

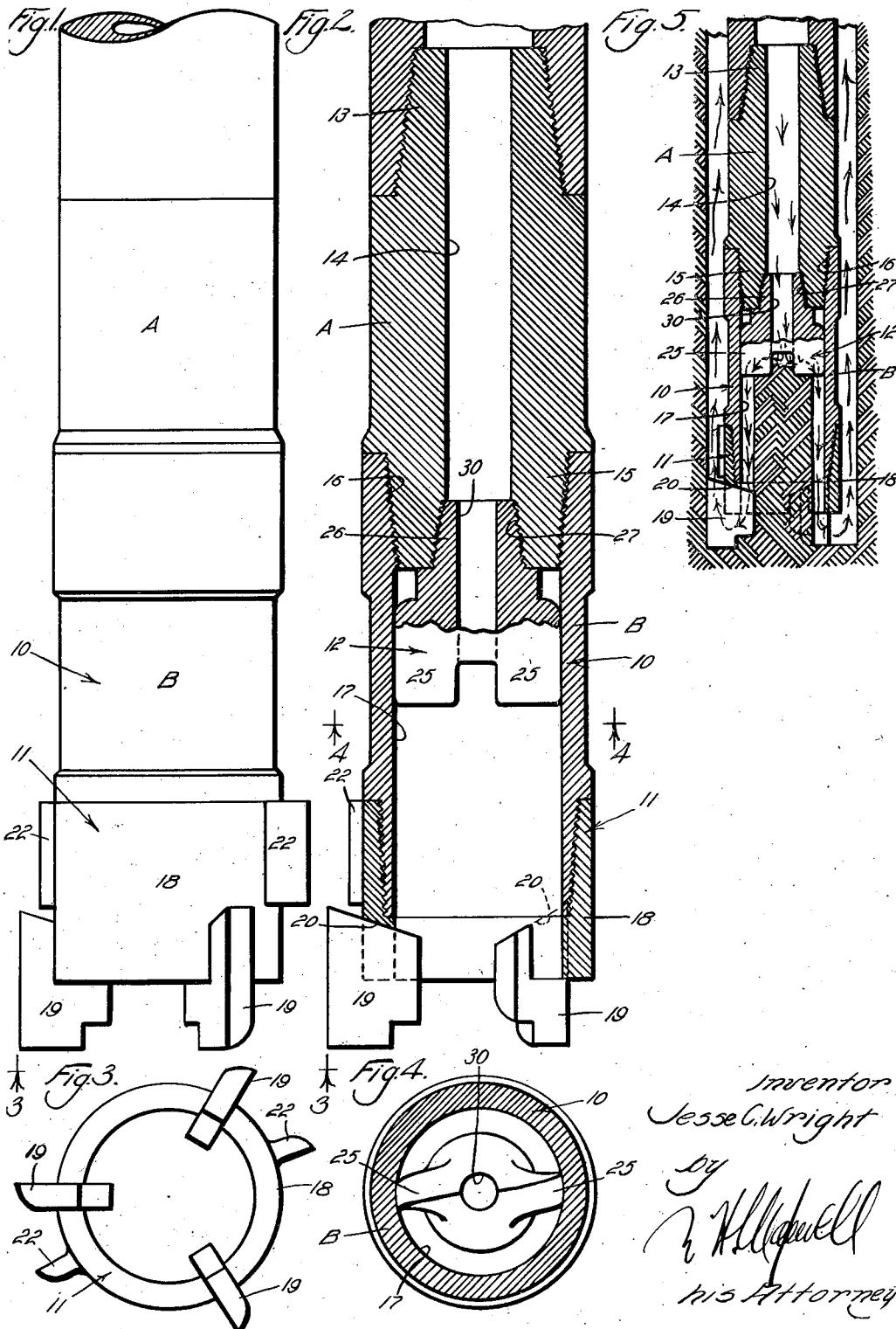
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WELL DRILLING BIT

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UNITED STATES PATENT OFFICE

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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 improved, practical bit of the type that operates to make an annular cut in the formation and then remove the core or center left by the annular cut.

It is a general object of the present invention to provide a bit which will effectively and economically drill a straight hole. The annular cut made by the bit leaves a core or center which operates to hold the bit steady and to keep it straight.

A further object of the invention is to provide a bit of the drag or tooth type which operates without becoming muddled up.

Another object of the present invention is to provide a bit in which the parts are constructed and related so that the bit can be maintained in operating condition at minimum expense, the wearing parts being in small units that can be easily renewed or replaced.

