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A. BOYNTON

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AUTOMATICALLY ROTATABLE BIT FOR CABLE WELL TOOLS

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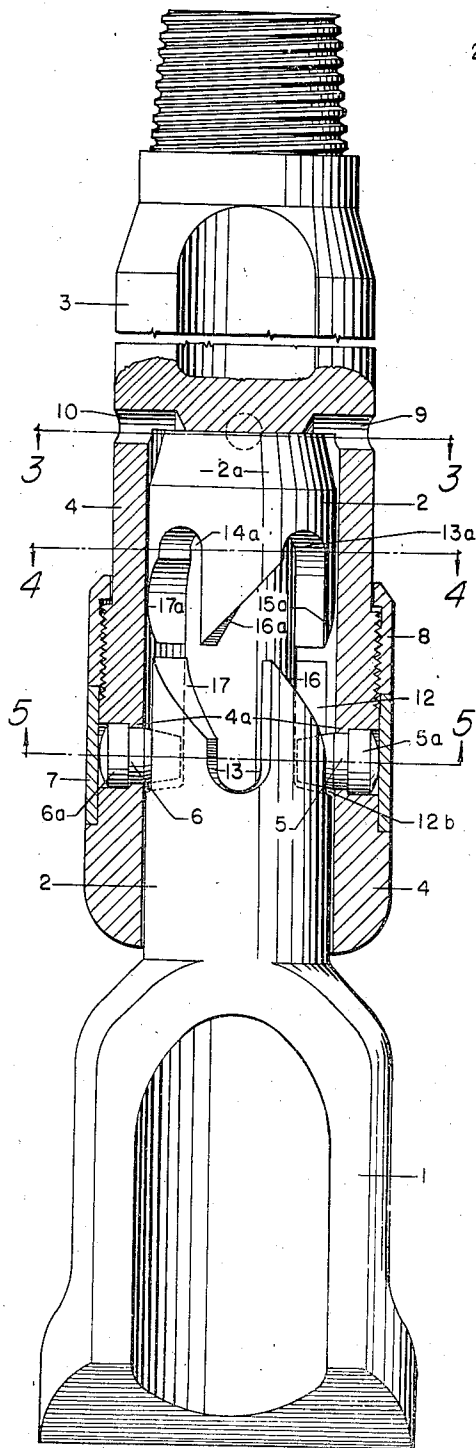


Fig. 1.

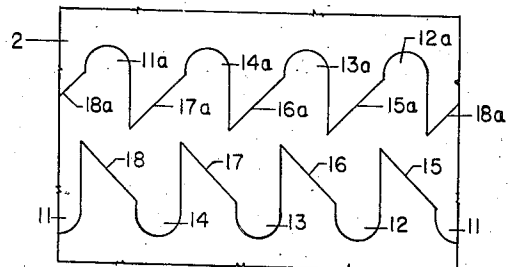


Fig. 2.

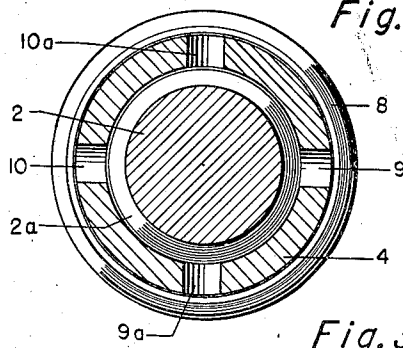


Fig. 3.

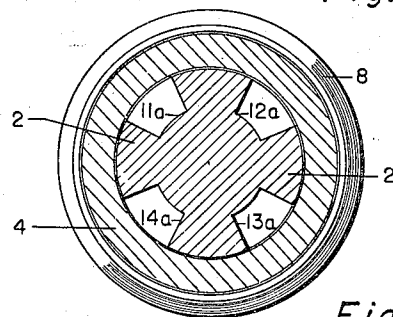


Fig. 4.

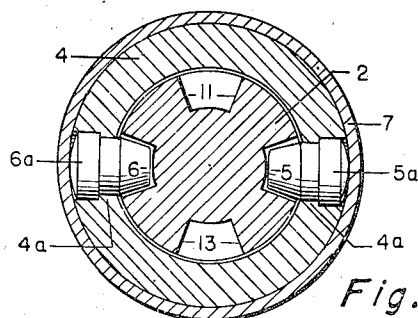


Fig. 5.

ALEXANDER BOYNTON, INVENTOR,

BY *John A. Robertson*

ATTORNEY.

UNITED STATES PATENT OFFICE

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AUTOMATICALLY ROTATABLE BIT FOR
CABLE WELL TOOLS

Alexander Boynton, San Antonio, Tex.; Sida S.
Martin executrix of said Alexander Boynton,
deceased

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6 Claims. (Cl. 255—27.1)

My invention relates to bits employed in drilling wells with cable tools.

