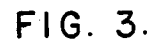


3,100,544

2 Sheets-Sheet 1

FIG. 4.



INVENTORS.
CHARLES R. OVERLY,
BY GEORGE E. CANNON,

James B. McQuinn
ATTORNEY

Aug. 13, 1963

C. R. OVERLY ET AL
DRILLING DEVICE

3,100,544

Original Filed May 31, 1960

2 Sheets-Sheet 2

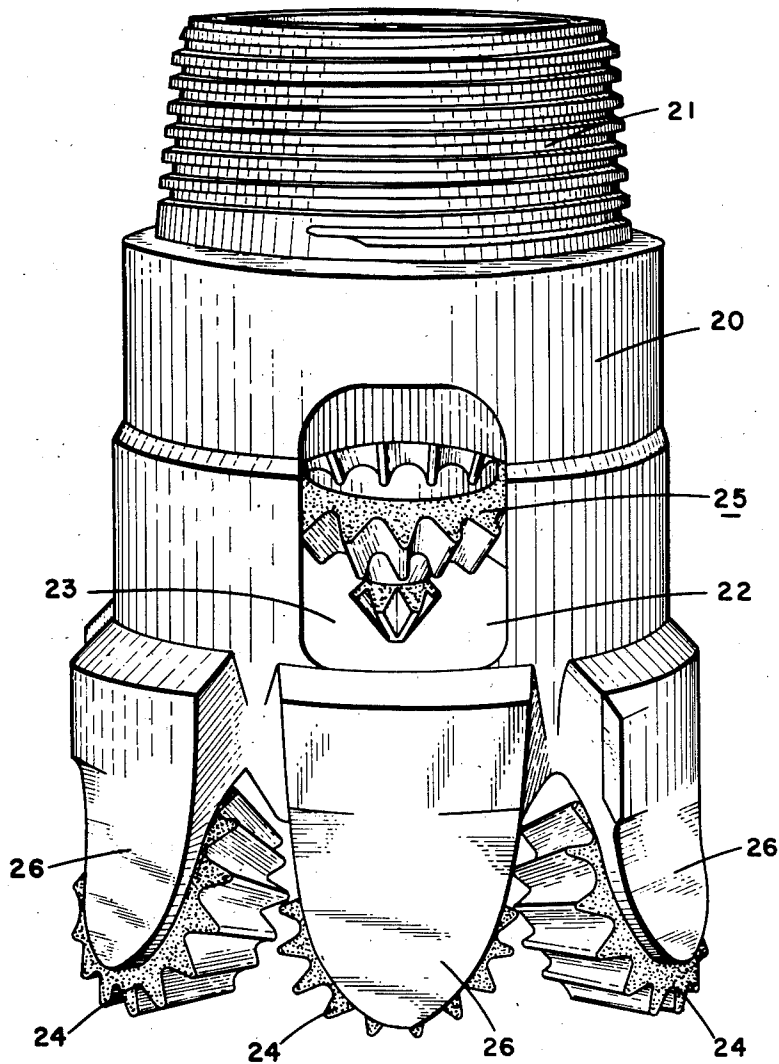


FIG. 5.

INVENTORS.
CHARLES R. OVERLY,
GEORGE E. CANNON,
BY

Harmon B. McCallum
ATTORNEY.

1

3,100,544

DRILLING DEVICE

Charles R. Overly, New Orleans, La., and George E. Cannon, Houston, Tex., assignors, by mesne assignments, to Jersey Production Research Company, Tulsa, Okla., a corporation of Delaware

Original application May 31, 1960, Ser. No. 32,815, now Patent No. 3,075,592, dated Jan. 29, 1963. Divided and this application Feb. 2, 1962, Ser. No. 170,628

7 Claims. (Cl. 175—333)

The present invention is directed to a drill bit which is suitable for drilling of oil and gas wells and the like. More particularly, the invention is concerned with a drill bit for drilling wells which is provided with a plurality of peripherally spaced-apart cutting means. In its more specific aspects, the invention is concerned with a combination drill bit comprising horizontally spaced-apart cutting means and enclosed drilling means.

