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J. E. SHOWS ET AL

1,780,447

ROTARY CORE DRILL

Filed Nov. 2, 1927

Fig. 1.

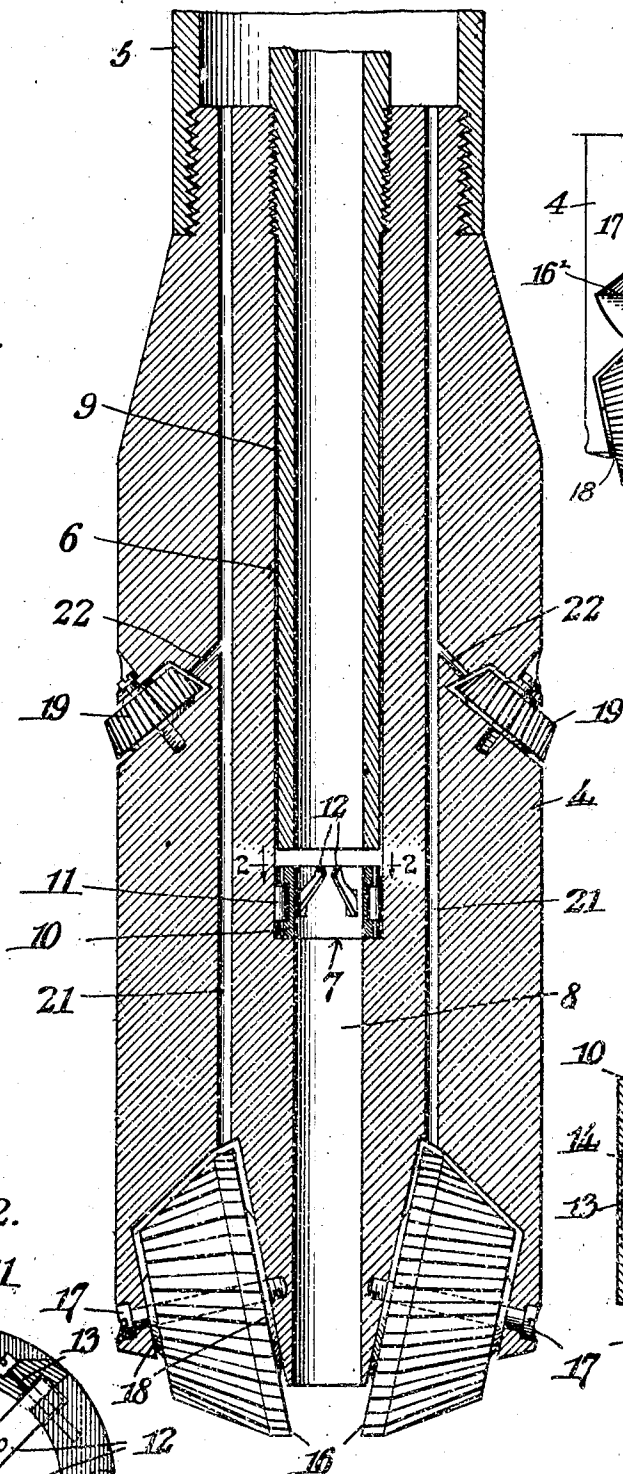


Fig. 2.

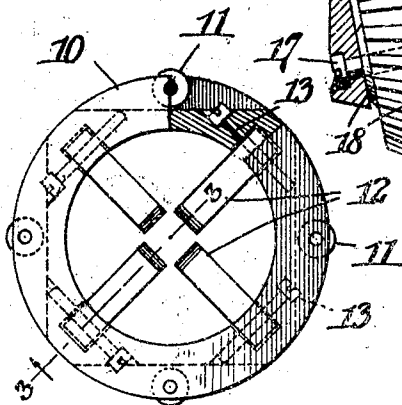


Fig. 4.

