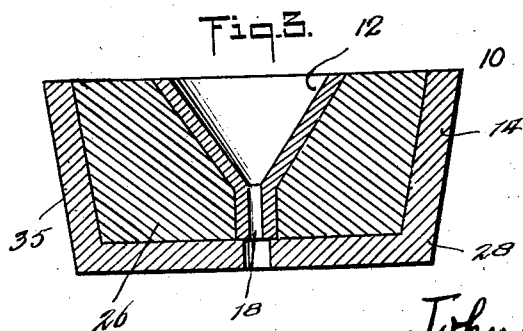
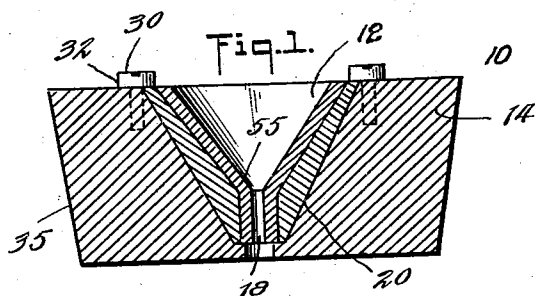
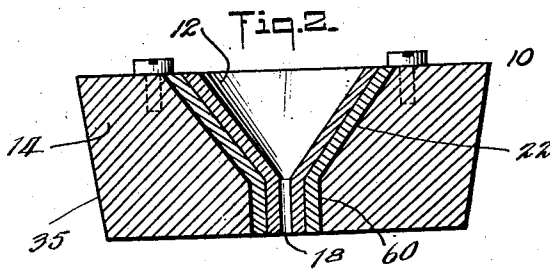
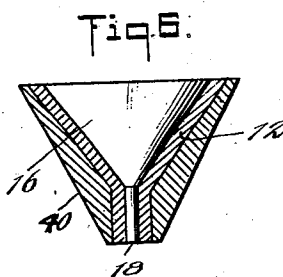
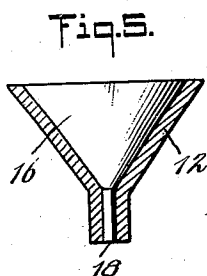
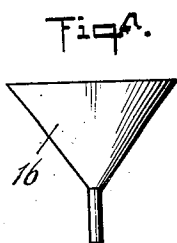


Aug. 4, 1931.

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DIE OF THE EXTRUDING AND WIRE DRAWING
TYPE AND PROCESS OF MAKING THE SAME
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DIE OF THE EXTRUDING AND WIRE DRAWING TYPE AND PROCESS OF MAKING THE
SAME

Application filed November 28, 1925. Serial No. 72,020.

This invention relates to dies, particularly of the type having small recesses or apertures, such as wire drawing dies and extruding dies, and to processes of manufacturing the same, and aims to provide improvements therein.

The wear on extruding or wire drawing dies is very considerable and the desirability of increasing the durability of these dies by applying a plate of chromium thereto has been recognized, but great difficulty has been experienced in applying an even, adherent and smooth plate of chromium to the working faces thereof.

The present invention provides a way around this difficulty: it provides a novel die having a chromium working face or surface which is smooth, even and adherent, and processes for producing such novel die.

Several embodiments of the die are illustrated in the accompanying drawings. Said drawings also contain figures illustrative of the processes.

Referring to said drawings:

Figure 1 is a sectional view of one embodiment of said die.

Fig. 2 is a sectional view of another embodiment of said die.

Fig. 3 is a sectional view of still another embodiment of said die.

Figs. 4, 5 and 6 are views illustrative of the processes.

Referring to said drawings, numeral 10 designates the die, comprising a shell 12 and a backing 14. The shell 12 is composed in whole or in part of chromium or other very hard metal, and the backing may consist of any suitable metal, such as steel or brass, applied in any suitable manner.

The shell is preferably made by first forming a matrix or counterpart 16 (Fig. 4), conveniently of brass or copper, which is carefully formed of the dimensions of the face of the die to be produced, and of the aperture or recess 18 therein, and carefully polished to the smoothness and finish of the desired working face to be formed on the shell 12. The formed matrix or counterpart is then placed in a bath and plated with chromium to a substantial thickness—1/64

to 1/16 inch, for example. This plating may be effected by any suitable process. The fine quality of plate which is produced with chromic acid baths according to the temperatures and current densities set forth in U. S. Patent No. 1,802,463, April 28, 1931, Fink, is most suitably used. The inside or working face of the chromium shell will, when of the quality of plate produced by said Fink process, have a smoothness and polish equal to that of the polished matrix.

When a sufficient quantity of chromium has been deposited to form a shell of the desired thickness, the deposition is discontinued, and the shell 12 separated from the matrix in suitable manner, as by dissolving in nitric acid, or by melting out the matrix. Where melting is resorted to, a low-melting brass, or one of the so-called low-melting alloys, such as white-metal, is used for the matrix. Oxidation may be prevented by melting in a neutral or inert atmosphere, or in a bath of lead.

