Sept. 1, 1925. 1,551,783

A. S. BAPTIE

ROTARY DRILLING TOOL FOR CABLE OPERATION

Filed Jan. 11, 1923

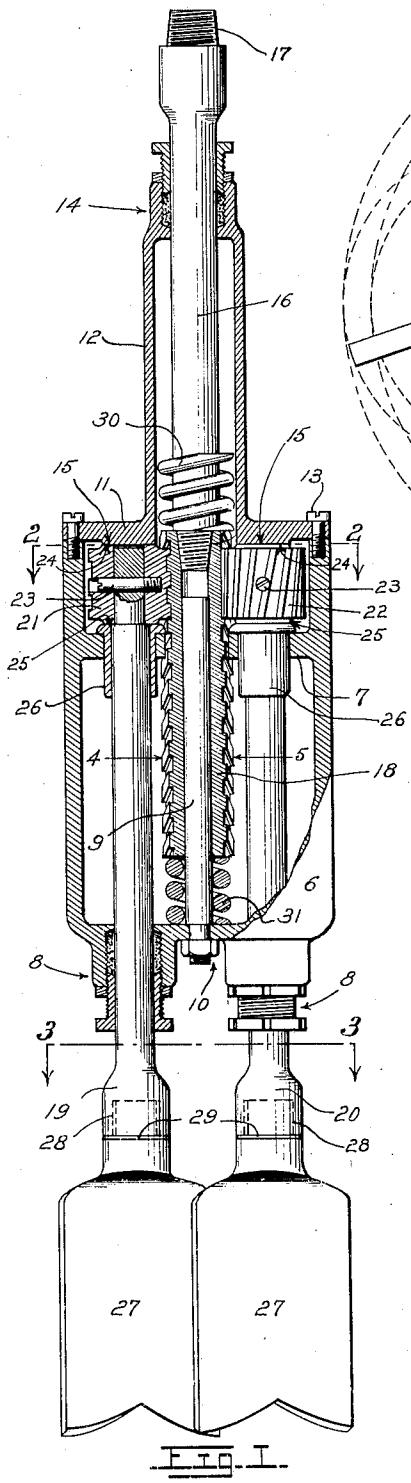


Fig. 1.

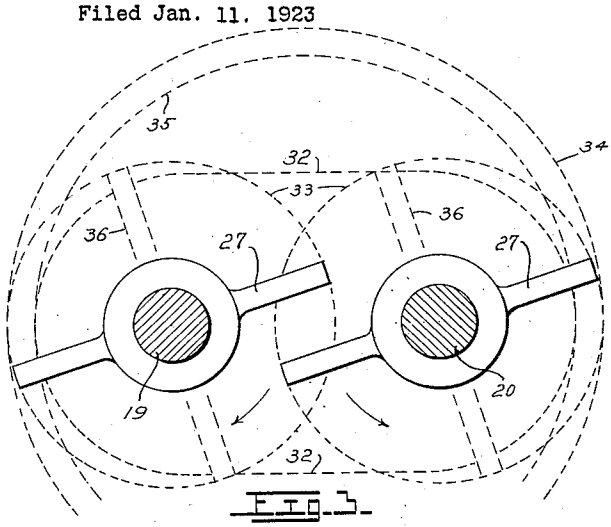


Fig. 3.

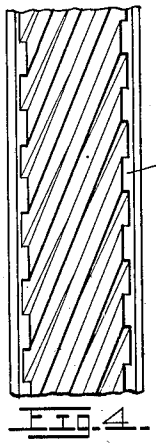


Fig. 4.

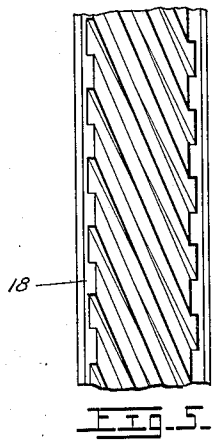


Fig. 5.

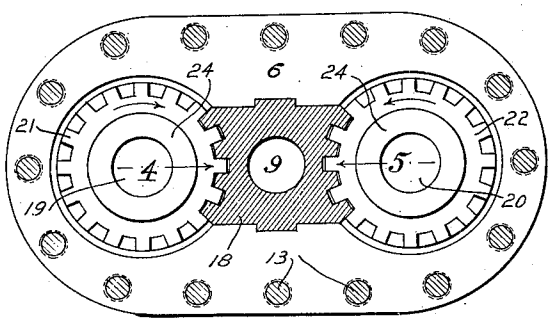


Fig. 2.

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UNITED STATES PATENT OFFICE.

ALBERT S. BAPTIE, OF LONG BEACH, CALIFORNIA.

