G. A. HUMASON.

DRILL.

APPLICATION FILED MAR. 19, 1918.

1,283,193. Patented Oct. 29, 1918.

3 SHEETS—SHEET 1.

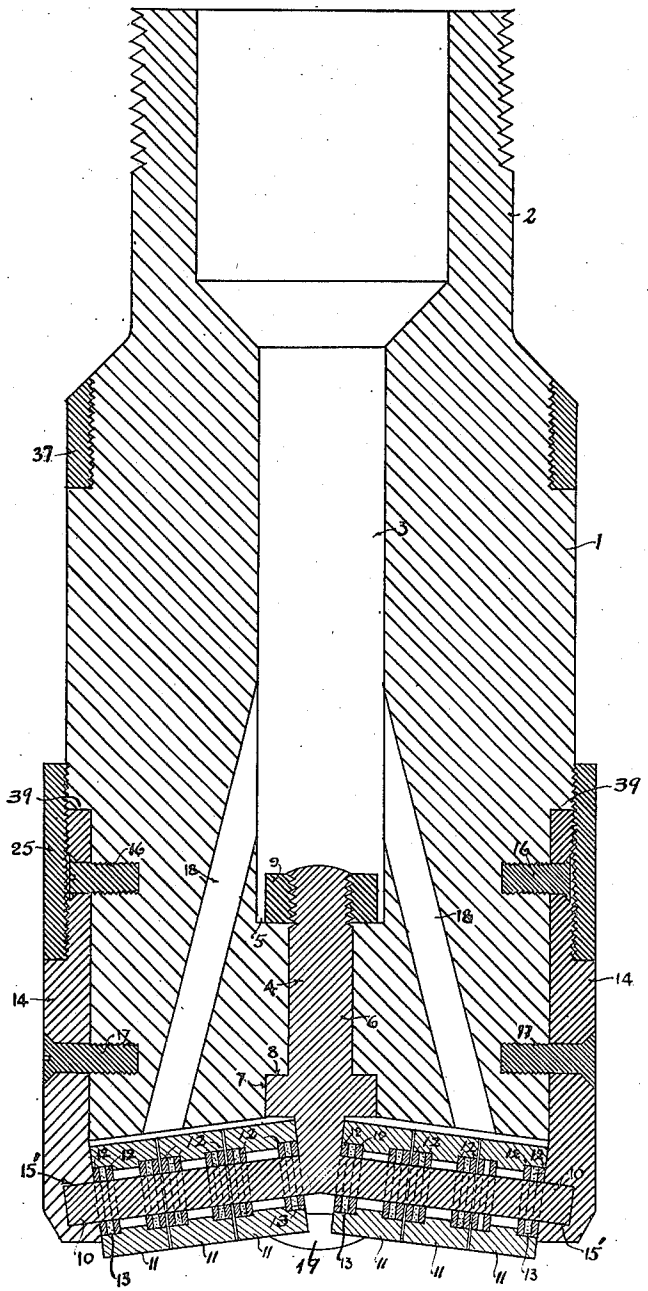



FIG. 1.

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3 SHEETS—SHEET 2.

