Aug. 24, 1926. 1,597,325

A. F. MELCHER

DRILL

Filed May 25, 1923

Fig. 1

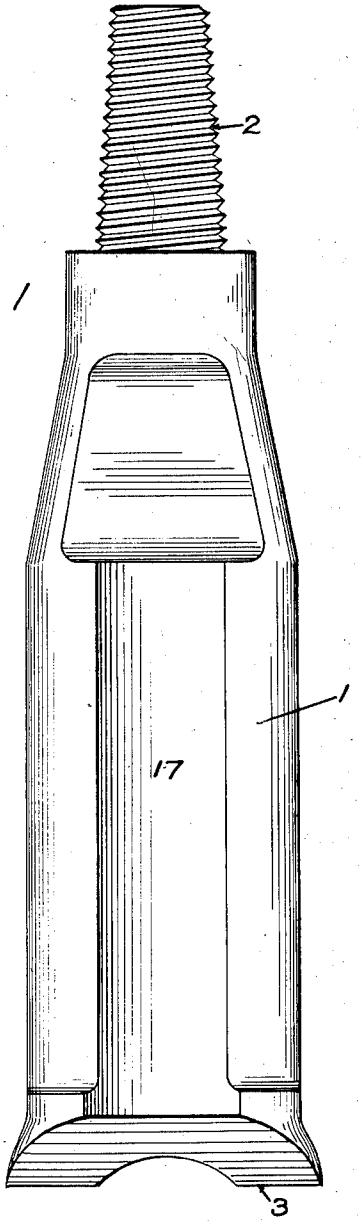


Fig. 2.

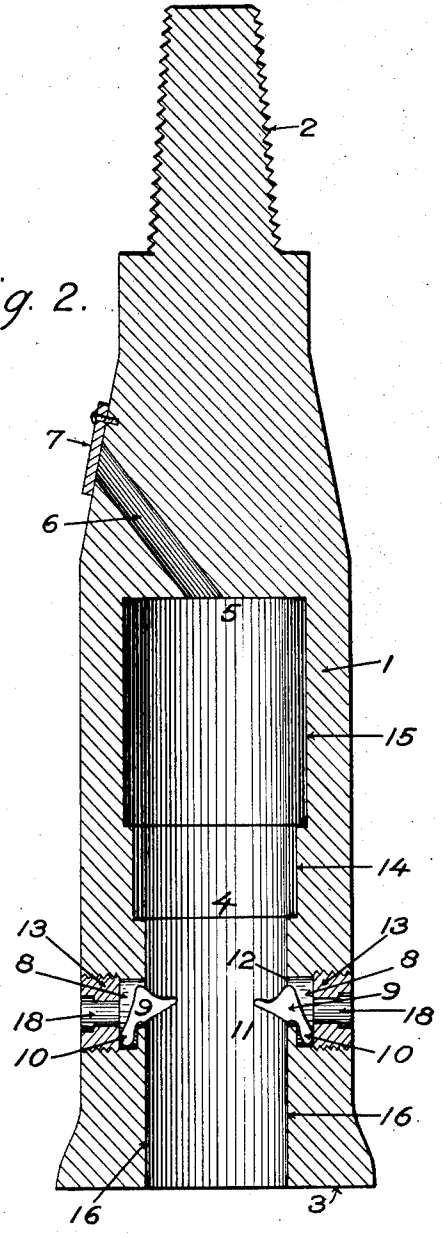
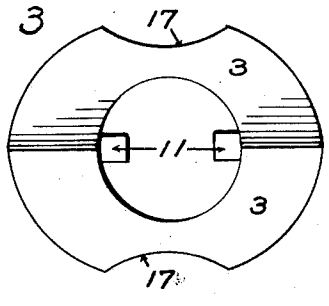


Fig. 3



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UNITED STATES PATENT OFFICE.

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DRILL.