This application is a division of Serial No. 32,815 filed May 31, 1960, now U.S. Patent No. 3,075,592 for Charles R. Overly and George E. Cannon and entitled "Drilling Device."

The present invention may be briefly described as a drill bit embodying a hollow body member provided on a free end with a plurality of peripherally spaced-apart cutting means. The drill bit is adapted to be connected on its other end to a hollow drill string through which drilling fluid is circulated. Arranged within the hollow body member and attached thereto is a drilling means. The hollow body member is provided with separate fluid passageways adapted to deliver drilling fluid from the hollow drill string separately to the cutting means and to the drilling means. The hollow body member forms a shroud which encloses the drilling means and has a window in its wall for discharge of cuttings from the drilling means to the outside of the shroud.

The present invention will be further illustrated by reference to the drawing in which:

FIG. 1 is an elevational view of one embodiment of the present invention;

FIG. 2 is a sectional view of the device of FIG. 1;

FIG. 3 is a sectional view taken along the line 3—3 of FIG. 2;

FIG. 4 is an elevational view of another embodiment of the present invention; and

FIG. 5 is an elevational view of a preferred embodiment.

Referring now to FIGS. 1, 2, and 3 of the drawings, numeral 11 designates a hollow body member having on its upper end a threaded pin 12 for connection to a hollow drill string, not shown. The hollow body member 11 is provided with a plurality of ports or windows 13 which communicate with the inner space 14 of the hollow body member 11. Formed on the free or lower end of the hollow body member 11 are a plurality of stepped blades 15. In this particular instance, the stepped blades 15 are stepped inwardly, as shown, and are suitably provided with a leading layer or facing 16 of abrasion resistant material such as illustrated and preferably may be tungsten carbide. As will be clear from the drawing, the blades 15 have a trailing edge 16a defining a curvilinear surface which extends from the face 16 to the body member 11 ahead of the next following blade. Rotatably mounted in the hollow body member 11 in the upper end of the space 14 are a plurality of cutting means such as conical cutters 17. In the embodiment illustrated in FIGS. 2 and 3, three cones are shown. As shown, the cutters 17 are spaced above the cutting blades 15 and serve to break and cause to fail a core which is cut by the peripheral blades 15. The body of the bit 11 is formed to provide passageways 18 for separately delivering drill-

2

ing fluid to the blades 15 and also passageways 19 for delivering drilling fluid to the conical cutters 17.

Referring now to FIG. 4, the drilling bit, as shown, is similar to that of FIGS. 1, 2, and 3, the only difference being that the blades 15a are not stepped blades. The drilling bit of FIG. 4 is also provided with a space 14, conical cutters 17, windows or ports 13, and fluid passageways 18 and 19. The bit is also provided with abrasion resistant means such as facing 16 on the leading surface of blades 15a. The bit of FIG. 4 functions in the same manner as that of FIG. 1 with the conical cutters 17 breaking or causing to fail the core cut by the blades 15a.

The abrasion resistant means such as facing 16 may suitably be a metal carbide such as tungsten carbide, cobalt borium, titanium carbide, iron carbide, ceramics, or a matrix containing diamonds and the like.

The devices of FIGS. 1 and 4 on rotation thereof cut an annular groove in the formation being drilled and enclose a core within the space 14, the cutters 17 causing the core to fail and be destroyed.

Referring now to FIG. 5, numeral 20 designates a hollow body member having on its upper end a threaded pin 21 for connection to a hollow drill string. The body 20 is provided with ports or windows 22 which communicate with the inner space 23 as do the windows 13 of FIGS. 1 and 4. Carried on the free or lower end of the hollow body 20 are a plurality of cutter means 24; in this particular instance, the cutter means 24 are a plurality of roller cutters which may be any number limited only by the dimensions of the drill bit of the present invention. In this particular instance, the roller cutters 24 may be six in number.

