R. R. BRAY.

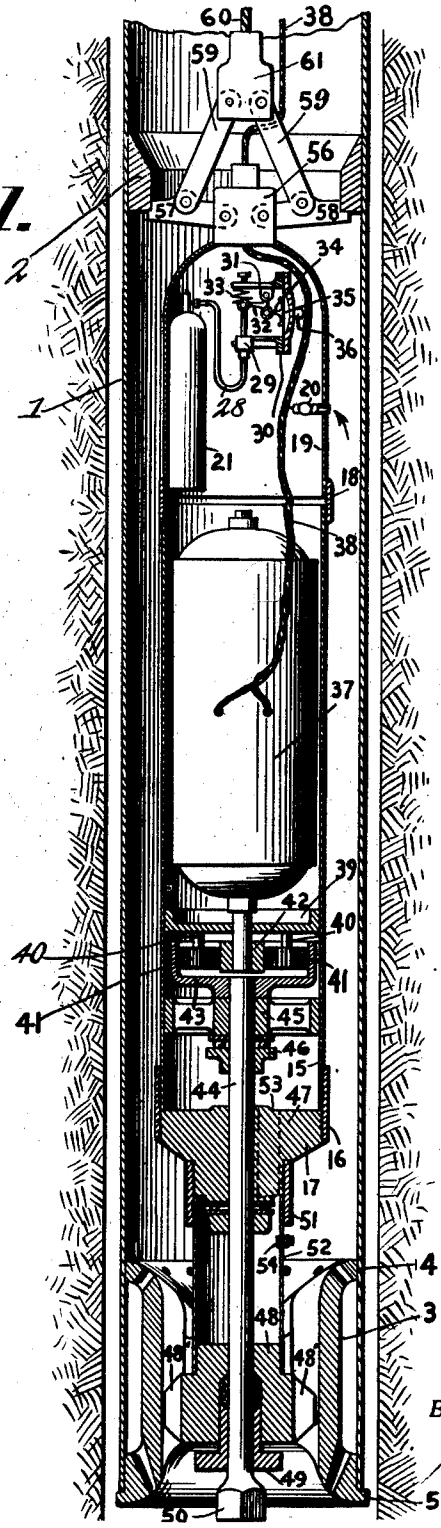
ELECTRIC WELL DRILL.

APPLICATION FILED JAN. 22, 1918.

1,307,847.

Patented June 24, 1919.

Fig. 1.



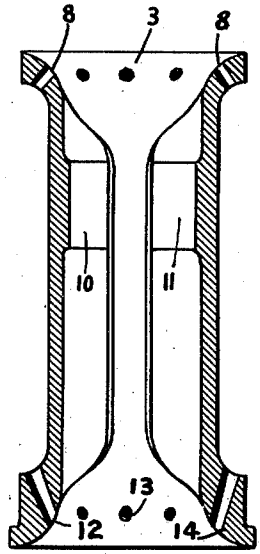


Fig. 2.

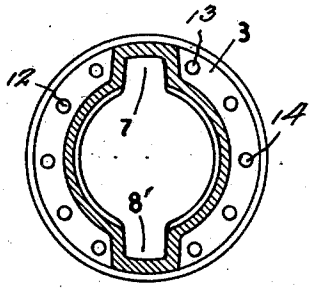


Fig. 3.

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ELECTRIC WELL-DRILL.

1,307,847. Specification of Letters Patent. Patented June 24, 1919.

Application filed January 22, 1918. Serial No. 213,166.

To all whom it may concern:

Be it known that I, ROBERT R. BRAY, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles, State of California, have invented a new and useful Electric Well-Drill, of which the following is a specification in such full and clear terms as will enable those skilled in the art to construct and use the same.

This invention relates to a rotary well drill of the electric type in which means is provided for preventing the water and grit in the drillings from working into the bearing for the shaft of the drill.

Another object of the invention is to provide means whereby a sufficient weight may be placed upon the drilling apparatus to cause the drill to cut the rock.

Another object of the invention is to provide means whereby the water used in the drilling operations may be distributed around the drill.