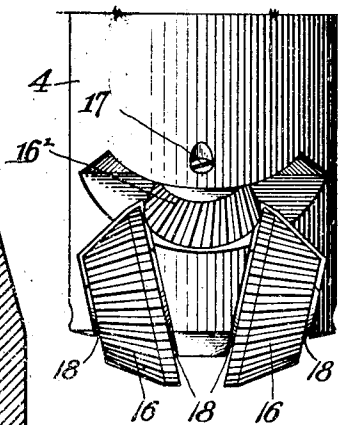
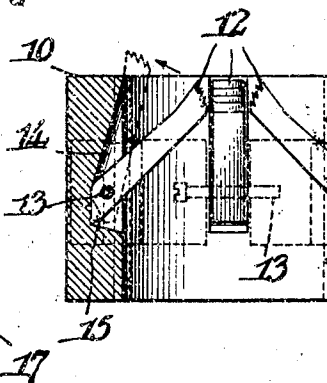


Fig. 3.



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ROTARY CORE DRILL

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This invention relates generally to drills for use in earth boring operations, having particular reference to rotary core drills.

The primary object of the invention is to provide a drilling tool having a head of extremely simple construction but of durable character, which may effectively be used in earth boring operations wherein strata of various characters may be encountered with little likelihood of damage or destruction to the head or any of the parts thereof.

A further object is to provide a drill head of this character which has its parts so assembled as to permit of repairs being quickly and easily made without the exercise of special skill or tools, and which repairs or adjustments may be made at the scene of operations and without resorting to forwarding the head to a machine shop for such corrections.

A further object is to provide in a drill head of the character generally specified, improved means for operating upon and gripping a core as the latter passes through the head, whereby to insure holding of the core against movement when the drill is moved from the well.

A still further object resides in the specific construction, assemblage and mode of operation of the core gripping member whereby to insure proper removal of the core at any desired time.

With these objects in view, together with others which will appear as the description proceeds, the invention consists in the novel construction, combination and arrangement of parts, all as will be described more fully hereinafter, illustrated in the drawings, and particularly pointed out in the claim.

In the drawings:

Fig. 1 is a view taken longitudinally through a core drill head embodying the invention,

Fig. 2 is an enlarged view taken substan-

tially upon line 2—2 of Fig. 1 and looking in the direction indicated by the arrows,

Fig. 3 is a fragmentary view taken substantially upon line 3—3 of Fig. 2, and

Fig. 4 is a side elevation on a reduced scale, taken at right angles to Fig. 1, illustrating the lower end of the head.

The drill head is represented generally at 4, and comprises an elongated metallic member of proper length and diameter, having its upper end reduced and threaded as shown to permit of screw threaded attachment to the drill stem 5. The head is provided with a central longitudinal opening 6 extending from the inner toward the outer end of the head, and this opening is reduced in diameter near its outer end to provide a shoulder 7; the reduced portion of the bore or opening constituting a coreway indicated at 8. This coreway, like the opening 6, is of circular formation. The opening 6 at the inner end of the head is internally threaded to receive the external threads of a barrel 9, the latter having an internal diameter or coreway corresponding to the dimension of the coreway 8. When properly inserted in the opening 6, the coreway of the barrel will be axially aligned with the coreway 8. The outer end of the barrel terminates short of the shoulder 7, so that a space is provided between said shoulder and the adjacent terminal of the barrel.

Within the space thus provided a gripper member for the core is arranged. This member is of such construction and operates in such manner with the drilling process as to permit of free feeding of the core without obstruction or interruption, yet operates in such manner that upon withdrawal of the head the core is "bitten" or broken and held against dropping out upon removal of the tool. In obtaining these results, we employ a core gripper capable of freely rotating within the head and having limited longitudinal movement. The member employed com-

prises an annular member, ring or column indicated at 10, of slightly smaller external diameter than the internal diameter of the opening 6, and having an internal diameter corresponding to the diameter of the coreway 8. This annular member is provided at proper intervals around its periphery with rollers or anti-friction members 11 which engage the inner wall in the opening 6. The height or thickness of the collar 10 is slightly less than the distance between the shoulder 7 and the adjacent end of the barrel 9. The distance between these elements may be varied as desired to increase or diminish the degrees of longitudinal travel of the collar 10. In the present instance, but little play is permitted the collar 10, as the distance between the end of the barrel and the shoulder 7 is relatively short.