The principal object is to provide an improved automatically rotatable bit for cable well drilling which will be automatically rotated at the bottom of the well instead of the former practice of manually rotating the cable above the well to accomplish rotation of the bit.

Another object is to employ similar means for rotating other types of drills such as are employed in mines, shafts, and surface excavations made by pneumatic drills and the like.

Other objects are to accomplish the operation of a diversity of tools, instruments, and equipment, including the firing of guns, operating of signals, making and breaking connections and the opening and closing of valves in wells, shafts, mines, fortifications, and other places where other types of remote control thereof would be difficult or otherwise impossible.

In carrying out the invention, I employ two members slidably connected together, one of said members having a series of pockets and inclined slopes adapted to cause rotation of said members relative to each other as the pins in one contact said slopes and pockets of the other during longitudinal movement of one of said members relative to the other.

In the drawing:

Fig. 1 is mainly an outside view of the preferred embodiment, a portion of the shell being in section to expose the actuating mechanism.

Fig. 2 shows the pin pockets and actuating slopes rolled out diagrammatically to present a complete view thereof.

Fig. 3 is a cross section on the line 3—3, Fig. 1.

Fig. 4 is a cross section on the line 4—4, Fig. 1.

Fig. 5 is a cross section on the line 5—5, Fig. 1.

Referring to Fig. 1, it will be noted that cable tools as usually heretofore constructed and operated had to be turned by twisting the cable above the well, or the haphazard means of trusting that the bit would not strike too often in the same position was relied upon in the hope that a round hole would be drilled. If the bit happened to strike too often in the same position, the hole would be flat. This necessitated the sometimes difficult operation of drilling the flat portion over again to make it round. My bit rotates a predetermined part of a revolution at each stroke.

The bit 1 has an axial shaft-like upward extension or male member 2 which is telescopically received within the operating shell or female member 4 of the shank 3. This shank may have connection with the usual jars, weights and well-known cable means for raising and lowering the bit, the latter being much lighter than the shank and jars.

The shell female member 4 has circumferentially spaced lateral openings within which the

pins 5 and 6 are rotatable. The pin heads 5a and 6a have slight clearance between the shoulders 4a and the pin retainer sleeve 7 which is secured in place as shown by the securing ring 8 having threaded engagement about the operating shell 4.

Two series of confronting pin pockets and actuating guide slopes are provided around the extension 2 of the bit 1 by omitting or removing a peripheral portion of said extension between the upper and lower series of pin pockets and guide slopes. The lower pin pockets 11, 12, 13, and 14 and the lower guide slopes 15, 16, 17, and 18 face upward, while the upper pin pockets 11a, 12a, 13a, and 14a, as well as the upper guide slopes 15a, 16a, 17a, and 18a, face downward.

The opposed pin pockets and guide slopes are rotatably offset with relation to each other, this offset being partial or a semi-step rotation so that the slope 18a is opposite the pocket 11; the slope 15a is opposite the pocket 12; the slope 16a is opposite the pocket 13; the slope 17a is opposite the pocket 14; the slope 18 is opposite the pocket 11a; the slope 15 is opposite the pocket 12a; the slope 16 is opposite the pocket 13a; and the slope 17 is opposite the pocket 14a. The sloping surfaces may be any desired distance apart vertically, provided this distance be such that the actuating pins 5 and 6 may pass freely between them, as will appear when the operation is discussed.

The pins 5 and 6 extend inward to approximate the inner extremity of the slopes and pockets and are adapted to be received freely within said pockets.

It will be observed that on the downward stroke of the tools when the greatest opposite turning thrust is imparted to the members 1 and 4 by the pins and slopes, the shank 3 will be urged clockwise. This is in order to tighten the threads between the shank 3 and the unshown jars which ordinarily will have right-hand threaded connection with the upper end of the shank.

While the employment of the lower pin pockets 11 to 14 and the upper pin pockets 11a to 14a are advised it is apparent that the guide slopes may be steepened to eliminate the pockets.

Operation, Fig. 1

The bit being upon the bottom of the well as shown in Fig. 1, the pin 5 is in the pocket 12 and the pin 6 is in the pocket 14. When the shank 3 is raised, the pin 5 will contact the upper guide slope 15a and will be guided thereby into the upper pocket 12a; while, in the same operation, the other pin 6 will contact the upper guide slope 17a and will be guided into the upper pocket 14a.

When the shank 3 is lowered in drilling, the pin 5 will contact the lower guide slope 15 and be guided thereby into the lower pocket 11; while, in the same operation, the other pin 6 will

contact the lower guide slope 17 and be guided thereby into the lower pocket 13. Similar movements take place each time the shank 3 is raised and lowered; thereby causing continued rotation of the bit 1.

It is apparent that either the bit 1 or the shank 3 is free to turn in the well bore, but since the shank and jars, the latter not shown, are many times heavier than the bit, it is apparent that the bit will be turned instead of the said heavier members.

