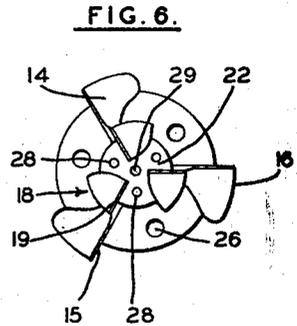
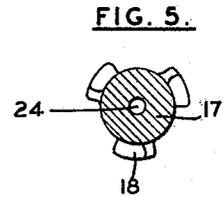
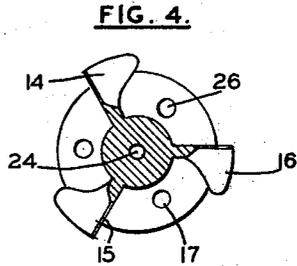
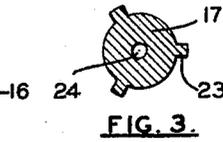
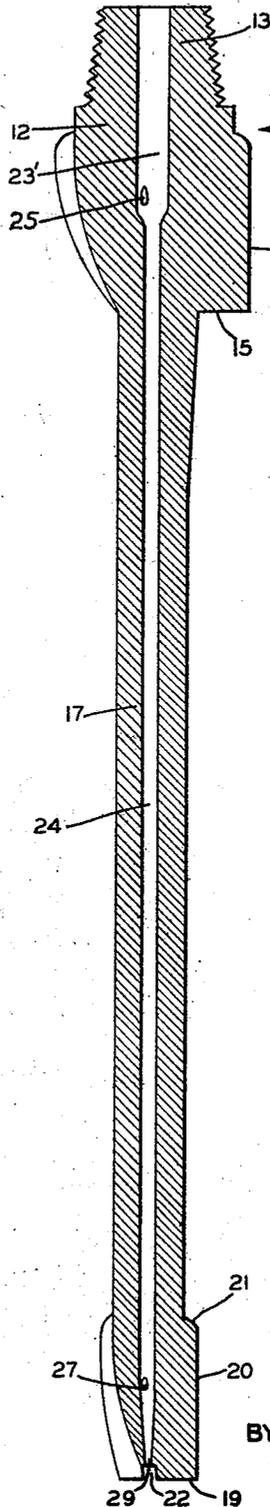
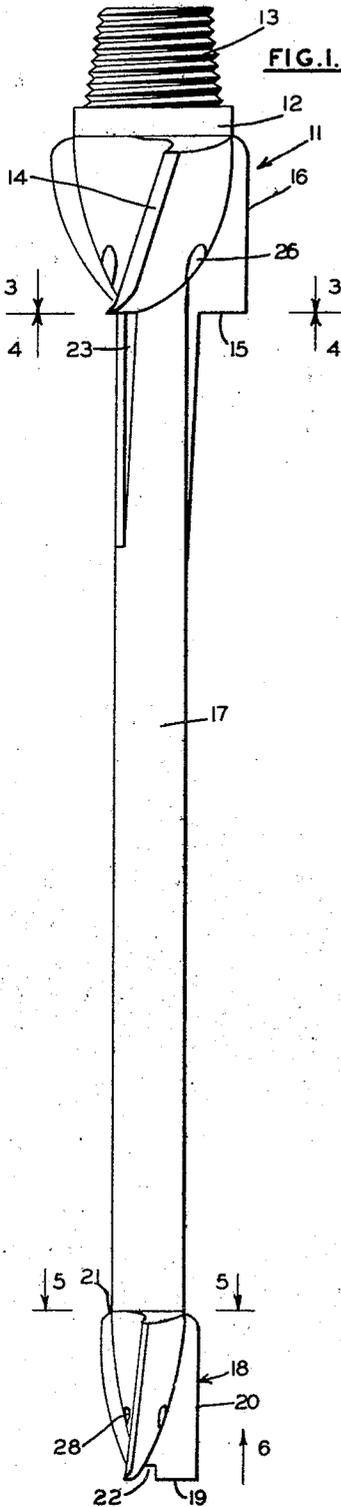


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W. P. COLE
SELF GUIDING DRILLING BIT

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SELF GUIDING DRILLING BIT

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My invention pertains to a self guiding drill bit for use in drilling deep wells such as artesian or oil wells, and it is designed to maintain a relatively straight hole, and has a construction which reduces the chance of inclined or hard strata throwing the drill bit out of a true vertical.

In well drilling it has been found that the drill with the drill pipe are frequently forced from a true vertical position by the bit engaging a hard strata of rock which may be inclined and in which one part of the bit for an appreciable time is working in the hard material and the opposite side of the bit may be operating in softer material. This causes the bit to ease off toward the softer material, and, eventually, an inclined hole is bored, thus making what is termed a crooked hole. Such crooked holes also result from many other factors in drilling.

