Oct. 28, 1924. 1,513,565

W. W. SOMERSALL

APPARATUS FOR SHAPING SHEET METAL ARTICLES

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Fig.1

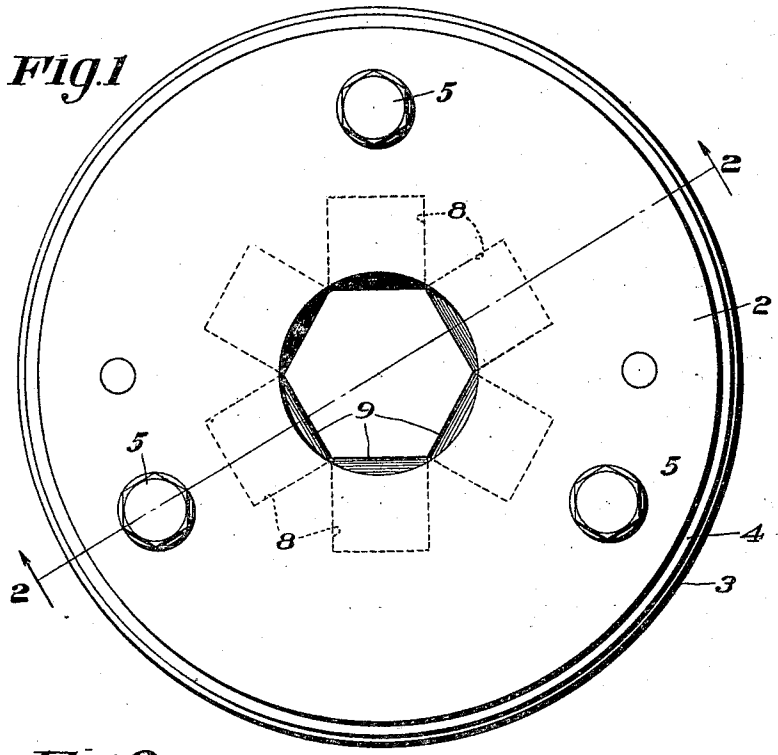


Fig.2

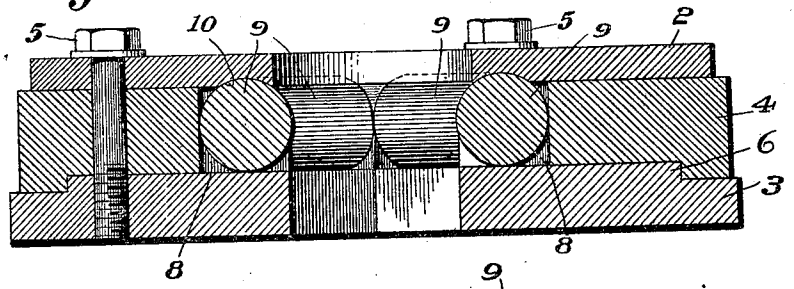


Fig.3

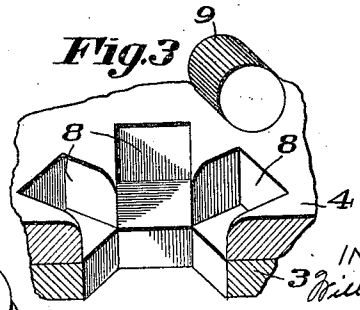
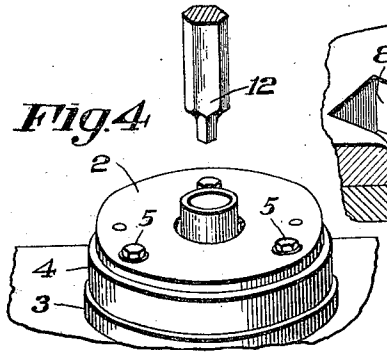