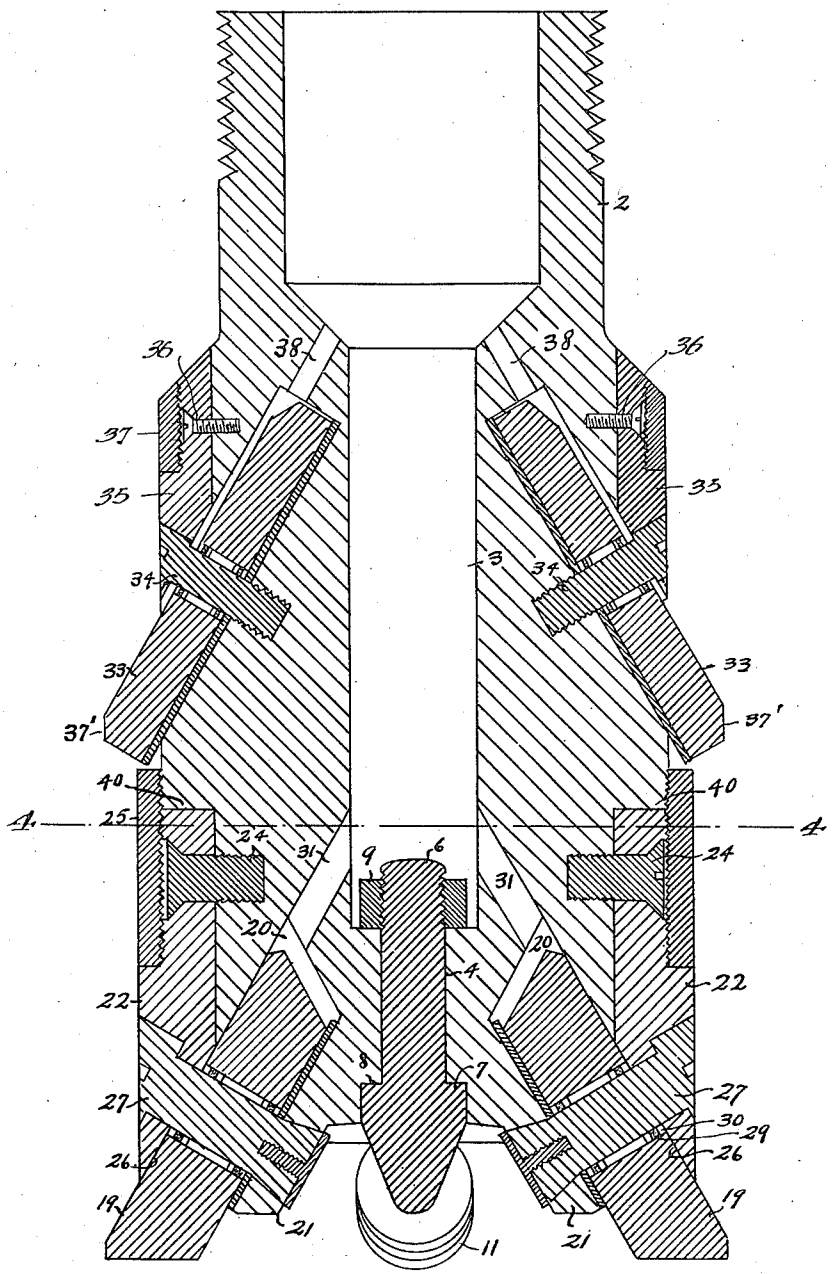



FIG. 2.

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DRILL.

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3 SHEETS—SHEET 3.

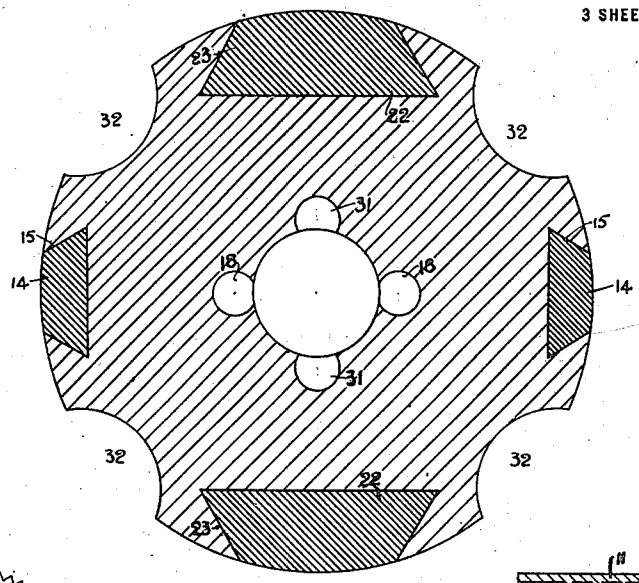



FIG. 4.

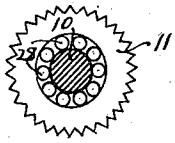



FIG. 6

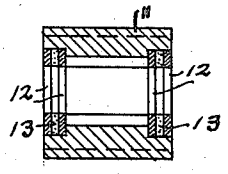



FIG. 5




FIG. 3.

