R. E. CARMICHAEL.

SAMPLE TAKING DEVICE.

APPLICATION FILED AUG. 4, 1919.

1,324,304.

Patented Dec. 9, 1919.

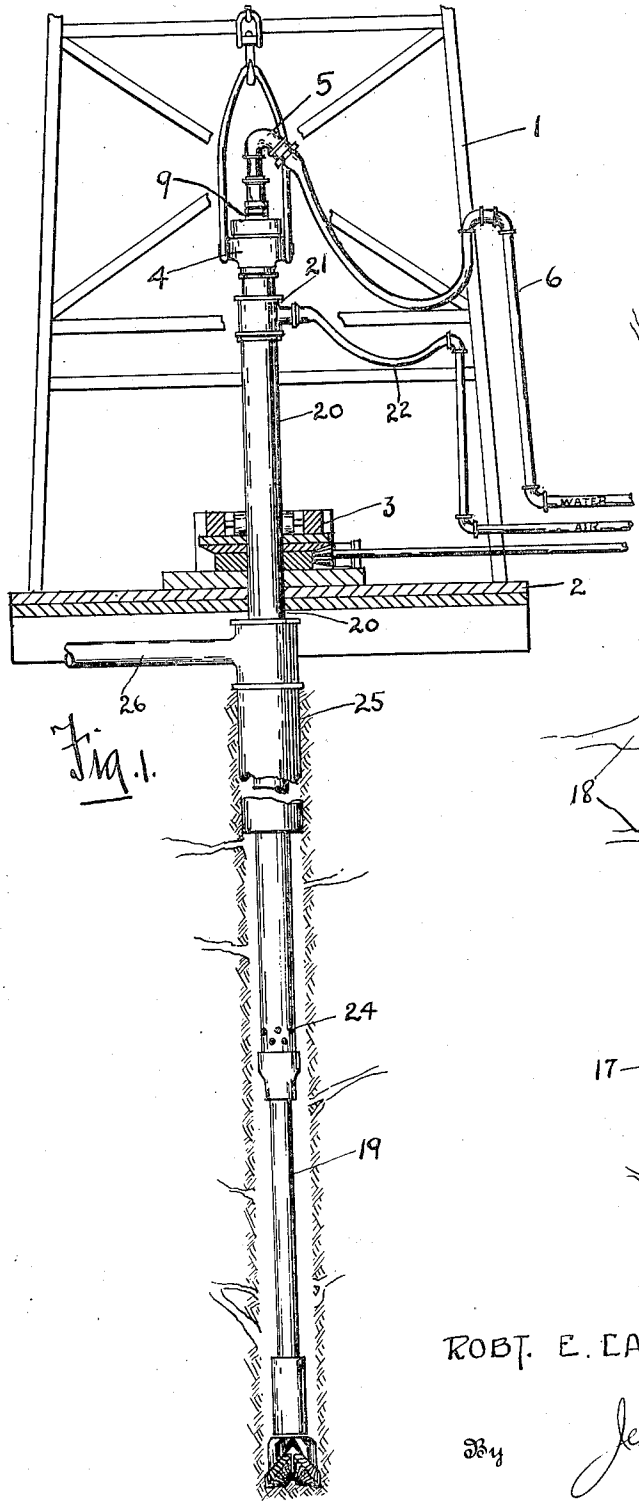


Fig. 1.

