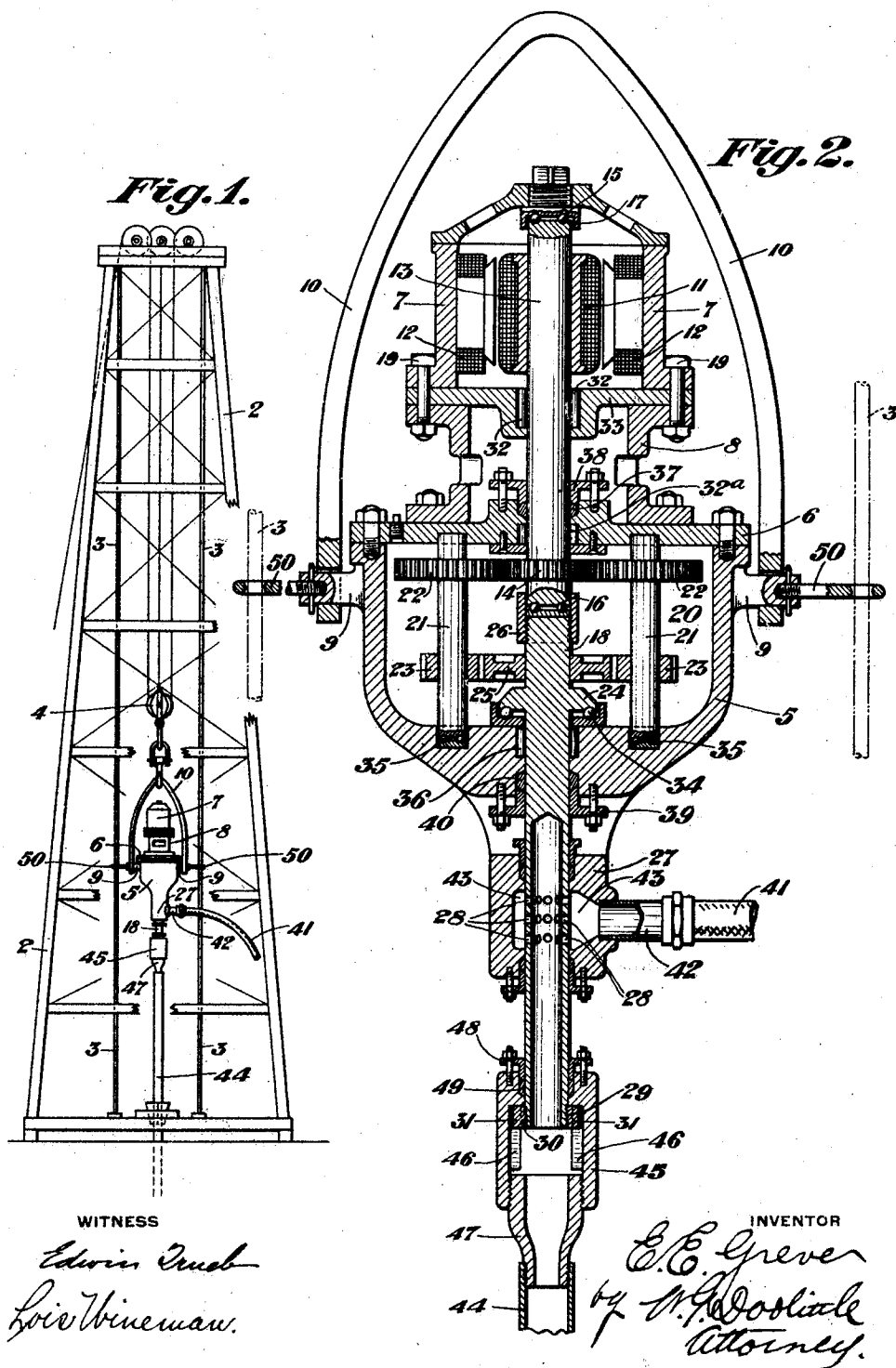


E. E. GREVE.
 ROTARY WELL DRILLING APPARATUS.
 APPLICATION FILED DEC. 22, 1919.

1,377,575.

