Aug 5, 1941. G. R. WATSON 2,251,309

MULTIUSE WINCH TOOL FOR WELL DRILLS

Filed Sept. 16, 1937 2 Sheets-Sheet 1

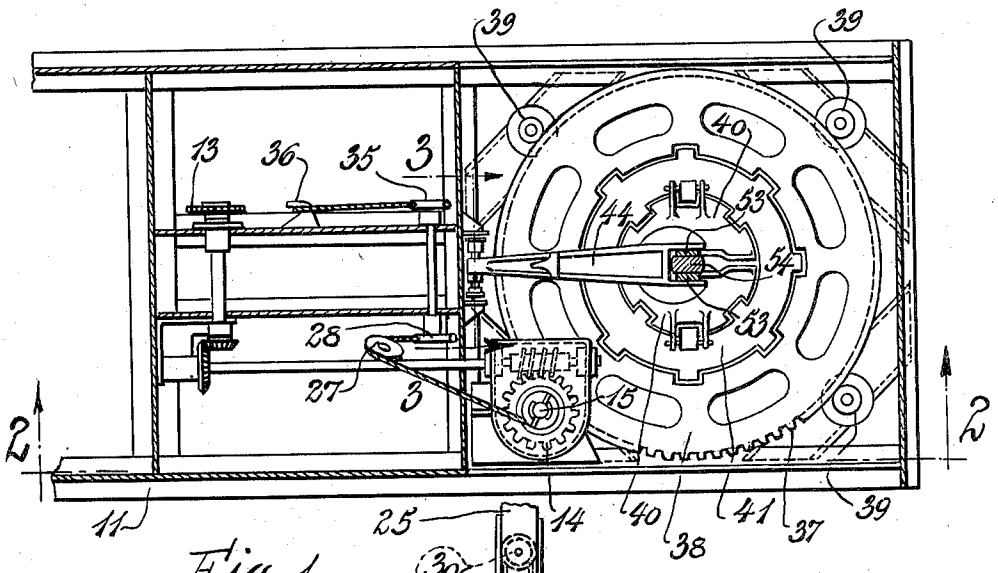


Fig. 1.