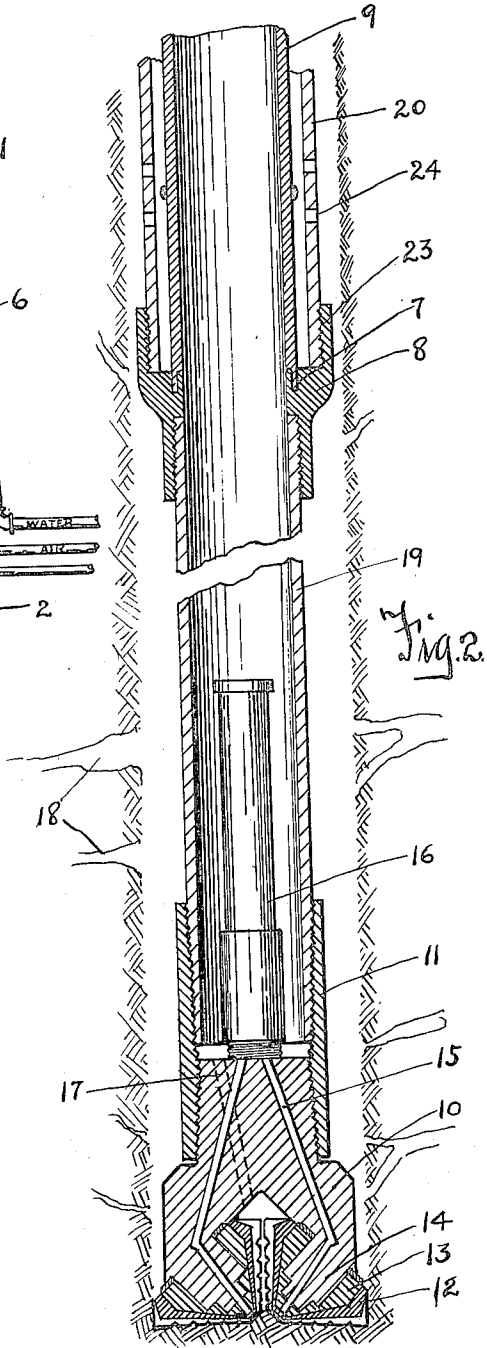


Fig. 2.

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UNITED STATES PATENT OFFICE.

ROBERT E. CARMICHAEL, OF DAMON, TEXAS, ASSIGNOR OF ONE-HALF TO GEORGE HAMMAN, OF HOUSTON, TEXAS.

SAMPLE-TAKING DEVICE.

1,324,304. Specification of Letters Patent. Patented Dec. 9, 1919.

Application filed August 4, 1919. Serial No. 315,211.

To all whom it may concern:

Be it known that I, ROBERT E. CARMICHAEL, a citizen of the United States, residing at Damon, Brazoria county, Texas, have invented a certain new and useful Improvement in Sample-Taking Devices, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in sample taking devices for use in preserving the log of the well in drilling operations in earth, rock, or other similar formations. It is especially adapted for drilling wells for oil or sulfur, wherein it is necessary to preserve an accurate record or log of the material through which the well shaft is sunk.

My invention has particular application in the formation found in the Gulf Coast field of Texas and neighboring States, although it is of value in all well drilling. In the Gulf Coast region the rock strata, in which my device finds particular application, are filled with crevices or caverns in the material through which the cuttings from the drill bit may be washed away laterally into the strata and thus lost. In the ordinary manner of drilling, a rotary drill is placed at the end of a hollow rotating drill stem through which water is pumped under pressure, this water finding passage through the bit and returning upwardly around the drill stem and between the same and the walls of the same to the surface, carrying with it a portion of the cuttings in suspension. Where the strata are filled with crevices, however, the pressure of the pump is sufficient to cause a large amount of detritus cut away by the bit to be carried away laterally into the crevices, and in some cases the log of the well is completely lost, it being impossible to obtain any record of the material being drilled.

An object of my invention is to provide a device which will assure the driller a return to the surface of the entire mass of material cut away by the bit so that an accurate log of the well may be thus obtained.

Another object is to provide a device of the kind described which will be more economical and efficient than any of the types of apparatus now in use. Other objects and advantages will appear in the description in the specification which follows and these objects will also be pointed out with more particularity in the claims appended hereto.

Referring now more particularly to the drawings, wherein like characters of reference are applied to like parts in both views, Figure 1 is a side elevation partly in section showing my device in operative position in a well; Fig. 2 is a central longitudinal section of the lower end of my device showing certain details thereof.

In the carrying out of my invention I contemplate employing the ordinary type of rotary drill, but to assure the proper return of the cuttings of the bit to the surface where they may be preserved, I contemplate employing a type of air lift pump which is adapted to cause an upward passage of the material outside of the drill stem of such strength and velocity as to lift with it in suspension all of the material cut away by the drill. In the drawings I have shown my apparatus in connection with an ordinary derrick 1, having the usual double platform 2, upon which is situated the rotary, shown more or less diagrammatically at 3. The drill stem 9 is suspended by the derrick by the usual apparatus, there being a supporting swivel 4, having at its upper end a goose-neck 5, connected by means of a pipe 6, to a pump, and through which the supply of flushing water is furnished for the drilling operation. The drill stem, supported rotatably within the swivel 4, extends downwardly within the well to a point spaced some distance above the bit where the lower end is seated within an annular slot 7 in a compound coupling 8. The lower end of this coupling is threaded interiorly for attachment to pipe 19 which forms a continuation of the drill stem and is attached at its lower end to the drill bit 10, by means of a drill collar 11. The drill 10 is the common type of rock drill now in use in rotary drilling operations and has two rolling cone-shaped cutters 12 journaled on bearings 13 which are mounted upon a spindle or post 14 integral with the head of the bit. These cutters are lubricated in operation by a lubricant conducted downwardly to the cutters through oil ducts 15 leading from a lubricant container 16 threaded onto the upper end of the bit.

