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J. C. WRIGHT ET AL

1,836,638

WELL DRILLING BIT

Filed Aug. 23, 1927

Fig. 1.

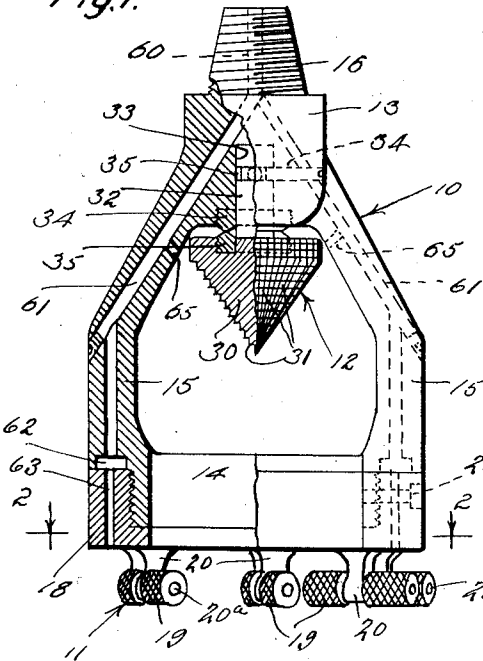


Fig. 3.

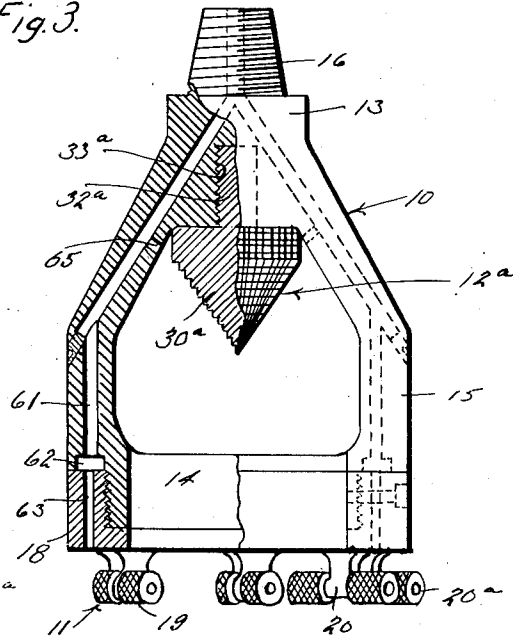


Fig. 2.

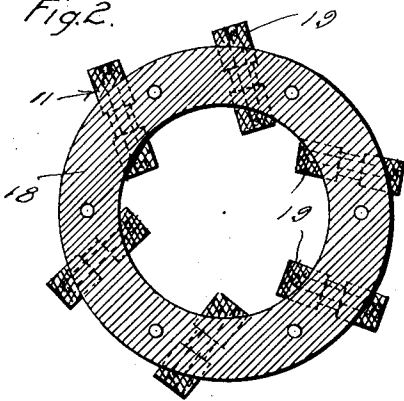
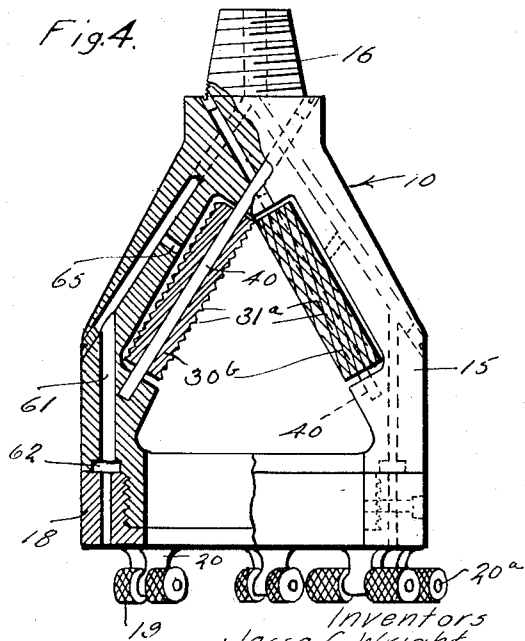


Fig. 4.



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WELL DRILLING BIT

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This invention has to do with a well drilling bit and it is a general object of the invention to provide an effective improved bit for use in drilling with the rotary method.

5 It is a general object of this invention to provide an improved bit of the type set forth in our copending application entitled "Well drill", filed on even date herewith.

10 It is another object of this invention to provide a bit including an annular cutting means to cut the core and an improved inner cutting means for removing the core.

