A. WARD.

METHOD OF FORMING TWIST DRILLS.

APPLICATION FILED FEB. 14, 1908.

950,645. Patented Mar. 1, 1910.

Fig. 1.

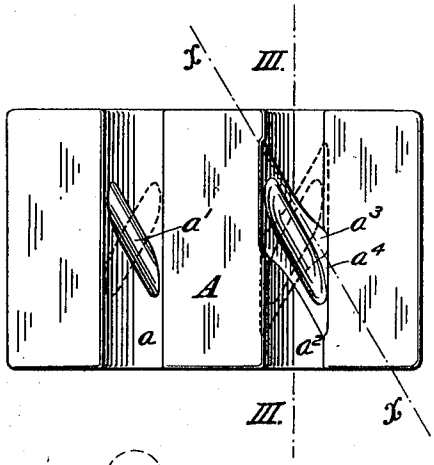

Fig. 2.

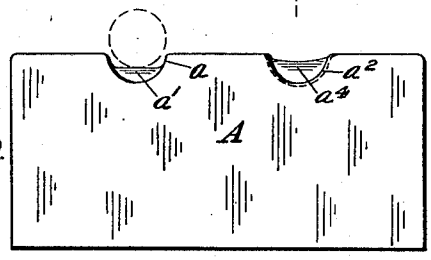

Fig. 4.

Fig. 5.

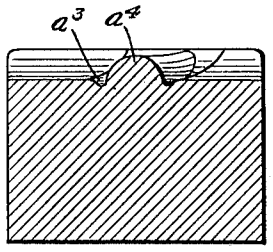

Fig. 3.

WITNESSES

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METHOD OF FORMING TWIST-DRILLS.

950,645. Specification of Letters Patent. **Patented Mar. 1, 1910.**

Application filed February 14, 1908. Serial No. 415,981.

To all whom it may concern:

Be it known that I, ALVIN WARD, a citizen of the United States, resident of Jackson, county of Jackson, and State of Ohio, have invented a new and useful Improvement in Methods of Forming Twist-Drills, of which the following is a specification, the principle of the invention being hereinafter explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

My invention relates to methods of forming the helical flutes and lands of twist drills or the like, the object of such invention being to form such flutes and lands in a blank rod with a minimum waste of material and without leaving the product with deleterious internal molecular strains.

The said invention consists of a method hereinafter fully described and particularly set forth in the claims.

The annexed drawing and the following description set forth in detail a certain method and means for carrying out the invention, such disclosed method and means, however, constituting but one of various forms in which the principle of the invention may be applied.

In said annexed drawing: Figure 1 is a plan of one of the dies constructed in accordance with that part of my invention relating to the means for carrying out my improved method. Fig. 2 is an end elevation of such die, and Fig. 3 is a cross-sectional view taken upon the plane indicated by line III—III of Fig. 1. Fig. 4 is an elevation of a blank rod and Fig. 5 is a similar view of the finished product of my improved method and means for carrying out same.

The die block A is formed with a semi-cylindrical depression a which is angularly traversed by a projection a', itself of semi-cylindrical cross-section. This projection is made of a height substantially equal to about one-half the extreme depth of the depression a as shown in Fig. 2 and its base intersects the cylindrical surface of the depression. The cross-sectional area of the depression a is made such that when the blank rod is laid therein and upon the projection a only a small amount of lateral play is permitted for a purpose hereinafter specified.

A similar depression a^2 is formed upon another part of the block whose extreme portions are made accurately of a semi-cylindrical form whose cross-sectional area is made exactly equal to one-half of the circular cross-sectional area of the required finished forging. An angularly placed portion a^3 of the depression a^2 is made of greater depth than the end portions of the depression a^2 as shown in Fig. 3, so as to present a greater cross-sectional area on a plane having an angularity substantially equal to the angle of the required flute and indicated by the line x—x, Fig. 1. Protruding upwardly from this enlarged portion of the depression is a projection a^4 which is also angularly placed with reference to the depression's axis as shown and is furthermore of a semi-cylindrical cross-section, the middle part of such cross-section corresponding substantially to the cross-section of the desired finished forging. This projection a^4 is furthermore of greater height than that of projection a'.

In carrying out my improved process, the die block A is placed in a suitable foundation to form an anvil and a similar die block provided with depressions and projections exactly similar to those just described but reversed to assume the position indicated in dotted lines in Fig. 1, is secured to the head of a suitable drop, trip or steam hammer.

The blank to be operated upon is heated to a suitable temperature and then placed in the depression a and upon the projection a' so as to bring the latter in a position which will be occupied by that end of the flutes adjacent to the shank of the drill. In this position, (see dotted lines Fig. 1), as was previously stated, only a small amount of lateral movement of the blank is permitted so that the projection a' will be properly centered with relation to the blank. The hammer is now operated to bring the other portion of the die down upon the top of the blank, whereby the projection a' and the corresponding projection of the other portion of the die are caused to make two oppositely disposed depressions of opposite angularity,

as will be readily understood. The blank is then given a helical movement in the direction of its axis and the hammering operation continued, the projection a' being used as a guide. Two oppositely disposed flutes are thus formed which have not, however, their final depth or form. The blank so impressed is now transferred to the groove a^2 of the die block and placed therein so as to cause the projection a^4 to engage the flutes formed in the above-described operation. The upper movable die is now caused to descend upon the blank in a number of successive blows so as to further enlarge the impression previously formed. Such action produces a projection having the coutour of the depressed portion a^3 of the depression a^2 and the projection a^4, the metal expanding into the portion a^3. After the required number of blows have been delivered to produce this contour, the blank is turned so as to impart thereto a helical movement in the direction of the blank's axis, the projection a^4 being used as a guide for such purpose. This brings a succeeding portion of the blank into the field of operation of the die and the required number of blows are now struck to produce a result upon this portion of the blank such as above described. In this manner every portion of the blank may be presented to the action of the die and two continuous helical and oppositely disposed flutes thereby formed upon the blank to produce the finished product.

The expanded portions of the blank after being formed are brought into the field of action of the cylindrical end portions of the depression a^2 and thereby caused to assume the exact required size. The completed forging is now placed in a straightening die to give it a rectilinear form.

All surfaces of the depression a^2 are rounded slightly as shown and particularly those surfaces which form the connection between the cylindrical portion thereof and the depressed portion a^3 thereof so that the product of the above described operation will on completion present a smooth and uniform appearance.

The action of the cylindrical end portions of the depression is such as to compress the enlarged portion formed in the vicinity of the projection a^4 which results in the slight contraction of the outer portion of the flutes. This contraction permits the edges of the flutes to present a sharp line when the drill is ground to its final exterior form.

I therefore particularly point out and distinctly claim as my invention:

1. The method of forging the flutes in twist drills which consists in first forming upon the blank and solely by means of two complementary dies, two oppositely disposed helical flutes of less depth than that of a desired forged flute; then subjecting the flute so formed to a further operation by means of additional dies whereby a further depth of the flutes is imparted, such latter depth being that of the desired finished forged form.

2. In a method of forging twist drills or the like, the steps which consist in simultaneously subjecting opposite sides of a blank to the impression of two tool elements of opposite angularity with reference to the blank's axis, while imparting to such blank a helical motion in the direction of its axis, one of said tool elements being used as a guide for such motion, simultaneously with such impressing action permitting the blank to expand laterally and only immediately adjacent to such tool elements, while the latter are acting, and then reducing the diameter of such expanded portion of the blank.

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