

Aug. 28, 1928.

E. MITCHELL

1,682,399

EXTRUSION OF METALS

Filed Aug. 8, 1927

2 Sheets-Sheet 1

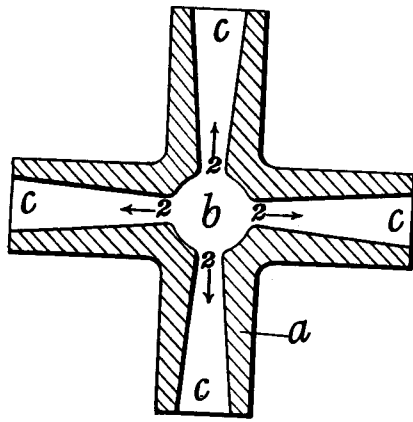


Fig. 1

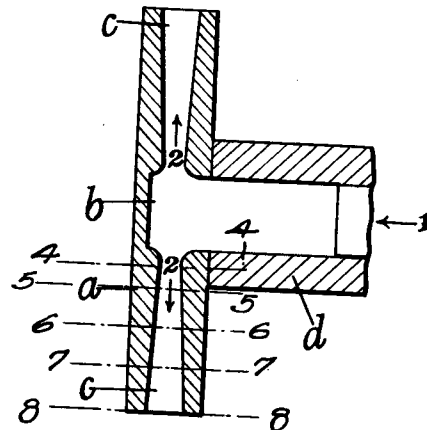


Fig. 2

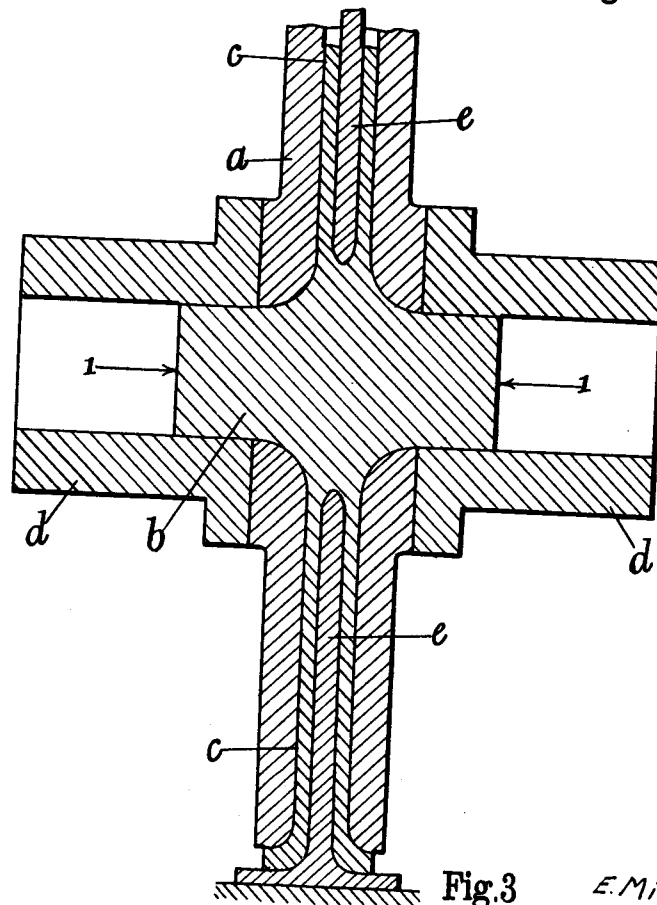


Fig. 3

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2 Sheets-Sheet 2

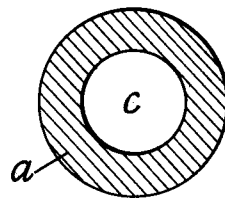


Fig. 4

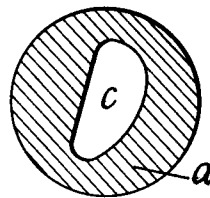


Fig. 5

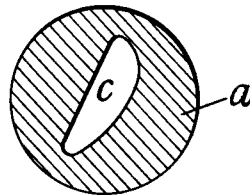


Fig. 6

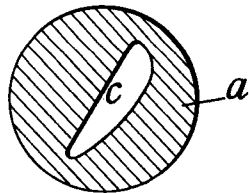


Fig. 7

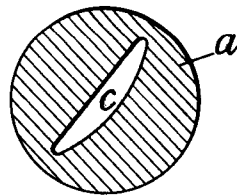


Fig. 8

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UNITED STATES PATENT OFFICE.

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EXTRUSION OF METALS.

Application filed August 8, 1927, Serial No. 211,547, and in Great Britain September 23, 1926.