An object of my invention in the rotary hydraulic type of drilling is to use a bit which will be self guiding and for this purpose I employ a guide bit connected by a substantial shank to the drill bit. This guide bit is of considerably smaller diameter than the drilling bit and is connected to the drilling bit by a shank of smaller diameter than the guide bit. The slushing fluid pumped down the string of drill pipe is discharged at the main drilling bit and also at the guide bit so that the cuttings from this guide bit flow upwardly around this shank.

Another feature of my invention is in both the guide bit and the drilling bit employing cutting blades with a horizontal cutting edge carried out to a right angular corner at the sides of the hole, the horizontal edge with the right angular corner effecting an improved cutting in inclined strata of rock and thus tending to maintain a straighter hole.

My invention is illustrated in connection with the accompanying drawing, in which:—

Fig. 1 is a side elevation of my invention.

Fig. 2 is a vertical longitudinal section.

Fig. 3 is a horizontal section on the line 3—3 of Fig. 1 in the direction of the arrows.

Fig. 4 is a horizontal section on the line 4—4 of Fig. 1 in the direction of the arrows.

Fig. 5 is a horizontal section on the line

5—5 of Fig. 1 in the direction of the arrows.

Fig. 6 is a bottom view in the direction of the arrow 6 of Fig. 1.

In my invention I employ a main drilling bit 11 which is indicated as having a body structure 12 with a threaded pin 13. This provides the usual type of connection with a string of drill pipe.

The bit is provided with three blades 14 extending outwardly from the body structure. A characteristic feature of these blades is that they have a horizontal cutting edge 15 and a vertical side edge 16. Extending downwardly from the main drilling bit there is a substantial shank 17 which has a guide bit 18 at its lower end. This guide bit is indicated as having three blades each of which has a horizontal lower cutting edge 19 and a vertical outer edge 20. There is a clearance shoulder 21 at the top of the blades cutting a clearance for the shank 17.

The guide bit has a central recess 22 of small diameter. At the upper part of the shank joining the main drill bit there are a plurality of strengthening ribs 23. These ribs, however, at their widest diameter have a slight clearance inside of the hole cut by the guide bit.

The slushing fluid is carried downwardly through a slushing passage 23' leading through the body of the drill bit; an elongated passage 24 of lesser diameter leading through the shank and through the guide bit. This slushing passage has discharge ducts 25 which discharge through the ports 26 adjacent each of the blades of the main drill bit. The guide bit is also slushed by having ducts 27 leading to discharge ports 28 adjacent each of the blades of the lower bit. The slushing passage in the guide bit also has a discharge opening 29 into the recess 22 at the bottom of the bit.

In making my bit I prefer to have it somewhat of the proportions illustrated, in which it will be seen that the shank 17 is a considerable distance below the drill bit. The guide bit cuts a hole and in such cutting the main drill bit in operating in the hole cuts a hole and if the main drill bit has not yet reached the formation for cutting it acts as

a centering device on the hole already drilled, possibly by another type of drill, until the guide bit has been sunk to the limit of the shank 17, at which time the blades on the drill bit engage the formation. In the continued drilling the slushing fluid is forced downwardly to the guide bit and to the drill bit. The mud, with the cuttings, flows upwardly on the outside of the shank 17 and mingles with the slushing mud with the cuttings from the main drill bit. The guide bit with the shank retains the main drilling bit from shifting sideways and cutting an inclined path due to the reaction of the bit between a hard and a soft stratum of material, especially if such stratum is tilted.

A characteristic feature of the blades of the guide bit and the drill bit having a horizontal lower cutting edge with a side edge with the blades is that in inclined strata the bits tend to cut a horizontal surface, and if part of this surface is in a hard rock and the other in a soft rock the main drill bit is kept from shifting sideways into the softer material but the blades give a true horizontal lower surface in the bottom of the bore and thus the shank 17 is adapted to occupy a vertical position. Thus, with my drill having the main guide bit with the elongated shank and the drill bit for the main cutting work it will be seen that an improved straight hole may be bored.

The drill bit 11 also has the function of maintaining the guide bit in a straight hole; for instance: presuming the guide bit enters a stratum of rock which may be inclined and have one part, possibly, harder than another, on account of the relatively long shank the drill bit 11 is working in a formation having the hole already cut and is thus maintained in a firm position so that the tendency of the hard rock to divert the guide bit is restricted by the shank and by the drill bit, thus causing the guide bit to form an entrance and to bore into the stratum of rock which would otherwise have a diverting effect. Therefore, the combination of the drill bit reacting on the guide bit and also the guide bit reacting on the drill bit causes the combination to maintain a much straighter hole than that which would be made by an ordinary drill bit.