The collar or annulus carries a plurality of grippers capable of engaging and firmly holding the core as it passes through the column. These grippers in the present instance comprise pawls or dogs 12 pivoted at their inner ends as at 13 within the collar and extending normally into the coreway within the collar. These dogs are set in recesses 14 in the inner face of the collar, and these recesses are so shaped as to permit the free ends of the dogs to swing away from the axis of the collar in an upward direction. Each dog has a toe 15 at its inner extremity to seat against a shoulder in the collar to limit the inward swinging movement of the dogs. There may be any desired number of pawls or dogs 12 carried by the collar, and it is preferred that they be disposed radially of the annular member 10.

The head 4 is provided near its lower end with bottom and side cutters for operation properly upon earth or rock in drilling the hole. The lowermost of these cutters 16 are of preferably frusto conical formation and are mounted in the end of the head at an angle to the axis thereof. These cutters have their inner edges disposed substantially in alignment with the outer edges of the coreway, so that in rotary cutting operations a smooth core will be formed to pass into the coreway. Disposed at substantially right angles to the cutter 16 and elevated slightly therefrom so as to protrude beyond the sides of the head are cutters 16'. These cutters 16—16' facilitate penetration as rotary movement is applied to the head and clears the way as downward progression is made. Each cutter is preferably supported upon a bearing bolt 17 threaded at its inner extremity into the head so as to be capable of being easily removed when required, and washers 18 are used in the assembly to minimize friction and to prevent jamming of the cutters. In the sides of the head at a point substantially remote from the lower end thereof clearance cutters 19 are mounted in a manner similar to

the cutters 16—16' and for purposes well understood. The head is equipped with ducts 21 leading from the upper end of the head to the cutters at the lower end thereof, and branch ducts 22 communicate with the recesses in which cutters 19 are mounted. These ducts permit of proper lubrication of the rotating cutters, as will be readily understood.

In operation, the head is given rotary drilling movement, and the cutters 16 and 16' penetrate the earth and clear the way for the head. The core passes upwardly through the coreway 8, and upon engagement with the dogs 12 forces them outwardly so as to pass into the coreway of the barrel 9. Free passage of the core through the collar is permitted by reason of the restricting movement of the dogs as well as the mobility of the collar both longitudinally and rotatably. This movement of the collar permits of the free passage of the core with the least possible danger of breakage of the same. When it is desired to remove the drill, upward movement applied to the drill stem will cause the head to move similarly, whereupon the action of the pawls in gripping engagement with the core causes the free ends of the pawls to bite into the core and sever the same at their point of engagement therewith. The downward movement to a slight degree permitted in the collar facilitates this cutting off operation. The core may then be removed from the barrel in the usual manner.

By constructing the head and its assembled parts in this manner, it is apparent that the head is considerably strengthened and will therefore withstand excess pressures with a minimum of opportunity for breakage or derangement of any of the parts. The drilling operation may be conducted more rapidly than has heretofore been possible, and the construction obviates the necessity of aspirators or check valves in the core barrel. The assemblage is such that in case of wear of the parts they may be easily replaced without the exercise of special skill or tools, and replacement of broken or worn cutters may be made, if desired, without detaching the head from the drill stem.

While the foregoing is a description of the invention in its preferred embodiments, it is nevertheless to be understood that variations in the construction and assemblage of parts may be liberally resorted to if desired within the limitations of the appended claim.

Having thus described our invention, we claim:

In a cutter, a head having a coreway therein, a collar slidable longitudinally therein, the said collar having longitudinally disposed recesses in its inner face, said recesses being relatively deep at their lower ends, a dog pivoted at its lower end in the deeper portion of each of said recesses, the bottom walls of said recesses inclining in an upward

direction toward the axis of said collar to
receive said dogs for a substantial part of
their length and to maintain the same inclined
toward the axis of said collar, said dogs of
slightly greater length than their recesses so
that their free ends project beyond the upper
end of said collar, and a toe on each dog to
engage with its respective bottom wall to
limit the inward swinging movement of the
dog.

In testimony whereof we hereby affix our
signatures.

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