June 12, 1923. 1,458,599

F. R. STAFFORD

METHOD OF MAKING DIES

Filed Feb. 12, 1919

Fig. 1.

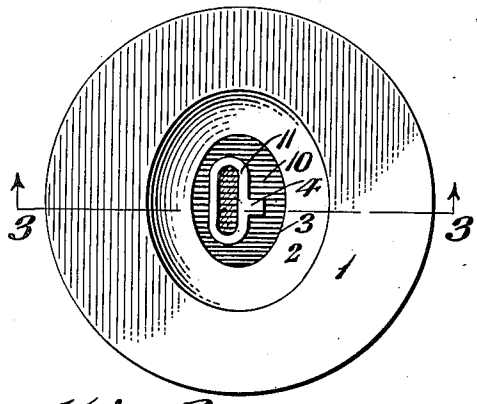


Fig. 2.

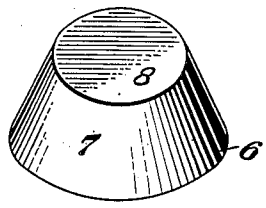


Fig. 3.

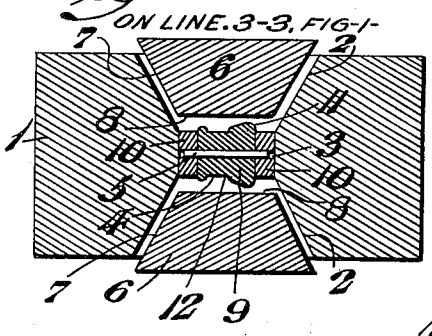


Fig. 4.

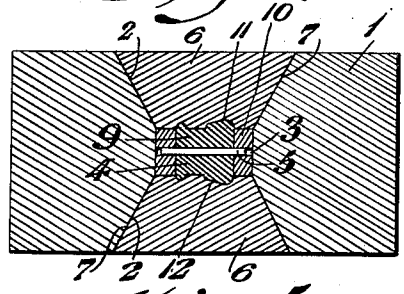


Fig. 5.

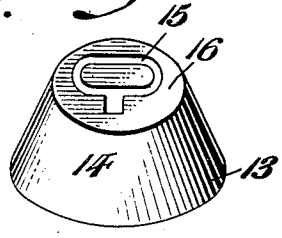


Fig. 8.

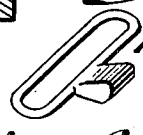


Fig. 6.

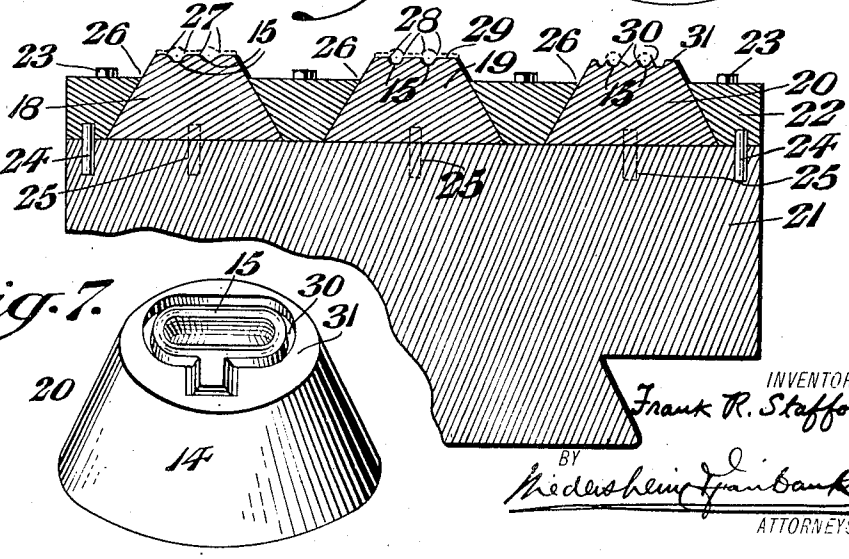


Fig. 7.

INVENTOR
Frank R. Stafford.
BY
Middleton Franbanks.
ATTORNEYS.