15 It is a general object of this invention to provide an improved bit of the character mentioned wherein the cutting means provided for removing the core includes a rotating cutting element.

20 Another object of this invention is to provide a well drilling bit of the character mentioned which operates to form a core and then removes the core through a crushing action.

25 It is another object of this invention to provide an effective and improved construction for the annular cutting means of a bit of the character mentioned.

30 The various objects and features of this invention will be best understood from the following detailed description of typical forms and applications of the invention throughout which description we refer to the accompanying drawings in which

35 Fig. 1 is a side elevation of a bit including our invention having a portion broken away to show in section. Fig. 2 is a transverse sectional view taken on line 2—2 on Fig. 1. Fig. 3 is a view similar to Fig. 1 showing another form of construction embodying the invention and Fig. 4 is a view similar to 40 Figs. 1 and 3 showing another form of construction embodying the invention.

45 The bit provided by this invention includes, generally, a body 10, outer or annular cutting means 11, operable to make an annular cut into the bottom of the hole being drilled to leave a core standing in the hole, and core removing means 12 operable to destroy or remove the core left standing by the means 11 through a crushing action. Referring particularly to Figs. 1 and 2 of the

drawings, the body 10 includes, generally, an upper or shank part 13, an annular carrier 14 at its lower end for carrying the annular cutting means 11, and a plurality of legs 15 connecting the shank 13 and the annular carrier 14. The shank 13 is provided at its upper end with a tapered screw threaded projection or pin 16 to be held in a socket at the lower end of a string of drilling tools or drill pipe. The annular carrier 14 is supported by the legs 15 a substantial distance below the shank 13 and concentric with the shank 13. The carrier 14 is considerably larger in diameter than the shank 13 and, therefore, the legs 15 extend upwardly and inwardly from the carrier 14 to the shank 13. In the form of construction illustrated in the drawings the shank 13, legs 15 and annular carrier 14 are formed integrally.

The annular cutting means 11 includes, generally, a ring shaped body 18 and a plurality of cutting parts 19 projecting from the body. The body 18 is detachably connected with the carrier 14, for instance, it may be screw threaded to the carrier in the manner clearly illustrated in the drawings. In practice, it is desirable to thread the ring 18 on to the carrier 14 so that it tends to tighten on to the carrier when the bit is in operation. Further, in practice it is desirable to provide locking means, for instance, a locking screw 21 for setting the cutter ring 18 in position on the carrier 14. The cutting parts 19 extend downwardly from the ring and project inwardly and outwardly from the ring to cut clearance for the ring. We have shown the parts 19 in the form of roller cutters mounted in pairs around the ring 18. Each pair of rollers or cutters is carried by a lug 20 projecting downwardly from the ring. A mounting pin 20a is carried by the lug 20 and rotatably supports the rollers at opposite sides of the lug. The lugs 20 support the pins in angular positions so that the rollers advance in an angular position. The faces of the rollers are occupied by cutting teeth. It is to be understood that the rollers may be of any desired shape or proportions and that any suitable means may be employed in mounting the rollers. Further, the rollers

may be arranged in various manners with reference to the ring. By constructing the cutting means 11 so that it is detachable from the carrier 14, the bit can be quickly reconditioned after operation, for instance the cutting means 11 can be renewed easily and quickly and further cutting means of various types, that is having various types, forms or arrangements of cutting parts may be applied to the bit to suit the wishes of the operator or the drilling conditions encountered.

The annular cutting means 11 above described operates to make a comparatively narrow annular cut into the bottom of the hole being drilled leaving a core which extends upwardly through the annular carrier 14 and between the spaced legs 15. In accordance with our invention, we provide means whereby this core is cut, broken down or otherwise removed through a crushing action, that is, through means 12 which crushes the core. In the form of the invention under consideration, that is in Fig. 1 of the drawings, we show a form of core removing means 12, which operates to bear or crush downwardly on the center of the core in which case the core is destroyed through the downward crushing pressure. To obtain this form of crushing action, we provide a central downwardly projecting crushing member to engage the center of the top of the core. This crushing member, as shown in Fig. 1, is in the form of a downwardly projecting conical cutter 30 having its exterior provided with a plurality of comparatively small teeth or cutting parts 31. This downwardly faced conical cutter is provided with a central upwardly projecting spindle 32 which is rotatively carried in a socket 33 extending upwardly in the lower end of the stem 13. A retaining screw 34 may extend into a groove 35 in the stem 32 to retain the stem in place within the socket. Bearing rings 34 and 35 may be carried by the lower end of the stem 13 and the base of the cone 30, respectively, to allow free rotation of the cone relatively to the stem 13. With this form of means 12, the conical member 30 being faced downwardly and being mounted for rotation relative to the stem 13, bears downwardly on the center of the core and because of its conical formation operates to force its way into the core and wedge the core apart, thus destroying it so that it passes out between the spaced legs 15.