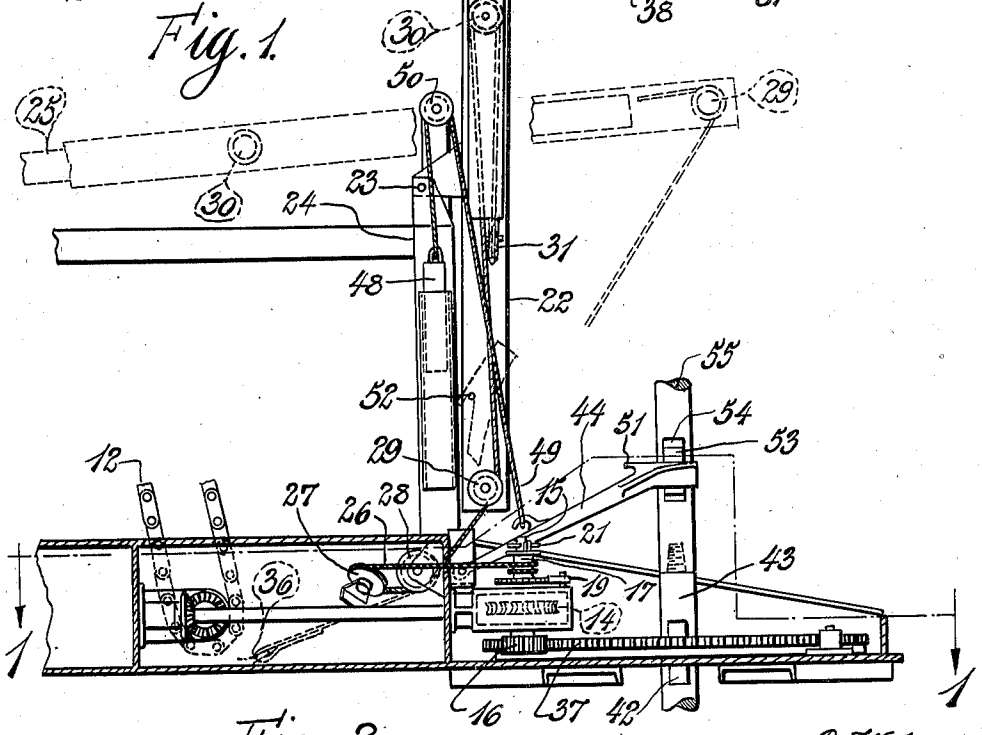


Fig 2.

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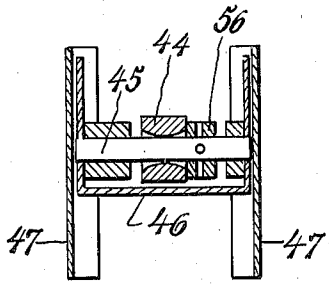


Fig. 3.

Fig. 4.

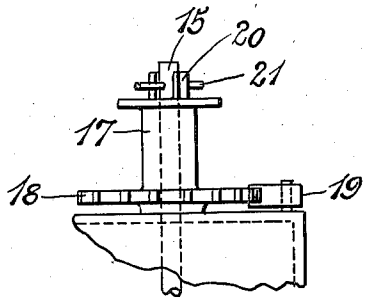


Fig. 5.

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UNITED STATES PATENT OFFICE

2,251,309

MULTIUSE WINCH TOOL FOR WELL DRILLS

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Application September 16, 1937, Serial No. 164,109

7 Claims. (Cl. 255—3)

My invention relates to new and useful improvements in multi-use winch-tool for well-drills.

The conventional well-drill, known in the art, has a main base, with a derrick projecting diagonally upward at a steep angle therefrom. This derrick should be telescoped and lowered to a nearly horizontal position for propelling. From the main winch on the frame, a cable extends up over a sheave at the upper extremity of the derrick; thence vertically downward into the well, where it supports the string of digging tools.

These tools are screw-jointed. Screwing them together and unscrewing them requires considerable force, both to brace one part of the joint and to rotate the other part, and wrenches for this purpose are very heavy, weighing from 250 to 400 pounds. The conventional wrench, not being attached to the drill, is likely to become mislaid.

Accordingly it is my principal object to devise, as a part of the drill itself, a power-operated mechanism for performing this function.

Another object of my invention is to contrive this mechanism in such a way that it can alternatively be employed to raise, lower, contract and expand the telescoping derrick.

In addition to my principal object, above stated, I have worked out a number of novel and useful details, which will be readily evident as the description progresses.

My invention consists in the novel parts and in the combination and arrangement thereof, which are defined in the appended claims, and of which one embodiment is exemplified in the accompanying drawings, which are hereinafter particularly described and explained.

Throughout the description, the same reference number is applied to the same member or to similar members.

Figure 1 is a plan view, partly in section, of a drill, which includes my invention, the view being taken along the lines 1—1 of Figure 2.

Figure 2 is a side elevation, partly in section, of the same, taken along the lines 2—2 of Figure 1.

Figure 3 is a rear elevation, partly in section, of a portion of my invention taken along the lines 3—3 of Figure 1.

Figure 4 is a reaving diagram, taken in elevation from the lower righthand corner of Figure 1, but considerably conventionalized.

Figure 5 is a side elevation, slightly enlarged, of the winch-drum of Figure 1.

Referring to Figures 1 and 2, it will be seen that 11 is the drill frame. From a power source (not shown) there extends a chain 12 to a sprocket 13. This sprocket, through intermediate gearing and shafts, actuates a gear 14 keyed to a shaft 15, which shaft also carries keyed thereto a pinion 16, and a floating winch-drum 17.

