

March 31, 1931.

E. F. JACKMAN

1,798,944

TOOL FOR REMOVING BROKEN STUD BOLTS AND THE LIKE

Filed Sept. 11, 1930

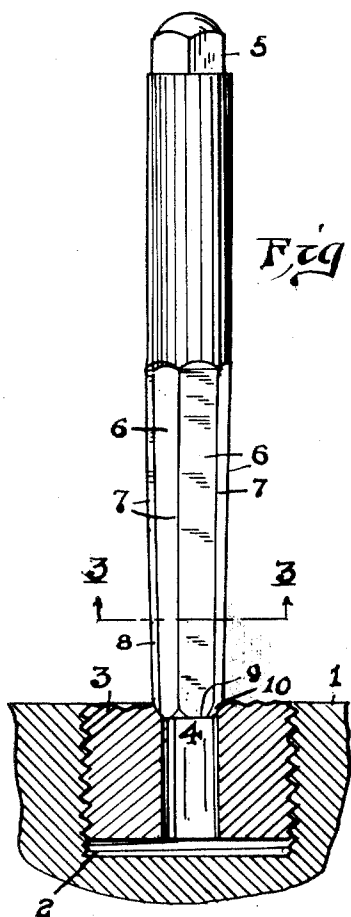


Fig. 1

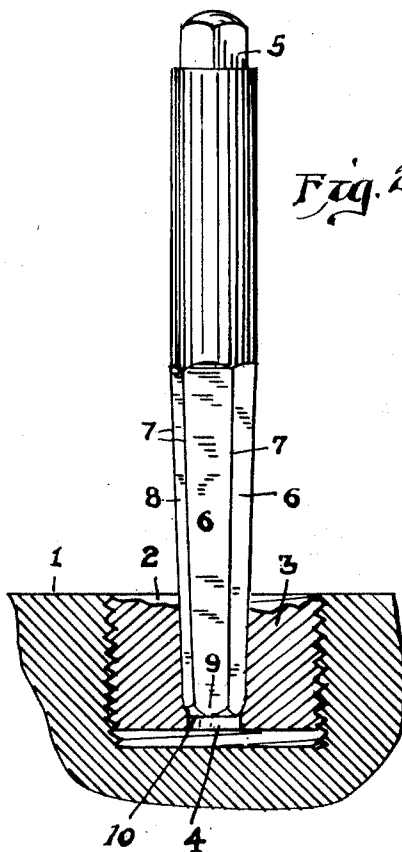


Fig. 2

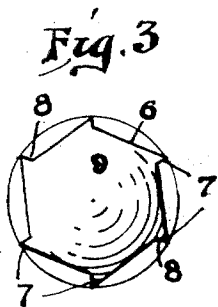


Fig. 3

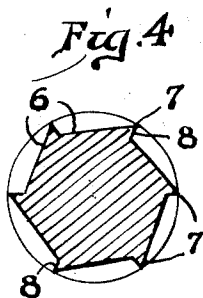


Fig. 4

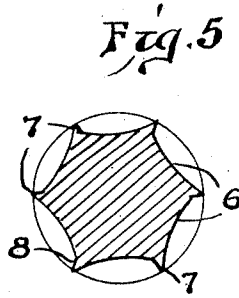


Fig. 5

INVENTOR

Elmer F. Jackman.
by Edward A. Lawrence
his attorney.

UNITED STATES PATENT OFFICE

ELMER F. JACKMAN, OF WILKINSBURG, PENNSYLVANIA

TOOL FOR REMOVING BROKEN STUD BOLTS AND THE LIKE

Application filed September 11, 1930. Serial No. 481,117.

Stud bolts and the like frequently break off so that their removal from threaded holes into which they have been screwed is difficult. In such cases the practice is to drill a hole longitudinally of the bolt-end, fix a tool therein and then unscrew the bolt-end by rotating the tool and the bolt-end.

My present invention relates to the improvement of such tools.

10 The tools hitherto employed for this purpose have been either cylindrical with longitudinal ribs, conical with longitudinal ribs or simply a tool similar to a twist drill.

15 In the case of all such tools great difficulty is experienced in properly centering the tool in the drilled hole and in maintaining its proper alinement with the axis of the hole.

20 The improved tool, which is the subject matter of the present invention, is self-centering and automatically maintains itself in accurate alinement with the axis of the drilled hole as it is driven into the same.

25 Again in the case of the cylindrical tool difficulty is experienced in properly starting the tool into the hole, and also an excess of material of the bolt must be cut away or shifted as the tool is driven home. Again it is very difficult to disengage the drilled bolt-end from the tool after the former has been 30 unscrewed.