One of the features which causes my bit to drill a straight hole is that the guide bit 18 cuts on the bottom of the formation and cuts a circular hole, the diameter of this hole being governed by the diameter of the cutting edge 19 and the vertical outer edges 20. Although the shank 17 is of smaller diameter than the hole cut by the guide bit, the ribs 23 extend outwardly at the top so that their outer edges are guided by the hole cut by the guide bit having but a slight operating clearance and these merge into horizontal cutting edges 15. The main drilling bit 11 is in no sense a reaming tool but cuts on the bottom of

the formation outside of the hole formed by the guide bit 18, and in this action the horizontal cutting edges 15 cut this formation in a horizontal cut, the size of the upper hole being regulated by the diameter across the cutting edges 15 and by the vertical side edge 16, this latter not being a cutting edge.

Drilling bits are generally guided out of a vertical line by drilling into strata which is on a slope and particularly when the lower strata is harder than the upper strata. Therefore, the bit is forced into the softer material away from the harder, but as my guide bit is of comparatively small diameter it cuts completely into the inclined strata, being itself guided by the main drilling bit which may be working in the softer formation. Then, when the main drilling bit reaches the inclined strata it is guided by the guide bit, the substantial shank 17, and the fact that the guide and strengthening ribs 23 are guided in the lower hole and that these join the horizontal cutting edge of the main drilling bit.

Various changes may be made in the details of construction without departing from the spirit or scope of the invention as defined by the appended claims.

I claim:

1. A device as described, comprising a drilling bit, a shank extending downwardly therefrom, a guide bit at the lower end of the shank, the shank having a plurality of guide and strengthening ribs at the top extending outwardly from said shank, the shank proper being of lesser diameter than the hole cut by the guide bit, and a plurality of cutting blades on the drilling bit, each blade having a horizontal cutting edge merging at their inner edges with the ribs and each blade having a vertical outside edge, the drilling bit, the shank, and the guide bit being formed integral and having a slushing duct there-through with discharge ends at the drilling bit and guide bit there being passages between the ribs for upflow of slushing fluid.

2. A device as described in claim 1, the guide bit having a plurality of cutting blades with a horizontal lower cutting edge and vertical side edge on each blade.

3. A device as described, comprising an upper drilling bit having means for connection to a rotatable string of drill pipe, a shank extending downwardly from such bit, a guide bit at the lower end of the shank, the shank being of lesser diameter than the hole cut by the guide bit, the shank having a plurality of guide and strengthening ribs diverging outwardly in a gradual slope beyond the upper diameter of the shank, the upper portion of said guide ribs having a small operating clearance in the hole cut by the guide bit, the upper drilling bit having blades each with a horizontal lower cutting edge, each edge at its inner portion being connected to the up-

per end of a rib, and a slushing duct extending through the drilling bit and the shank to the guide bit and having discharge openings at the drilling bit and the guide bit, there being passages between the ribs for upflow of slushing fluid.

4. A device as described, comprising in combination, an upper drilling bit, a shank extending downwardly therefrom with a guide bit at the lower end of the shank, the drilling bit, the shank, and the guide bit being formed integral, the guide bit having a plurality of blades, a lower horizontal cutting edge and a vertical side edge, the shank being of lesser diameter than the hole cut by the guide bit, the shank being cylindrical and having a plurality of upwardly diverging ribs, said ribs at their lower end merging with the shank, and at their upper end the diameter across the ribs being but slightly less than the diameter of the hole cut by the guide bit, the main drilling bit having a plurality of blades each with a horizontal lower cutting edge, each edge at its inner portion being connected to the upper end of a rib, and each blade having a vertical cutting edge, means to secure the main drilling bit to a string of rotary drill pipe, a slushing duct extending through the drill bit, the shank, and the guide bit, and having discharge openings at the drilling bit and the guide bit.

5. A device as described, comprising a drilling bit, a shank extending downwardly therefrom, a guide bit at the lower end of the shank, the shank having a plurality of guide and strengthening ribs adjacent the top, said shank being of lesser diameter than the hole cut by the guide bit, and the lower end of the ribs merging with such shank and extending outwardly, and the top being but slightly less in diameter than the diameter of the hole cut by the guide bit, the drilling bit having a plurality of cutting blades, each blade having a cutting edge extending outwardly from the upper terminating end of a rib, a slushing duct through the drilling bit, the shank, and the guide bit, with discharge openings at the drilling bit and the guide bit, there being passages between the ribs for the upflow of slushing fluid.

6. A device as described in claim 5, the cutting blades on the drilling bit having no part thereof extending downwardly below the upper terminating end of said ribs, and the blades forming with the ribs passages for the upflow of the slushing fluid from the guide bit.

In testimony whereof I have signed my name to this specification.

WILLIAM PERRY COLE.