June 17, 1947. K. E. REISCHL 2,422,210

LEVELING DEVICE FOR CABLE-TOOL DRILLS

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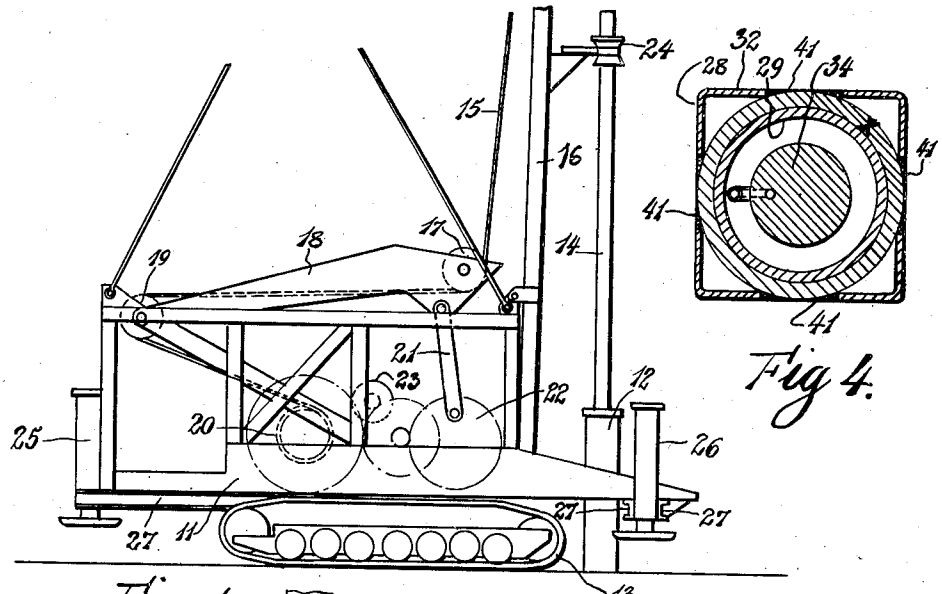


Fig. 1.

Fig 4.

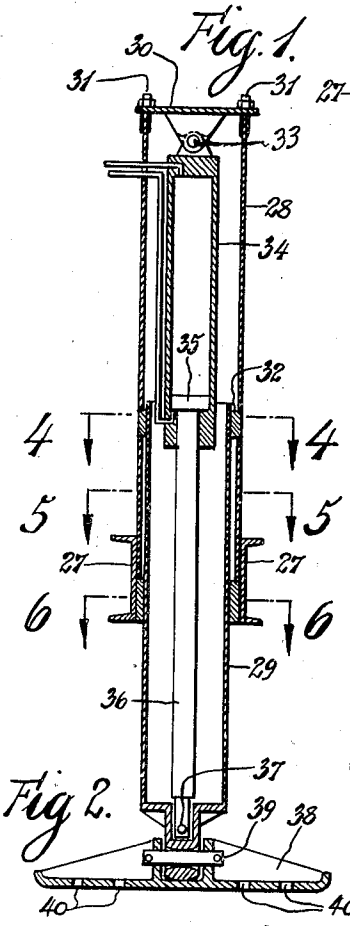


Fig 2.

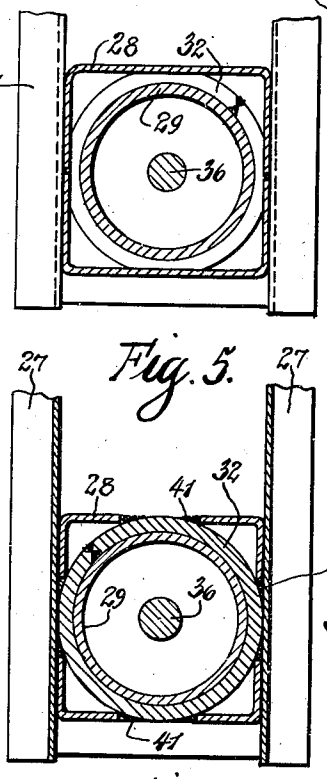


Fig. 5.

Fig 6

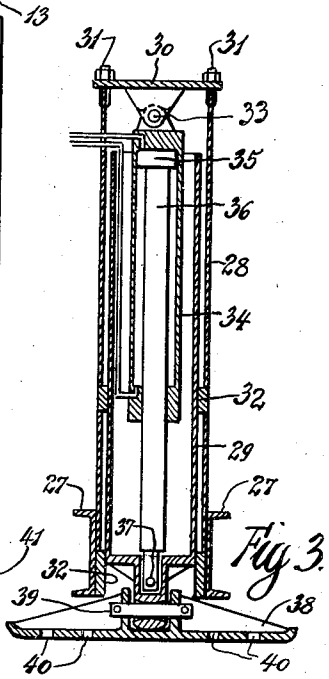


Fig 3.

