April 14, 1953 J. S. JOHNSON 2,634,955

ROTARY DRILL

Filed May 15, 1950 2 SHEETS--SHEET 1

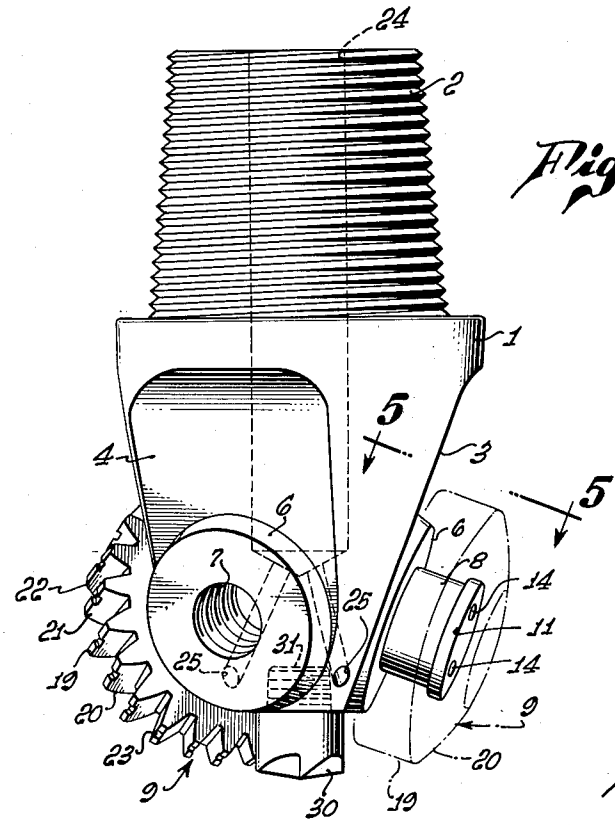


Fig. 1.

Fig. 4.

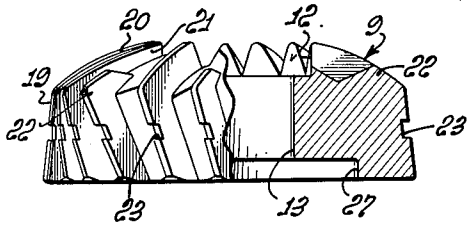
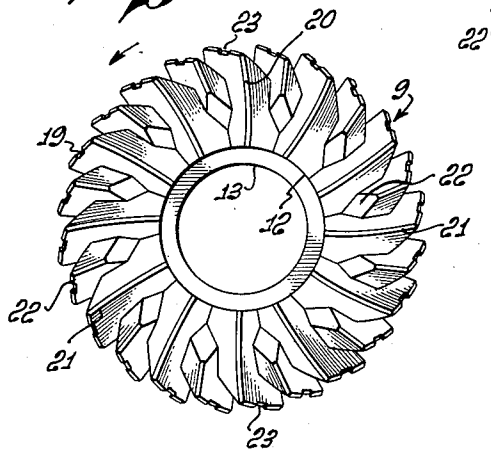


Fig. 3.



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Fig. 2.

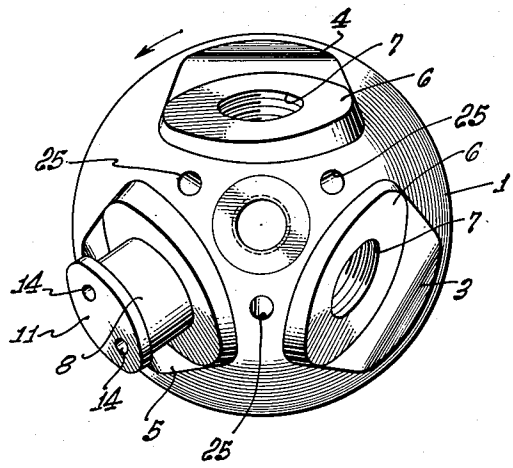


Fig. 5.

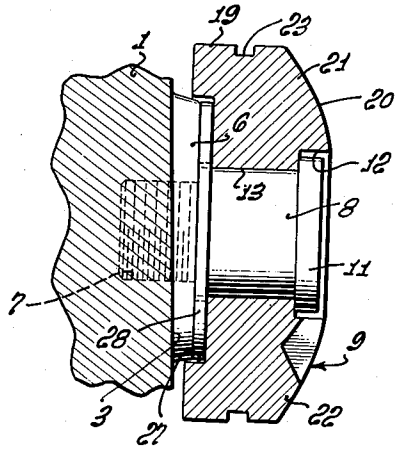
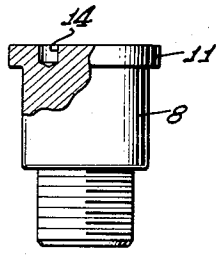


Fig. 6.