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# UNITED STATES PATENT OFFICE.

GRANVILLE A. HUMASON, OF SHREVEPORT, LOUISIANA, ASSIGNOR OF ONE-THIRD TO EDWARD B. BIERCE AND ONE-THIRD TO JOHN W. PARKER, BOTH OF HARRIS COUNTY, TEXAS.

## DRILL.

1,283,193. Specification of Letters Patent. Patented Oct. 29, 1918.

Application filed March 19, 1918. Serial No. 223,316.

*To all whom it may concern:*

Be it known that I, GRANVILLE A. HUMASON, a citizen of the United States, residing at Shreveport, in the parish of Caddo and State of Louisiana, have invented certain new and useful Improvements in Drills, of which the following is a specification.

This invention relates to new and useful improvements in a drill.

The object of the invention is to provide a drill of the character described which is especially adapted for drilling through rock and other hard strata.

Another object of the invention is to provide a drill of the character described having rotatable pilot cutters, which forms the bore, and which operate in conjunction with rotatable reamers, which follow and ream out, enlarge and complete the bore.

A further feature of the invention resides in the provision of novel means whereby the pilot cutters and side reamers are securely attached to and may be readily detected from the head of the bit.

A still further feature of the invention resides in a novel means for retaining the lubricant within the bearings of the cutters and reamers.

With the above and other objects in view, the invention has particular relation to certain novel features of construction, operation and arrangement of parts, an example of which is given in this specification and illustrated in the accompanying drawings, wherein:—

Figure 1, shows a vertical sectional view of the bit, taken on the line 1—1 of Fig. 3.

Fig. 2 is a vertical sectional view taken on the line 2—2 of Fig. 3.

Fig. 3, is a bottom view of the bit.

Fig. 4 is a transverse sectional view of the head, taken on the line 4—4, of Fig. 2, looking down, and showing the collars and cutters removed.

Fig. 5, is a side view of a section of one of the cutters employed, and

Fig. 6, is an end view thereof.

Referring now more particularly to the drawings, wherein like numerals of reference designate like parts in each of the figures, the numeral 1, refers to a drill head whose upper end has a reduced shank 2, which is outwardly threaded to receive a drill collar, by means of which it is attached to the lower end of the drill stem. The drill head has a central passageway 3, therethrough.

The diameter of the lower end of said passageway is reduced abruptly toward the lower end of the head for a portion of its length, said reduced portion being indicated by the numeral 4. An annular shoulder 5 is formed at the upper end of said passage 4 thus furnishing a secure seat for a cutter supporting means. The said cutter support comprises an upright post 6 fitting closely within the passage 4 and threaded at its upper end to receive a nut 9 seating on the shoulder 5 and by means of which said post is secured in place. The lower end of the passage 4 is enlarged to form a seat 8 adapted to receive a shoulder 7 on said post.

The lower end of the post is forked to form two integral laterally extending spindles 10, 10, said spindles having, in my preferred embodiment, here shown, a slight downward declination. The outer ends of these spindles are received and supported in recesses 15′, 15′ in removable supporting plates 14, 14 dovetailed to fit in correspondingly shaped recesses or grooves 15, 15 in the opposite sides of the head. The supports 14 are retained in place in the grooves 15 by set screws 16, 17 and by the further provision of an annular collar 25 threaded on to the head so as to secure the upper end of each support and cover the heads of the screws 16.

Mounted upon the spindles 10, 10, are a series of disk-shaped cutters 11 of which I have shown three on each spindle. Each cutter is provided with antifriction roller bearings, shown particularly in Figs. 5 and 6. At both ends of each cutter the central bearing portion is enlarged to receive three annular washers including outer and inner washers 12, 12 and an intermediate felt or other fabric washer, 13. In the process of assembling the cutters on the spindles 10 the interior bearing portion is filled with lubricant, the felt washers 31, clamped between the metal washers 12, 12 are then forced into the recess at each end of the cutter. When the cutters are mounted on the spindles 10, the felt washers 13 will prevent the escape

of lubricant from between the cutter and spindle thus retaining the lubricant for long periods and will also prevent the entrance of water and sand or other grit about the bearings.

