

Feb. 20, 1945.

J. T. PHIPPS

2,370,070

BIT

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Fig. 1

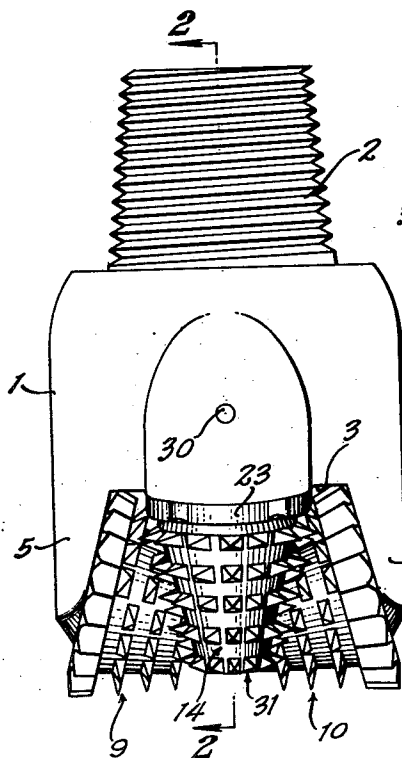


Fig. 2

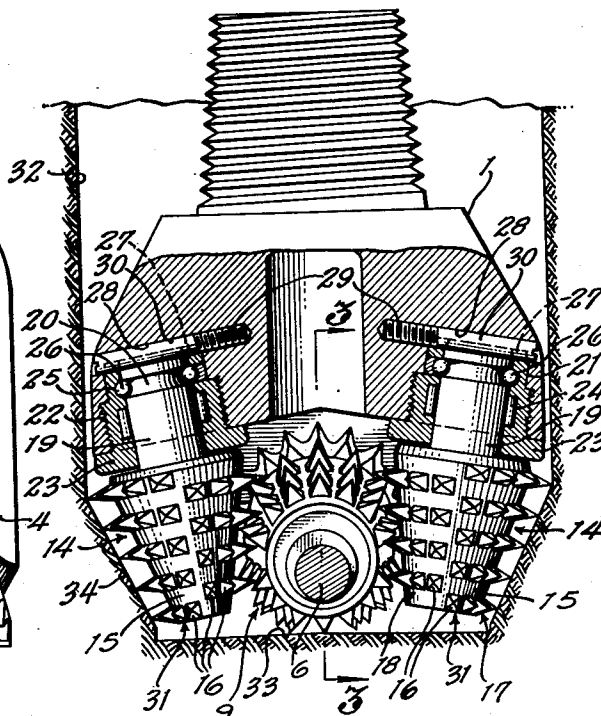
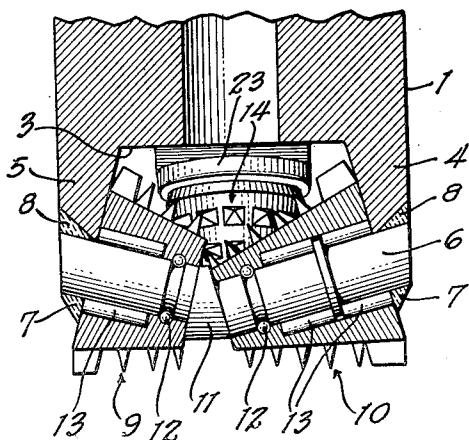


Fig. 3



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Application May 8, 1942, Serial No. 442,197

1 Claim. (Cl. 255—71)

This invention relates to bits, and particularly to cutter bits of the cross roller type.

At the present time, the ordinary cross roller cutter combines in addition to the cross rollers, side or gauge cutters. These gauge cutters are usually arranged so that the axes thereof are at right angles to the axis of the cross roller cutters. It has been found that the teeth of the gauge cutters wear quite rapidly in certain formations. Particularly, the outer edges of the teeth of said gauge cutters tend to become dull and rounded. When this occurs, the gauge cutters do not cut the formation in a satisfactory manner, with the result that the cross roller cutters cut more rapidly than the gauge cutters, all of which tends to throw the tool off balance, often resulting in a crooked hole and the useless expenditure of power in an attempt to rotate the drill to produce a hole.

An object of the present invention is the provision of a drill provided with cross roller cutters and a novel form of gauge cutters, the gauge cutters being so situated, arranged and constructed as to overcome rounding off or flattening of teeth.

Another object is the provision of gauge cutters for a bit so arranged and constructed as to relieve stress from the pins carrying said cutters.

Another object is the provision of gauge cutters for a bit wherein the teeth of the gauge cutters are at all times in contact with the formation to be cut.

Another object is the provision of a bit incorporating gauge cutters which will readily cut the formation by providing a greater cutting edge than normally present in the well known type of gauge cutters.

Another object is the provision of a bit having gauge cutters so situated and arranged as to center the bit during rotation thereof.

Another object is the provision of gauge cutters for a bit wherein the gauge cutters are readily assembled or disassembled from the bit body.

Other objects of the invention will become apparent to those skilled in the art to which this invention appertains, among which objects are simplicity of structure, inexpensiveness in cost of manufacture, and general superiority to gauge cutters now incorporated in cross roller bits.

With the above mentioned and other objects in view, the invention consists in the novel and useful provision, formation, construction, association, and relative arrangement of parts, members, and features, all as shown in a certain embodiment in the accompanying drawing, described generally, and more particularly pointed out in the claim.