It is another object of the present invention to provide a bit of the type above mentioned in which the parts are arranged and related so that the circulating fluid introduced to the bit from the drill pipe operates to effectively flush the cuttings from the bit and to keep the cutting parts of the bit free or clean of mud.

The various objects and features of the invention will be best and more fully understood from the following detailed description of a typical form and application of the invention, throughout which description reference is had to the accompanying drawings, in which:

Fig. 1 is a side elevation of the bit provided by the invention. Fig. 2 is a vertical longitudinal detailed sectional view of the bit. Fig. 3 is a bottom end view of the bit, being a view taken as indicated by line 3—3 on Fig. 1. Fig. 4 is a detailed transverse sectional view taken as indicated by line 4—4 on Fig. 2, and Fig. 5 is a reduced view similar to Fig. 2 illustrating the action of the bit.

The bit provided by this invention is intended primarily for use with the rotary method of drilling and includes, generally,

a body 10, a drill head 11 on the lower end of the body 10, and a core cutter 12 within the body.

The body 10 is an elongate tubular structure preferably formed of sections. In the case illustrated the body 10 is formed of two sections, an upper section A, and a lower section B. The upper section A of the body is adapted to be connected with the lower end of a string of drill pipe. I have shown the section A provided at its upper end with a tapered screw-threaded pin 13 to be connected to a drill collar, or the like, carried by the drill pipe. It is to be understood that in practice the bit may be used in connection with a reamer or other equipment in which case the bit may be attached to the reamer and the reamer in turn attached to the drill stem. The body section A has a central longitudinal circulation opening 14 extending completely through it, as clearly shown in Fig. 2 of the drawings.

The body section B is attached to the lower end of the section A to project or extend downwardly therefrom. In the preferred construction the sections of the body are screw threaded together, for instance, one of the sections is provided with a tapered threaded part 15 adapted to fit a corresponding socket 16 in the other section. In the preferred form of the invention the outside diameter of the lower section B is substantially the same as that of the upper section A, making the exterior of the body substantially uniform in diameter from one end to the other. The body is preferably of substantially the same diameter as the drill collar, or the like, to which it attaches. The wall of the lower section B is made comparatively thin so that the opening 17 through the lower section B is comparatively large in diameter.

The drill head 11 is detachably mounted on the lower end of the body section B and is designed to make an annular cut in the formation as the bit is operated. The head includes a ring 18 which is attached to the body section, and a plurality of teeth 19 carried by the ring to engage the formation. The ring 18 may be attached to the lower end of the body sec-

tion B in any suitable manner, for instance, it may be screw threaded to the body section in the manner illustrated in the drawings.

The teeth 19 are mounted on or applied to the lower end portion of the ring 18 to project downwardly below the ring and radially inward and also outward from the ring so that they make an annular cut which will receive the ring 18 and the body section B with substantial clearance. In accordance with the invention the teeth 19 may be of various shapes and may be attached to the ring in various manners, for instance, they may be integral with the ring or they may be formed separate from the ring and suitably attached thereto. In the form of the invention shown notches 20 are provided in the lower end portion of the ring 18 and the teeth 19 are set in the notches. The teeth 19 may be made secure in the notches by welding. The teeth 19 are spaced apart around the ring 18, it being preferred to arrange the teeth symmetrically as shown in the drawings. In the preferred construction the lower end portions of the teeth are notched so that the lower cutting edge is stepped inwardly. Reaming blades 22 may be provided on the head to ream the outer wall of the cut made by the teeth 19. In the case illustrated I have shown reaming blades 22 located diametrically opposite each other on the exterior of the ring 18 immediately above the teeth 19. It is a feature of the invention to relate the ring 18, teeth 19 and reaming cutters 22 so that they form a unit or assembly which is compact and simple, making it inexpensive and convenient to renew the cutting head or to replace the cutting head to keep the bit in efficient operating condition. With the construction that I have provided, the assembly of ring 18, teeth 19, and blades 22 is comparatively small and is of simple construction.

