C. MOORE.

ROTARY TOOL FOR DEEP WELLS.

APPLICATION FILED SEPT. 15, 1913.

1,110,639.

Patented Sept. 15, 1914.

2 SHEETS—SHEET 1.

Fig. 1.

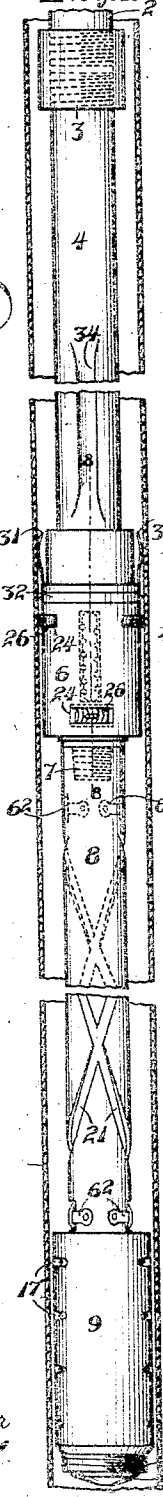


Fig. 2.

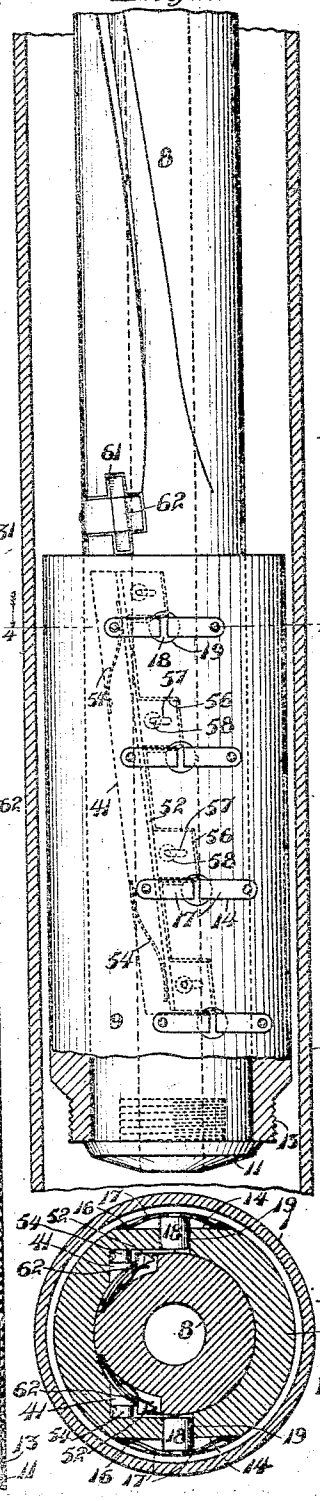


Fig. 3.

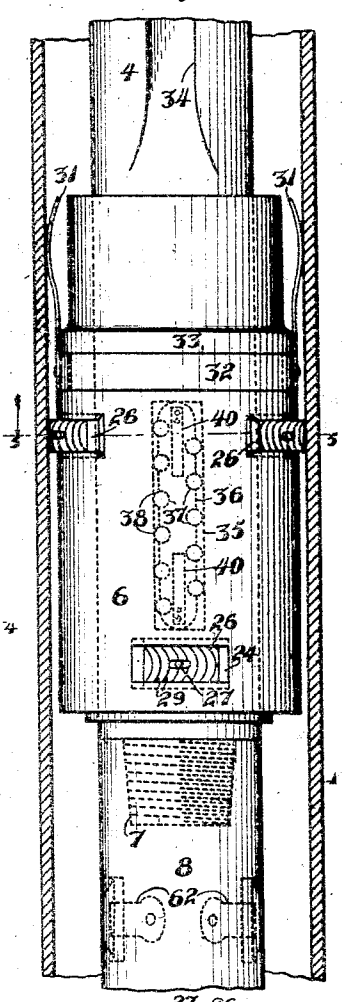


Fig. 6.

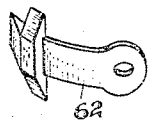


Fig. 7.