ROTARY DRILLING TOOL FOR CABLE OPERATION.

Application filed January 11, 1923. Serial No. 612,119.

To all whom it may concern:

Be it known that I, ALBERT S. BAPTIE, a citizen of the United States, residing at Long Beach, in the county of Los Angeles and State of California, have invented a new and useful Rotary Drilling Tool for Cable Operation, of which the following is a specification.

My invention relates to deep well drilling tools, and particularly to rotary tools of this kind that are adapted for cable operation. My objects in the invention are, first, to provide practical means for rotating cable suspended drilling bits by the effects of gravity; second, to afford facilities for combining churning and rotary drilling action in a single device; and, third, to produce a mechanism for this purpose that is adapted for use in connection with well casings of ordinary dimensions, and which is capable of under-cutting such casings if desired.

Other objects and advantages of my construction will appear hereinafter, and while I show herewith and will describe a preferred embodiment, I desire to be understood that I do not limit myself to such embodiment, since various changes and adaptations may be made therein without departing from the spirit of my invention as hereinafter claimed.

My objects are attained by means of the mechanism illustrated in the accompanying drawing, in which—

Figure 1 is an elevational view with certain parts broken away and shown in central section.

Figure 2 is an enlarged sectional plan view taken on the line 2—2 of Fig. 1, looking in the direction indicated by the arrowheads.

Figure 3 is an enlarged sectional plan view taken on the line 3—3 of Fig. 1, illustrating diagrammatically the separate and combined drilling areas of the respective bits employed.

Figures 4 and 5 are fragmentary elevations of opposite sides of the actuating bar of the mechanism, as viewed in the direction indicated by arrows 4 and 5 respectively.

Similar numerals refer to similar parts throughout the several views.

In the form of my invention selected for illustrative purposes the housing 6 is roughly elliptical in section, with the major axis somewhat smaller than the bore of the well casing in which it is to operate. It is interiorly provided with a horizontal perforate partition 7, near the top, and there are a pair of stuffing boxes 8 at the bottom. There is also provided an interior axial guide rod 9, affixed to the housing in some suitable manner at the bottom, as by the reduced threaded end and nut 10.

A strong cover plate 11, with an integral upstanding axial tube portion 12, is conveniently attached to the housing as by the cap screws 13. There is a stuffing box 14 at the upper end of tube portion 12, and the lower face of the cover plate is provided with surfaced bosses 15 to serve as thrust abutments for certain of the working parts to be described later.

Within tube 12, and stuffing box 14, the working stem 16 is adapted to reciprocate. At its upper end this stem carries the usual taper screw pin 17, by means of which the whole mechanism of my invention may be suspended from a drilling stem or cable in the manner common to the art. At its lower end stem 16 screw-engages the actuating bar 18, through which rotary motion is imparted to the drill stems 19 and 20 in a manner to be explained presently.

Actuating bar 18 has an axial bore and is adapted to reciprocate on guide rod 9. It has opposed concave cylindrically arcuate surfaces 4 and 5, parallel with its axis, and these surfaces are helically grooved in such a manner that in effect they constitute multi-threaded partial nuts adapted to engage the skew, or helically cut, pinions 21 and 22 respectively. These respective pairs of engaged helices are made right and left, so that longitudinal movement of the actuating bar imparts rotary motion to the pinions in opposite directions.

Pinions 21 and 22 are attached in some suitable manner, as by the screw pins 23, to the upper ends of drill stems 19 and 20 respectively, so as to be able to impart rotary motion to the latter as well as to support their weight. In order to accomplish the latter, as well as to resist the upward thrust that results from the drilling operations, the pinions are provided with central finished bosses 24 and 25 perpendicular to their axes. The upper of these re-act against bosses 15 on the under surface of the cover

plate, and the lower rest upon the upper end faces of the journal bushings 26 which are supported by partition 7.

Drill stems 19 and 20 are adapted to rotate in bushings 26 and stuffing boxes 8. At their lower ends they have means for attaching the rotary bits 27. The latter commonly are of the fish tail type as shown and, when the width of these is greater than the distance between the axes of the drill stems, means must be provided for attaching them in proper angular relation to afford mutual clearance during rotation. The angular means of adjustment is not a part of the present invention, and any suitable means may be employed. As illustrated the attachments comprise straight shank screw and socket connections, as indicated by dotted lines at 28, and interposed shims 29 of proper thickness to allow the bit stocks to seat on their respective stems in the desired angular position.

To overcome excessive operating shocks when the reciprocating parts reach the end of their travel, a heavy helical spring 30 surrounding stem 16 is provided at the top, and a similar spring 31, surrounding guide rod 9, is used at the bottom.

