E. C. WILSON.

UNDERREAMER.

APPLICATION FILED JULY 5, 1907.

981,510. Patented Jan. 10, 1911.

Fig. 1.

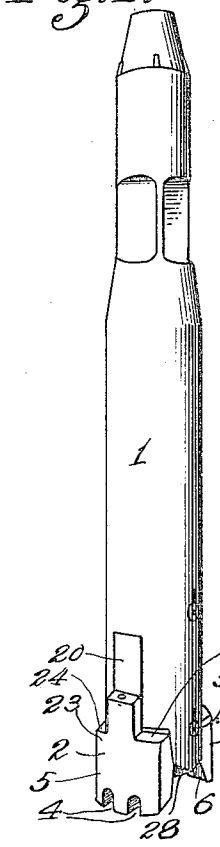


Fig. 2.

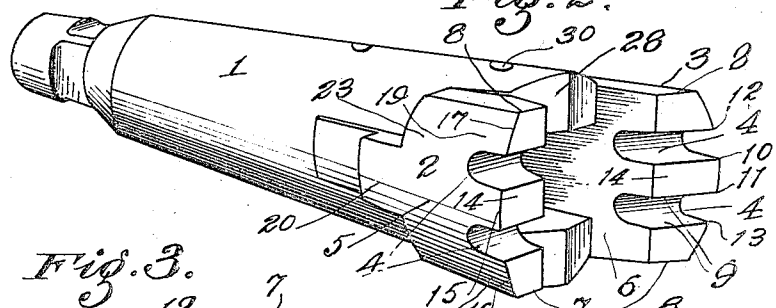


Fig. 3.

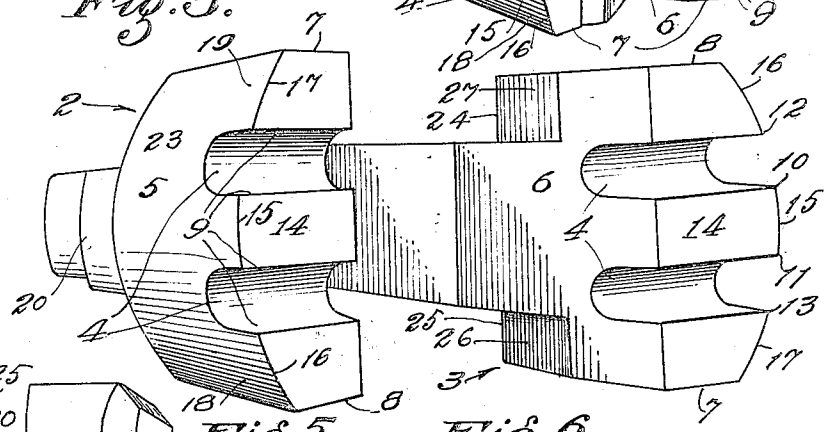


Fig. 4.

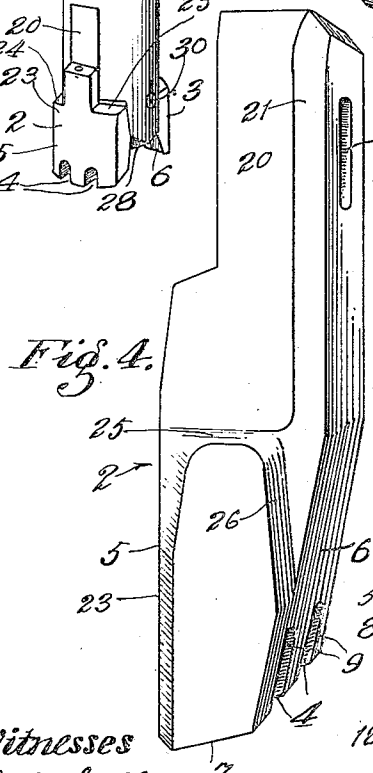


Fig. 5.