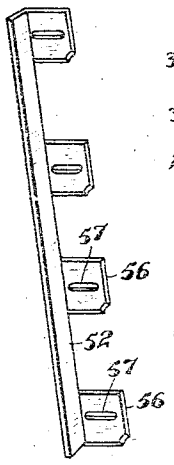


Fig. 5.

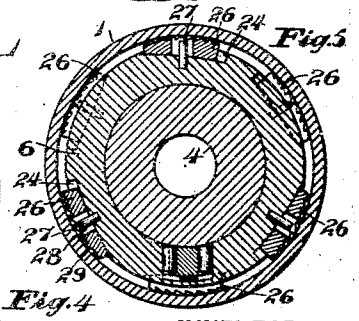


Fig. 4.

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2 SHEETS—SHEET 2.

Fig. 8.

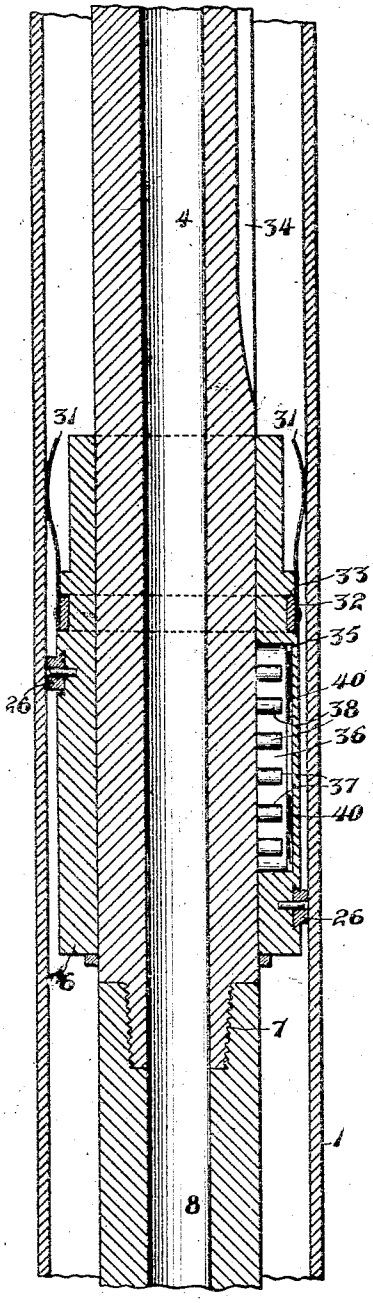


Fig. 9.

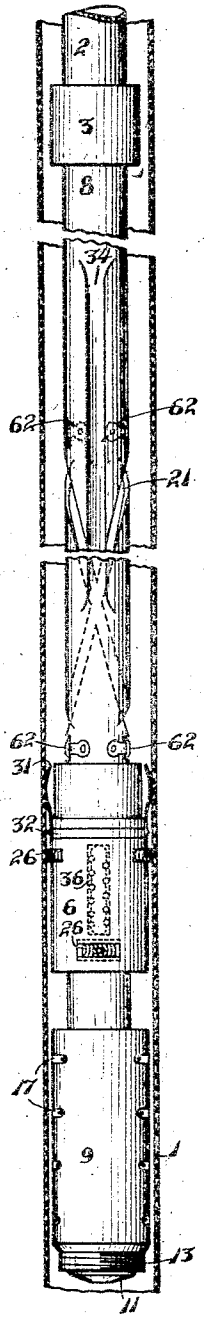


Fig. 10.