This invention relates to the extrusion of metals, as for example, magnesium or magnesium alloys, and has for its object the production by extrusion of articles having a central boss and radiating arms, such as aeroplane propellers, not hitherto produced by such process. The invention relates more particularly to the known method in which the metal is caused to extrude in a lateral direction relatively to the direction of application of the pressure setting up extrusion.

The invention consists in the extrusion of articles comprising a central boss and radiating arms, the metal being forced into a pair of similar matrices or die parts which, when assembled, provide a central aperture for the formation of the boss and radial or lateral passages through which the metal is extruded into the atmosphere and which give the requisite shape to a portion of the length of each arm adjacent to the boss.

In one convenient application of the invention to the production of aeroplane or like propellers, or other articles having a central boss like part with blades, arms or projections radiating or projecting therefrom, the metal or alloy at the required temperature is forced, by a hydraulic ram or otherwise, from a container into a die disposed at one end of such container or cylinder.

The said die is made up from a pair of similar matrices or die parts which, when assembled, provide a central aperture for the formation of the boss of the propeller or other article and radial or lateral apertures such that the metal can flow or extrude there-through from such central aperture to the exterior of the die. The said lateral apertures are of such form or section as to give the required shape to a portion of the blades or like parts of the propeller or other article adjacent to the central boss.

The charge of metal forced from the cylinder or container into the said die is sufficient to produce the boss of the article and also by the flow or extrusion of the metal through the said lateral apertures to provide blades or arms radiating or projecting to the required extent from such boss and from the die.

Referring to the accompanying explanatory drawings:—

Figure 1 is a sectional elevation and Figure 2 a sectional end view illustrating, in dia-

grammatic form, one manner of producing an aeroplane propeller in accordance with this invention.

Figure 3 is a sectional plan illustrating another manner of applying the invention, in the production, for example, of the arms or spokes of a wheel integrally with the boss or centre of the wheel.

Figures 4, 5, 6, 7 and 8 are cross sectional views on the lines 4—4, 5—5, 6—6, 7—7 and 8—8 of Figure 2, showing the cross section of the radial passages through which extrusion is effected.

The same reference letters and figures in the different views indicate the same or similar parts.

Referring to Figures 1, 2, 4, 5, 6, 7 and 8, the four blades or arms of the propeller and the boss or centre are formed with the aid of a die part *a* having a central matrix *b* for the formation of the boss and the matrices *c* radiating therefrom for the formation of the root and a portion of each blade or arm, the said matrices *c* being of the required cross section, which may vary in different parts, to produce blade portions of the required shape. Figures 4 to 8 show the cross sections of the blades at various points in the die. The blades project beyond the outer ends of the said matrices *c* and are subsequently finished by machining operations. The die is suitably split or divided or made of segmental form to permit of separation for the removal of the propeller.

The container or cylinder *d* into which the metal is inserted for extrusion, has one end abutting against the face of the die *a* as shown at Figure 2. The extrusion pressure is applied, by a ram or otherwise, in the direction indicated by the arrow 1 (Figure 2) and under such pressure the metal is forced into the die and extruded from the central matrix *b* towards the outer ends of the matrices *c*, as indicated by the arrows 2, for the formation of the propeller.

In the example illustrated at Figure 3, of the manner of producing hollow wheel arms or spokes integrally with a wheel boss or centre, the container or extrusion cylinder *d* is in two parts with the die *a* interposed between them. The extrusion pressure is applied to each cylinder part as indicated by the arrows 1, and to give the hollow formation to the wheel arms or spokes a fixed mandrel or

core as *e* is disposed as shown in the centre of each of the matrices *c* which radiate from the central matrix *b*.

What I claim is:—

1. Means for the extrusion of metals to form articles having a central boss and arms radiating from said boss, consisting in part of a die having a central matrix for the formation of the said boss and a plurality of matrices radiating from said central matrix and extending to the perimeter of the die into and from which the metal is extruded for the formation of the said arms.

2. In means for the extrusion of metals to form articles having a central boss and arms radiating therefrom, the combination comprising a die having a central matrix and a plurality of lateral matrices open at their outer ends radiating from said central matrix

and extending to the perimeter of the die, and an extrusion cylinder abutting against a face of said die and opening into its central matrix.

3. In the manufacture of a propeller, a die having a central matrix and a plurality of lateral matrices radiating therefrom and shaped to correspond with the root and a portion only of the length of each blade, the end of each lateral matrix being open so that the metal issues into the atmosphere from the die, a container for metal at right angles to the radiating matrices, and means extruding the metal from the container into the die and partly into the atmosphere through the die.

In testimony whereof I have signed my name to this specification.

ERNEST MITCHELL.