Patented May 10, 1921.



UNITED STATES PATENT OFFICE.

EDGAR E. GREVE, OF BELLEVUE, PENNSYLVANIA.

ROTARY WELL-DRILLING APPARATUS.

1,377,575.

Specification of Letters Patent.

Patented May 10, 1921.

Application filed December 22, 1919. Serial No. 346,664.

To all whom it may concern:

Be it known that I, EDGAR E. GREVE, a citizen of the United States, residing at Bellevue, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Rotary Well-Drilling Apparatus, of which the following is a specification.

This invention relates to improvements in hydraulic rotary well drilling apparatus, and particularly to that class of apparatus described in a companion application filed by me on the 22nd day of December, 1919, Serial No. 346,663.

An object of the present invention is to provide a new and improved rotary drilling apparatus including a hydraulic swivel structure, a motor, and connections between the motor and the swivel structure, all combined in a unitary apparatus capable of being suspended and designed to support and operate a drill-stem or drill-pipe in the operation of drilling.

A further object is to provide a construction of the character stated, including an electric motor having a rotative shaft; a swivel-stem; and speed reducing means interposed between and connecting said shaft and stem.

In the accompanying drawings, which illustrate an application of my invention,

Figure 1 is a side elevational view showing a derrick and my invention in connection therewith; and

Fig. 2 is a part elevational and a part vertical sectional view of a rotary well drilling apparatus constructed in accordance with my invention.

Referring to the drawings, 2 designates a derrick of the usual and well known construction, and 3 rods or cables extending upwardly from the bottom of the derrick to the top thereof. The function of these rods or cables will be hereinafter described. The rotary well drilling structure is suspended from the top of the derrick by a rope or cable and block and tackle construction 4, of the usual and well known type, thereby permitting the structure to be raised and lowered in the same manner as is now customary to raise and lower the hydraulic swivel of a rotary well drilling apparatus.

In the embodiment of my invention as shown, I employ a small high speed electric motor, a water or hydraulic swivel, reduc-

ing gears interposed between the motor shaft and the swivel-stem, all embraced in a unitary structure. As illustrated, 5 designates the casing, housing or body of a water swivel structure, and 6 a cap plate therefor; 7 the housing or casing of an electric motor; and 8 a spacer casing interposed between the swivel and motor bodies, and connecting the same. The swivel body is provided with trunnions 9 and the entire structure is supported by a bail 10, which latter in turn is connected with the hook and rope of the rig.

As illustrated, the motor includes rotating armatures 11, fixed fields or stators 12, and a rotatable motor shaft 13. Shaft 13 projects downwardly from its casing through cap plate 6 of the swivel casing 5, and carries near its lower end a gear or pinion 14. Bearings 15 and 16 are located at the upper and lower ends of the shaft 13, the upper bearings 15 being disposed between an adjustable plug cap member 17 and the upper end of the shaft 13, and the lower bearings 16 between the lower end of the motor shaft and the upper end of a swivel-stem 18. The electric motor is designed to be supported on the upper end of the casing 8 and is connected thereto by means of bolts 19, the lower end of the spacer casing 8 in turn being connected with the cover plate 6 of the swivel housing body 5.

Swivel body 5 is formed with a chamber 20 designed to contain the upper end of the swivel-stem 18, the lower end of the motor shaft 13, and its gear 14. Within chamber 20 is also located the means for operatively connecting the swivel-stem to the motor shaft and, as shown, these means include vertically extending shafts 21, and an upper set of gears 22 and a lower set of gears 23, said gears being mounted upon the shafts 21. Swivel-stem 18 is provided with a swivel head 24 and also with a gear 25, the latter being adapted to mesh with the gears 23 carried on the shafts 21. Gear 14 carried near the lower end of motor shaft 13, is adapted to mesh with the gears 22.