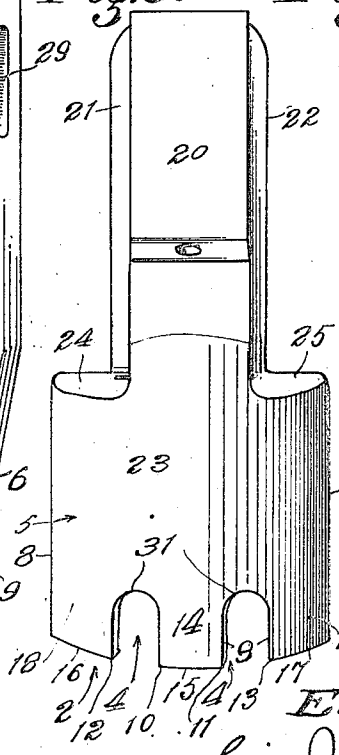
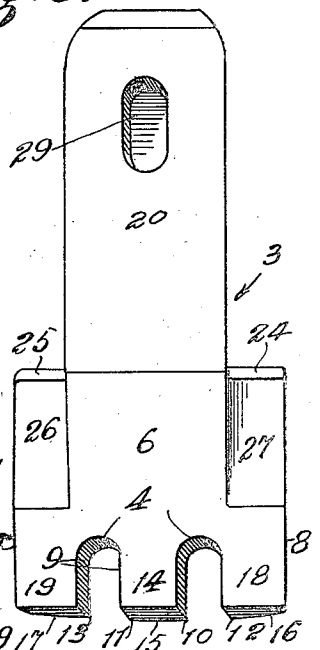


Fig. 6.



Witnesses
C. C. Holly.
J. Townsend.

Inventor
Elihu C. Wilson.
by James R. Townsend
his atty

UNITED STATES PATENT OFFICE.

ELIHU CLEMENT WILSON, OF BAKERSFIELD, CALIFORNIA.

UNDERREAMER.

981,510. Specification of Letters Patent. Patented Jan. 10, 1911.

Application filed July 5, 1907. Serial No. 382,366.

To all whom it may concern:

Be it known that I, ELIHU C. WILSON, a citizen of the United States, residing at Bakersfield, in the county of Kern and State of California, have invented a new and useful Underreamer, of which the following is a specification.

This invention relates to underreamers for reaming underneath the casing of bored wells.

An object of this invention is to provide an underreamer for this purpose which is superior to former underreamers in various respects, and especially in the efficiency and rapidity with which the same will perform the work.

Freedom from liability of deflection from the vertical in the course of operation, and certainty of making a true, straight hole beneath the casing, are objects and advantages attained and secured by this invention.

Other objects and advantages may appear from the subjoined detailed description.

The invention is capable of embodiment in various forms, and I do not desire to limit the invention to any specific form.

The invention more particularly relates to the construction of the cutters of the underreamer.

The accompanying drawings illustrate the invention.

Figure 1 is a view of the underreamer detached and in upright position. Fig. 2 is a perspective view on a larger scale looking at the lower end of the underreamer. Fig. 3 is a perspective view of the two cutters detached, looking at the cutting ends thereof. Fig. 4 is a side view of one of the cutters detached. Fig. 5 is a front view of one of the cutters detached. Fig. 6 is a back view of one of the cutters detached.

1 is the hollow body of the tool which may be constructed in any of the usual forms, and the cutters 2, 3, may be mounted therein in the manner common in various forms of underreamers.

I prefer to construct the underreamer substantially like the underreamer shown in Letters-Patent of the United States, Number 827,595, patented to me July 31, 1906, but I do not limit the application of this invention to underreamers of that construction.

The underreamer cutters 2 and 3 are duplicates and interchangeable, as is the case with the cutters in said patent, but they differ from underreamer cutters heretofore in use in the following respects, to wit: The cutting end or face of the underreamer cutter has one or more grooves 4 having vertical walls and extending across such face from the front or outer usual semicylindrical face 5 of the cutter, to the usual flat back or inner face 6 of the cutter. These grooves are preferably cut in such a manner that the cutting end of the cutter has between its edges 7, 8, two or more flat faces 9 parallel with each other. By this means the end of the usual convex cutter is formed of a plurality of gouges, each having a flat end face, two parallel side faces, a flat inner face and a segmental convex outer face; the inner flat face being aslant downwardly and outwardly, as clearly shown in Fig. 4. The outer face 5 of the cutter is of semicylindrical form, while the inner face 6 is flat. By extending the grooves as shown, at right angles to the chord of the convex surface, the cutting end of the cutter is made irregular by one or more points 10, 11, projecting beyond the others, as 12, 13. The cutting end is aslant, as customary, from the inside outward downwardly, so that in the case of a cutter provided with two or more grooves, each tooth, as 14, between any two grooves will be provided with two points as 10, 11, that project beyond the others relative to the flat face 6 of the cutter, and there is formed between them a cutting edge 15 that projects beyond the cutting edges 16, 17, of the two outside teeth 18, 19, of the cutting end of the cutter. By forming the groove or grooves in the end of the cutter, two or more teeth or projections are provided at the cutting end, thus forming the cutter as a fork of two or more prong-like extensions. In practical operation, these extensions act separately upon portions of the rock or earthy material to be cut away that are separated from each other, whereby such material is gouged off of the walls of the hole while the intermediate material serves in a measure as a guide for the cutters; and in any event the tendency to press the cutters inwardly, or to deflect them from the true course, is not so great as is the case where the cutting end of each cutter is uninterrupted from edge to edge.