35 In the case of the conical tool the taper is such that the tool is simply wedged into the hole and the interlocking between the tool and the drilled bolt involves such a reduced area that the tool is insecurely fixed to the bolt and in the case of a tightly seated bolt the tool will slip instead of rotating the bolt.

40 My improved tool readily enters the drilled hole in properly centered relation and is easily driven home therein. The material of the bolt-end forming and adjacent to the wall of the drilled hole is readily shifted by the tool to provide the proper interlocking. 45 ing.

50 In the case of tools hitherto used or designed and which are provided with longitudinally disposed ribs or the like, the bottoms of the groove or valleys between the ribs become wedged against the wall of the

drilled hole and thus prevent the further insertion of the tool into the drilled hole. Thus the fixation of the tool is frequently such that the tool becomes so wedged in the drilled hole that the bolt may be disengaged from the tool 55 only with the greatest difficulty.

My improved tool is readily driven into and fixed to the bolt so that the latter may be conveniently unscrewed and the bolt may be readily disengaged from the tool without 60 difficulty after the former has been unscrewed.

In general my improved tool comprises a steel bar or rod having its bolt engaging end provided with perimetral surfaces which are 65 substantially tangential to a circle described from the axis of the tool, such surfaces being either flat planes or somewhat curved. At the intersections of these lateral surfaces are formed the bolt-engaging ribs which are preferably of acute triangular cross-sectional 70 shape, with their shorter faces disposed in the direction in which the tool is to be rotated. The lateral surfaces and ribs are preferably so arranged that the former will be out of 75 contact with the wall of the drill hole so that the body of the tool will not become wedged in the hole.

The surfaces and ribs preferably converge slightly toward the insertion end of the tool 80 and such end of the tool is tapered and the ends of the ribs bevelled so that the extreme end of the tool may first be inserted into the drilled hole, thus rendering the tool self-centering and maintaining it in axial alinement 85 with the hole as the tool is driven into the latter.

When the tool is driven home or to the desired degree into the hole, the ribs are in engagement with the wall of the hole for 90 their entire inserted length or extent while the lateral faces of the tool are out of such engagement. Thus the ribs in providing grooves for themselves act to spread the metal 95 which forms the wall of the hole and the spaces between the lateral surfaces of the tool and the wall of the hole provides clearance for the displaced metal.

Other novel features of construction and 100

also of arrangement of parts, will appear from the following description.

In the accompanying drawings, wherein I have illustrated a practical embodiment of the principles of my invention, Fig. 1 is a view partly in plan and partly in cross-section showing the tool presented to the drilled hole and ready to be driven thereinto.

Fig. 2 shows the tool driven into the hole and ready to be rotated to unscrew the broken stud bolt.

Fig. 3 is a cross-section taken along the line 3—3 in Fig. 1.

Fig. 4 is a view of the insertion end of the tool.

Fig. 5 is a view similar to Fig. 3 but showing a modification.

Referring now to the drawings, 1 represents the casting or other element into whose threaded hole 2 the broken stud bolt 3 is screwed.

In removing a broken stud bolt such as shown at 3, the practice is to drill a hole 4 coincident with the axis of the bolt.

My improved tool has an impact head so that it may be hammered into the hole 4 and the head is also squared as at 5 for the application of a wrench or socket handle to rotate the tool.

The insertion end of the tool is provided with a plurality of lateral surfaces 6 which may be flat planes tangentially disposed as illustrated in Figs. 1 to 4, inclusive, or may be slightly curved such for instance as concaved as illustrated in Fig. 5.

These surfaces are at all times out of engagement with the wall of the drilled hole 4, the hole and tool being proportioned to avoid such engagement.

At the intersections or corners of the surfaces 6 are formed the longitudinally disposed ribs 7 which are triangular in shape and which may be simply the edges formed by the juncture of the lateral surfaces 6 or, as shown, by forming the short faces 8 disposed in the direction in which the tool is to be rotated, thus forming sharper or knife-edge ribs.

The surfaces 6 and the ribs 7 may be parallel but I prefer to taper the body of the tool slightly toward its insertion end so that the surfaces and ribs converge slightly.

The insertion extremity of the tool is tapered, as indicated at 9 so that it will enter the outer end of the hole 4 and the ends of the ribs are bevelled as at 10 so that such bevelled ends will also enter the hole.

When a broken bolt is to be removed, a hole, suitable in diameter to the tool to be employed, is drilled into the bolt, and the tool placed in the position shown in Fig. 1 with its rounded end seated in the outer end of the hole and the bevelled ends of its ribs seated as shown.

The tool is then driven down into the hole

to the desired degree, as shown in Fig. 2, the ribs 7 displacing the metal of the wall of the hole laterally and maintaining a continuous engagement with the metal of the bolt for the full inserted length of the tool. However the surfaces 6 of the tool are out of contact with the wall of the hole, thus providing ample room for the displaced metal and also preventing the tool from becoming so tightly wedged in the bolt as to render the dislodgment of the latter, after its removal, from the tool difficult.