The flushing water which is pumped into the hollow drill stem through the pipe 6 is

discharged downwardly under pressure through the hollow drill stem and through passages 17 in the head of the bit against the cutters 12, thereby serving to wash the cutters free of the material and carry the material cut away by the drill upwardly in suspension outside of the drill stem.

These cuttings carried in suspension in the water would ordinarily flow outwardly through crevices in the strata, such as are shown diagrammatically at 18, and be thus lost. I find, however, that by pumping air under pressure downwardly, so that it will be discharged in the well some distance from the surface of the ground, that the upward passage of the air bubbles will cause such a rapid upward current in the well shaft as to carry with it all of the water pumped down through the drill stem, and the cuttings carried in suspension thereby. In order to accomplish this, I have placed outside of the drill stem 9 a larger pipe 20 concentric therewith, through which air may be conducted downwardly outside of the drill stem. This pipe is suspended at its upper end in the swivel block 4 and has at 21 a second swivel connection by means of which air may be pumped inwardly thereto from a pipe 22 leading to an air pump, not shown. This outer pipe is secured at its lower end within the coupling 8, being threaded therein at 23. At a point slightly above its lower end it is perforated at 24 to allow escape of air pumped in through the pipe 22. At the upper end of the well I have fixed an outer casing 25 which extends downwardly for some distance in the well and provides a lining for the upper portion thereof. The upper end of this casing is closed so as to form a connection with the pipe 20 which will be more or less fluid tight, but which will also allow free rotation of the pipe 20 therein. The escaping current of water and air carrying with it the cuttings from the drill will then flow upwardly inside of this casing 25 and discharge laterally into any receptacle by means of pipe 26.

In the operation of my device the pipe 20 will be rotated by means of the rotary 3 and because of its connection at the coupling 8, with the lower end of the drill stem 19, will cause the rotation of the bit 10. The inner drill stem 9, which is also supported in the swivel 4, will be seated also within the coupling so that it may be raised and lowered from its seat 7 as desired. This provision is made so that, as the drill is advanced, the inner section 9 may be raised for coupling with a new section of the drill stem as desired, it being necessary that it be elevated in advance for this purpose, because of the outer pipe 20 which also has to be extended from time to time by the attachment of an extra length of pipe. The rotation of the drill stem and the drill bit 10 will cause the cutters 12 to roll upon the bottom of the hole and to disintegrate the material which will be carried away by flushing water pumped downwardly through the pipe 6 and the drill stems 9 and 19 to the drill. Air pumped downwardly through the pipe 22 and the outer pipe 20 will find an exit through the openings 24 into the well and will bubble up outside thereof to the surface acting in the manner of an air lift pump. The raising of the water by the air will cause such a strong upward current of the fluid in the well that it will carry with it the flushing water and the cuttings suspended therein which will be discharged at the upper end of the well through the pipe 26 for inspection and preservation by the driller.

This type of apparatus makes it possible to insure a complete discharge of all the cuttings from the well at very great depths. It is occasionally necessary in deep well drilling to extend the well down as far as a mile in depth. Devices have previously been constructed for preserving a record of the log of the well in which a core cut by a core bit may be discharged upwardly to the surface, but this type of apparatus will not operate under the conditions ordinarily existing in depths of over 750 to 1000 feet. Beyond that depth the amount of pressure capable of being exerted by ordinary apparatus used in well drilling is not sufficient to further discharge the core. In the device herein disclosed, however, it has been found that the cuttings will be entirely discharged at the greatest depths to which well drilling is extended. It has also been found that much less pump pressure, both on the water and on the air, is necessary in this type of sample taking device from any now in ordinary use.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. In a device of the character described, a rotating drill stem, a drill thereon, a concentric outer pipe connected with said drill stem at a point spaced above the drill, said outer pipe being perforated toward the lower end thereof, means to rotate said pipes and means to discharge fluid downwardly through both pipes.

2. In a device of the character described, a rotating drill stem, a drill thereon, means to discharge water downwardly through said drill stem, and a pipe outside said drill stem adapted to discharge air or other fluid within the well at a point spaced upwardly from the drill.

3. In a device of the character described, a rotary drill stem seated removably at its lower end in a coupling member, a second section of drill stem connected in the lower end of the said coupling, a drill connected

with said lower section, an outer pipe concentric with said first mentioned drill stem and secured in said coupling, said outer pipe having perforations therein adjacent said coupling and means to force fluid downwardly through said pipes while said pipes are rotating.

4. In a device of the character described, a rotary drill stem, a drill thereon, means to discharge flushing water downwardly through said drill stem and drill and a separate pipe outside said drill stem to discharge fluid downwardly within the well and outside said stem.

In testimony whereof, I hereunto affix my signature this the 30 day of July, A. D., 1919.

ROBERT E. CARMICHAEL.