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My invention relates to an improvement in drills for extracting cores or samples from wells or drillings for the purpose of scientific study and practical examination. For convenience I will limit the discussion herein to its use in the drilling of oil wells, although it is, of course, understood that my invention is not thus limited and extends to all of the fields in which it can be used.

A common system of drilling oil wells is the churn drill system. A solid drill is suspended from a steel cable which passes over a walking beam to a reel. A vertical reciprocating motion is imparted to the cable by the walking beam and the drill is thus alternately lifted and then dropped, the length of the cable being so adjusted that the drill strikes the earth on each downward stroke. The system is efficient in cutting a hole through the rock, but the cuttings are pulverized or so finely divided that they are of little value for the purpose of study to determine the geological and physical characteristics of the strata through which the drill is passing. Since the character of these strata is one of the most important guides to the driller for estimating the probability of striking oil and the probable quantity of it when found, it is essential for him to obtain unbroken samples of sufficient size for proper examination. It is equally important for him to know positively that the samples have come from the bottom of the hole and are not simply fragments which have fallen from the sides of the hole to the bottom—a fact of which he can never be certain when relying upon the cuttings of the churn drill.

The most positive method of obtaining a satisfactory sample from a definite strata and of sufficient size is by means of a drill so designed that it will cut an annular groove several inches in depth around the outer circumference of the hole, leaving a solid center or core. This core is then removed bodily in one piece or a few large pieces and affords an excellent opportunity for proper analysis and examination.

In mining for coal and other minerals diamond core drills have been used to a limited extent for obtaining samples of the strata, but this custom has not prevailed in the oil fields probably because of the great cost of such drills.

The object of my invention is to provide an efficient and inexpensive drill for obtaining samples without otherwise altering the customary drilling methods. As I have said, its use is not limited to oil drilling.

Broadly stated, my invention is a drill with a chambered body provided with means for retaining the core within the drill. The device also includes means whereby the retaining element may be automatically maintained in free operable condition. Only one embodiment is illustrated by the accompanying drawings, in which—

Figure 1 is a side elevation of the drill;
Figure 2 is a longitudinal section, and
Figure 3 an end view of the cutting end.

The drill consists of a body 1, terminating in a shank 2 at its upper end by which it is attached to the cable. At its lower end is provided a chamber 4, and adjacent thereto is the drilling face having cutters 3. An opening 5 in the upper end of the interior chamber 4 communicates with the exterior of the drill by a passage-way 6, which may or may not be closed by a flap of leather or other suitable material 7. In the body of the drill are also formed one or more apertures or chambers 8 which communicate with the interior and exterior of the drill, as shown, and each of these chambers is adapted to receive a dog 9 having downwardly projecting leg 10, which acts as a loose hinge for the dog, and an arm 11 which normally projects through the opening 12 into the interior of the drill. The exterior opening of the chamber 8 is partially closed by a tubular bushing 13 of brass or other suitable material which serves as the outer wall of the chamber within which the dog 9 is loosely retained and at the same time affords a more or less restricted passage between the exterior and interior of the drill. The interior of the body may be counterbored as at 14 and 15, so that the interior diameter of these portions is larger than the interior diameter of the lower portion 16. On the exterior surface of the drill are formed two diametrically opposed depressions 17, commonly called water courses.

The operation of the device herein described is as follows:

When it is desired to obtain a sample of the strata at the bottom of a hole, the ordinary drill is removed from the end of the cable and my drill substituted therefor. It is then lowered to the bottom of the hole and