It will be seen that my improved tool may be quickly applied to the drilled bolt, will properly aline itself as it is driven into place and will maintain its engagement with the bolt for the unscrewing of the latter, and that the unscrewed bolt may be easily dislodged from the tool.

What I claim is:—

1. A tool, to be driven in a hole drilled in a broken stud bolt and the like and to be rotated to unscrew the bolt, comprising a body having plane side surfaces disposed tangentially to a circle described from the axis of the tool, and knife-edge ribs formed at the intersection of said surfaces, said ribs having relatively narrow flat surfaces disposed at substantially right angles to the direction in which the tool is to be rotated to unscrew the bolt, said ribs having their ends bevelled off at the entrance end of the tool so as to rest against the end of the hole, said tool being driven into the hole and the ribs displacing the metal of the bolt without cutting chips, the body and ribs having such a converging relation as to facilitate the entrance of the tool into the hole by crowding the edges into the work for substantially the whole length of penetration of the tool without bringing the plane side surfaces of the tool into contact with the side of the hole.

2. A tool, to be driven in a hole drilled in a broken stud bolt and the like and to be rotated to unscrew the bolt, comprising a body having plane side surfaces disposed tangentially to a circle described from the axis of the tool, and knife-edge ribs formed at the intersection of said surfaces, said ribs having relatively narrow flat surfaces disposed at substantially right angles to the direction in which the tool is to be rotated to unscrew the bolt, said tool being driven into the hole and the ribs displacing the metal of the bolt without cutting chips, the body and ribs having such a converging relation as to facilitate the entrance of the tool into the hole by crowding the edges into the work for substantially the whole length of penetration of the tool without bringing the plane side surfaces of the tool into contact with the side of the hole.

3. A tool, to be driven into a hole drilled in a broken stud bolt and the like and to be rotated to unscrew the bolt, comprising a body having plane side surfaces disposed substantial-

ly tangential to a circle described from the axis of the tool, and knife-edge ribs formed at the intersection of said surfaces, said ribs having relatively narrow flat surfaces which are substantially radial and parallel to the axis of the tool, said tool being driven into the hole and the ribs displacing the metal of the bolt without cutting chips therefrom, the body and ribs having such converging relation as to facilitate the entrance of the tool into the hole by crowding the edges into the work for substantially the whole length of penetration of the tool without bringing the plane side surfaces of the tool into contact with the side of the hole.

4. A tool, to be driven into a hole drilled in a broken stud bolt and the like and to be rotated to unscrew the bolt, comprising a body having plane side surfaces disposed substantially tangential to a circle described from the axis of the tool, and knife-edge ribs formed at the intersection of said surfaces, said ribs having relatively narrow flat surfaces which are substantially radial and parallel to the axis of the tool, said tool being driven into the hole and the ribs displacing the metal of the bolt without cutting chips therefrom, the body and ribs having such converging relation as to facilitate the entrance of the tool into the hole by crowding the edges into the work for substantially the whole length of penetration of the tool without bringing the plane side surfaces of the tool into contact with the side of the hole, said ribs having their ends bevelled off to facilitate the entrance of the tool into the hole.

5. A tool, to be driven in a hole drilled in a broken stud bolt and the like and to be rotated to unscrew the bolt, comprising a body having side surfaces, and knife-edge ribs formed at the intersection of said surfaces, said ribs having relatively narrow flat surfaces disposed at substantially right angles in the direction in which the tool is to be rotated to unscrew the bolt, said tool being driven into the hole and the ribs displacing the metal of the bolt without cutting chips, the body and ribs having such a converging relation as to facilitate the entrance of the tool into the hole by crowding the edges of the tool into the work for substantially the whole length of penetration of the tool without bringing the side surfaces of the tool into contact with the side of the hole.

6. A tool, to be driven in a hole drilled in a broken stud bolt and the like and to be rotated to unscrew the bolt comprising a body having side surfaces, and knife-edge ribs formed at the intersection of said surfaces, said ribs having relatively narrow flat surfaces disposed at substantially right angles in the direction in which the tool is to be rotated to unscrew the bolt, said ribs having their ends bevelled off at the entrance end of the tool so as to rest against the end of the

hole, said tool being driven into the hole and the ribs displacing the metal of the bolt without cutting chips, the body and ribs having such a converging relation as to facilitate the entrance of the tool into the hole by crowding the edges of the tool into the work for substantially the whole length of penetration of the tool without bringing the side surfaces of the tool into contact with the side of the hole.
Signed at Pittsburgh, Pa., this 9th day of September, 1930.

ELMER F. JACKMAN.

80

85

90

95

100

105

110

115

120

125

130