June 12, 1928. 1,673,285

H. H. HOLDAWAY ET AL

DISK BIT

Filed April 14, 1924

FIG. 1.

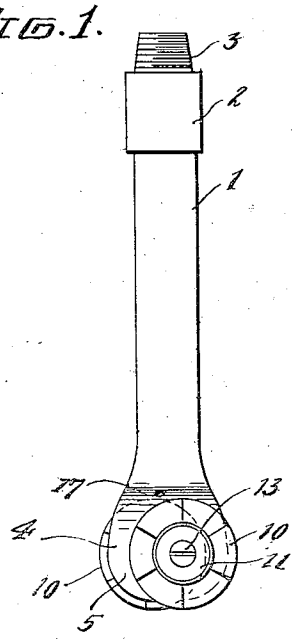


FIG. 2.

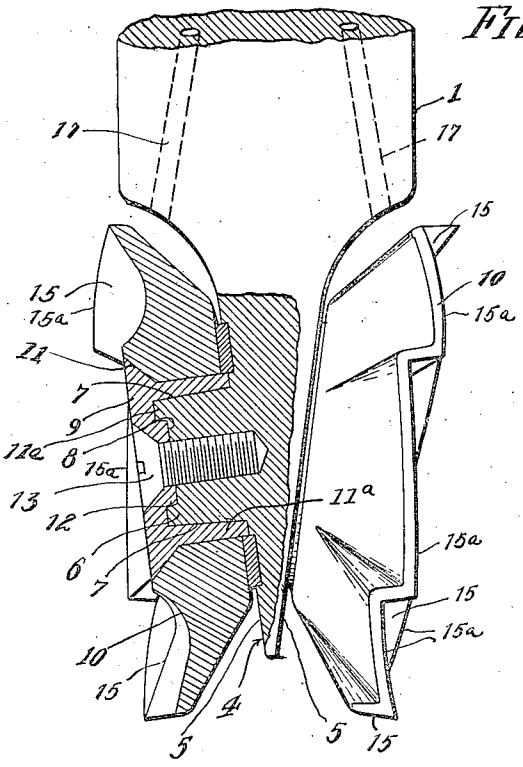
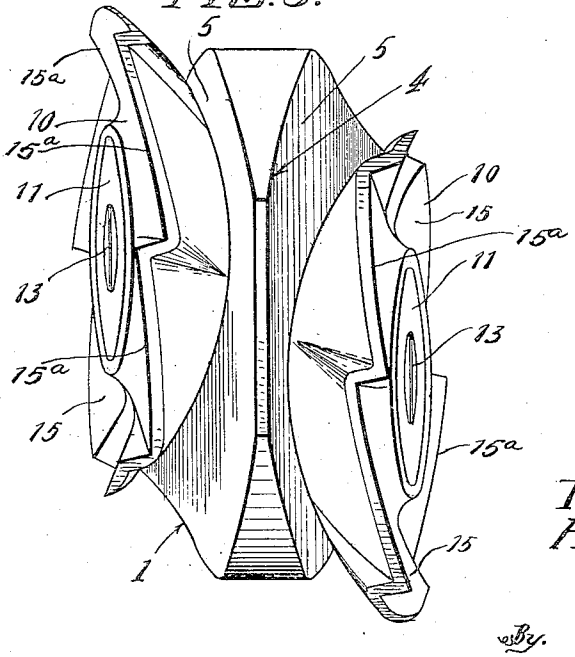


FIG. 3.



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UNITED STATES PATENT OFFICE.

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DISK BIT.

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This invention relates to rotary drilling bits of the type employed in drilling of wells such as oil wells, and refers particularly to the type of rotary disk bits employing a disk cutter mounted to rotate relative to the body of the bit, which cutter operates upon the formation by a shearing action.

Heretofore, the disk bits employed in drilling of deep wells such as oil wells have had a tendency to force the material out by the disk up against the body of the bit holding the disk, with the result that such material, which is mixed with flushing fluid during the drilling process would become packed against the body of the bit during the drilling operations and interfere with the effective drilling of the well; or such disk bits as have hitherto been designed to force the débris cut and mud developed in the well away from the disks and body of the bit have not been correctly designed and constructed to effect the proper shearing action upon the formation and have further operated to cut around the center of the well hole, leaving a core of uncut material in the bottom of the hole which seriously interfered with the effectiveness of the bit, except in very soft formations.

An object of the present invention is to provide a bit employing disk cutters by which the débris and mud formed during drilling operations will be forced away from the space between the disks and prevented from pasing up against the bottom of the body of the bit, and by which a well hole may be formed in which a minimum core will be produced, so that the bit may be employed for drilling other than in the very softest formations and will in no formation tend to clog on account of the mud or débris formed in the well hole.

Another object of the present invention is to provide such a disk cutter and method of mounting and securing the disk cutter to the body of the bit, that the cutter or disk will operate upon the formation by a combined shearing and slicing action.

Various other objects and advantages of the present invention will be understood from the description of the accompanying drawings, wherein there is illustrated the invention in its preferred embodiment.

In the accompanying drawings:

Fig. 1 is an elevation of one embodiment of the invention.

Fig. 2 is an enlarged elevation of the lower end of the bit, the same being partially in vertical section.

Fig. 3 is a bottom view.

