No. 867,639. PATENTED OCT. 8, 1907.

G. J. BRAGG.

TWIST DRILL.

APPLICATION FILED MAY 21, 1906.

Fig. 1,

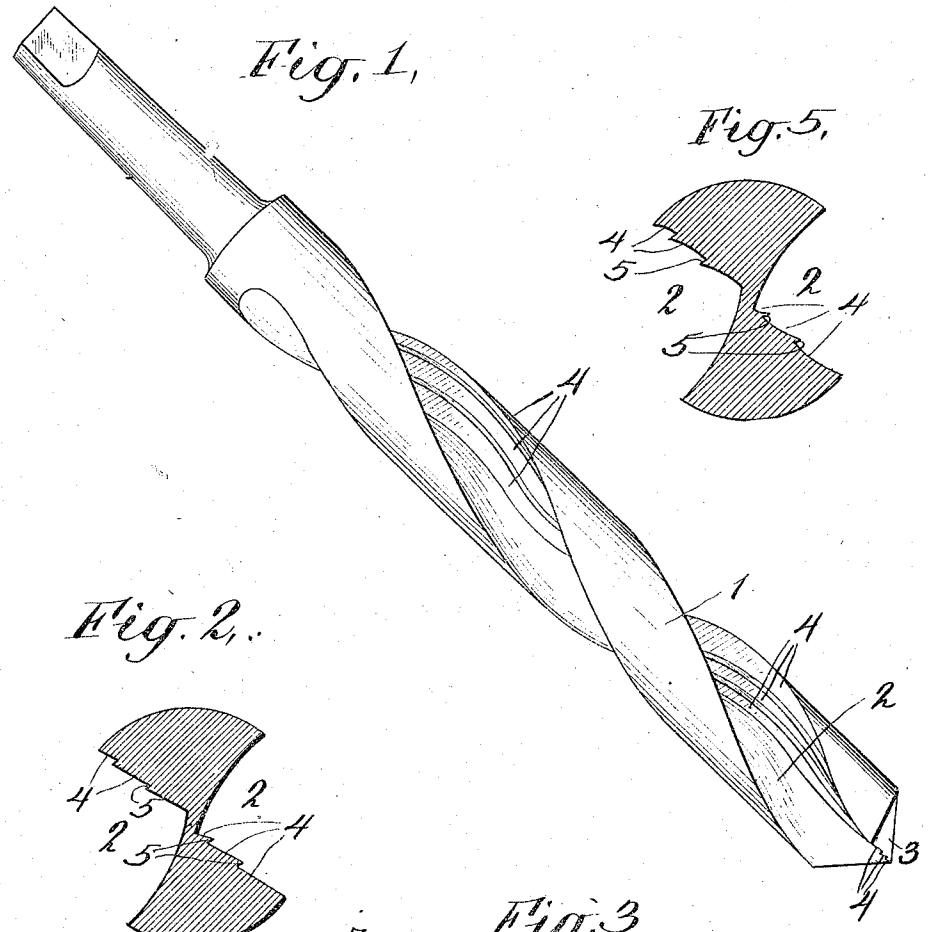


Fig. 5,

Fig. 2,

Fig. 4,

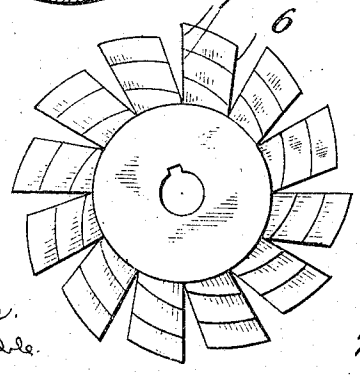
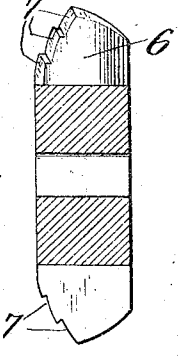


Fig. 3,



WITNESSES:

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TWIST-DRILL.

No. 867,639. Specification of Letters Patent. Patented Oct. 8, 1907.

Application filed May 21, 1906. Serial No. 317,850.

To all whom it may concern:

Be it known that I, GEORGE J. BRAGG, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Twist-Drills; and I do hereby declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in drills and consists in improved means for breaking up the chips, and in other features as hereinafter more particularly described and pointed out in the appended claims.

The object of my invention is to increase the cutting speed and the efficiency of drills.

I will now proceed to describe my invention with reference to the accompanying drawings, illustrating one form of drill embodying my invention and a cutter which may be used in forming the drill, and will then point out the novel features in claims.