Patented June 12, 1923. 1,458,599

UNITED STATES PATENT OFFICE.

FRANK R. STAFFORD, OF PHILADELPHIA, PENNSYLVANIA.

METHOD OF MAKING DIES.

Original application filed August 22, 1916, Serial No. 116,346. Divided and this application filed February 12, 1919. Serial No. 276,490.

To all whom it may concern:

Be it known that I, FRANK R. STAFFORD, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented new and useful Methods of Making Dies, of which the following is a specification.

My present invention comprehends a novel method of making dies.

It further comprehends a novel method of making dies wherein die blanks having tapered walls are pressed against a master die in such a manner that all of the dies thus formed are exact duplicates of each other.

Other novel steps of my method and other novel features of advantage will hereinafter appear in the detailed description of my invention.

For the purpose of illustrating my invention, I have shown in the accompanying drawing an embodiment thereof which is at present preferred by me, since said embodiment will give in practice satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of these instrumentalities as herein shown and described.

Figure 1 represents a top plan view of a master die employed.

Figure 2 represents, in perspective, a die blank.

Figure 3 represents a section on line 3—3 of Figure 1 and shows in addition the die blanks as ready to be brought into engagement with the master die.

Figure 4 represents a section on the same line as that of Figure 3 with the die blanks moved into contact with the master die.

Figure 5 represents, in perspective, a die made in accordance with my invention.

Figure 6 represents a sectional view of a plurality of dies assembled on a block.

Figure 7 represents, in perspective, a die showing more clearly the cutting edge.

Figure 8 represents, in perspective, a butt swivel for a gun which has been formed by dies of the configuration illustrated.

Similar numerals of reference indicate corresponding parts.

Referring to the drawings.

The die in my invention may vary in shape and proportion in accordance with the use for which it is intended and the article which is to be made from it, and in order to illustrate the die as being constructed to form a definite article, I have preferred to illustrate it as constructed in such a manner as to form a butt swivel for a gun.

1 designates a die block having an aperture through it which is provided on opposite sides of its center with tapered side walls as indicated at 2 and these sides walls 2 merge into a straight side wall 3 at which point the master die 4 is secured in any desired manner. The master die 4 is illustrated as of sectional construction and has its parts connected by means of a pin 5 but it will be understood that this die can be made in one piece if desired. Owing to the manner in which the master die 4 is positioned in the die block, an upper and a lower die face is formed as will be apparent from Figures 3 and 4.

6 designates a die blank which is formed with a tapered side wall 7 and with a flat top or crown 8 and, as illustrated, the tapered wall 7 is shown as having conical contour, so that it will be brought into accurate register with the corresponding conical wall 2 of the die block.

The master die 4 is illustrated as having a central portion 9 and the side portions 10 through which the pin 5 passes. Upper and lower faces 11 and 12 respectively of the master die are formed which reproduce opposite halves of the shape of the article when two die blanks are forced toward each other and toward the master die so that the faces 8 of the blank will receive an impression corresponding to the shape of the master die, and simultaneously with such operation the sides of the die blanks will be formed with an accurate taper conforming to the taper of the side walls 2 of the die blank.

The die blanks 6 are formed in any desired manner and preferably by drop forging them while hot. The scale is then removed and they are then brought together as seen in Figure 3 and the parts thus assembled are placed in a hydraulic press and subjected to a very heavy pressure, thereby forming impressions in the top faces 4 of the two blanks corresponding to the faces 11 and 12. The die 13 formed in this manner is seen in Figure 5 and such die is provided with a tapered side wall 14 and its top face is provided with the impression 15

and with a flat portion 16. I have shown the impression in the die such as to form a butt swivel 17 for a gun, see Figure 8, and in the making of such butt swivel, I preferably employ these dies as shown in Figure 6. For convenience of description, I have identified these by reference characters 18, 19 and 20.

The dies 18, 19 and 20 are held in position on a body portion 21 by means of a clamping plate 22 which is secured to said body portion by fastening bolts 23. The clamping plate can be accurately positioned on the body portion 21 by means of dowel pins 24 and the different dies are preferably positioned on the body portion 21 by means of dowel pins 25. The clamping plate has openings 26 the walls of which are tapered to conform to the taper of the side walls of the different dies.