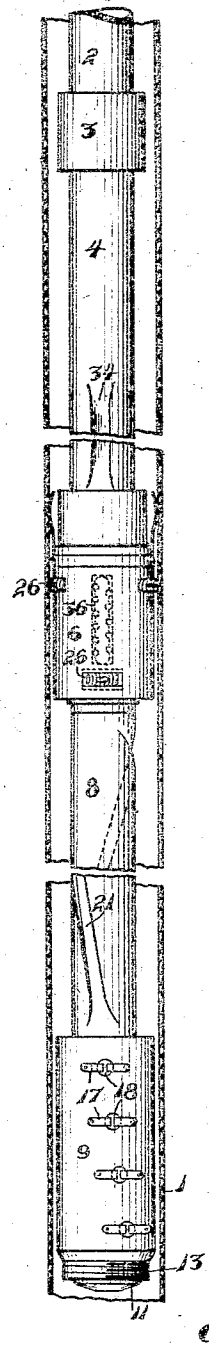
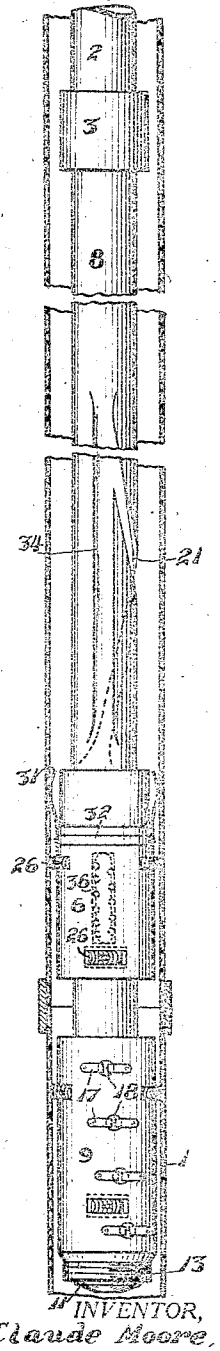


Fig. 11.



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ROTARY TOOL FOR DEEP WELLS.

1,110,639. Specification of Letters Patent. Patented Sept. 15, 1914.

Application filed September 15, 1913. Serial No. 789,818.

To all whom it may concern:

Be it known that I, CLAUDE MOORE, a citizen of the United States, residing at Taft, in the county of Kern and State of California, have invented new and useful Improvements in Rotary Tools for Deep Wells, of which the following is a specification.

The object of the present invention is to provide a tool to be used in deep wells, such as oil wells, to unscrew or tighten up one or more pipes, or a collar, from or to a string of pipes, or, in a well of open formation, to turn a pipe, or a string of pipes, to the right or left, to loosen it up when it has become stuck or frozen.

In the accompanying drawing, Figure 1 is a broken vertical section of a well casing, showing my improved tool therein; Fig. 2 is an enlarged similar view of a portion of the same, showing more particularly in side elevation a rotary driver; Fig. 3 is a similar view showing more particularly in side elevation a stationary guide; Figs. 4 and 5 are horizontal sections on the lines respectively 4—4 of Fig. 2, and 5—5 of Fig. 3; Figs. 6 and 7 are detail views of parts of the apparatus; Fig. 8 is an enlarged detailed vertical section on the line 8—8 of Fig. 1; Figs. 9, 10 and 11 are views similar to Fig. 1 of modified forms of the invention.

Referring to the drawing, 1 indicates a well casing in the part of which below that shown in the drawing may be a string of pipes, or the like, to which my improved tool is to be applied. In the upper part of said casing is a tube 2, which is connected by a collar 3 to a tube 4, which can slide through a guide 6, and is connected, as shown at 7, to a tubular stem 8, the lower part of which can slide in a rotary driver 9. Into the lower end of said tubular stem, as shown more particularly in Fig. 2, is screwed a tubular screw 11, having a head sufficiently wide to extend beyond the circumference of the stem 9, and form a support for the rotary driver. The lower end of said driver is reduced in diameter, and is threaded externally, as shown at 13, so that said lower end can, by the rotary movement of the driver, be screwed into the upper end of a pipe or collar, and thus said driver can be used to unscrew said pipe or collar from, or screw it to, another pipe or string of pipes.

In the outer surface of the driver are two upwardly extending series of recesses 14 in each of which recesses are secured by screws 16 springs 17, (Fig. 4) which press against the outer end of a pin 18, slidable through a hole 19 formed in the wall of the driver, and the inner end of which pin is adapted to be pressed by said springs inwardly beyond its inner surface. When so extending inwardly, each pin is adapted to enter one of two helical grooves 21 formed in the outer surface of the tubular stem 8. Thus, if said tubular stem be given a vertical reciprocation, and at the same time be prevented from rotating horizontally, a rotary movement will be imparted by said pins to the driver, in the manner of the well known "Yankee" drill and screw-driver.

