May 9, 1933. I. C. BELL 1,908,656

DISK DRILL BIT

Filed Dec. 9, 1930 2 Sheets-Sheet 1

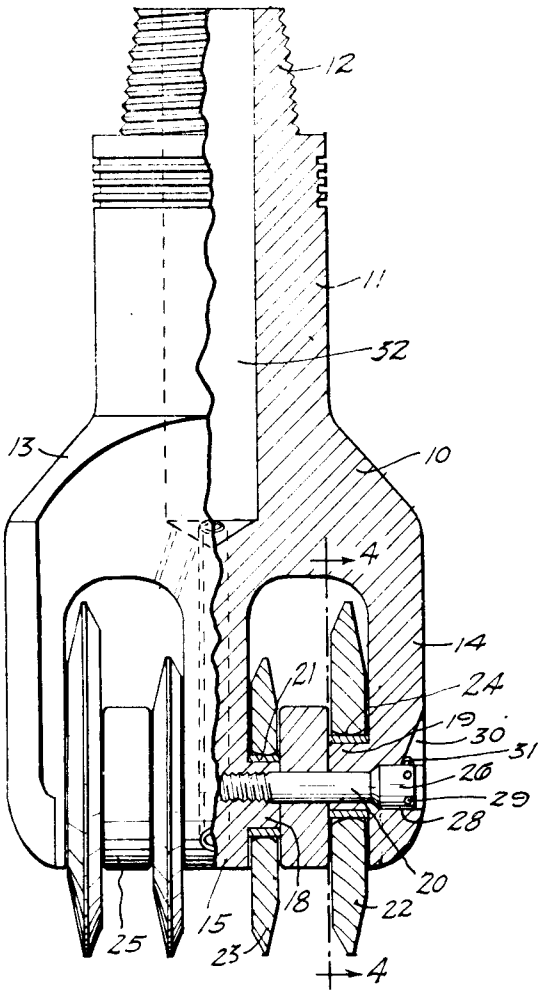

Fig. 1

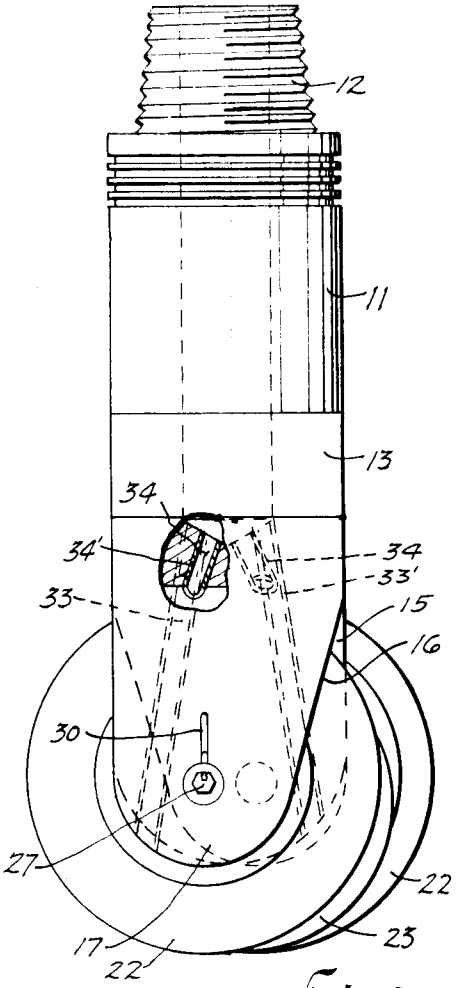

Fig. 2

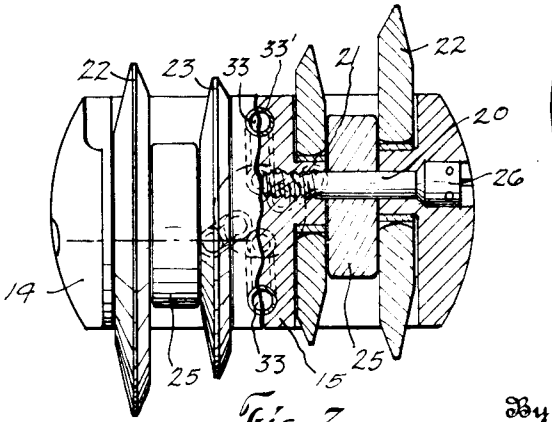

Fig. 3

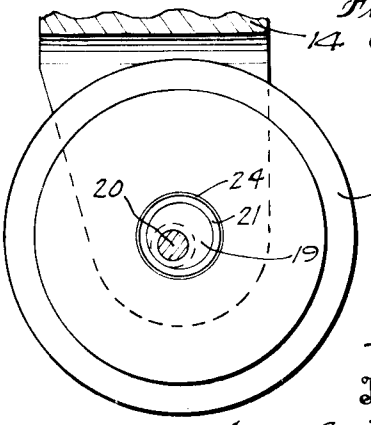

Fig. 4

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DISK DRILL BIT

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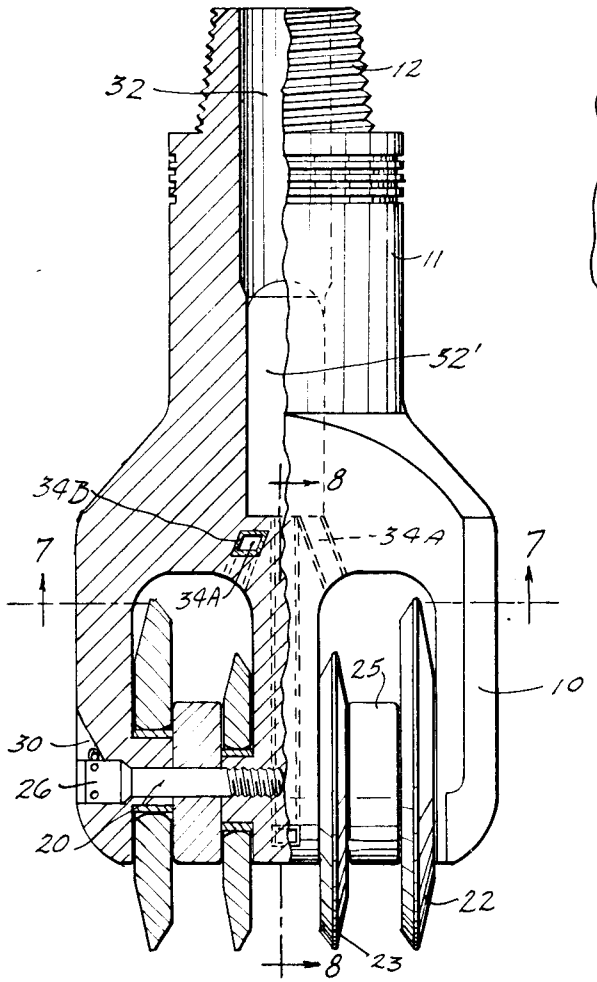