Likewise, it is apparent that the pins are free to slide upon the guide slopes or they may rotate thereon and in the shell 4. In either event, the pins have the characteristics of roller bearings. The heads 5a and 6a of the pins, being round at their outer extremities, have the effect of ball bearings upon the retainer sleeve 7.

During the upward and downward movements of the shank 3, drilling sludge will be alternately drawn into and forced out of the shell 4 through the lateral openings 9, 9a, 10, and 10a.

Attention is directed to the fact that the pins do not absorb the drilling thrust of the shank 3 and the unshown jars above because on the downward stroke the shank engages the extension 2 as appears in Fig. 1; while the clearance 12b is still under the pins. On the upstroke of the tools, the pins do engage completely within the upper pockets when only the bit is to be lifted.

It will be noted that the guide slopes incline at an angle which will actuate the pins without causing them to absorb enough of the vertical thrust to damage them.

The bevel 2a at the upper end of the extension 2 provides clearance with the shell 4 in order that the hammering engagement between the extension 2 and the shank 3 as the bit strikes bottom of the well, will not mushroom the extension 2 and thereby prevent free movement of the shell 4 relative thereto. It will be seen that the shank 3 has a similarly beveled extension within the upper extremity of the shell 4 in order that the circulation ports 9, 9a, 10, and 10a always will be completely open.

While the pin pockets and actuating guide slopes in Fig. 1 are arranged to provide four different positions of the bit, it is apparent that the same may be arranged for a greater or lesser number of such positions. Likewise, the spacing of the pockets around the extension 2 may be odd or even, as may be desired.

Manifestly in Fig. 1 the pins may be secured within the male member and the guide slopes and pin pockets may be transferred into the female member. The construction which would result from such transposition is considered the full equivalent of the construction shown.

Obviously, many minor changes in construction and arrangement of parts, as well as the substitution of mechanical equivalents for parts shown, may be made within the scope and purpose of the stated objects and appended claims, and I reserve the right to make such changes, arrangements, and substitutions.

I claim:

1. In an automatically rotatable bit for cable well drilling: a bit; an upward extension thereof, said extension having a beveled upper end and a plurality of upper guide slopes and upper pin pockets, and an equal number of lower guide slopes and lower pin pockets, said upper and lower slopes and pockets being in rotatably offset

relation to each other; a shank having an internal beveled extension engageable with said beveled upper end; a shell on the lower end of said shank, said shell being slidable over said upward extension and having one or more circulation ports proximate the upper end thereof; one or more actuating pins rotatably secured in said shell, said pins being successively engageable within said pockets and upon said guide slopes to cause said bit to rotate relative to said shank as said shank is alternately raised and lowered; and a pin retainer sleeve secured upon said shell.

2. In an automatically rotatable bit for cable well drilling: a bit; an upward extension thereon, said extension having a peripheral portion omitted providing an upper and a lower circular series of spaced guide slopes and pin pockets, said upper and lower slopes and pockets alternating and being in axially rotated offset relation to each other; a shank adapted to be connected upon other members employed in cable drilling; a shell on said shank, said shell being slidable over said extension; and one or more actuating pins secured rotatably in said shell and extending into said omitted portion, the inner ends of said pins being adapted to become engaged upon said slopes and within said pockets to produce relative rotation between said upward extension and said shank as said last two members alternately contact each other and move apart, said parting movement being limited by said pins and lower pockets.

3. In an automatically rotatable bit for cable well drilling: a shank; a shell thereon; a bit; an extension thereon telescopically engageable within said shell and having two series of alternating guide slopes and pin pockets in partially offset or semi-stepped relation to each other; and one or more actuating pins in said shell, said pins extending between said slopes and pockets and being adapted to engage alternately upon each to produce relative rotation between said bit and shank when the same are reciprocated.

4. In an automatically rotatable bit for cable well drilling: a male member and a female member having limited telescopic relation, one of said members having two series of opposed and spaced guide slopes and pin pockets, said series being in semi-offset relation to each other; and one or more pins in the other of said members, said pins extending into an opening between said series, said limited telescopic relation being produced by said spacing in combination with said pins.

5. In an automatically rotatable bit for cable well drilling: a member having two series of spaced and semi-offset guide slopes and pin pockets; and another member adapted to have telescopic relation with said first member and having one or more actuating pins engageable upon said slopes and within said pockets to produce relative rotation between said members as the same are reciprocated.

6. In an automatically rotatable bit for cable well drilling: a bit member; a shank member in telescopic relation therewith; one or more pins in one of said members; two series of semi-offset guide slopes in the other of said members; and means for securing said pins in engageable relation with said slopes so that said bit and shank will be rotated relative to each other continuously in one direction when the same are reciprocated.

ALEXANDER BOYNTON.