Feb. 11, 1930. D. C. FABEL 1,746,825

SCREW EXTRACTOR

Filed Aug. 3, 1928

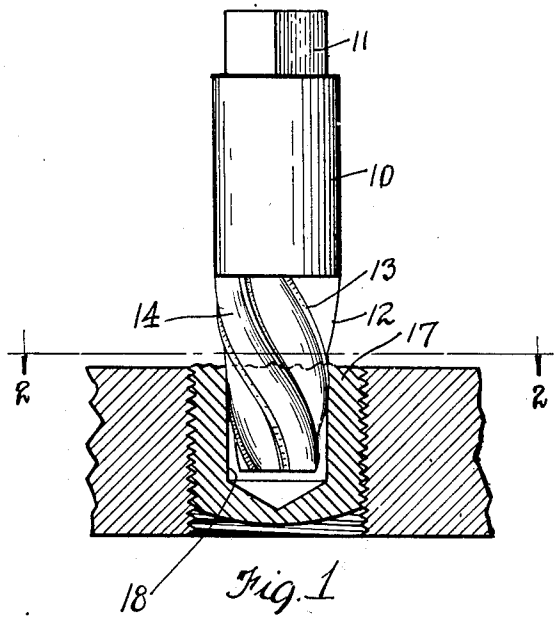


Fig. 1

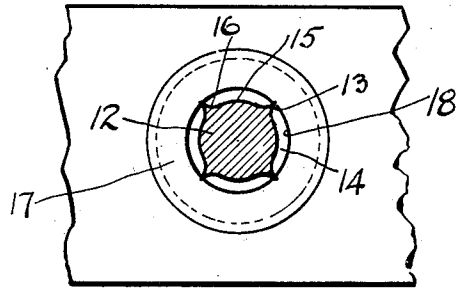


Fig. 2

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Patented Feb. 11, 1930 1,746,825

UNITED STATES PATENT OFFICE

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SCREW EXTRACTOR

Application filed August 3, 1928. Serial No. 297,271.

The present invention, relating, as indicated, to screw extractors and the like, has more particular reference to tools of the type employed for removing the embedded parts of pipes, screws, etc., which have had their heads or outside portions twisted or broken off without leaving a projection sufficiently long to enable their removal in the usual manner.

Devices of the character referred to usually consist of a tapered operating portion which is provided with helically arranged ribs or lands and intermediate flutes or grooves, these latter having concave surfaces so as not to interfere with the desired engagement between such lands and the metal or other material of the part to be extracted. As at present manufactured, such tools are open to objections; in the first place, their strength is not always sufficient to enable them to resist the torsional stresses incident to normal use, and in the second place, the lands or ribs sometimes dig too deeply into the broken element with the result that such element is expanded radially and its extraction hindered, if not entirely prevented.

This invention, with the object of improving these tools and making them more positive and certain in action as well as stronger, contemplates providing raised or convex portions intermediate the ribs or lands, such portions serving to strengthen the body against torsional stresses and also forming stops for preventing the lands from expanding the metal or other material of the part to be removed to such an extent as to interfere with its extraction. In other words, the extracting tool which is the subject of this invention provides for the lands having an initial and non-expanding bite followed by a substantially general distribution of pressure over practically the entire inner surface of the bore of the element being operated upon, this obviating the above mentioned objections and adapting such tools to more reliably performing their intended function.

To the accomplishment of the foregoing and related ends, the invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims, the annexed drawing and the following description setting forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawing:—

Fig. 1 is a partly sectional elevational view showing my improved extractor and illustrating its manner of use in removing a broken set screw; and Fig. 2 is a transverse horizontal section taken on a plane indicated by the line 2—2 of Fig. 1.

As best shown in Fig. 1, the extractor contemplated by my invention consists of a body 10 having a polygonal shaped end 11 and a tapered operating portion 12, such portion being provided with a plurality of helical lands or ribs 13 and intermediate flutes or grooves 14. Such grooves are formed with raised or convex portions 15 which may connect with the ribs 13 by the more or less concave surfaces 16 and which desirably have a central course with respect to the adjacent lands. As shown in Fig. 2, such a tool in section presents the general appearance of a substantially circular body having radially extending points which project a short distance beyond the general circumference. If desired, however, the base circle of the lands may be of smaller diameter than the circle defined by the raised portions or ridges 15, this being the case when the surfaces 16 are within or below a circle outlined by the intermediate convexities.

When being used, as for instance, in extracting a broken-off set screw 17 (Fig. 1), such screw is first provided with a hole or socket 18 into which the extractor is inserted until the lands 13 engage with the metal adjacent the mouth of the bore; then as the extractor is turned by a wrench applied to the end 11, the lands 13 bite into such metal, this being stopped when a predetermined depth has been attained and the raised portions 15 come into contact with the wall of such bore. When this happens, not only is further biting by the ribs 13 prevented but a solid engagement is produced which enables sufficient force to be applied without danger of expanding the work or breaking the tool;

the tool, of course, being turned in the direction required for loosening the work and the lands leading in a counter direction relatively to the threads.

It will be understood that a single tool will be satisfactory for use in drilled screws or pipes of a wide range of sizes and that the proportions and configuration of the lands and intermediate stops can be varied as necessary for tools of different sizes or to regulate the extent of penetration which occurs before the ridges come into contact with the wall of the bore. It will also be apparent that even in the same tool the relations existing between circles defined by the outer faces of the ridges, by the engaging parts of the lands, and by the bases of the lands, may vary if different proportions are desired for the different diameters provided for use in holes of different sizes.

For some purposes, it has been found that the most satisfactory operation is obtained when the helix angle is approximately thirty five degrees and the taper about one and one-half or two inches per foot. But in general the helix angle can be between fifteen and sixty degrees and the longitudinal taper between one and four inches per foot. These values for taper of the body and angularity of the lands have been ascertained experimentally and are such as to produce the most efficient tool in combination with the present improvements as above explained.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctively claim as my invention:—

1. An extracting tool comprising a body having a tapered operating portion provided with helical lands and grooves intermediate said lands, said grooves having outwardly and transversely curved surfaces forming stops for limiting the penetration of said lands.

2. An extracting tool comprising a tapered operating portion provided with a plurality of helically arranged ribs and grooves intermediate said ribs, said grooves having transversely convex parts forming stops for limiting the action of said ribs when penetrating the wall of the bore of the part to be extracted.

3. An extracting tool comprising a body provided with helically arranged lands and ridges between said lands, said ridges serving to limit the penetration of said lands and having spiral courses between such lands.

4. An extracting tool comprising a body having a substantially circular operating portion provided with helical ribs, said ribs being disposed at an angle of approximately thirty-five degrees and having a longitudinal taper of between one and one-half and two inches per foot.

5. An extracting tool comprising a body having a substantially circular operating portion provided with helical ribs, said ribs extending at an angle between fifteen and sixty degrees and having a longitudinal taper between one and four inches per foot.

6. An extracting tool comprising a body having helical ribs, said ribs extending at an angle of about thirty-five degrees and defining surfaces which taper about one and one-half or two inches per foot, said surfaces being convex in radial directions.

7. An extracting tool comprising a tapered body having helical ribs and helical convexities between said ribs, said convexities being adapted to contact with the wall of a bore in order to limit the penetration of said ribs into said wall.

8. An extracting tool comprising a body having helical ribs and helical ridges between said ribs, a circle drawn through the bases of said ribs being coincident with a circle drawn around said ridges.

9. An extracting tool having a tapered and cross-sectionally circular body provided with helical lands.

Signed by me, this 27th day of July, 1928.

DONALD C. FABEL.