Turning now to Figures 4 and 5, we see that, integral with the drum 17, there is a ratchet wheel 18, capable of being locked by the pawl 19. Rising from the top of drum 17, there are two lugs 20, whereby the drum can be clutched to the shaft 15, by inserting a pin 21 through a hole in the shaft 15.

Reverting for a moment to Figure 2, we see that the lower element 22 of the derrick is supported by a horizontal transverse pivot 23 on a riser 24, from the frame 11. Derrick 25 slides in this lower element.

Figure 4 shows the course of rope 26 from drum 17 to be as follows: sheaves 27 and 28, mounted on frame 11; sheaves 29 and 30, mounted on the lower boom element 22; sheaves 31 and 32, mounted on the derrick 25; sheaves 33 and 34, mounted on the lower element 22; sheave 35, mounted on the frame 11; anchorage 36 on the frame 11.

When the derrick is in the horizontal traveling position shown dotted in Figure 2, a pull on the rope 26, by the winch drum 17, first rotates element 22 about pivot 23 until slightly past vertical, and then extends the derrick 25 upwardly. There it is locked by pawl 19 on ratchet 18.

Slackening on rope 26 first lowers the derrick 25. Further slackening permits the derrick to be manually pushed past vertical. Still further slackening returns the derrick to its carrying position.

Reverting now to Figures 1 and 2, we see that pinion 16 engages rack 37 on the edge of table 38. This table, having no center-pintle, is guided by this pinion and the three rollers 39.

Two clamping pieces 40 are hinged to the center section 41 of the table 38. These clamping pieces can be thrown back out of the way during drilling; or, when drilling a very large hole, the entire center section 41 can be lifted out.

The entire table rotates during the raising or lowering of the derrick, but that is of no consequence.

When it is desired to connect or disconnect two tool-sections, pin 21 (see Figures 4 and 5) is removed from shaft 15. Clamping pieces 40 are swung down to engage the constricted portion,

(called the wrench-square) 42, on the lower tool-section 43.

There is a holding wrench 44, pivoted on shaft 45, fixed in slide 46 (see Figure 3 for details). This slide is free to rise or fall in guides 47 on frame 11. The holding wrench is counterbalanced by weight 48, to which it is connected by rope 49, passing over sheave 50. When the holding wrench is not in use, its hook 51 is hooked over pin 52 in derrick element 22, as shown by the dotted lines in Figure 2. To accomplish this hooking, slide 46 is raised in guides 47.

When the holding wrench is to be used, it is unhooked and lowered into the position shown in full lines in Figure 2. Chocks 53 secure the holding wrench to the wrench-square 54 of the upper tool-section 55.

Turning now to Figure 3, we see that washer 56 is secured to shaft 45 by a pin (not shown) having the proper resistance to shear, inserted through the holes in shaft and washer. The pivotal end of holding wrench 44 bears against this washer, as the table 38 is rotated counterclockwise to tighten the tool joint. The length of the holding wrench is such that, when the joint becomes exactly tight enough the pin will shear off, thus interrupting the tightening by permitting the washer 56 to shift to the right in Figure 3. The snapping of the pin warns the operator to shut off the power in time to prevent the washer 56 from shifting far enough to the right to resume the tightening. In my reduction to practice I have so proportioned the parts that an ordinary nail, of size to correspond to the size of tool joint being tightened, can be used in place of the pin, having just the requisite resistance to shear to cause it to break when the joint attains the predetermined desirable tightness.

The table can be rotated clockwise to unscrew a joint.

The table can also be used to grip a short rotary boring tool, for the purpose of starting a hole to be finished by percussion.

Having now described and illustrated one form of my invention, I wish it to be understood that my invention is not to be limited to the specific form or arrangement of parts hereinbefore described, except insofar as such limitations are specified in the appended claims.