The wall surrounding the impression 15 in the first die 18 is somewhat rounded as indicated at 27 so that the metal being worked will flow properly into the form. In the die 19 the impression 15 is rounded and has its corners sharper, as indicated at 28, and is provided with a flat face 29 outwardly of the impression 15. The finishing die 20 has the impression 15 rounded but outside of this impression the metal of the die is cut away so as to produce sharp cutting edges 30 for the purpose of trimming off superfluous metal from the article. The die is protected by means of the flat face 31. These dies 18, 19 and 20 it will be understood are hardened and are preferably ground both before and after hardening and each of them has a broad base and a tapered or conical side wall, and in the top or crown of the die is an impression corresponding to one-half or one side of the article.

In the making of the article, for example, a butt swivel, the assemblage seen in Figure 6 is secured in a drop press. A heated bar is then inserted between the first pair of dies 18 and the drop head is lowered. The article is thus initially formed and as the drop head rises the article is removed by means of the gate projection connecting it to the bar. The article thus far formed is placed between the second pair of dies 19 and the finished shape is imparted to the article by this action but the article is not trimmed and the gate projections are left on it. After the second blow the article is again removed and placed between a pair of dies 20 and the power blow of the drop press completes the surface finish of the article and trims the bulk of the metal away from the outer and inner surfaces.

If the dies are properly set in the press the entire bulk of metal is cut away from the outer and inner surfaces and in any case only a very thin film of metal is left.

When dies of this character are to be employed for stamping or cutting out sheet metal blanks, the pairs of blanks will ordinarily be male and female. As illustrated they are female dies. It will be apparent that dies constructed in accordance with my present invention form interchangeable dies which are self centering and self adjusting and by my novel method of manufacturing dies, I not only effect a great economy in the cost of manufacture but during the process of manufacture, I am able to obtain what is known as a "glass finish" on the tapering side wall of the die. I furthermore eliminate the fine work of milling, grinding and cutting away the metal by hand tools from the edges of the dies and at one operation I am enabled to obtain a more perfect die than can be made by hand by an expert toolman.

It will be understood that where different dies are employed as shown in Figure 6 to form the article each of these dies would be made in the manner illustrated in Figures 3 and 4. The cutting edges formed around the edge of the depression or impression 15 would preferably be formed from the master die but if preferred the round edges of the die 18, the sharp edges of the die 19 and the sharp edges of the die 20 can be formed in the die in any desired manner after the impression has been first sunk into the die.

The present application is a division of my parent application filed August 22, 1916, Serial #116,346.

In Figure 6, I have shown in dotted lines the article in the form it assumes at different stages of the operation.

Having thus described my invention what I claim as new and desire to secure by Letters Patent, is:

1. The method of die making, which consists in forming die blanks with tapering walls, and simultaneously moving a pair of blanks against a hub positioned between them to thereby form depressions in each blank of a pair.

2. The method of die making, which consists in forming die blanks with tapering side walls and moving the blanks against a master die positioned between them to thereby form depressions in the blank with the outer walls of such depressions forming raised cutting edges and the juxtaposed walls forming flat protecting surfaces.

3. The method of forming dies which consists in forming a die block having an aperture through it with tapering side walls, positioning a master die within said block in juxtaposition to the inner ends of said tapering walls, making die blanks with tapering walls conforming to the contour of the tapering walls of the die block and moving said die blanks into the die block to engage the master pattern to form depressions in the tops of the die blanks and simultane-

ously therewith accurately finishing the tapered side walls on the blanks of exact dimensions.

4. The method of die making, which consists in simultaneously moving a pair of die blanks against a master die positioned between them.

5. The method of die making, which consists in forming a die blank with its side walls tapering, positioning a master die with respect to a die block having tapering side walls, and moving the die blank into the die block to engage the master die and simultaneously accurately finish the tapering side walls of the blank.

FRANK R. STAFFORD.

Witnesses:
H. S. FAIRBANKS,
C. D. MCVAY.