caused to reciprocate up and down, as already described. The annular shape of the cutting edge 4 will cause the drill to cut an annular ring in the bottom of the well, leaving a solid central core. When this core is of sufficient height its upper edge will strike the lower inner face of the arm 11 of the dog 9 causing the dog to swing back to permit the core to pass. When the drill again lifts, the projecting point of the arm 11 of the dog 9 will engage with the core and cause it to be retained in the core chamber after it has been broken off by the concussion of the down stroke of the drill. It may happen that the core will not be broken off when the dog first engages with it. In that case the dog will be pulled loose from the core on the next up stroke of the drill to engage again on the following descending stroke. And practice has demonstrated that the core will be certain to break off from the bottom of the hole because of the concussion and vibration of the drill before it has attained a height equal to that of the interior chamber of the drill. When this occurs the dog will function to retain the core within the drill. Since the first sample may not be satisfactory, it is customary to continue drilling until samples are obtained which approximately fill the interior of the drill. Each of these samples is obtained as above described. Their retention in the body of the drill is facilitated by the counterbored portions 14 and 15, into which the first sample, broken off, is lifted by succeeding samples, and where it tends to jam because of the smaller diameter of the lowest section 16 of the drill interior.

To lubricate the drill it is customary to pour water into the drill hole unless sufficient moisture from natural sources is present. As the drill descends it is necessary to provide for the escape of the moisture and drillings which are technically called slush. In the ordinary drill, escape of the slush is provided for by means of depressions in the sides of the body of the drill similar to that shown at 17, but ordinarily deeper. As the drill descends the slush passes upward through these courses to return downwardly again as the drill ascends. In my invention I prefer to have the water courses relatively shallow so that the passage of the slush through them is quite restricted, with the result that a certain proportion of slush will be forced up through the interior of the drill and out to the exterior through the opening 12 and the chamber 8 and the opening 18 thus keeping the chamber 8 free from obstructions to insure free operation of the dog.

The loose mounting of the dog also assists in this function. While the dog may be said to swing on its lower end as a hinge, it will be noted that the so-called hinge is formed merely by the leg of the dog resting on the bottom of the chamber 8 and that this point of contact may be at any part of the bottom of the chamber. It will also be seen that the opening 12 of the chamber 8 is somewhat larger than necessary for the accommodation of the gripping end of the dog which not only provides an outlet for slush through the chamber 8 and its external opening 18, but permits the lower end of the dog to lift entirely off the bottom of the chamber 8. In other words, the dog can oscillate to a limited extent in a vertical, as well as a horizontal direction and thus act as an agitator to prevent the settling of solid matter in the chamber.

The passage-way 6 through which the interior of the tool communicates with the exterior at its upper end, affords an exit for any slush which is unable to escape by the means already described, and enables it to assist in lifting the sample into the upper part of the interior of the drill. On the upward stroke of the drill the slush flows in the opposite direction, a certain amount passing inwardly through the chamber 8, thus assisting in forcing the dogs towards the interior of the drill, and at the same time removing any sediment which may have accumulated in the chamber 8. The check valve 7 may be added if desired to close the passage 6 on the up-stroke of the drill.

When my drill is to be used in drilling by the rotary system in which the drill is given a rotary motion by a tubular shaft extending to the surface, the passage-way 6 may be omitted since in such drills there is customarily a passage through the shank of the drill communicating with the tubular shaft through which the necessary lubricating moisture may be conveyed to the cutting edge of the drill. The motion of the drill is rotary and not reciprocating as in the case of the churn drill, and, therefore, no passage-way such as 6 is required since there is no necessity of relieving internal pressure. No other material change is necessary, my improved drill being substituted for the regular rotary drill whenever it is desired to obtain a sample.

Having thus described an embodiment of the invention, what I claim is:

1. A core drill having wall pockets provided with apertures communicating with the interior and exterior of the drill, and core-gripping and retaining means loosely mounted within the pockets and normally projecting through the inner aperture into the inner chamber of the drill in a core-engaging position.

2. A core drill with core-gripping dogs, apertures in the drill walls in which the dogs may be loosely mounted, a perforated removable plug partially closing the external end of the aperture to permit restricted

communication between the exterior and interior of the drill and thereby maintain the dogs in operable condition.

3. A drill having a hollow body, pockets in the side walls thereof and dogs seated within said pockets capable of limited movement in all directions.

4. A drill having a hollow body with pockets within the side walls thereof, each pocket having a depression, a dog in each pocket seated in the depression and capable of limited movement in all directions.

ARLES FRANCIS MELCHER.