In operation the device is suitably suspended from a drilling cable, and reciprocated vertically thereby, in the ordinary manner employed in churn drilling. In the upper position of the cable the operating stem is extended and the actuating bar is at the top of its stroke and mostly within tube portion 12. This disposition of the cooperating parts is maintained until, on the downward throw of the cable, the bits strike the bottom of the drill hole, which arrests their downward motion. The actuating bar, impelled by its momentum and that of whatever drill rods and other parts are used above it, continues its downward movement, and in so doing causes bits 27 to rotate oppositely as shown by the arrows of rotation in Figs. 2 and 3. This rotary movement of the bits may continue until the several parts are in the relative positions shown in Fig. 1. The succeeding upward movement of the cable reverses the rotation of the bits, and allows the operating stem and actuating bar to reach the upper end of their travel, while the whole device is being elevated to repeat the operations just described.

The drilling effect resulting from the use of my device is a combination of rotary and churn drill action. It is a chisel-edge impact with a very strong rotary tendency accompanied by actual rotation where the nature of the ground permits. The backlash and twist of the suspending cable insure that a constantly changing point of attack is presented to the cutting edges of the bits.

Referring to Fig. 3, the dotted line 32 represents the outline of the housing in plan; circles 33 represent the rotary drilling areas of their respective bits; circle 34 is the area covered by the combined rotary and churn drill action of the device considered as a whole; and circle 35 indicates the minimum bore of the well casing in which the mechanism can be operated. It will be noted that the diameter of circle 34, corresponding to the size of the hole that is being drilled, is considerably larger than the diameter of circle 35 representing the bore of the well casing. Consequently the device may be used to under-cut the casing when desired.

To withdraw the mechanism from the drill hole, the bits must be brought into some such position as indicated by the dotted lines 36 of Fig. 3, so as to be contained wholly within the periphery of circle 35.

I desire to point out that, if considered desirable, ratchet devices may be introduced between pinions 21 and 22 and their respective bits. This would enable the actuating bar to be elevated without turning the bits backward.

I also wish to say that the housing preferably should be partially oil-filled to insure continuous lubrication of the interior working parts.

Having thus fully described my invention in a manner that will readily be understood by those familiar with this art, I claim;

1. In combination with a cable adapted to reciprocate vertically; a drilling tool suspended from said cable comprising a pair of rotary bits having parallel axes spaced less than the cutting diameters of the bits; said tool being adapted for causing its bits to rotate by reciprocating the cable and, by twisting the cable during reciprocation, to change its angular position in the drill hole for presenting new drilling areas to the bits and causing the tool to drill a round hole of larger diameter than the bits.

2. In combination with a cable adapted to reciprocate vertically; a drilling tool suspended from said cable comprising a pair of bits adapted for rotation in opposite directions having parallel axes spaced less than the cutting diameters of the bits; said tool being adapted for causing its bits to rotate by reciprocating the cable and, by twisting the cable during reciprocation, to change its angular position in the drill hole for presenting new drilling areas to the bits and causing the tool to drill a round hole of larger diameter than the bits.

3. In combination with a cable adapted to reciprocate vertically; a drilling tool suspended from said cable comprising a pair of bits adapted for rotation in opposite directions by gravitational descent of cooperating parts; said bits having parallel axes spaced less than their cutting diameters; said tool being adapted for causing its bits

to rotate by reciprocating the cable and, by twisting the cable during reciprocation, to change its angular position in the drill hole for presenting new drilling areas to the bits and causing the tool to drill a round hole of larger diameter than the bits.

4. In combination with a cable adapted to reciprocate vertically; a drilling tool suspended from said cable comprising a pair of flat bits adapted for rotation in opposite directions by gravitational descent of cooperating parts; said bits having parallel axes spaced less than their cutting diameters and means for preventing mutual interference of their cutting blades; said tool being adapted for causing its bits to rotate by reciprocating the cable and, by twisting the cable during reciprocation, to change its angular position in the drill hole for presenting new drilling areas to the bits and causing the tool to drill a round hole of larger diameter than the bits.

5. In combination with a cable adapted to reciprocate vertically; a drilling tool suspended from said cable comprising a pair of flat bits adapted for rotation in opposite directions by gravitational descent of cooperating parts; said bits having parallel axes spaced less than their cutting diameters and being gear connected in a manner to prevent mutual interference of the cutting blades and to allow of parallel disposition of said blades; said tool being adapted for causing its bits to rotate by reciprocating the cable and, by twisting the cable during reciprocation, to change its angular position in the drill hole for presenting new drilling areas to the bits and causing the tool to drill a round hole of larger diameter than the bits.

ALBERT S. BAPTIE..