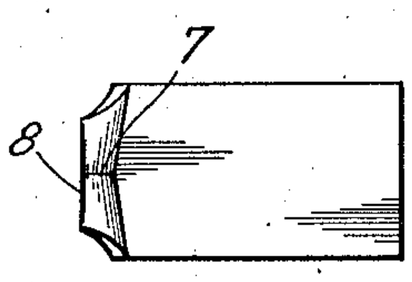

Fig. 7

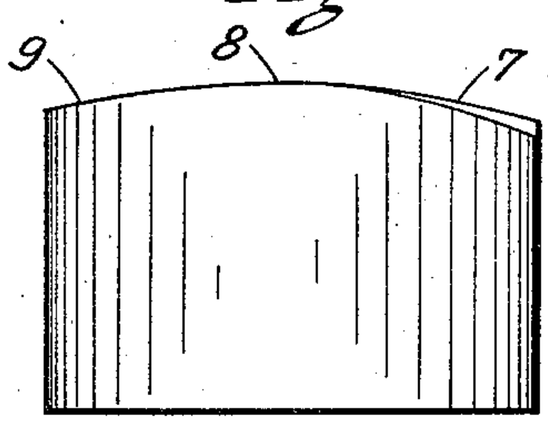

Fig. 6

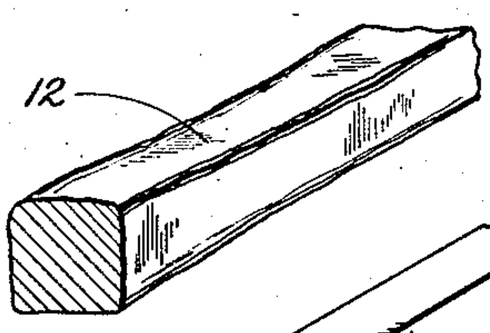

Fig. 9

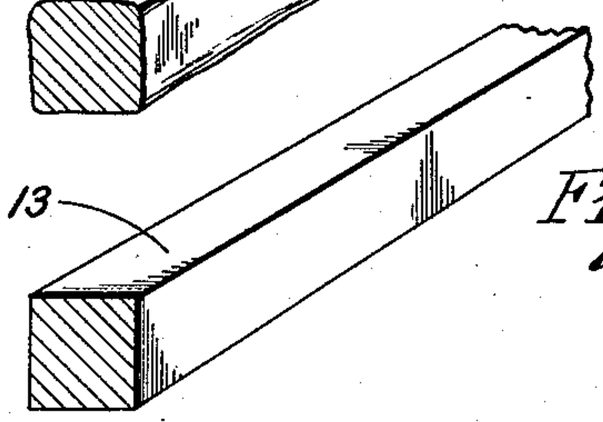

Fig. 10

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UNITED STATES PATENT OFFICE

2,012,022

DRAWING DIE

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

Application April 29, 1935, Serial No. 18,711

6 Claims. (Cl. 205—26)

This invention relates to drawing dies for forming and/or working elongated polygonal metal shapes such as hot rolled bars. The primary object of the invention contemplates the provision of an improved die which will obtain polygonal shapes of uniform cross section having well filled sharp edges or corners.

An example of one of the uses to which the improved die has been applied to advantage is in salvaging deffective square and hexagonal bar stock from the hot mill. Frequently such material leaves the mill with slightly rounded and/or unfilled corners which are objectionable for certain classes of commercial use. By reworking this defective stock in the improved die the lineal edges thereof will be straightened, the corners well filled and the material will be thus conditioned for use. It will be understood that the improved die comprehends use not only for the reclamation of defective stock, but may be used in the initial drawing process, since the design of the die insures polygonal sections of more fully developed edges and more sharply defined corners than has been possible with prior known types of dies.

The foregoing and other objects and advantages 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;

Figure 8 is a perspective view of one of the blocks; and

Figures 9 and 10 are perspective views of pieces of bar stock showing the latter before and after working.

A support or housing is shown at 5 having an opening 6 therein in which the die segments or blocks forming 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 embodiment used for illustrative purposes in the drawings. The upper and lower blocks are indicated at A and B, and the two side blocks at C and D.

