April 25, 1933. H. W. FLETCHER 1,905,165

DISK BIT

Filed March 17, 1930

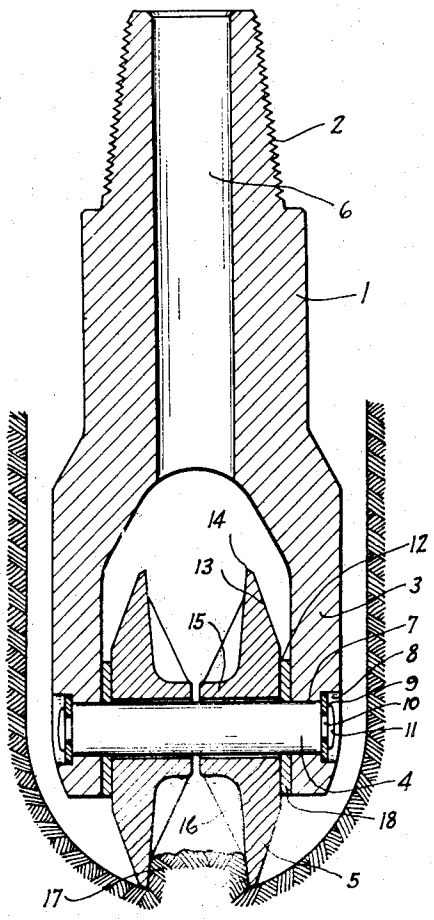


Fig. 1

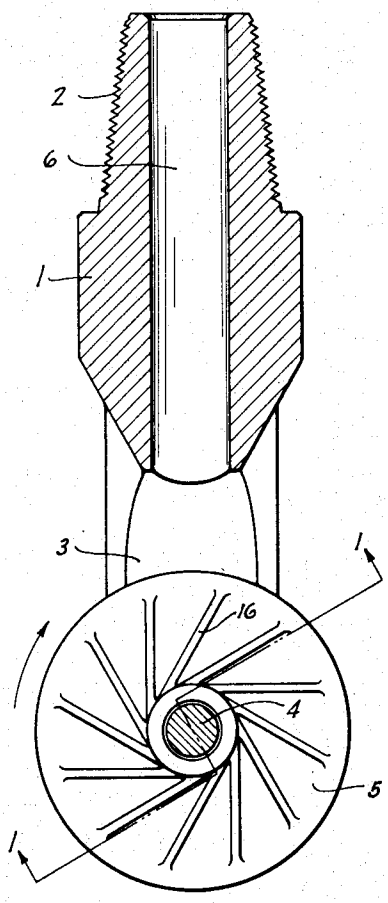


Fig. 2

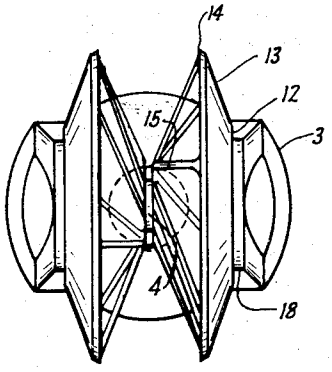


Fig. 3

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UNITED STATES PATENT OFFICE

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DISK BIT

Application filed March 17, 1930. Serial No. 436,335.

My invention relates to earth-boring drills employed in drilling deep wells and has particular application to drill bits of the so-called disk type in which the bore of the well is drilled by a plurality of disk-shaped cutters mounted rotatably upon a shaft supported in the drill head.

A difficulty experienced with bits of the disk-type, which are intended particularly for drilling soft formations, is that the disks may easily become clogged with disintegrated material which is not carried away from the drill head sufficiently, thus preventing the rotation of the cutters.

It is an object of my invention to provide a drill bit having disk-shaped cutters thereon, said cutters being so formed as to engage the bottom of the hole so as to obtain sufficient traction thereon to cause them to rotate freely.

It is also an object to so construct the cutters that the flushing fluid may be employed in rotating the cutters to clear them of material tending to clog thereon.

I also desire to construct the cutters so as to protect the shaft upon which the cutters are mounted so as to thereby prevent excessive wear of the cutter shaft due to the abrasive action of the flushing fluid.

In the drawing herewith Fig. 1 illustrates a drill bit equipped with cutters employing my invention, the head and cutters being shown in central vertical section, the cutters being in section on the line 1—1 of Fig. 2.

Fig. 2 is a central vertical section through the drill taken at right angles to the view shown in Fig. 1.

