

Feb. 6, 1934.

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1,945,964

ROLLER BIT

Filed Sept. 5, 1931

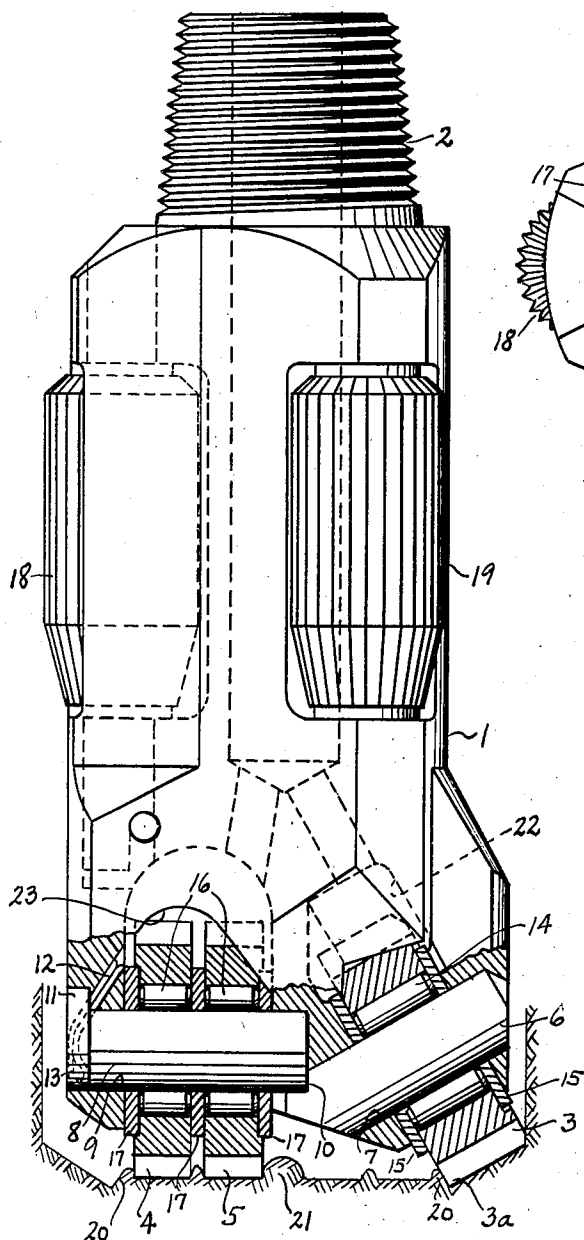


Fig. 1.

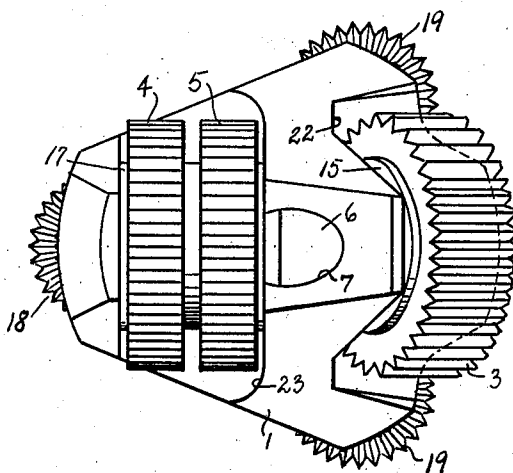


Fig. 2.

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## UNITED STATES PATENT OFFICE

1,945,964

## ROLLER BIT

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Application September 5, 1931. Serial No. 561,404

5 Claims. (Cl. 255—71)

This invention relates generally to deep well drilling apparatus and specifically to roller bits.

The conventional cross roller bit embodies a pair of large side cutters mounted on opposite sides of the lower end of the bit head on axes that incline downwardly and inwardly toward the axis of the bit, and a plurality of small cross roller cutters mounted on a horizontal axis extending diametrically across the lower end of the bit head between and at substantially a right angle to the axes of the side cutters.

One of the objects of this invention is to provide a new and improved roller bit embodying a side cutter and relatively large cross cutters, the axes of the side and cross cutters being aligned, and the cutters being disposed to cut annular grooves in the formation against the walls of which cutters bear to prevent objectionable lateral movement of the bit. And for the purpose of guiding the bit, the invention also provides, in combination with the side and cross cutters, a new and improved arrangement of reamers.

Another object is the provision of a new and improved cutter mounting comprising but few parts whereby the cutters may be quickly and easily mounted in and removed from the bit head.

Other objects will hereinafter appear.

The preferred embodiment of the invention is illustrated by the accompanying drawing, of which Fig. 1 is a partly sectional side elevation of the bit; and Fig. 2, a bottom plan view thereof.

In the drawing, the bit head is indicated at 1. It has on its upper end the usual screw threaded shank 2 by which it may be attached to the conventional drill stem, not shown.