Fig. 5

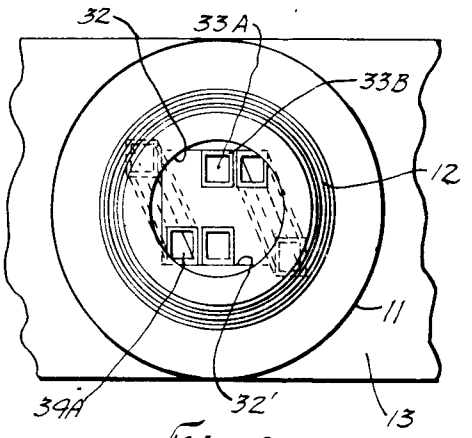

Fig. 6

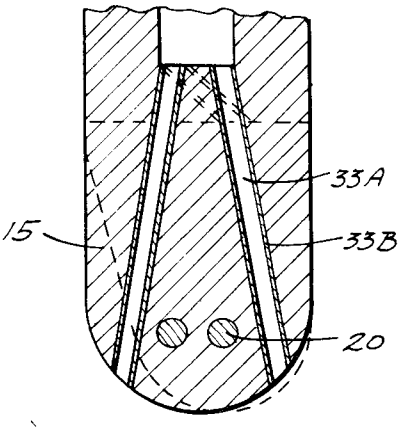

Fig. 8

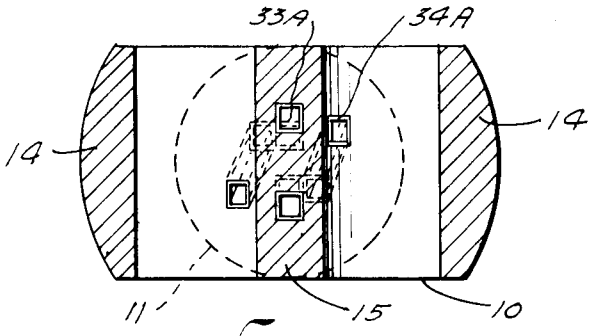

Fig. 7

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Patented May 9, 1933 1,908,656

UNITED STATES PATENT OFFICE

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DISK DRILL BIT

Application filed December 8, 1930. Serial No. 500,814.