The pilot cutters form a bore somewhat less in diameter than the diameter of the head, and for the purpose of enlarging the bore to admit of the passageway of the head down through the same, frusto conical shaped reamers 19, 19, have been provided. These reamers operate in the side recesses 20, 20, of the head, said recesses being of a form in the head to receive said reamers which fit against the end bearing supports 21, 21, carried by the head. Supporting members 22, 22, dove-tailed in cross section are fitted up into the opposing dove-tailed grooves 23, 23, provided in the head, and these supports 22, 22, are secured in position by means of set bolts 24, 24, which pass therethrough and are threaded into the head 1. A collar 25, fits over the upper ends of the supporting members 14, and 22, and also over the set bolts 16 and 24, locking them against detachment. The lower ends of the supporting members 22, 22, are outwardly beveled forming the bearing faces 26, 26, which take up the side thrusts of the respective reamers 19. A spindle 27, is provided for each reamer 19, each spindle passing through a central bearing in its corresponding reamer, and having its ends anchored in the corresponding bearing member 22, and bearing 21, respectively. Each reamer 19 is provided with anti-friction rollers 28, and the lubricant is retained in the reamer bearings by means of felt washers 29, 29, arranged at each end of the bearing and clamped between the metal washers 30, 30, said lubricant retainers being of the same construction as those described in connection with the pilot cutters, as shown in Fig. 1. Flushing water is fed to both the central pilot cutters 11 and the reaming cutters 19 by ducts, 18, 18 and 31, 31, respectively, leading from the central channel 3 to the housings of the said cutters. These streams of water clear the cutters of the disintegrated material and flush it from the bore hole, upward outside the drill, to the surface.

The operative faces of the pilot cutters, and the reamers are corrugated or toothed, so as to readily abrade and cut into the hard strata to be pierced.

For the purpose of reaming and smoothing the bore of the hole and to maintain the gage of the same I have provided the side reamers 33, 33, disk-like in form. These reamers are mounted on the spindles 34, 34, which pass through central bearings therein and whose inner ends are threaded into the head 1. The outer ends of these spindles are anchored in the bearing supports 35, 35, which are dove-tailed in cross section and are fitted into vertical, opposite correspondingly shaped grooves in the head. These bearing supports 35 are secured in position by means of set screws 36, 36, which pass therethrough, and are threaded into the head. These set screws are locked in position by means of the sleeve 37, which is screwed onto the upper end of the head and which fits over said set screws. The lower ends of the bearing supports 35, are outwardly beveled, to form end bearings for the reamers 33, and the spindles 34, are upwardly inclined so as to bring the outer angle of the reamers 33 against the side of the bore, said reamers being beveled off at 37', thus providing an operative face, suitably toothed so as to effectively ream out the bore. The reamers 33 are provided with roller bearings, placed around the spindle 34, and provided with lubricant retainers as in the case of the pilot cutters.

The stem 6 is locked in position by means of the nut 9 and the annular shoulder 7, said shoulder resting against the seat 8 of the head and receiving the upward thrust of the stem. The nut 9 is manipulated through the passage 3 and serves to draw the parts into rigid contact. The bearing supports 14, 14, and 22, 22, are locked in position by means of the set screws 16 and 17 and 24, and the collar 25, so that it is impossible for said cutters or reamers to become lost in the bore and likewise the side reamers 33, 33, are locked in position by means of the bearing supports 35, 35, which are secured by the set screws 36, and the sleeve 37, so that these side reamers cannot become lost in the bore. Furthermore the upper ends of the bearing supports 14 and 22 abut against straight shoulders 39, 39, and 40, 40, of the head, which receive the upward thrust imparted to the pilot cutters and reamers 19, thereby relieving the set bolts 16, 17 and 24 from the strain of said thrust and from liability of being sheared off.