To so prevent the stem from rotating, I provide a cylindrical guide 6, surrounding the tube 4. The outer surface of this guide is formed with upper and lower circular series of recesses 24, having undercut sides, of which recesses there are here shown three in each series. The bottoms of said recesses slope away from the outer surface of the guide, that is, one end of each recess is nearer to the axis of the cylindrical guide than the other end, and said bottoms slope in opposite directions in the two series. In each recess is employed a wedge 26, (Fig. 5) each wedge having beveled sides fitting closely against the undercut sides of the recesses. After said wedges are placed in said recesses, they are retained therein by means of pins 27 extending through slots 28 in the wedges and driven into the tubular guide. On the outer side of said wedges are formed teeth 29, which point backwardly, or toward the thick end of the wedge. As best shown in Fig. 3, the edges of these teeth are curved convexly, so that only the middle portions of the teeth engage the pipe casing. The effect of this is that, when the guide is let down with the tube 4 into the pipe casing, if the teeth come in contact with the casing, the wedges are caused to slide lengthwise into the recess. Certainly, they have no tendency to move outward while the guide is moving downward into position. Now as soon as the stem is turned in either direction, the engagement of the teeth of the wedges of one of the two series with the inner surface of the casing causes said wedges to slide in the opposite direction from that in which the stem is turned, and thus the wedges of one or the other of the two series

will be moved toward the narrow end of the recesses, and will thus be still more firmly wedged between the guide and the casing, so that the guide is held rigidly to the casing by the wedges of one of the two series. This engagement will not prevent the guide from being withdrawn upwardly, because, by such upward movement, the pressure of the casing upon the teeth of the wedges will only cause the wedges to slide toward the deep ends of the recesses.

To hold the guide temporarily in position, before it has been secured by the slight rotary movement of the stem produced by its reciprocation through the driver at the beginning of the work, there are provided spring fingers 31, the lower ends of which are connected to a band 32, rotatable in a groove 33 formed in the guide, and the upper portion of which presses against the inner surface of the casing.

For the purpose of guiding the tube 4 in the guide 6, said tube is formed on its outer surface with a vertical keyway 34, and the guide is formed on its inner surface with a groove 35, in which is a key 36, which is pressed outward by springs 40 and can enter the keyway 34. This key 36 has in each side recesses 37, in which are received horizontal rollers 38, which, as the tube reciprocates vertically in the guide, rotate in contact with the sides of the groove 36 and keyway 34. Thus the tube 4 and stem 8 can have free vertical reciprocation without being permitted any rotary movement.

The parts hitherto described operate in the following manner: The tool is let down into the well, until the threaded portion 13 of the driver engages the upper end of the part to which the tool is to be applied. The stem is then further lowered, the head of the screw 11 depending within the pipe or collar upon which the tool is being used. The spring fingers 31 hold up the guide while the stem is so descending through the driver. By the descent through the driver, by reason of the pins 18 engaging a helical groove 21 of the stem, the stem is at first given a slight rotary movement. This causes also the guide 6 to rotate slightly, causing the wedges 26 of one series to enter the narrow ends of the recesses, so that the guide is very quickly secured to the casing against further rotation. Consequently the stem is now permitted to move in a vertical direction only, since a rotary movement is prevented by the engagement of the keyway 34 with the rollers 38 of the key 36. By this vertical reciprocation of the stem, a horizontal rotation is imparted to the driver, thus enabling it to perform its function or office in releasing the pipe or collar.

Any desired form of fishing tool can be attached to the end of the tool herein described.