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UNITED STATES PATENT OFFICE

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LEVELING DEVICE FOR CABLE-TOOL DRILLS

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Application January 1, 1945, Serial No. 570,976

4 Claims. (Cl. 254—93)

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My invention relates to new and useful improvements in leveling devices for cable-tool drills.

The cable-tool drill is a highly specialized, but well-known, form of drill for drilling vertical holes in earth or rock. The drilling too is successively hoisted by a rope and then dropped against the bottom of the hole which is being drilled.

In the past it has been customary to block up the main frame of the machine with timbers before starting drilling. Mechanical jacks have sometimes been used, in place of such cribbing.

The objects of such jacking or cribbing have been: (1) to level the machine preliminary to drilling, this being especially necessary in view of the vertical nature of the drilling operation; (2) to broaden the support base beyond the limits of the traction mechanism, as otherwise the lifting and dropping of the drilling tools at a point beyond the traction base would introduce great instability; (3) to relevel during drilling; and (4) to protect the traction mechanism, and the connections between it and the main frame, from jarring strains.

The substitution of hydraulic jacks for mechanical jacks, would serve to speed-up the leveling operation, but would introduce no further advantages along the above lines; in fact, would introduce some further complications, as follows: The control-valves of an hydraulic jack system would not stand the strains imposed on the system by the drilling operation, and any attempt at introducing lateral stability would impose undue bending strains on the jacks themselves. Furthermore it would be necessary to protect the jacks themselves from external damage.

Neither cribbing nor jacks (not even hydraulic jacks) were adapted to releveling plus centering, and furthermore provided no lateral stability. Lateral stability is essential, to keep the line which suspends the drilling tools centered over the hole.

Accordingly the invention disclosed and claimed in copending application of Herbert W. Thornburg, for leveling device for cable-tool drills, Serial No. 553,437, filed September 9, 1944, was devised by said Thornburg for the following objects: (1) to provide an hydraulic leveling system; (2) to provide a leveling system which will afford lateral stability; (3) to prevent the lateral stabilizing means from imposing bending strains on my hydraulic apparatus; (4) to protect my hydraulic apparatus from external damage; and (5) to protect my control valves from drilling shocks.

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He attained these advantages by employing, instead of hydraulic jacks, telescoping spuds, rigidly attached to the main frame of my drill, and operated by hydraulic mechanism; by locating these hydraulic mechanisms inside the spuds, which latter are wholly enclosed so as to protect these mechanisms; by so connecting these operating mechanisms to the spuds, that the spuds take all the bending strains, and the mechanisms are under merely pure compression; and finally by adding means to close the pressure conduit between each spud and its control-valve, during drilling.

In this connection, I contributed to his design one very important detail, namely a novel and useful improvement in telescoping spuds, which will now be described.

To attain the lateral stability so essential to the Thornburg invention, and to protect the hydraulic apparatus thereof from external damage, the outer (i. e., upper) section of the spud has to be rectangular in cross-section, in order that it may have adequate contact with the structure of the main frame of the machine. Preferably its rectangular cross-section should be a square, for purposes of symmetry with the inner (i. e., lower) section.

From the mass production point of view, the guides to be built into the outer section, to guide the inner section, should be readily assemblable.

For maximum sliding contact, and resistance to bending in all directions, the inner section should be cylindrical.

To protect the hydraulic apparatus within the spud from external damage, it is essential that both the outer section and the inner section of the spud be continuous, without openings.

Accordingly it is the principal object of my invention to provide a telescoping spud to the above specifications.

A more specific object is to devise an outer section in which the guides for the inner section are readily assemblable.

In addition to my principal objects, 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 side elevation of a cable-tool drill containing my invention.

Figure 2 is a vertical section of one of my spuds, expanded.

Figure 3 is a corresponding vertical section of the same spud, contracted.

Figures 4, 5, and 6, are horizontal sections of the same spud, taken respectively along the lines 4—4, 5—5, and 6—6, of Figure 2.

Referring now to Figure 1, we see that 11 is the main frame of my drilling machine, 12 is a casing, inserted in the upper end of the hole being drilled. 13 is any convenient form of ground support for the drill preferably but not necessarily of the endless tread variety.