This invention relates to new and useful improvements in disk drill bits.

One object of the invention is to provide an improved disk bit wherein the supporting tongue and side hangers are made integral with the head or body of the bit, thus making a more solid and inexpensive structure; together with a new and novel arrangement of disk mounting.

A further object of the invention is to provide disks mounted in offset pairs and each disk of each pair being carried by a support formed integral with the body of the bit.

Another object of the invention is to provide removable spacing members between the disks of each pair of disks and means for supporting and fastening the spacing members in place, whereby only the load of the spacing members and not the load of the disks is carried by said fastenings.

A further object of the invention is to mount the disks in offset relation to the transverse axis of the bit and those of each pair in vertical offset relation to each other, together with means for concentrically supporting the spacing member between the disks.

Still another object of the invention is to provide washing-fluid ducts which are angular in cross-section, whereby whirling of the washing fluid is prevented.

A construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings in which an example of the invention is shown, and wherein:

Figure 1 is a view partly in elevation and partly in section showing a disk bit constructed in accordance with the invention,

Figure 2 is a side elevation of the same,

Figure 3 is an underside view of the bit,

Figure 4 is a vertical sectional view taken on the line 4—4 of Figure 1,

Figure 5 is a view similar to Figure 1 showing improved washing-fluid ducts,

Figure 6 is a partial plan view of the same,

Figure 7 is a horizontal cross-sectional view taken on the line 7—7 of Figure 5, and

Figure 8 is a vertical sectional view taken on the line 8—8 of Figure 5.

In the drawings the numeral 10 designates a bit head having a reduced upwardly cylindrical neck 11 surmounted by a tapered axial screw-threaded pin 12. The head has sloping shoulders 13 extending downwardly on each side of the neck.

Hangers 14 depend from the head on each side and with a central depending tongue 15, constitute an integral body. Each hanger has one vertical edge perpendicular and the opposite edge 16 inclined upwardly, whereby the lower end of the hanger is reduced and formed into a rounded nose 17. The inclined edge becomes the rear or trailing edge when the bit is rotated in a clockwise direction, thus the inclined edge of one hanger is on the opposite side of the transverse axis of the bit from the other inclined edge; while the tongue is the full thickness of the head, as is shown in Figures 2 and 3.

In order to give a sturdy structure and yet save stock and weight, the bit body is flattened below the neck 11 on what might be termed the front and rear sides, while its outer vertical ends formed by the hangers are rounded, preferably concentrically to the vertical axis of the body. The breadth between the hangers is less than the diameter of the cutting orbit, thus preventing the outer faces of the hangers and the noses 17 from dragging on the walls of the hole being drilled and tending to reduce wear.

The hangers 14, which are at each end of the body, are spaced a substantial distance on each side of the central tongue 15, thus providing vertical gaps or spaces therebetween. On opposite sides of the tongue integral bosses or trunnions 18 extend outwardly into the gaps a short distance above the bottom of the tongue; while similar bosses or trunnions 19 extend into the gaps from the inner faces of the hangers. These trunnions are arranged in pairs, each pair being composed of a trunnion 18 and a trunnion 19. The trunnions are disposed so that those of a pair may be penetrated by a bolt 20, but at the same time the correlated trunnions 18 and 19 are offset vertically as well as horizontally from

each other, as will be evident from Figures 1 and 3. By observing Figures 2 and 3, it will be seen that one pair of trunnions is offset from the other pair of trunnions on opposite sides of a transverse axis bisecting the vertical axis of the bit body.

I do not claim any invention in the particular offsetting or disposition of the disks, because such an arrangement is shown to some extent in my former Patent No. 1,657,604 issued January 31, 1928 and in the patent issued jointly to Charles S. Crickmer and myself June 17, 1930, Reissue No. 17,700; but I do claim the particular structure and arrangement herein set forth. It is perferable to cast, weld or otherwise surround the trunnions by annular bushings 21 made of hard metal and having maximum wear resisting qualities. In this connection it is obvious that while it is preferable to make the trunnions cylindrical, they could be otherwise shaped as the cylindrical surface of the bushing will form a proper bearing.

On the outer bushings surrounding the trunnions 19, I mount outer cutting disks 22; while on the bushings 21 surrounding the inner trunnions 18, I mount inner cutting disks 23. Due to the vertical offset of the trunnions, the disks, although of different diameters, have their extreme bottom points in the same horizontal plane; but this is subject to variation. By reason of the offset axes of each pair of disks, the outer disk 22 is mounted in advance of the inner disk 23 in the order of rotation. This arrangement gives the disks sufficient lead and also drag, to assure rotation.