Referring to the drawings, the rotary drilling bit is shown as comprising a body 1 which is provided with an enlargement 2 near its upper end and terminates at the upper end in a screw-threaded pin 3 by which the bit may be attached to a drill rod and rotated in a drilling operation, the threaded stem 3 of the bit preferably being tapered upwardly as indicated. The shank of the body 1 should be preferably long in comparison with its diameter, and terminates at its lower end in a wedge-shaped extension 4 which thus provides two opposed downwardly and inwardly inclined faces 5. From each inclined face 5 a boss 6 extends outwardly, the bosses 6 being offset from the center of the faces 5 in opposite directions, so that, as later described, the cutters mounted thereon are positioned one in advance of the other.

The bosses 6 are provided with outwardly tapered sides 7 and with a recess 8 in their end-face. 9 indicates collars for mounting rotating cutter or disks 10 upon the body 1. each collar 9 being enlarged at its outer end 11 to provide a means for holding a disk 10 upon the body 1. Each collar 9 also provides a shell extension 11^a which fits over the side 7 of the boss 6. The collars 9 are also provided with an extension 12 fitting in the recess 8 at the end of the boss so that the collar 9 is prevented from being sheared off the boss 6 both by the shell 11^a extending over the outer face of the boss and by contact between the extension 12 and such boss. The collar 9 is held to the body by means of a pin 13 screwed through the center of the collar 9 and boss 6.

Due to the angle of the wedged extension 4 of the body, the disk cutters 10 are thus positioned in inclined planes which converge

below the body of the bit and thereby the lower edges of the disk cutters 10 are brought close together, with the result that little space exists between the opposed disks where a hard core may be left when the drill is employed.

The disks 10 are provided with a plurality of step cutting edges 15ª, each making a slight angle with the plane of rotation of the disks. The disks 10 also have their outer cutting faces 15 bent outwardly from the hub of the disk so that such faces 15 of the disk joining the cutting edges 15ª are relieved inwardly from the cutting edges. Such faces are found to increase the shearing action of the cutters.

Again referring to the body 1 of the bit, the body 1 is enlarged slightly above the disks 10, as indicated at 16, to house flushing ducts 17 which extend through the body of the bit in order to conduct flushing fluid to the disk from the top of the well. Such ducts 17 discharge against the edges of the cutters 10, and preferably to that side of the axis of the disks which will enable the flushing fluid to operate to rotate the disks. It will be noted that, as the disk cutters 10 are relieved inwardly from the outer face of the disks, the same are intended to be pushed around by the body 1 of the disk or rotated counter-clockwise as viewed in Fig. 3. In such case the disk cutters 10 will tend to rotate relative to the body 1 counter-clockwise as viewed in Fig. 1, so that by discharging the water from the ducts 17 from near the center of the body 1, such water operates to aid in rotating the disks.

The drilling bit herein described will in operation rapidly remove material from the bottom of the well hole, and the material removed will be forced by the disk outwardly away from the body of the bit so that such material passes upwardly past the body without tending to become packed and clog operation of the bit. The lower edges of the disk 10 being brought close together by the tilted position of the disks, prevents the formation of a core between the disks; the cutting edges 15, being bent outwardly from the hub of the disk, provide an effective shearing action upon the formation; also such cutting edges being angled with respect to the plane of rotation of the disk, will in operation operate to slice into the material as well as by a straight shearing action upon the same, which is found to result in a substantial increase in the rate of drilling of such a bit.

While the rotary drilling bits herein described are well suited for the purposes of this invention, various modifications may be made in the form of the bits herein described without departing from the spirit of the invention. The invention is not limited to the detatils of construction of such examples of the invention, but is of the full scope set forth in the appended claims.

We claim:

1. A rotary drilling bit comprising, a body, disk cutters mounted on the body so as to lie in inclined planes converging below the body, said cutters having their periphery brought to a thin cutting edge of insufficient thickness for crushing the formation, the peripheral cutting edge of said cutters having step-like portions angled slightly relative to the plane of the disk and disposed so that said portions may shear material from the formation while pushing the débris forward and away from the body.

2. A rotary drilling bit comprising, a body having disk cutters mounted on the body so as to lie in planes converging below the body, the disk cutters being arranged with their cutting faces facing outwardly from the body, the disk cutters having their periphery brought to a cutting edge of insufficient thickness for crushing the formation, the cutting edge of the cutter being further formed in a plurality of shearing faces angled but slightly relative to the plane of the cutters.

3. A rotary drilling bit comprising, a body having a single lower extension, a disk cutter mounted upon each side of such extension, the cutters being positioned one in advance of the other and provided with cutting faces facing outwardly from the extension, the cutters being brought to thin cutting faces of insufficient thickness for operating upon the formation by a crushing action, the cutting faces being formed in a plurality of step cutting portions, the edges of which are disposed at a slight angle to the plane of the disk.

4. A rotary drilling bit comprising, a body having two disk cutters mounted thereon, said disk cutters being mounted one in advance of the other and in converging planes, the disk cutters being brought to relatively narrow non-crushing cutting edges, said cutting edges facing away from the body and being in step-like portions angled slightly relative to the plane of the disk, there being interconnecting portions of the cutting edge whereby the cutting edge of the disk is made continuous.

Signed at Los Angeles, California, this 20th day of March, 1924.

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