Fig. 3 is a bottom plan view of the drill head with the cutters thereon.

In the drawing I have illustrated my cutters as mounted upon a cylindrical head 1 having a threaded shank 2 for engagement with the drill collar. There are two downwardly extending legs 3 within which the cutter shaft 4 is mounted to support the disk-shaped drill cutters 5. There is a central longitudinal channel 6 through the axis of the drill to accommodate the flushing water which is discharged directly downward upon the disks.

The cutter shaft 4 is shown as being a cylindrical shaft extending diametrically of the head and supported at each end in openings 7 in the legs of the bit. The ends of said openings 7 are countersunk at 8 to receive a washer 9 and the end of the shaft is reduced in diameter at 10 to extend through the washer 9 and the end of the reduced portion is upset or riveted at 11 against the washer so as to lock the shaft securely in position after the cutters have been placed thereon. When this shaft is to be removed the upset end 11 of the shaft is chiseled off and the shaft removed.

The cutters 5 are disk-shaped, having their outer faces flattened at 12 to engage with the bearing washer 18 adjacent the leg. Beyond the flattened portion the cutter is beveled at 13 so as to form a sharp cutting edge 14 presented inwardly. The inner side of each cutter has a hub 15 extending inwardly to a point spaced slightly from the hub of the adjacent cutter. This hub furnishes a bearing surface for the cutter and protects the shaft 4 from wear, due to the discharge of flushing fluid through the channel 6.

To provide for sufficient traction to cause a positive rotation of the cutters and also to allow the flushing water to assist in the rotation of the cutters, I form, on the inner faces of each cutter, vanes or webs 16, which, as shown in Fig. 2, are tangential to the hub and are inclined from the end of said hub inwardly to the face of the disk and terminate on the face of the disk at a point spaced slightly from the margin, as seen in Fig. 2. These vanes or blades on the disks engage with the core 17 which forms between the cutters on the bottom of the hole, and by contact therewith assure sufficient traction to cause the cutters to positively rotate. The core coming in contact with these vanes is broken up and disintegrated.

These webs are also of use in allowing the flushing fluid to clear the blades of mud or material tending to clog the cutters. When it is noted that the bit is not cutting in the usual manner due to the clogging of the cutters, the bit may be raised off the bottom of the hole and the pumps used to flush the mud in a strong current downwardly through the

channel 6 against the blades of the cutters. With the cutters off the bottom of the hole they are easily washed clear of material and the flushing water striking the webs 16 will cause the cutters to rotate and be uniformly cleared of material on all sides. The bit may then again be dropped upon the bottom of the hole and the drilling may continue.

By the use of my particular construction of the cutters I am enabled to secure sufficient traction to cause rotation of the cutters even though the cutters are not offset one from the other, and, further, when the cutters tend to clog, the cutters may be easily washed clear of material in the manner stated. By thus mounting the cutters in opposite relation I am enabled to provide a simple and economical structure which may be manufactured cheaply and which is strong and sturdy and able to withstand the strains to which they are subjected. Also, even where the cutters are mounted directly opposite to each other, I am enabled to get rotation of the cutters.

What I claim as new is:

1. A drill head, a straight shaft supported thereon, disk-shaped cutters on said shaft, means to space said cutters apart in opposite relation on said shaft, and means on the inner faces of said cutters adapted to be acted upon by flushing fluid to rotate said cutters for the purpose stated.

2. A drill head, a straight shaft supported thereon, disk-shaped cutters on said shaft, means to space said cutters apart in opposite relation on said shaft, and webs on the inner faces of said cutters to be engaged by flushing fluid to rotate said cutters and allow said cutters to be cleaned.

3. A drill head, a straight shaft supported on the forward end thereof, a pair of disk-shaped cutters having a bearing thereon, means to space said cutters apart, water passages in said head discharging on said cutters, and webs formed on the inner faces of said disks tangential to the axis thereof and positioned to be engaged by the flushing fluid to rotate the cutters.

4. A drill head, downwardly extending legs thereon, a shaft supported in said legs, opposite disk-shaped cutters rotatable on said shaft, hubs on said cutters spacing said cutters apart, webs on said hubs and the disks of said cutters, said webs tapering in width outwardly and tangential to the axis of the cutters, and water passages in said head discharging on said webs, whereby said cutters are cleaned and the rotation thereof assisted.

In testimony whereof I hereunto affix my signature this 12th day of March, A. D. 1930.

HAROLD W. FLETCHER.