It will be noted that the gear construction illustrated provides for a speed reduction between motor shaft 13 and swivel-stem 18, thereby permitting a relatively high speed electric motor to be employed for driving the swivel-stem at the desired speed.

Shaft 13 may be a solid shaft, as shown, or it may be hollow. In either case, the

shaft is preferably of the same diameter as the diameter of the swivel-stem 18, and is arranged in line with the said stem.

26 designates an extended sleeve secured to stem 18; said sleeve slightly overlaps shaft 13 and the upper end of stem 18, and functions to maintain members 13 and 18 in alinement. Swivel-stem 18, for a portion of its length, is solid, and for the remainder of its length is hollow; the said hollow portion projects downwardly through the casing 5 and the hollow extension 27 of said casing, and intermediate its ends is provided with openings 28 and its lower end with a threaded portion 29 to engage a collar 30, the latter having driving lugs 31.

In addition to the bearings 15 and 16 referred to, I preferably employ roller bearings 32 between shaft 13 and the motor housing, or member 33 thereof; roller bearing 32^a; ball bearings 34 for the swivel head 24; ball bearings 35 for shafts 21; and roller bearings 36, the latter being disposed between the swivel-stem and a wall of housing 5.

In practice, I prefer to partially fill chamber 20 with oil, thus providing an oil bath in which the swivel-head, swivel-stem, and the gearing connecting said stem and shaft 13 operate. To prevent the escape of oil from said chamber, I employ an upper packing 37 and a gland 38, and a lower gland 39 and a packing 40.

Water, mud, etc., comprising the mixture employed in the operation of drilling is introduced to the apparatus from a source of supply, not shown, by pipe 41 and connection 42, the latter being entered in an opening 43 formed in the extension 27 of casing 5. Said mixture passes from connection 42 into chamber 43 and through openings 28 into the hollow portion of the swivel-stem, and thence to the drill-stem or pipe, a section of the latter being indicated by the numeral 44.

Means for connecting the drill-stem section 44 to the lower end of the swivel-stem include a slidable coupling member 45, having vertically extending recesses 46 adapted to receive the lugs 31, and a second coupling member 47 interposed between section 44 and member 45. A gland 48 and a packing 49 are employed at the upper end of member 45.

The combined motor and swivel struc-

ture is designed to be suspended by means of the bail 10, and in order to prevent a rotative movement of the housings or casings 5 and 7, I provide two apertured arms or members 50 secured to the trunnions 9, said arms being designed to engage the rods or members 3, whereby the rotation is prevented.

What I claim is:

1. In a rotary drilling apparatus, the combination with a drill pipe, of a combined motor and water swivel structure including a motor shaft, a swivel stem, reducing gearing interposed between the shaft and stem and connecting the same, and mechanism connecting a drill pipe section and the swivel stem, said mechanism including means for permitting an independent vertical movement of the pipe section relatively to the swivel stem.

2. In a rotary drilling apparatus, the combination with a drill pipe, of a suspended combined motor and water swivel structure including a motor shaft, a swivel stem, reducing gearing interposed between the shaft and stem and connecting the same, mechanism connecting a drill pipe section and the swivel stem including means for permitting an independent vertical movement of the pipe section relatively to the swivel stem, and means for preventing a rotation of the combined motor and water swivel structure while suspended.

3. In a rotary drilling apparatus, a combined motor and water swivel structure including a motor shaft, a swivel stem, reducing gearing interposed between the shaft and stem and connecting the same, and a slidable coupling member on the stem.

4. In a rotary drilling apparatus, a combined motor and water swivel structure including a motor shaft, a swivel stem having a hollow portion, reducing gearing interposed between the shaft and the stem and connecting the same, means for introducing a drilling mixture to the hollow portion of the stem, and a slidable coupling member carried on the lower end of the stem.

In testimony whereof I affix my signature in presence of two witnesses.

EDGAR E. GREVE.

Witnesses:

J. M. GEOGHEGAN,
LOIS WINEMAN.