In the drawing:

Figure 1 is a side elevation of the improved bit.
Figure 2 is a sectional view on the line 2—2 of Figure 1, and,

Figure 3 is a fragmentary sectional view on the line 3—3 of Figure 2.

Referring now to the drawing, the improved bit includes a body 1 provided with the usual pin 2, whereby it may be connected to the drill string. The body is recessed inwardly from the bottom, as shown at 3, to provide two diametrically opposed arms 4 and 5. A bent pin 6 extends between the arms and is secured thereto in any manner, such as by the welding shown at 7 and 8 for each arm. The pin carries cross roller cutters 9 and 10, the cutters being separated at their inner ends by a spacer member 11 carried by the pin. As is usual practice, the cutter 10 is of greater length than the cutter 9. The usual ball bearings or rollers 12 and 13 are provided between each cutter and the pin. The character of the teeth on the cross rollers is not important to this invention, although I prefer to use teeth of the character shown in my co-pending application for "Cross roller bits," Serial No. 431,408, filed February 18, 1942.

As has previously been stated, instead of using an ordinary type of gauge cutter, I incorporate in the present bit construction gauge cutters of the type shown in the drawing and here designated as entirety as 14. Two of said gauge cutters are provided, being diametrically disposed and in a plane at right angles to the axes of the pin 6. The gauge cutter 14 has a tapered body 15, the surface of which is provided with teeth 16 of the type described in my co-pending application heretofore referred to. Briefly, the teeth of said co-pending application are arranged in staggered relationship on the body 15, which is to say that one set of teeth 17 extends semi-circumferentially of the body, while a second set 18 is staggered with relation to the set 17 and extends semi-circumferentially of the body. This procedure follows for the remaining sets of teeth on the body. In this construction, it will be observed that the plane of each semi-circumferential set of teeth is substantially at right angles to the axis of the cutter body and that each set does not provide what might be termed a "lead" or "pitch."

While I have specifically shown the type of teeth referred to on the gauge cutters, still I do not wish to limit the present invention to teeth of the type specified, as other teeth have been found to operate satisfactorily in the practice of the present invention.

The body is provided with a spindle 19, which is formed with a bearing race 20. The bit body 1 is provided with a bore 21, screw-threaded at 22 to receive a bearing type nut 23. This nut accommodates rollers 24 adapted to bear against the periphery of the spindle and likewise is formed with a race 25 complementary to the race 20, between which races 20 and 25 are disposed rollers 26 which lock the spindle to the nut. The end of the nut is castellated, as shown at 27. The body 1 is provided with a bore 28 threaded at 29 to receive a pin 30, the pin adapted to be received between diametrically disposed castellations in the end of the nut 23. Thus, when the nut is threaded within the body 1 and the pin 30 secured to threads 29, the nut 23 is prevented from unscrewing from body 1. The construction, arrangement, and means of securing the other gauge cutter is identical with the one just described.

The axis of the spindle and body of the gauge cutter is at an angle to the rotative axis of the body 1, and in the drawing, Figure 2, it is to be observed that the axis for each gauge cutter converges downwardly, the included angle therebetween being less than 90°. The outermost end 31 of each gauge cutter terminates above the plane of the cutter teeth of the cross roller cutters, to the end that said gauge cutters are out of contact with the bottom of the hole being cut.

The operation, uses, and advantages of the invention are as follows:

Reference is made to Figure 2 wherein is depicted the bit in the act of cutting formation, the well hole being indicated at 32. It will be observed that the cross roller cutters for cutting the formation are indicated for the bottom of the well hole at 33. The two gauge cutters have cut the formation slant-wise, as shown at 34. Thus, the ends 31 of the gauge cutters are maintained out of contact with the bottom 33 of the well hole. All of the teeth of the gauge cutters are in contact with the slant-wise section 34. In this manner, as the bit is rotated, the cross roller

cutters will cut a diametric hole equal to the diameter of the bottom portion thereof at 33, while the gauge cutters will increase the diameter of the hole to the diameter shown at 32. By having a large number of teeth in engagement with the formation to gauge the hole, the gauge cutter teeth do not become dulled as rapidly as in the conventional form of gauge cutter.

By inclining the axes of the gauge cutters downwardly, or convergently, the gauge cutters tend to center the bit. Ordinarily, the conventional form of gauge cutters imposes considerable stress upon the pins. In the present instance, the spindles are relieved of undue stress as the bit rotates. The stress on each spindle is communicated through the ball bearings 26 to the nut, and thence to the body 1. Any side stress is, of course, communicated through the spindle to the rollers 24. As illustrated, each spindle in the present construction is relatively short and, in fact, does not require a long spindle as is sometimes required with the conventional type of gauge cutters now generally employed with cross roller bits.

If for any reason a gauge cutter need be changed, the pin 30 is removed, which will allow the nut 23 to be unscrewed and the entire cutter in that manner removed. The rollers 26 are removed from the nut in the usual manner, to-wit, through a transverse opening, which will permit the spindle to be released from the nut.

I claim:

In bit construction, a body, a gauge cutter comprising a conical portion provided with teeth and a spindle, an annular nut adapted to be threaded within said body, castellated at one end, the said nut and said spindle provided with complementary grooves and ball bearings between said grooves for locking the spindle to the nut, and a pin threaded into the body and engaging the castellations for locking the nut against rotation when threaded to the body.

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