Fig.4



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Fig. 8

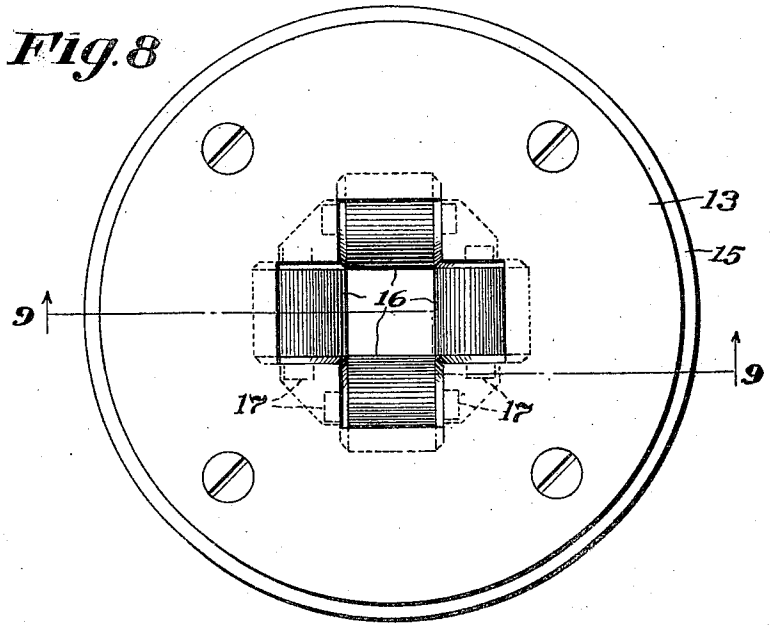


Fig. 9

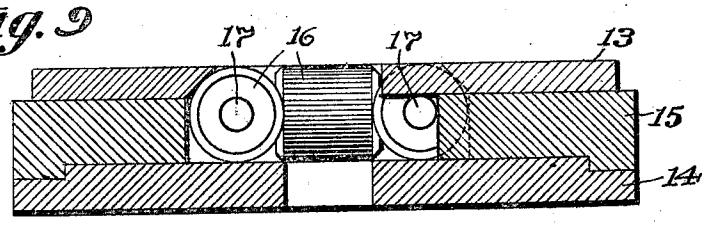


Fig. 5

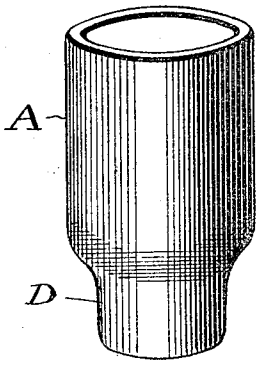


Fig. 6

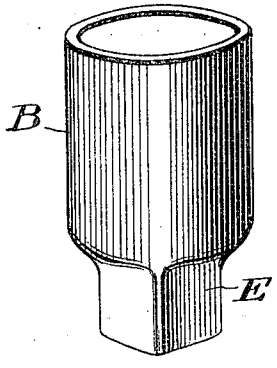
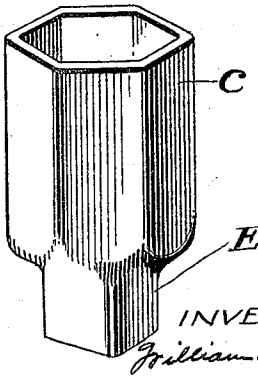


Fig. 7



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Patented Oct. 28, 1924. 1,513,565

UNITED STATES PATENT OFFICE.

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APPARATUS FOR SHAPING SHEET-METAL ARTICLES.

Application filed October 30, 1922. Serial No. 597,783.

To all whom it may concern:

Be it known that I, WILLIAM W. SOMERSALL, a citizen of the United States, residing at Natick, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Apparatus for Shaping Sheet-Metal Articles, of which the following is a specification.

This invention relates to punch and die apparatus of the character used in the pressed metal industry. The invention will be herein disclosed as embodied in an apparatus designed especially for use in making tubular wrenches, such as spark plug wrenches, and the like, although the invention may also be used to advantage in the manufacture of a great variety of hollow sheet metal articles.

As is well understood by those skilled in this art, it is the usual practice to manufacture wrenches of the tubular type by starting with a flat metal blank. This blank is subjected to a series of cupping and drawing operations until it is worked into an elongated cup-shaped form. Usually it is then necked; that is, a shank of reduced diameter is formed in the closed end of the blank. This neck or shank is next given the desired cross sectional outline, usually that of a square, and the blank is then forced through a die which gives the body the desired polygonal outline. This usually is either a square or an hexagonal form. These shaping and drawing operations are performed by forcing the blank through suitable dies while the blank is cold, or at ordinary temperatures, and consequently it subjects the walls of the apertures in the dies to very rough usage. These walls soon become scored, worn, or mis-shapen, and after only a very short time it is necessary to discard the die and replace it with a new one. Often such dies last only during the shaping of three hundred or four hundred pieces of work, and even under very favorable circumstances they will rarely last for more than seven thousand or eight thousand pieces. Such dies are expensive to manufacture and when a die is worn out and must be replaced, considerable time is lost in setting and adjusting the new die. The percentage of imperfect pieces of work produced by such dies also is high.

With these considerations in mind, it is the chief object of the present invention to improve the construction of dies of the general character above mentioned with a view to reducing their cost of manufacture, providing a die construction which will give substantially greater length of service, will reduce the percentage of defective pieces of work produced, and will result in economies in the repair and changing of the tools.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawings, and the novel features will be particularly pointed out in the appended claims.

In the drawings,

Figure 1 is a plan view of a die constructed in accordance with this invention;

Fig. 2 is a vertical cross sectional view on the line 2—2, Fig. 1;

Fig. 3 is a perspective view showing certain details of the die construction;

Fig. 4 is a perspective view of the die and a punch for forcing the work therethrough;

Fig. 5 is a perspective view of a tubular wrench blank at an intermediate stage in the necking operation;

Fig. 6 is a perspective view of the blank after the shaping of the neck has been completed;

Fig. 7 is a perspective view of the blank after it has been forced through the die shown in Figs. 1 and 2;

Fig. 8 is a plan view of a necking die embodying the present invention; and

Fig. 9 is a cross sectional view on the line 9—9, Fig. 8.