Arranged within the space 23 and spaced above the cutters 24 is a single coaxial drilling means generally designated by the numeral 25, which may be in the shape of a conical cutter. The cutter means 25 of FIG. 5 instead of being rotatably mounted to the body 20 is fixedly attached to the body 20 within the space 23 so as to rotate with the body member 20. The single cutter core 25 functions in the same manner as do the cutters 17, causing to fail and break a core cut by the roller cutters 24 since the roller cutters 24 are spaced around the periphery of the hollow body member 20, being carried rotatably by depending legs 26. The body member 20 as in the other embodiments is provided with passageways (not shown) for delivering drilling fluid to the cutters 24 and the cutter core 25.

The drill bit of the present invention is quite important and useful and creates stress concentrations in the portion of the earth formation embraced by the bit. Thus, a bit employing the present invention has been found to function satisfactorily in destroying a core cut by the cutting means carried on the free end of the drilling bit and thus provides for rapid drilling operations. It will be understood that the drill bit of the present invention is attached to the free end of a hollow drill string and rotated with drilling fluid supplied down the hollow drill string and discharged separately to the blades or cutting means on the lower end and to the inner drilling means enclosed within the shroud.

In the embodiment of FIG. 5, only one window or port is shown but a plurality of windows or ports may be used as shown in FIGS. 1 to 4. For example, three ports may be employed spaced 120° apart. These ports allow the discharge of the large cuttings formed by destruction of the core by the drilling means within the shroud or hollow body member such that it is unnecessary for these cuttings to be discharged at the free end of the drilling bit, which would require their grinding by the cutters on the free end of the hollow body member. As a result of not requiring the grinding up of the large cuttings, increased

3

speed and efficiency of the drilling bit of the present invention are obtainable.

While the devices of FIGS. 1 and 4 describe and illustrate a cutting means employing a plurality of rotatable cone cutters such as 17, a single fixed cutter such as 25, shown in FIG. 5, may be employed. Likewise, the cutter blades 15 or 15a of FIGS. 1 to 4 may be substituted for the roller cutters 24 of FIG. 5.

The nature and objects of the present invention having been completely described and illustrated, what we wish to claim as new and useful and secure by Letters Patent is:

1. A drill bit which comprises a hollow body member provided with a plurality of separate, circumferential peripherally spaced-apart blades on a free end and adapted to be connected to a hollow drill string on its other end, each of said blades having a flat leading face and a trailing edge defining a curvilinear surface extending from said face to said body member ahead of the next following blade, conical drilling means attached within said hollow body member for rotation relative thereto, means adapted to deliver drilling fluid separately to each of said blades ahead of its leading face and to a point above said drilling means, said hollow body member forming a shroud enclosing said drilling means and having a window in its wall adjacent said drilling means for discharge of cuttings from said drilling means to the outside of said shroud.

2. A drill bit in accordance with claim 1 in which the blades are faced with abrasion-resistant means.

3. A drill bit in accordance with claim 1 in which the blades are faced with metal carbide.

4

4. A drill bit in accordance with claim 1 in which the drilling means is a three-cone rock bit.

5. A drill bit which comprises a hollow body member provided with a plurality of separate, circumferential peripherally spaced-apart inwardly stepped peripheral blades on a free end and adapted to be connected to a hollow drill string on its other end, each of said blades having a flat leading face and a trailing edge defining a curvilinear surface extending from said face to said body member ahead of the next following blade, conical drilling means attached within said hollow body member for rotation relative thereto, means adapted to deliver drilling fluid separately to each of said blades ahead of its leading face and to a point above said drilling means, said hollow body member forming a shroud enclosing said drilling means and having a window in its wall adjacent said drilling means for discharge of cuttings from said drilling means to the outside of said shroud.

6. A drill bit in accordance with claim 4 in which the blades are faced with abrasion-resistant means.

7. A drill bit in accordance with claim 4 in which the blades are faced with tungsten carbide.

References Cited in the file of this patent

UNITED STATES PATENTS

1,805,899	Wright	May 19, 1931
1,836,638	Wright et al.	Dec. 15, 1931
2,708,103	Williams	May 10, 1955
2,830,794	Mills	Apr. 15, 1958
2,854,219	MacNeil	Sept. 30, 1958