Another object of the invention is to provide means for holding the drill in a rigid position with respect to the drill casing during the drilling operation in order to prevent the hole from running off to one side or the other side as the case may be.

Another object of the invention is to provide means for the removal of the drill bits from the hole without removing the casing and without the necessity of drawing up the long line of drill rods thereby cutting down the time of operation over the present system to about one half.

Other objects of the invention will be seen as the description proceeds.

An embodiment of the invention is shown in the drawings in which the same reference numeral is applied to the same portion throughout, but I am aware that there may be modifications thereof.

Figure 1 is a vertical sectional view of the complete drilling apparatus.

Fig. 2 is a vertical sectional view of the bushing used at the lower end of the drill casing for holding the drill in a fixed position with respect to the casing, and

Fig. 3 is a horizontal sectional view of the bushing shown in Fig. 2.

The numeral 1 indicates the bell casing, 2 a ring which is secured to the casing therein in any suitable manner.

The ring 2 has its lower surface in a plane at right angles to the axis of the casing, while its upper surface is beveled as indicated for the purpose of permitting the drilling tools to pass down without being stopped thereby. At the bottom of the casing there is a bushing 3, said bushing is forced into the casing and it has portions 4 and 5 in contact with the casing for holding it in a fixed position.

This bushing is provided with two slots 7 and 8′, or as many more as may be deemed desirable to prevent the turning of the cylinder carrying the motor without turning the drill.

The bushing 3 is flared outwardly at top and bottom as indicated to allow the drill body to pass thereinto and to be withdrawn therefrom without being likely to be engaged thereby during such operations, and it is provided with a broad rib 10, 11 which snugly fits the head carrying the packing gland so that any water that is used must pass through the openings 8 at the top of the bushing 3, and out at the bottom through the openings 12, 13 and 14.

The drilling apparatus proper consists of a tube 15 which is screwed into the coupling 16, which coupling is screwed on a reducing plug 17.

At the upper end of the casing 15 there is a coupling 18 which is screwed on the upper end of the pipe 15 and on the lower end of the cap 19. The cap 19 has an outwardly opening safety valve 20, and carried within the same is a suitable tank, as for example 21, of a gas under a high pressure, said gas tank being connected by means of a pipe 28 with the regulating valve 29. The regulating valve 29 is supported by an arm 30 above which is an arm 31 inside the cap 19.

Carried by the arm 31 is a bell crank lever 32 which is maintained in the position illustrated by means of a spring 33. A post 34 bears upon the diaphragm 35 and transmits power to the bell crank 32 from the diaphragm, and the arrangement is such that the pressure of the water outside the head 19 is admitted to the diaphragm by the pipe 36, and the regulating valve is so set as to maintain within the casing and head the same pressure of air as is maintained on the outside by the column of water bearing upon the casing. The pressure maintained within the drill casing may be greater than the outside pressure if desired, so that there is no leakage of gas or lubricants; the leakage

will be from within to without thereby insuring the exclusion of water or grit from the bearings and the motor.

Within the pipe 15 there is a motor 37, which motor has suitable bearings for its shaft and is driven through the current supplied thereto by means of a cable 38 which extends through the cap and to the surface. Below the motor there is a transverse partition 39 which partition forms a support for the two stud shafts 40 which support the two gears 41. The two gears 41 are each in mesh with a gear 42 on the end of the motor shaft, and they drive the drill shaft gear 43. The two gears 41 are in mesh with an internal gear 43 on the upper end of the drill shaft 44. The drill shaft has a bearing 45 at its upper end, a step bearing 46 immediately below the bearing 45, and a larger bearing 47 below the step bearing. Below the bearing 47 is another bearing 48 forming a packing gland closed by means of the bushing 49.

A suitable packing is inserted around the shaft 44 in the bearing 48 and above the bushing 49 to prevent the gritty water from coming into contact with the working bearings.

The lower end of the shaft 44 has a head 50 which may have any suitable means for connecting to a drill bit or other piece of drilling apparatus.