Provision is made in accordance with our invention for the introduction of circulating fluid to the cutting means 11 and also to the cutting means 12. A fluid passage 60 extends downwardly through the screw threaded pin 16 and discharges into branch passages 61 which extend from the pin 13 through the legs 15 and discharge into an annular chamber 62 provided in or at the annular carrier 14. Discharge openings 63 are formed in the

ring 18 of the cutting means to communicate with the chamber 62 and to discharge downwardly at the cutting parts. For the purpose of directing fluid on to the conical cutter 30, discharge openings 65 are provided in the inner sides of the legs 15 to communicate with the passages 61. The openings 65 are disposed to direct streams of circulating fluid on to the cutter 30 in a manner to properly flush it.

In the form of the invention illustrated in Fig. 3 of the drawings the body 10 and outer cutting means 11 may be the same as the corresponding parts in the form of the invention first described. In this form of the invention, however, the means 12a provided for crushing or removing the core left standing in the hole by the outer cutting means 11 includes a centrally arranged downwardly projecting conical cutter 30a carried by the lower end of the stem 13 of the body to be rigid with the body, that is, to turn with the body. In this case the conical cutter 30a is substantially the same as the conical cutter 30, as shown in Fig. 1, the principal difference or distinction being that the cutter 30a is fixed against rotation relative to the body while the cutter 30, in the form of the invention first described, is mounted for rotation relative to the body. The cutter 30a may be mounted centrally at the lower end of the stem 13 in any suitable manner, for instance, it may be provided with a stem 32a to screw thread into a socket 33a provided in the lower end of the stem 13. The threads on the stem 32a may be pitched so that the normal operation of the bit tends to tighten the stem in the socket.

In the operation of this form of the invention, the conical cutter 30a bears downwardly on the center of the core as the bit is advanced and, in addition to turning with the body and therefore cutting downwardly into the center of the core through the action of the teeth 31, it bears on the core in a manner to crush it. In this form of the invention provision may be made for handling circulating fluid so that it is directed on the cutters 19 and also on to the conical cutter 30a.

In Fig. 4 of the drawings we illustrate another form of the invention in which case the breaking down or crushing of the core is accomplished through or by means of roller cutters 30b. The roller cutters 30b are arranged or mounted at the inner sides of the legs 15 of the body so that they are upwardly convergent or in an inverted V arrangement. The cutters 30b may have straight cylindrical exteriors provided with cutting teeth 31a. We have shown the cutters 30a rotatably mounted by means of mounting pins 40. In this form of the invention like in the other forms above described provision is made for circulating fluid to the cutting means 11 and also on to the roller cutters 30b.

In the operation of this form of the invention, the roller cutters 30b engage the upper end of the core as it passes upwardly through or between the legs 15 of the body and act on the core to crush or remove its upper end portion leaving its upper end pointed corresponding to the arrangement of the two cutters 30b. The cutters 30b in this case roll on the core and through the action of the teeth 31a have the crushing action characteristic of roller cutters of this general type. In this type of cutter, that is in the roller type of cutter, the teeth cut mainly through a crushing action as distinguished from a shearing action such as occurs in the use of a blade cutter.

Having described only a typical preferred form of our invention we do not wish to limit ourselves to the specific details set forth, but wish to reserve to ourselves any changes or variations that may appear to those skilled in the art or fall within the scope of the following claims.

Having described our invention, we claim:
1. A well drilling bit including a body having a shank, an annular lower end part and spaced legs supporting the end part, cutting means carried by the end part to make an annular cut in the formation drilled, and a roller between the legs for crushing the core of formation left by the cutting means, the body having circulation openings extending from the shank and directing fluid to the cutting means and the roller.

2. A well drilling bit including a shank, spaced legs projecting downwardly from the shank, an annular end part carried on the lower ends of the legs, a detachable ring on the end part, and a plurality of cutters on the ring to make an annular cut in the formation, there being fluid passages in the shank, legs, end part, and ring discharging at the lower end of the ring.

In witness that we claim the foregoing we have hereunto subscribed our names this 15th day of August, 1927.

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