I claim:

1. In a drill, the combination of: a base; a derrick foot element pivoted thereon for rocking from a substantially horizontal position to a position inclined forwardly just past vertical; a derrick, extensible upwardly in said derrick foot element; a turntable on the base, said turntable having an orifice beneath the position of the top of the derrick when the latter is extended, for the downward passage of drilling tools; a rope for successively rocking the derrick foot element and extending the derrick; means on the turntable for gripping one of a pair of tools; means on the base for gripping the other of the pair of tools; shear means in one of these last two mentioned means, such shear means being of just sufficient shear strength and being located at just the proper radial distance from the center of rotation of the turntable, so as to shear, and thus interrupt tightening, as soon as the joint between the two tools has been screwed together to a predetermined desirable tightness; means for selectively actuating the rope and the turntable; means for locking the rope actuation; and means for disconnecting the rope actuation from the actuating means.

2. In a drill, the combination of: a base; a derrick foot element pivoted thereon for rocking from a substantially horizontal position to a position inclined forwardly just past vertical; a derrick, extensible upwardly in said derrick foot element; a turntable on the base; said turntable having an orifice beneath the position of the top of the derrick when the latter is extended, for the downward passage of drilling tools; a rope for successively rocking the derrick foot element and extending the derrick; means on the turntable for gripping one of a pair of tools; means on the base for gripping the other of the pair of tools; means for selectively actuating the rope and the turntable; means for locking the rope actuation; and means for disconnecting the rope actuation from the actuating means.

3. In a drill, the combination of: a base; a turntable on the base, said turntable having an orifice, for the downward passage of drilling tools; means on the turntable for gripping one of a pair of tools; means for rotating the turntable; a holding wrench, having means for gripping the other of the pair of tools; a hook on said wrench; means carried by the base for engaging said hook; a vertically movable pivot for said wrench; means for equalizing the weight of said wrench; and shear means carried by the pivot, such shear means being of just sufficient shear strength and being located at just the proper radial distance from the center of rotation of the turntable, so as to shear, and thus interrupt tightening, as soon as the joint between the two tools has been screwed together to a predetermined desirable tightness.

4. In a drill, the combination of: a base; a turntable on the base, said turntable having a central orifice for the downward passage of drilling tools; means on the turntable for gripping one of a pair of tools; means for rotating the turntable; a holding wrench, having means for gripping the other of the pair of tools; a hook on said wrench; means carried by the base for engaging said hook; and a vertically movable horizontal fulcrum for said wrench such that the wrench can be bodily lifted, while still attached to the drill, to engage the hook with the engaging-means therefor.

5. In a drill, the combination of: a base; a turntable on the base, said turntable having an orifice, for the downward passage of drilling tools; means on the turntable for gripping one of a pair of tools; means for rotating the turntable; a holding wrench, having means for gripping the other of the pair of tools; a horizontal shaft on the base, the handle of the wrench being pivoted thereon for rotation thereabout, and being horizontally slidable thereon; a fixed abutment thereon at one side of the handle pivot; and a shear abutment thereon at the other side of the handle pivot.

6. In a drill, the combination of: a base; a turntable on the base, said turntable having an orifice, for the downward passage of drilling tools; means on the turntable for gripping one of a pair of tools; means for rotating the turntable; a holding wrench, having means for gripping the other of the pair of tools; a horizontal shaft on the base, the handle of the wrench being pivoted thereon for rotation thereabout; a fixed abutment thereon at one side of the handle pivot; and a shear abutment thereon at the other side of the handle pivot.

7. In a drill, the combination of: a base; a turntable on the base, said turntable having a

central orifice for the downward passage of drilling tools; means on the turntable for gripping one of a pair of tools; means for rotating the turntable; a holding wrench, having means for gripping the other of the pair of tools; means carried by the wrench and cooperating means carried by the base, for securing the wrench out of the way of the tools; and a vertically movable horizontal fulcrum for said wrench, such that the wrench can be bodily lifted, while still attached to the drill, to engage the means carried by the wrench, and the cooperating means carried by the base, so as to secure the wrench out of the way of the tools.

GEORGE R. WATSON.