The backing 14, may consist of a piece of metal to which the shell 12 is fitted, in suitable manner, as by tool-shaping the backing with a recess 20 or 22 corresponding to the outside dimensions of the shell. (Figs. 1 and 2) or by "setting" or solidifying molten metal around the shell, as indicated at 26, Fig. 3. The solidified metal 26 may constitute the backing alone, or the backing may be composite, and comprise a metal cup 28, which may serve as a receptacle for the metal 26 while molten, and unite with the shell 12 and metal 26 on solidification taking place.

Suitable means 30 for holding the shell 12 in the backing may be provided. These means may be used for the purpose of preventing separation of the shell and backing, as when a let-up or relaxation occurs in the drawing of the wire passing through the aperture 18 in the shell. These means are conveniently in the form of cap-screws 32 tapped into the backing and the heads of which overlap the edges of the shell 12, as shown in Figs. 1 and 2. The film of metal of the backing 26 adhering to the shell 12 acts as the means for holding the shell and backing together in that embodiment where

the backing is metal which is solidified around the shell.

The sides 35 of the backing are preferably tapered so as to fit within the seat in the die-block of the drawing mill.

When the fitting of the shell 12 in the backing is effected by tool-shaping, the final fitting, in order to obtain a very solid and even bearing of the shell in the recess, is preferably effected by grinding the shell in the recess, with the aid of an abrasive, as well understood, the grinding being similar to the grinding of valves to valve seats.

After the deposition of chromium to form the shell 12 has been completed, a layer 40 of another metal, as for example, electrolytic iron, may be deposited on the back side of the chromium shell, as shown in Fig. 6. This layer 40 may serve a number of functions. It may serve to support and strengthen the chromium shell 12. It may serve as a softer metal to facilitate the shaping of the outer surface of the shell 12 to the recess 22 in the backing. It may also serve as a means facilitating the bond between the shell 12 and the solidified metal 26 around it. The layer 40 also serves as a metal which may be readily worked to give the outer surface of the shell a different or more regular shape (conical for example) than the working face of the shell, so that the recess 20 may be correspondingly shaped and the fitting of the shell 12 and backing 14 facilitated. The inner face of a wire drawing die is usually funnel shaped as shown, and the principal stress is on the shoulder 55. By shaping the metal layer 40 on the back side of the shell 12 as a cone, the maximum thickness of metal and consequently the maximum support is behind the shoulder 55, where most needed. The full taper to the apex of the shell also serves to support the part of the die ahead of the shoulder 55, as well as the part behind it.

Where there is a ground fit between the shell and backing, the softer metal layer 40 on the back side of the shell 12 facilitates the grinding.

The solidity and fullness of fit of the shell 12 in the recess 22 may be furthered by interposing a foil of soft metal, as indicated by the thickened lines 60, Fig. 2.

The invention may receive other embodiments than those herein specifically illustrated and described, and the process may be carried out by other modes of procedure than those specifically described.

What is claimed is:

1. A die having a relatively small aperture or recess, and difficult to form by deposition of a hard metal on a foundation-metal, comprising a separately formed chromium shell, and a backing for said shell.

2. A process of forming a die of the type having a relatively small aperture or recess and difficult to form by deposition of a hard

metal on a foundation metal, comprising depositing chromium upon a matrix or counterpart having the shape of the working face of the die, and building up a shell thereon, and electrodepositing iron on the back of said shell to form a backing.

3. A die according to claim 1 in which the backing for the shell is constituted of electrodeposited iron.

4. A die according to claim 1 in which a layer of soft material is provided on the side of the shell opposite its working face.

5. The process of producing a hollow die of the extruding and wire-drawing type which comprises making a hollow form of metal capable of being dissolved by an acid, establishing said form as a cathode in a chromium electroplating bath, electrodepositing chromium on the exterior of said hollow cathode, continuing said electrodeposition of chromium until a plate of the desired thickness has been made, and removing said plated form from the electroplating tank, treating the same with an acid reagent capable of dissolving said metallic form to produce a shell of electrodeposited chromium.

6. The process of producing a hollow die of the extruding and wire-drawing type which comprises making a cathode of a substance capable of subsequent removal, electrodepositing chromium on the exterior of said cathode, continuing the electrodeposition of chromium until a shell is formed, then removing said cathode and shell of electrodeposited chromium from the electroplating tank, converting the substance constituting the cathode into a fluid form to cause the removal thereof from the shell of electrodeposited chromium and surrounding the outside of the shell of electrodeposited chromium with a layer of softer metal to reinforce said shell.

7. The process as set forth in claim 6 in which the softer metal has a relatively low melting point.

8. A process of forming dies of the type having a relatively small aperture or recess and difficult to form by deposition of a hard metal on a foundation metal, comprising depositing the hard metal upon a matrix or counterpart having the shape of the working face of the die, said die having tapered faces and having a relatively small aperture or recess at the end of said tapered faces, depositing a chromium shell thereon, and surrounding the exterior of said shell with a relatively soft metal capable of being readily worked.

In witness whereof, I have hereunto signed my name.

JOHN T. PRATT.