The core cutter 12 is located within the body 10, preferably in the upper end portion of the body section B so that it operates to remove the core left standing by the drill head 11. The core cutter may include one or more blades 25 positioned to engage and cut the core. In accordance with the improved arrangement provided by this invention, the core cutter is in the nature of a small bit detachably mounted in the body so that it can be conveniently removed for purpose of repair or replacement. In the form of the invention shown the core cutter is provided with a tapered screw-threaded mounting pin 26 which screw threads into a socket 27 provided in the lower end of the upper body section A. The core cutter is thus mounted in the body, that is, attached to the body section A so that it projects downwardly into the body section B. In the particular form of cutter illustrated there are two blades 25 arranged diametrically opposite each other and extending outwardly to the inner wall of the opening 17.

The handling of circulation fluid is an important feature of the present invention, the bit being such as to handle the fluid so that the cutting parts are kept clean and free of mud so that they are always in condition for operation. The circulation opening 14 through the upper body section A is sufficiently large to freely handle the circulating fluid delivered to the bit from the drill pipe. A circulation opening 30 is provided in the core cutter 12, the opening 30 being of reduced diameter so that the circulating fluid passes through it at high velocity and is discharged downwardly onto the upper end of the core to materially aid the core cutter in destroying the core.

In the preferred arrangement, the opening 30 is centrally located in the core cutter and is arranged to discharge the circulating fluid downwardly between the inner ends of the blades 25. It will be obvious that the circulating fluid will not only effectively remove any material left inward of the blades 25, but will also materially aid the blades 25 in removing the core. The fluid after discharging from the core cutter, circulates downwardly through the body sections B between the wall of the opening 17 and the core standing in the body. The fluid discharges from the lower end of the body 10 through the ring 18 and passes around the lower end of the ring between the teeth 19 and then circulates upwardly between the tool and the wall of the bore. The circulation of fluid around the lower end of the ring 18 and between the teeth 19 flushes the teeth so that they are kept clean and in proper operating condition. The manner in which the circulating fluid passes through the bit is indicated by arrows in Fig. 5. From examination of this figure it will be obvious that the circulating fluid not only operates to effectively remove the cuttings but also acts on the core to effectively aid the core cutter and also effectively washes the teeth, keeping them clean and free for operation. In practice the core cutter is preferably constructed so that it is short, that is, so that the opening 30 is as short as possible in order that the flow of the circulating fluid may be restricted only at one point and then so that it will not choke. By having the restricted opening 30 comparatively short, it is always possible to lift the bit off bottom and apply pressure to the circulating fluid to establish circulation through the bit. Further, in drilling any large portions of the core that may be free in the lower body section B can be dislodged in a manner to be destroyed by lifting the bit off bottom and flushing the body out by means of circulation.

Having described only a typical, preferred form of my invention, I do not wish to limit myself to the specific details set forth, but wish to reserve to myself any changes or variations that may appear to those skilled in the

art or fall within the scope of the following claims.

Having described my invention, I claim:

1. A well drilling tool including, an upper section having a longitudinal fluid passage, a tubular cutter detachably mounted on and projecting downwardly from the lower end of the upper section, and a core cutter closing the upper end of the tubular cutter and having a pin screw threaded into the lower end of the fluid passage and having a discharge fluid passage communicating with and of less diameter than the said fluid passage and discharging downwardly into the tubular cutter.

2. A well drilling tool including, an upper section having a longitudinal fluid passage, a tubular cutter detachably mounted on and projecting downwardly from the lower end of the upper section, and an integral core cutter including a pin screw threaded into the lower end of the said fluid passage, and cutting parts on the lower end of the core cutter in the interior of the tubular cutter, the core cutter having a passage discharging downwardly from the said fluid passage into the interior of the tubular cutter.

3. A well drilling tool including, an upper section having a longitudinal fluid passage, a tubular cutter detachably mounted on and projecting downwardly from the lower end of the upper section, and an integral core cutter including a pin screw threaded into the lower end of the said fluid passage, and cutting parts on the lower end of the core cutter in the interior of the tubular cutter, the core cutter having a passage discharging downwardly from the said fluid passage into the interior of the tubular cutter and being of less diameter than the said fluid passage.

4. A well drilling tool including, an upper section having a longitudinal fluid passage, a tubular cutter screw threaded onto the upper section and projecting downwardly therefrom, and an annular core cutter on the lower end of the upper section within the tubular cutter having cutting parts on its lower end and having a pin screw threaded into the lower end of the said fluid passage, there being a fluid discharge opening in the core cutter of less diameter than the said fluid passage for discharging fluid downwardly from the said passage into the tubular cutter to aid in destroying the formation.

In witness that I claim the foregoing I have hereunto subscribed my name this 18th day of June, 1929.

JESSE C. WRIGHT.