A coupling 51 is secured on the plug or bearing 47, and said coupling is connected by means of the pipe 52 with the bearing 48 which is also secured in the pipe 52.

In order that the gas within the cylinder may have access to the space below the plug 47, there is an opening 53 through said plug to said space, and in order that the pipe 52 may be filled with lubricant it is provided with a plug 54 in its side.

In order to supply the necessary weight to the drill, the cap 19 has a head 56, to which head two arms 57, 58 are pivotally connected, and said arms are in turn pivotally connected with two links 59, and with a head 61.

The arms 57, 58 are long enough so that when the weight of the head 61 comes upon them they will stand out far enough to pass below the ring 2 so that as soon as the drill is let down into position the well casing can be raised and then let down slowly upon the two arms 57, 58 with such weight as may be deemed desirable to effect the cutting operations.

In order to hold the drill apparatus in a fixed position with respect to the casing and prevent it from whirling around instead of the drill, the bearing 48 is provided with lugs 48′ on each side thereof which fit into the grooves 7 and 8′ of the bushing 3 and thereby cause the drill to rotate.

The entire apparatus is hoisted out of the well by means of the cable 60 after the weight on the arms 57, 58 has been removed by lifting the casing, although of course the number of arms will be determined entirely by the weight of the motor and drill, a heavy drill having a larger number than a small drill.

It will be clear that any type of drilling head may be secured to the head 50 which will pass through the bushing 3 and make a sufficiently large hole to run the drill casing into.

In operation the casing is set up as nearly vertical as it is possible to set it up, and the drill is then placed within the casing and started. As the drill descends in operating the necessary water to prevent the drill body from burning up is supplied to the casing and escapes from the well outside the casing. At the same time as the pressure on the casing inclosing the motor and reduction gear increases, the cylinder 21, through the equalizing valve, will allow a sufficient quantity of gas to escape therefrom to prevent water from having access to the cylinder or bearings contained therein, and as soon as the drill is removed from the well the excess pressure within the cylinder blows off through the valve 20 which opens outwardly under excess pressure.

The water besides cooling the bit and the motor is for the purpose of the removal of the broken stone from the well and any sandy formations. The circulating water must be mixed with clay in order that the return of water forced down by the pressure pumps will mud up the side walls of the hole thereby preventing caving of the well.

Having thus described my invention what I claim as new and desire to secure by Letters Patent of the United States is as follows, express reservation being made of permissible modifications.

1. A well drill comprising a casing, a motor therein, a drill shaft having journaled bearings in said casing, a reduction gear between said shaft and motor and means to maintain a gas under pressure within said casing at the same pressure as the water pressure outside the casing at different levels.

2. A well drill comprising a casing, a drill shaft therein, bearings therefor, a motor within the casing for driving the drill shaft, and means to maintain said casing under a pressure of gas within the same, the same as the hydrostatic pressure outside the casing at different levels to prevent the water from having access to the bearings and motor.

3. A well drill comprising a casing, a drill shaft therein, bearings within the casing for the drill shaft, a motor within the casing adapted to drive the drill shaft, means to maintain said casing under a pressure the same as the hydrostatic pressure on the outside of said casing at different levels, a well

casing, means to carry a portion of the weight of the well casing upon the drill, and a bushing for holding the drill in a fixed position to enable the drill to be rotated.

4. A well drilling apparatus comprising a casing, a drill shaft therein, bearings for said drill shaft in the casing, a motor within the casing, and having a reduction gear to drive the drill shaft, a high pressure gas receptacle within the casing, means to discharge gas, under pressure, from said receptacle to maintain the casing under the same pressure as the pressure outside the drilling apparatus, a well casing having means to carry a portion of the weight thereof upon said drilling apparatus, and a bushing secured to the well casing for holding the drilling apparatus in a fixed position to rotate the drill shaft, said bushing having its upper and lower ends conveniently shaped to direct the drilling apparatus thereinto upon the insertion and removal of the drilling apparatus.

In testimony whereof I have hereunto set my hand this 10th day of January A. D. 1918.

ROBERT R. BRAY.