20 designates a shank of the cutters respectively, and 21, 22 designate shoulders on opposite sides of the shank projecting at right angles to and extending lengthwise of

said shank. The main body 23 of the cutter projects beyond the shank at either edge forming shoulders 24, 25, and on each of said shoulders an oblique bearing face 26, 27, is formed, the same being adapted to engage the spreading bearings 28.

29 designates the usual socket for the cross-piece or head, not shown, of the underreamer, and 30 designates the bolt forming the detachable cross-piece shown in said patent.

The operation of inserting and withdrawing the tool from the well is substantially the same as that of the patented underreamer referred to.

In practical use, for underreaming, the projections of the cutting end of the underreamer extend downwardly lengthwise of the cutter so that as the tool is reciprocated up and down beneath the well-casing, not shown, it will gouge and chip away from the walls of the well the material below the shoe of the casing. By making the cutters in duplicate forms, as shown, the teeth of the completed underreamer are arranged in pairs on opposite sides of a medial line between the cutters, and as the tool is rotated in the process of underreaming, the cutting away of the wall is effected by the numerous points and cutting edges provided for by this construction. The cutting edge of each cutter is not confined to the ends of the teeth, but is formed in part by the upper walls 31 of the grooves. The principal cutting action, however takes place at the ends of the teeth and the force of each blow is thus concentrated on a smaller surface than with former underreamers, thereby cutting away the walls with greater rapidity than previously possible. The outer cutting edges of the elongated teeth 14, 18 and 19 are in the form of arcs of a circle, the teeth themselves being practically segments of a cylinder, having flat side walls that are approximately radial to the cylinder and extend in planes that are parallel to each other lengthwise of the cutter. By making the teeth elongate with flat sides, liability to clog is avoided. By thus providing the lower ends of the tilting cutters with teeth adapted to gouge out grooves in the vertical walls of the hole whenever the cutters are expanded and stand aslant, the operation of underreaming is greatly facilitated as each downward stroke of the underreamer weakens the walls of the hole leaving the same in a grooved and ridged condition ready to be more easily broken down at each succeeding stroke than has even been the case with any underreamer heretofore known.

I claim:—

1. In an underreamer, the combination with the underreamer body, of two tilting cutters adapted to stand aslant, said cutters being provided with segmental outer faces and having deep parallel walled grooves in their lower ends extending inward from said faces to form teeth the outer edges of which are arcs of a circle, the walls of said teeth being vertical, substantially as and for the purpose set forth.

2. An underreamer cutter consisting of a body and a shank, the shank having a dove-tail shoulder on either side and projecting at right angles to said shank; the body having two shoulders, one extending on each side of the shank, at right angles to the shank, and having bearing faces on the inner side of said shoulders; the cutting end of said cutter having one or more grooves extending across the face at right angles to the back of the cutter, the side walls of said grooves being in vertical planes.

3. An underreamer having a central bore and a lower extension below the bore with dove-tail means for retaining the cutters; cutters for same; said cutters being provided with dove-tails on the shanks of said cutters, and shoulders extending at right angles to said shank with bearing faces on the inner side of said shoulders; the lower end or cutting end of said cutters having one or more grooves extending across said cutting end at right angles with the back of said cutters, the sides of said grooves being in parallel planes.

4. An underreamer-cutter, the upper portion consisting of a shank and the lower portion constituting the main body of the cutter, the lower extremity of the body of the cutter comprising the cutting end, or cutting faces, the upper portion or shank of said cutter having shoulders flush with the back or inner face, and extending at right angle to the shank; the lower face of main body or cutting face, having one or more grooves having walls extending in parallel planes from the outer face to the back, or inner face, thus dividing the lower or cutting end into two or more separate faces.

5. In an underreamer, a tilting cutter having downwardly-projecting elongate segments, the outer faces of which are segments of a cylinder and the side walls of which are vertical planes substantially as and for the purpose set forth.

6. An underreamer cutter having segmental teeth extending longitudinally of the cutter to form the end thereof, the sides of said teeth that extend inwardly from the outer face of the cutter being vertical planes.

In testimony whereof, I have hereunto set my hand at Los Angeles California this 26th day of June 1907.

ELIHU CLEMENT WILSON.

In presence of—

JAMES R. TOWNSEND,
TILLIE E. ADAM.