Referring first to Figs. 1 to 4 inclusive, the die there shown comprises top, bottom and intermediate plates designated at 2, 3 and 4, respectively. These plates are registered by means of dowel pins, and they are all secured together by bolts 5. The bottom plate 3 preferably has a central projection 6 formed thereon which extends into a recess or aperture in the bottom of the central plate 4 and thus aids in holding these two plates in the proper relationship. These

plates are all apertured centrally, the apertures registering with each other to form a hole that extends vertically through the die, and the wall of the aperture in the plate 4 has six notches or recesses formed in it, as best shown at 8, Fig. 3. Positioned within each of these recesses is a roll 9, each roll fitting snugly in its recess and resting on the lower plate 3.

The die shown is designed to give the hexagonal form to the body of the wrench, and the six rolls 9 are arranged, as clearly shown in Fig. 1, to form the walls of a restricted aperture having this outline. In order to prevent the rolls from moving forward into the aperture, the upper plate 2 has grooves formed therein, as indicated at 10, Fig. 2, to receive the rolls, sufficient clearance being provided to enable the rolls to rotate freely about their individual axes. It will be observed from an inspection of Fig. 3 that the walls of the plate 4 which separate the recesses 8 are curved at their forward edges so that their faces merge substantially with the adjacent surfaces of the rolls.

When the blank B, Fig. 6, is forced through the die by means of the punch 12, Fig. 4, the body of the blank will be reshaped and its circular outline will be changed to the hexagonal form shown at C in Fig. 7. This re-shaping is effected by the punch 12 forcing the metal into contact with the rolls 9, these rolls rotating freely about their axes and being held in their cooperative relationship to each other by the other parts of the die. It should be noted that the rolls are supported by their peripheral engagement with the walls of the recesses in which they are mounted, as distinguished from being supported by axles or trunnions.

Due to the fact that the work-shaping surfaces of the die, namely the rolls, move with the work as it is forced therethrough, the friction on the die surfaces is greatly reduced and the power required to perform this operation is correspondingly reduced. I have found in actual practice that a die of this construction will outlast the usual dies several times. Furthermore, it greatly reduces the percentage of imperfect pieces of work, since the tendency to score either the work or the walls of the die is practically eliminated. Due to the reduced friction, a die of this construction runs much cooler than the usual forms of dies. When the rolls have become worn to such an extent that the die is no longer fit for service, it is simply necessary to replace them, and the die is ready for use again. Such a replacement may be made at a trifling expense and without disturbing the setting or adjustment of the die. The saving thus effected in tool repair is a very substantial item.

In Figs. 8 and 9 a slightly different construction is shown, the particular die there illustrated being designed especially for performing the necking operation on the blank A. This construction comprises top, bottom and middle plates, designated at 13, 14 and 15, respectively, and it also includes a series of rolls 16. These rolls rest on the lower plate 14 and they are located in notches or recesses formed in the central plate 15, as in the construction above described. Each roll, however, is provided with bevelled ends and with short trunnions 17. The bevelled ends prevent the rolls from moving forward into the aperture, as will readily be appreciated from an inspection of Fig. 8. The trunnions 17 are not subjected to any strain during the shaping of the work, the rolls being supported at this time by their peripheral engagement with the plates 14 and 15 in the same way that the rolls 9 are supported in the construction above described; but the trunnions engage the upper plate 3 when the work is pulled back through the die, and they thus hold the rolls in their proper relationship at this time.

This construction has substantially the same advantages as that shown in Figs. 1 and 2.

While I have herein shown and described the best embodiments of my invention which I have so far devised, it will be appreciated that the invention is not limited to embodiment in the precise form shown.

Having thus described my invention, what I desire to claim as new is:

1. A die for the cold shaping of hollow sheet metal articles, comprising a roll for shaping one face of the work, additional die members cooperating with said roll to support it and shape the work, said members including stationary parts located at opposite ends of said roll having faces curved to substantially merge with the surface of the roll where the work comes in contact with it.

2. An apparatus for shaping hollow sheet metal articles of polygonal cross-sectional outline, comprising a plurality of rolls arranged to form the walls of an aperture having said outline, the sides of said outline consisting, respectively, of elements of said rolls, means supporting the peripheral surfaces of said rolls to hold them in said relationship but enabling the rolls to rotate about their respective axes, and a punch for forcing the work through the aperture formed by said rolls.

3. An apparatus for shaping hollow sheet metal articles, comprising a die member having an aperture therethrough, a punch for forcing the work through said aperture, said member having a plurality of recesses in the wall of said aperture, rolls positioned in said recesses and supported by the walls of said recesses, the surfaces of said rolls constituting work shaping surfaces of said die, and means cooperating with said member to

support the rolls in their operative positions.

4. An apparatus for shaping hollow sheet metal articles, comprising a middle die plate having a hole therethrough, said hole having a plurality of recesses formed in the wall thereof, rolls positioned in said recesses and arranged to form the walls of an aperture of polygonal outline, top and bottom plates cooperating with said middle plate to hold said rolls in their operative positions, said rolls being supported by the engagement of their peripheral surfaces with the walls of said recesses, and a punch for forcing the work through said aperture.

WILLIAM WARREN SOMERSALL.