In assembling the bit, the pilot cutters are first assembled on their spindles independently of the head, and the stem 6 is inserted up into the bore 4, and locked in position by the nut 9. The reamers 19, 19, are then mounted on the spindles 27 which are screwed in place, and the collar 25 screwed over the head, as shown in Fig. 1. The reamers 33, 33, are then inserted in the side recesses of the head provided to receive them and the bearing members 35, 35, then inserted in their corresponding grooves and secured in place by means of the set bolts 36, and the locking sleeve 37, and the spindles 34, then screwed in position. Water is supplied to the side reamers 33, through the water passageways 38, 38, said water passing from the interior of the drill stem and

finding its way to the operative faces of said reamers to carry away the cuttings therefrom.

What I claim is:—

1. A drill including a head, a detachable post secured to the head, said post being formed with diverging spindles, a rotatable cutter mounted on each spindle, each cutter being formed of sections, and a bearing support dovetailed into the head and provided with a recess to receive the outer end of each spindle.

2. A drill formed of a head, a detachable post fitted into a bearing in the lower end of the head, spindles integral with and diverging from said post, bearing supports secured to the head, and provided with recesses to receive the outer ends of the respective spindles, rotatable cutters on each spindle and lubricant retainers arranged at the cutter ends.

3. A drill including a head, a detachable supporting member fitted into the head and whose lower ends are provided with radial spindles which decline relative to the axis of the head, rotatable cutters formed of disks and mounted on said spindles, the disk bearings being provided with lubricant retainers, detachable bearing supports secured to the head and whose lower ends have recesses which receive the outer ends of the respective spindles.

4. A drill including a head, having a central bearing and side grooves, the upper ends of said grooves forming shoulders in said head, bearing supports fitted into said grooves whose upper ends abut against the said shoulders, the lower ends of said bearing supports being provided with recesses, means for securing said bearing supports against detachment from the head, a stem fitted into said central bearing, an annular shoulder carried by said stem which abuts against the head to receive the upward thrust against the stem, means for locking said stem in position, spindles integral with said stem whose outer ends are fitted into the corresponding recesses of said bearing supports and rotatable cutters mounted on said spindles.

5. A drill including a head, a central water channel therein, a detachable post adapted to be inserted longitudinally in said head, means seated in said water channel for securing said post in said head, said post having integral diverging spindles on the lower end thereof and rotatable cutters mounted on each spindle.

6. A drill formed of a head, a detachable post fitted into a bearing at the lower end of the head, a plurality of detachable bearing supports carried by the head, spindles whose inner ends are secured to the post and whose outer ends are secured in corresponding bearing supports, rotatable cutters having bearings on each spindle, and lubricant containers arranged at the ends of the said cutters.

7. In a drill, a head, detachable bearing supports mounted in the head, means for securing said bearing supports, against detachment from the head, a locking ring threaded over said securing means, and rotatable reamers mounted on said bearing supports.

8. In a rotary boring drill, a head, a detachable supporting post, spindles integral therewith, supporting plates for the outer end of said spindles, said plates being dovetailed in said head and held against upward movement by shoulders on said head, and rotatable cutters on said spindles.

9. In a rotary boring drill, a head, a central supporting post in said head, spindles integral therewith, cutters on said spindles and outer supports for said spindles comprising plates dovetailed in grooves in said head, said grooves being closed at the upper end.

10. In a rotary boring drill, a head, a central upright detachable post in said head, downwardly inclined spindles integral therewith, cutters on said spindles and means on the upper end of said post for securing said post in said head.

11. In a rotary boring drill, a head, a central detachable post therein, spindles integral with said post, outer supports for said spindles comprising plates held in position on said head by securing means including a threaded locking ring and cutters on said spindles.

12. A drill comprising a head having a central channel therein, a supporting post detachably secured in said channel, two spindles integral with said post, said spindles being supported at their outer ends in detachable supporting plates secured in said head, and cutters on said spindles.

13. In a rotary boring drill, a head, a central post detachably secured in the base of said head, integral bearing spindles inclined downwardly from said post, supports for the outer ends of said spindles, each support comprising a detachable plate secured in said head and having a recess to receive said spindles, and cutters on said spindles.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GRANVILLE A. HUMASON.

Witnesses:

E. V. HARDWAY,

E. B. BIERCE.