In the said drawings, Figure 1 shows an elevation of the said drill; Fig. 2 shows a cross section thereof; Fig. 3 shows a cross-section of a milling cutter which may be used in forming said drill; Fig. 4 shows a side view of such cutter; and Fig. 5 is a view similar to Fig. 2 illustrating an alternative construction.

It is well known that the power required by metal cutting tools, and the speed of cutting, are greatly affected by the character of the chip formed; and numerous attempts have been made to produce drills and other cutting tools capable of operating at higher speed and with less power than the drills commonly used.

I have found that drills as ordinarily constructed, cut too wide a chip, and that the cutting efficiency of the drill can be greatly increased by dividing the chip into a plurality of narrower chips. When this is done, by means such as hereinafter described, not only does the drill cut more easily, but it may be run at higher speed and does not heat up as fast as corresponding drills of the ordinary type.

According to my invention I break up the cutting face of each groove of the drill into a plurality of faces, which therefore are relatively narrow as compared with the continuous cutting face of the ordinary twist drill, and which are separated by what may be termed "chip-interrupting" faces, which preferably do not cut at all, and in any case serve to break the continuity between the chip formed by one such sub-face and the chip formed by the next sub-face. This I do, preferably, and as shown in the drawings, by forming the cutting face in a plurality of steps, the "risers" of which are under-cut or reëntrant so as to provide necessary clearance.

Referring now to the drawings, and at first to Figs. 1 and 2 thereof, 1 designates a twist drill, which is like ordinary twist drills in that it is provided with a plurality of spiral grooves 2 and with a conical point 3; but the drill differs from ordinary twist drills in that the said grooves, instead of having continuous cutting faces as in ordinary drills, have their cutting faces broken up into a plurality of relatively narrow stepped faces 4, the risers 5 of which steps are undercut somewhat, as indicated, so that these risers do not themselves form cutting edges. Each of these steps 4 acts as an independent cutting edge and forms an independent relatively narrow chip which is far more flexible than the wider chip of the ordinary drill and tends to break up more readily. The power required for the formation of these relatively narrow chips is apparently much less than that required for the formation of a single chip of breadth equal to the aggregate width of cut of the several steps of each cutting face.

It is desirable that the edges of the corresponding chips formed by the two sides of the drill shall be staggered relatively. By so doing the work of the drill is distributed more uniformly and better cutting assured. For this purpose therefore, I stagger the steps 4 on the two sides of the drill; for example, referring to Fig. 2, the innermost step 4 on the right hand side of said figure is relatively narrow while the corresponding step on the left hand side of said drill is wider but not as wide as the combined width of the first two steps on the right hand side. The formation of the stepped cutting faces of the twist drill offers no difficulties if a cutting tool of proper form be used. In Figs. 3 and 4 I illustrate a milling cutter such as may be used, the same comprising teeth 6 having serrations 7 corresponding to the several steps on one cutting face of the drill. This milling cutter may be used in the ordinary manner. Obviously in order to stagger the steps of the two sides of the drill, different but corresponding cutters must be used for the two sides.

It is not necessary that the sectional contour of the cutting faces 4 shall be straight, as shown in Fig. 2. To the contrary, these faces may be somewhat concave, as indicated in Fig. 5. I consider it important, however, that the risers 5 of the steps shall be slightly under-cut or reëntrant to an extent sufficient so that the radius at the base of the riser shall not be greater than the radius at the point. If this were not the case, the edges of the risers would offer additional resistance; and if the risers, instead of being under-cut were outwardly curved, the

effect would be to extend the length of the cutting edge, which would then be substantially one continuous but curved edge. As above stated, the object of my invention is to form a plurality of narrow chips instead of a single wide chip, and to this end I divide each cutting face of the drill into a plurality of continuous but preferably over-lapping faces.

What I claim is:—

1. A longitudinally grooved drill having sub-grooves in a groove thereof extending to the cutting end of the drill, each of the said sub-grooves being provided with an overhanging edge.

2. A longitudinally grooved drill having a plurality of longitudinal main grooves and having sub-grooves in said main grooves extending to the cutting end of the drill, each of said sub-grooves being provided with an over-hanging edge, the sub-grooves of the said main grooves staggered relatively so that the over-hanging edges of the sub-grooves of the different main grooves do not track.

In testimony whereof I affix my signature, in the presence of two witnesses.

GEORGE J. BRAGG.

Witnesses:
H. M. MARBLE,
ROGER H. LYON.