A drilling-tool 14 is suspended in the hole by a rope 15, which passes over a crown-sheave (not shown) at the top of mast 16, thence around spudding-sheave 17, on spudding-beam 18, thence around heel-sheave 19 at the rear pivot of beam 18, and thence to a winch drum 20. The beam 18 is reciprocated by motor 23, acting through intermediate unnumbered gearing and crank 22 and pitman 21. Various methods, well-known in the art, can be used to pay-out and take-in rope 15.

Tool 14 may be steadied by tool-guide 24.

The description thus far is conventional and, as to its details, constitutes no part of my invention.

The Thornburg application, previously referred to, has added thereto front spud 25 and two rear spuds 26, to give a three-point support to the machine during drilling.

Let us now turn to Figures 2 and 3, and consider the details of each spud and its associated hydraulic operating mechanism.

First there is the telescoping spud, consisting of an outer casing 28, built rigid with channels 27 of the frame 11, and a cylindrical inner casing 29. The outer casing 28 has a cap 30, secured thereto in any convenient manner, as by bolts 31. The inner casing 29 slides on guide-rings 32, secured to the outer casing in a manner to be hereinafter described.

Pivoted to the cap 30, as at 33, is a cylinder 34, containing a piston 35, and piston rod 36. The piston rod is pivotally attached to the inner spud casing 29, as at 37.

The bottom end of the inner spud casing is universally attached to a ground-engaging shoe 38, as at 39. If desired, the shoe 38 may have suction-relieving holes 40.

The rigid attachment of the outer casing 28 to the main frame of the machine enables the spud to hold the machine against lateral movement.

The placing of the cylinder-piston assembly inside the spud, causes the spud to take all bending stresses, and places the cylinder-piston assembly under pure compression whenever the spud is under load. Also this construction protects the cylinder-piston assembly from dirt and other damage.

The outer casing 28 is seen to be an elongated box of square cross-section, open at the ends. It is built preferably of structural steel, either two channels (or plates bent to form channels), or two angles (or plates bent to form angles), or four plates, welded together at the edges. In actual practice I prefer and use two plates each bent to form a channel, but this is not essential.

Each of my rings 32 is preferably either cast

(internally machined or not), or made of bar stock bent into a circle and with its ends then welded together, in either case so as to provide a slip fit for my inner casing 29. The bar-stock variant is the one used by me and shown herein. The outer diameter of each of my rings 32 is preferably slightly greater than the inner width of my outer casing 28. Accordingly, to receive each of four equally spaced portions of the circumference of my ring, I cut a rectangular hole 41 in my outer casing. If the diameter of ring 32 is merely equal to the width of the outer casing, hole 41 need merely be large enough to weld through. Although a square cross-section for the outer casing is preferable, some other polygonal shape could be employed.

Assembly is accomplished as follows. The two or more structural pieces which constitute my outer casing 28, are loosely put together, with my rings 32 projecting into or abutting holes 41. The structural pieces are then secured tightly together in any convenient manner, and are welded together along their abutting edges. The rings 32 are welded to some or all of the three or four edges of each hole 41.

The use of a ring of larger outside diameter than the inside width of the casing, all other things being equal, permits the ring to be built thicker and stronger, without any appreciable offsetting weakening of the body proper of the outer casing.

It is to be noted that all welding is done externally, and that there is a very small number of parts and of welded joints. These features are what render my invention so easy and inexpensive to fabricate on a mass-production basis.

It is to be noted that the absence of gussets to secure the ring within the body proper of the casing, permits the extrusion of whatever mud may work its way inside the outer casing.

The outer casing, constructed as above, can then be welded, or otherwise secured, to channels 27.

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 herein described and shown.

I claim:

1. In an outer casing of a telescoping strut, which strut comprises an outer casing, and an inner casing slidable within said outer casing, and means to force the two casings apart to increase the effective length of the strut, the combination of: a hollow body of polygonal cross-section; and at least one hollow cylindrical ring within the body, with its axis lengthwise of the body; the body having, in the center of at least one side, a hole registering with the ring; the ring being welded to the body through said hole.

2. In an outer casing of a telescoping strut, which strut comprises an outer casing, and an inner casing slidable within said outer casing, and means to force the two casings apart to increase the effective length of the strut, the combination of: a hollow body of rectangular cross-section; and at least one hollow cylindrical ring within the body, the outer diameter of the ring being greater than the inner width of the body; the body having, in the center of each side a hole into which the ring projects, the edges of each such hole being welded to the ring.

3. A casing according to claim 2, further characterized by the fact that the ring is of bar stock, with its ends welded together.

4. A casing according to claim 2, further characterized by the fact that the body consists of two plates, each in the form of a channel, and with their abutting edges welded together.

KARL E. REISCHL.

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