Although the die blocks may be constructed with different over-all dimensions to accommodate their securement in the die housing, the working face of each die block is the same, as will be noted in Figures 1 and 3. The portion of the working face of each die block which defines the throat or mouth of the die is formed with a tapered axial convexity 7 which is preferably but not necessarily substantially wedge-shaped in cross section or formed with an axial ridge to provide, in effect, a plowing or spreading action of the surface metal and direct or extrude the material so worked into the corners of the die. This axial ridge or convex portion of the die gradually merges or tapers into a plane or flat surface 8 in each of the die segments, thus defining a perfect square in the die opening proper or at the point where the bar is drawn to its final shape. The rearward portion 9 of the working face of each die block is preferably relieved to flare outwardly, so that the outlet of the die assembly will provide clearance for the metal during the drawing operation as shown in Fig. 2.

The blocks are retained in the die housing 5 by wedges 10. It will be understood, however, that the manner of locking the die blocks as shown herein is merely illustrative and that other forms of anchorage may be employed without departing from the spirit of the present invention. To avoid displacement of the blocks in assembled position, the side members C and D of the die are preferably formed with longitudinal concave faces 11, while the upper and lower blocks A and B are of complemental configuration for engagement therewith.

The shape of the die opening defined by the die segments or blocks will be readily apparent from Figures 1 and 4. The mouth of the die is flared, the working face of each die block within the mouth of the die presenting a convex or generally wedge-shaped surface which merges into a flat or transverse lineal surface 8 at a point adjacent the die opening proper. As shown the surface within the zone in which the convexity of the die merges with the flat surface is V-shaped. However, the configuration of the die at this point may vary with the manner of side relief or the form of convexity of the die. Beyond the die opening proper or most constricted opening in the die, the surfaces flare outwardly to clear the bar, note particularly Figure 2.

Figure 9 shows a piece of bar stock 12 having rounded and unfilled corners and being other-

wise more or less deformed. As such stock approaches the die opening proper the metal in the side walls of the bar stock will first engage the convex surface of the die, then as the bar is advanced into the constricted die opening the metal in the side walls of the bar will be crowded or extruded into the corners of the die, the metal in each surface of the bar being forced from the medial axis of the bar outwardly to the corner edge thereof as shown in the finished bar 13, Fig. 10. When the bar reaches the constricted opening in the die some inward extrusion of the metal may occur particularly if the stock is initially formed with portions having fully filled edges or over size transverse sections.

Although the embodiment illustrated herein shows the stock as square in cross section, it is to be understood that hexagonal, octagonal or other polygonal forms may be used in the improved die, the only change necessary for application being the appropriate number of die blocks in the die assembly. In some forms of stock a bar could be satisfactorily rectified or worked by a die assembly wherein some of the die blocks were formed with plane or flat working surfaces while other of the die blocks are formed with the improved convex surface. An example of such application would be in a bar of a semicircular section with a flat base portion.

Although the foregoing sets forth a theory of operation of the improved die with respect to the working of the metal, it is to be understood that such theory is not to be considered as a limitation, since it is given from impressions received from viewing the die in operation and the resultant product, and not from examination of etched sections or other and similar means of study 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.

1. A die for drawing polygonal-shaped elongated metal sections, such as bar stock, having a flared inlet with a working face for each face of the bar to be drawn formed with an axial convexity which merges into a plane surface in 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 to be drawn formed with an axial ridge which, upon reaching the die opening proper, merges into a plane surface.

3. A die for drawing polygonal 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 central convex portion extending axially of the face, said convex portion being flattened into a plane surface upon reaching the die opening proper, and together with the remaining die surfaces forming a sharply defined opening configured in the shape of the finished section.

4. A die for drawing polygonal-shaped elongated metal sections, such as bar stock, having a bell-shaped inlet defined by a plurality of working faces one for each face of the polygon, each face being formed with a convexity which merges into a plane surface at the die opening proper, the outlet of the die beyond the said die opening proper being flared outwardly to clear the bar.

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 extruding the surface metal along each face of the section at divergent angles into the corners of the die to insure a well filled section having sharply defined corners.

6. A die block for a drawing die having a working face formed with an axial convexity which merges into a plane surface.

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