On one side of the lower end of the head is a side roller cutter 3 and adjacent the opposite side of the lower end of the head are cross roller cutters 4 and 5. The side roller cutter pin 6 is insertible outwardly and upwardly in the inwardly opening bore 7 in the head. The cross roller cutter pin 8 is insertible inwardly in the outwardly opening bore 9 in the head. The side roller cutter pin 6 has a recess 10 in its inner end for the reception of the inner end of the cross roller cutter pin 8. The pins are thereby interlocked, the pin 8 serving to hold the pin 6 non-rotatably in the head. The outer end of the pin 8 has an eccentric head 11 and a bore communicating with a bore in the head for the reception of a cotter pin 12. It also has a groove therein so that the head 13 of the cotter pin may be bent inwardly as shown by the dotted lines in Fig. 1. The cotter pin 12 serves to hold the cross roller cutter pin 8 in place.

Suitable roller bearings 14 and washers 15 may be provided for the cross roller cutter pin; and corresponding roller bearings 16 and washers 17 may be provided for the cross roller cutters 4 and 5.

Immediately above the cross roller cutter 4 is a reamer 18; and above the side roller cutter 3 are a pair of spaced reamers 19.

The cutting edge 3a of the side roller cutter 3 extends below the cutting edges of the cross roller cutters 4 and 5. And so the side roller cutter 3 cuts a relatively deep groove and the cutter 3 bears against the wall 20 of this groove to prevent lateral movement of the bit. The cross roller cutter 5 is at one side of the longitudinal axis of the head and it leaves a portion 21 of the formation to assist in preventing lateral movement of the bit. It will be understood that this roller bit is particularly adapted for the drilling of hard rock formations; and that the wall 20 and portion 21 are, therefore, strong and able to practically resist lateral movement of the bit.

The reamers 18 and 19 function to guide the bit as it descends into the earth.

In assembling the cutters, the side roller cutter 3 is first placed in its recess 22 in the head. The side roller cutter pin 6 is then inserted upwardly and outwardly in the bore 7. Then the cross roller cutters 4 and 5 are placed in their recess 23 in the head and the pin 8 is moved inwardly in the bore 9. The cotter pin 12 is then driven through the end of the pin 8 and into its bore in the head. The head 13 of the cotter pin is then bent downwardly into the slot in the pin head 11. As the pin 6 cannot move outwardly through the bore 7 and as its inner end is interlocking with the pin 8, as indicated at 10, the bit is ready for use.

When it is desired to change cutters, the driller may strike a hard blow on the outer end of pin 6. The pin 6, being thereby moved inwardly in its bore 7 will move the pin 8 outwardly, thereby shearing the cotter pin 12. The pins 8 and 6 may then be removed.

Various other advantages of this invention will be apparent to those skilled in the art.

I claim:

1. In a roller bit: a head; a side roller cutter mounted on one side of the lower end of said head on an axis extending downwardly and inwardly toward the axis of said head; and a cross roller cutter mounted adjacent the opposite side of the lower end of said head on an axis at substantially a right angle to the axis of said head;

said side roller cutter having a cutting edge extending below the cutting edge of said cross roller cutter.

2. In a roller bit: a head; a side roller cutter  
5 mounted on one side of the lower end of said head on an axis extending downwardly and inwardly toward the axis of said head; a cross roller cutter mounted adjacent the opposite side  
10 of the lower end of said head on an axis at substantially a right angle to the axis of said head; and a reamer mounted on said head directly above said cross roller cutter.

3. In a roller bit: a head; a side roller cutter  
15 mounted on one side of the lower end of said head on an axis extending downwardly and inwardly toward the axis of said head; a cross roller cutter mounted adjacent the opposite side  
20 of the lower end of said head on an axis at substantially a right angle to the axis of said head; a reamer mounted on said head directly above said cross roller cutter; and a pair of spaced  
reamers mounted on said head directly above said side roller cutter.

4. In a roller bit: a head; a side roller cutter

mounted on one side of the lower end of said head on an axis extending downwardly and inwardly toward the axis of said head; a cross roller cutter mounted adjacent the opposite side  
80 of the lower end of said head on an axis at substantially a right angle to the axis of said head; said side roller cutter having a cutting edge extending below the cutting edge of said cross roller cutter; and a reamer mounted on said head directly above said cross roller cutter.

5. In a roller bit: a head; a side roller cutter  
85 mounted on one side of the lower end of said head on an axis extending downwardly and inwardly toward the axis of said head; a cross roller cutter mounted adjacent the opposite side  
90 of the lower end of said head on an axis at substantially a right angle to the axis of said head; said side roller cutter having a cutting edge extending below the cutting edge of said cross roller cutter; a reamer mounted on said head directly  
95 above said cross roller cutter; and a pair of spaced reamers mounted on said head directly above said side roller cutter.

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