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UNITED STATES PATENT OFFICE

2,634,955

ROTARY DRILL

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Application May 15, 1950, Serial No. 161,941

1 Claim. (Cl. 255—71)

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This invention relates to oil well drilling tools and refers more particularly to improvements in bits and cutters for such tools. It is the general object of the invention to provide an improved form of drilling bit which is sturdy and inexpensive to manufacture. It is a further object of the invention to provide a bit which is shaped to support thereon cutters in position designed to render such cutters more efficient. Another object is to provide a bit having cutter bearing members projecting therefrom which bearing members are detachable from the body of the bit for cleaning and replacement purposes; still another object is to provide an improved type of cutter which is rotatably mounted on each of said bearing members and rigidly locked in position thereon. These and other objects of the invention, together with the many advantageous features thereof, are hereinafter described in detail and reference is invited to the accompanying drawings on which a preferred form of the invention is illustrated.

In the drawings:

Fig. 1 is a side elevational view of a drill bit combination embodying the invention;

Fig. 2 is a substantially corresponding end view of the body of the bit with the cutters and two of the cutter bearings removed therefrom;

Fig. 3 is a face view of an improved type of cutter adapted for use on the bit of the invention;

Fig. 4 is a side view of the cutter with a portion thereof broken away for the sake of clearness;

Fig. 5 is a fragmentary view taken substantially on line 5 of Fig. 1 more clearly to show the manner of mounting the cutters; and

Fig. 6 illustrates one of the bearing studs of the device.

The bit assembly of the invention comprises a substantially conical body portion 1 from which a tapered shank 2 extends and this shank may be threaded for attachment to a drilling string in the manner such bits conventionally are mounted in position. The body of the bit is cast or machined to provide three downwardly tapering faces 3, 4 and 5 which are equidistantly spaced circumferentially on the body. Since these three faces and all the parts mountable thereon are exactly alike, the following description is mostly directed to one of these faces, but it is to be understood that it pertains equally to all three faces. From each face rises an annular boss 6 the recess 7 of which is threaded to receive therein a stud 8 on which a cutter 9 is

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mounted to rotate and the cutter is locked in position on the stud by means of a head 11 of the stud which comes to rest within an enlarged recess 12 of the bore 13 of the cutter. In the face of the stud are provided notches 14 for engagement by a suitable pin wrench by means of which the stud is rotated to lock it in position on the tapering face of the bit.

The peripheral surface of each cutter consists of a cylindrical portion 19 covering about one-half of the depth of the cutter and the outer portion thereof is at 20 shown inwardly curved to meet the outer edge of the recess 12. The teeth 21 of the cutter are helically directed and it is noticed that every other tooth is cut back from the face of the cutter as indicated at 22 in the drawings, all for the purpose which will now be explained. As illustrated in the drawings, the bit is designed for clockwise rotation and when rotated for drilling purposes it is found that the cutters by contact with the surface to be drilled are caused to rotate counter-clockwise. It is for this reason important to note that the screw threads 7 within which the bearing stems 8 are seated must be fitted with left-hand screw threads in order that the direction of the rotation of the cutters will tend to rotate the bearing stems in interlocking direction. It is also important to note that where the drill bit is mounted for clockwise rotation and a tendency on the part of the cutters is to rotate in counter-clockwise direction the helical curvature of the teeth of the cutters is also counter-clockwise directed.

Another important feature of the device is that the face of the bosses 6 is not parallel with the tapered faces 3, 4, 5 of the bit but is angularly inwardly tapered in the direction of rotation of the bit. The result is that the bearing studs 8 and the cutters on these studs become similarly inclined and that due to this arrangement the pressure against the face of each cutter, as it is advanced to the ground, becomes evenly distributed over the entire working surface of the cutter. This is the most important feature of the present invention.

The reason for cutting back every other tooth as indicated at 22 is to provide spaces for discharge passage of chips and other sediments and I have found it advantageous in addition to sink a groove 23 into the cylindrical surface of the cutter through which such chips or other cutting residue may be discharged.

It is customary in drilling bits to provide a passage for the flow of water from the drill string to the cutters and such passage is in Fig. 1 shown

to enter the bit at 24 and to flow to the lower end thereof and to discharge through openings 25 directly behind the rear surfaces of the cutters, thereby to flush all sediments out of the recess 27 in the inner surface of the cutters. Excessive wear on the bearings is in this manner eliminated.

For the purpose of reducing friction between the inner surface of the cutter and the face of the boss 6, it is found advantageous to place a hardened and ground washer 28 between these surfaces. But other types of anti-friction bearings may be substituted, if preferred. It is also customary in drill bits of this type to mount a pilot cutter 30 in the end of the body and this cutter is made with a threaded shank 31 seated in left-hand screw threads of the body in cases where the bit is mounted for clockwise rotation.

I claim:

A drill bit assembly comprising, a conical body having downwardly tapering equidistantly spaced faces on the surface thereof, and annular bosses rising from said faces, the surfaces of said bosses being inwardly inclined in the direction of rotation of the bit, bearing studs having threaded shanks seatable in internal screw threads of said bosses, and cutters hung for rotation on said studs, the cutters being substantially cylindrical through the inner half-portion thereof and outwardly curved therefrom, the said cutters having on their faces teeth helically extending from the studs along said curved and cylindrical faces thereof to the inner surface of the cutters and inclined in the direction of rotation of the cutters, the outer end of every alternate tooth of each cutter being cut back to form a passage for discharge of sediment from drilling.

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