As in the former patents, each disk has a curvilinear hub bore 24 and its correlated bushing 21 longer than the width or thickness of the disk, thereby giving ample support for the wobbling or rocking of the disk. While it is preferable to mount the disks loosely or to rock on the bushings, they may be otherwise mounted, and the invention is not limited to such a disk. When the bushings become worn they may be chipped off and new ones formed on the trunnions.

In order to confine the disks on the bushings I provide collars or retaining washers 25 fitting snugly between the trunnions 19 on the bolts 20. The collars are mounted axially on the bolts, but are of sufficient diameter to overlap the hub-section of each disk. It will be noted that each collar is mounted substantially concentrically to the lower edge of the nose 17 of the correlated hanger 14. This equally distributes the strain and load.

The disks have double bevelled or chisel cutting edges and are also slightly reduced in thickness outwardly from the hub bores, so as to more freely rock. Each bolt 20 has its inner end screw-threaded into the tongue 15 and is formed on its outer end with an enlarged head 26 having a countersunk wrench socket 27. The head fits in a sump 28 in the outer side of the hanger. The head is turned so that one of a plurality of radial holes 29 registers with a groove 30 for receiving a cotter key 31.

It will be seen that very little, if any, strain, and substantially no load is placed upon the bolts 20, although they do act to prevent spreading of the hangers 14. To remove or place the disks the bolt is taken out so that the collar 25 drops out; either disk may then be slid into the space occupied by the collar or inserted in said space and slid onto its bushing.

A vertical axial well 32 is formed in the pin 12, neck 11 and head 10. Diverging ducts 33 extend from the bottom of the well to the bottom of the tongue 15 for supplying the washing fluid to the bottom of the hole and the bottoms of the disks. Ports 34 extend from the bottom of the well of each side of the tongue for discharging the washing fluid into the spaces between the tongue and the hangers. Each port is directed so as to discharge fluid over the top of the inner disk 23 and toward the outer disk 22.

The ducts 33 have liners 33′ and the ports 34 are made with liners 34′. These liners may be formed of hard metal such as is now in common use, to resist wear. In Figures 5 to 8, I have shown a modified form in which the portion 32′ of the well 32 is made square in cross-section instead of round. This shape is used to check whirling and consequently cutting. The ducts 33*a* and the ports 34*a* are also made square in cross-section. The ducts have square liners 33*b*, while the ports have liners 34*b*. Because of the square well, the ports may be given a greater inclination and more effectively wash the advance cutting edges of the disks.

The sturdy short head and hangers made for economy and simplicity. The bit may be run with an ordinary reamer above the pin 12. When the hangers 14 and the noses 17 wear they may be built up by coating with hard metal, as is now the common practice.

Various changes in the size and shape of the different parts, as well as modifications and alterations, may be made within the scope of the appended claims.

Having illustrated and described preferred forms of the invention, what I claim, is:

1. In a disk drill bit, a head, an axial neck integral with the head, the head having inclined shoulders, a central tongue depending from the head and integral therewith, outer hangers depending from the head on each side of the tongue and integral with the tongue, trunnions on the adjacent sides of the tongue and hangers integral therewith, inner cutter disks mounted on the tongue trunnions, outer cutter disks mounted on the hanger trunnions, bolts passing through the hanger trunnions into the tongue

trunnions, and spacing collars mounted on the bolts between the inner and outer disks.

2. In a disk drill bit; a bit body including a head, a central tongue and hangers on each side of the tongue depending from and integral with the head; trunnions projecting from and integral with adjacent sides of the hangers; cutter disks journaled on said trunnions; and spacing members removably mounted between adjacent trunnions and extending between adjacent disks.

3. In a disk drill bit, a bit body including a head and a central tongue and hangers on each side of the tongue depending from and integral with the head, trunnions projecting from and integral with the tongue and hangers, cutter disks rotatably mounted on the trunnions, retaining collars between the trunnions and the disks, and fastenings extending through the hangers, trunnions and collars and also extending into the tongue.

4. In a disk drill bit, a bit body including a head and a central tongue and hangers on each side of the tongue depending from the head, the tongue and hangers being integral with the head, trunnions integral with the tongue and hangers and projecting therefrom and spaced apart, cutter disks rotatably mounted on the trunnions, and removable means for holding the disks on the trunnions.

In testimony whereof I affix my signature.

IVAN C. BELL.