I have herein shown two helical grooves in the stem, so that a rotation can, by the reciprocating motion of the stem, be produced in either direction desired. To further accomplish this object I provide, adjacent to each series of pins 18, a recess 41 in the inner surface of the driver, which recess contains a controller 52, particularly shown in Fig. 7, and which is normally pressed outward by springs 54, one end of each of which is secured to the back of the recess, and which controller 52 has, extending at right angles therefrom, and close to a side of the recess, four fingers 56, each of which has therein a slot 57, through which passes a screw 58 screwed into the side last mentioned of the recess. Said fingers are, as shown in Fig. 4, adapted to be moved by said springs 54 in front of the holes 19 through which the pins 18 can move, and thus the fingers are adapted to prevent said pins extending inwardly through said holes, and to thus render said pins inoperative. In said stem, both above and below the helical grooves therein, are formed two recesses 61, in each of which can be received a spring-actuated dog 62, of which one end is secured to the stem, and the other end forms a hook arranged, when out of said recess, to engage the controller. When the stem is first passed into the driver, said pins 18 do not project inwardly past the inner surface of the driver, being prevented from doing so by the fingers of the controller. When the stem has been lowered in the driver to the proper level, it is turned in one direction or the other, and, in so turning, one or the other of the dogs engages the back of the corresponding controller, and withdraws it against the pressure of the springs 54, thereby withdrawing the corresponding fingers from in front of their holes 19, so that the pins of one series project inwardly into the driver. Thus only one series of pins will engage a helical groove in the stem, and produce rotation of the driver. It is understood that the parts are so arranged that the pins thus allowed to become operative will be the proper ones for engaging a groove 21 for turning the driver in the direction required. Also it is understood that the pins of each series are arranged in a helix of pitch the same as that of the corresponding groove.

In the form of the invention shown in Fig. 9, the tube 4 is dispensed with and the keyway 34 is made in the stem 8, the guide and the driver being placed close together, as likewise the helical groove and the keyway.

In the form of the invention shown in Fig. 10, the device is arranged to be rotated in one direction only, and only one series of pins 18, and one helical groove are used. In the latter modification, the means for

changing from one series of pins 18 to the other series is, of course, dispensed with.

In Fig. 11 is shown a modification of the invention in which the driver is also provided with the wedges 26, so that said driver can engage a lower section of a pipe, while the guide engages, as before, by means of its wedges 26, an upper section. By this means said sections, if screwed together, can be unscrewed from one another, or conversely.

I claim:—

1. An instrument for imparting a rotary motion within a well casing comprising a rotary driver, a vertically reciprocable stem extending coaxially through said driver, said stem and driver having parts coengaging each other in the reciprocating movement of the stem, one of said parts being helical, and means surrounding the stem, and arranged to engage said casing to prevent rotation of the stem while permitting its reciprocating movement.

2. An instrument for imparting a rotary motion within a well casing comprising a rotary driver, a vertically reciprocable stem extending coaxially through said driver, said stem and driver having parts coengaging each other in the reciprocating movement of the stem, one of said parts being helical, a guide, and wedges carried by the guide and arranged to engage the internal surface of the casing to prevent rotary movement of the stem.

3. An instrument for imparting a rotary motion within a well casing comprising a rotary driver, a vertically reciprocable stem extending coaxially through said driver, said stem and driver having parts co-engaging each other in the reciprocating movement of the stem, one of said parts being helical, a guide, spring fingers carried by the guide and arranged to contact with the inner surface of the casing, wedges carried by the guide and arranged to engage the internal surface of the casing to prevent rotary movement of the stem.

4. An instrument for imparting a rotary motion within a well casing comprising a rotary driver, a vertically reciprocable stem extending coaxially through said driver, said stem and driver having parts coengaging each other in the reciprocating movement of the stem one of said parts being helical, a guide, and two series of oppositely directed wedges carried by the guide and arranged to engage the internal surface of the casing to prevent rotary movement of the stem.

5. An instrument for imparting a rotary motion within a well casing comprising a rotary driver, a vertically reciprocable stem extending coaxially through said driver, said stem and driver having parts coengaging each other in the reciprocating movement of the stem, one of said parts being helical, a guide, and wedges carried by the guide and having convex teeth and arranged to engage the internal surface of the casing to prevent rotary movement of the stem.

6. An instrument for imparting a rotary motion within a well casing comprising a rotary driver, a vertically reciprocable stem extending coaxially through said driver, said stem and driver having parts coengaging each other in the reciprocating movement of the stem, one of said parts being helical, and a guide having a groove in its inner surface, a key in said groove, and springs for pressing said key out of said groove.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CLAUDE MOORE.

Witnesses:
F. M. WRIGHT,
D. B. RICHARDS.