

May 17, 1955

J. P. CALDWELL

2,708,566

DRILLING UNIT

Filed Nov. 26, 1951

2 Sheets-Sheet 1

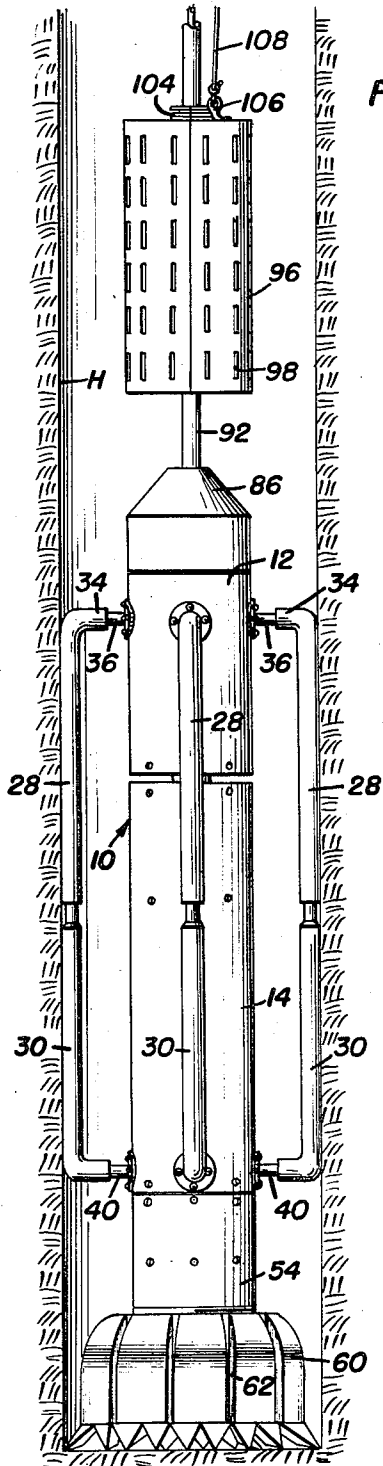


Fig. 1

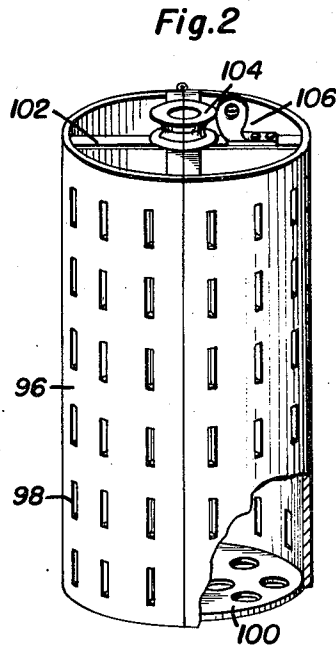


Fig. 2

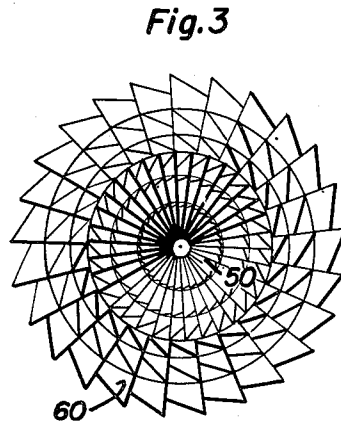


Fig. 3

Joe P. Caldwell
INVENTOR.

BY *Almonce A. O'Brien*
and Harvey B. Jackson
Attorneys

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2 Sheets-Sheet 2

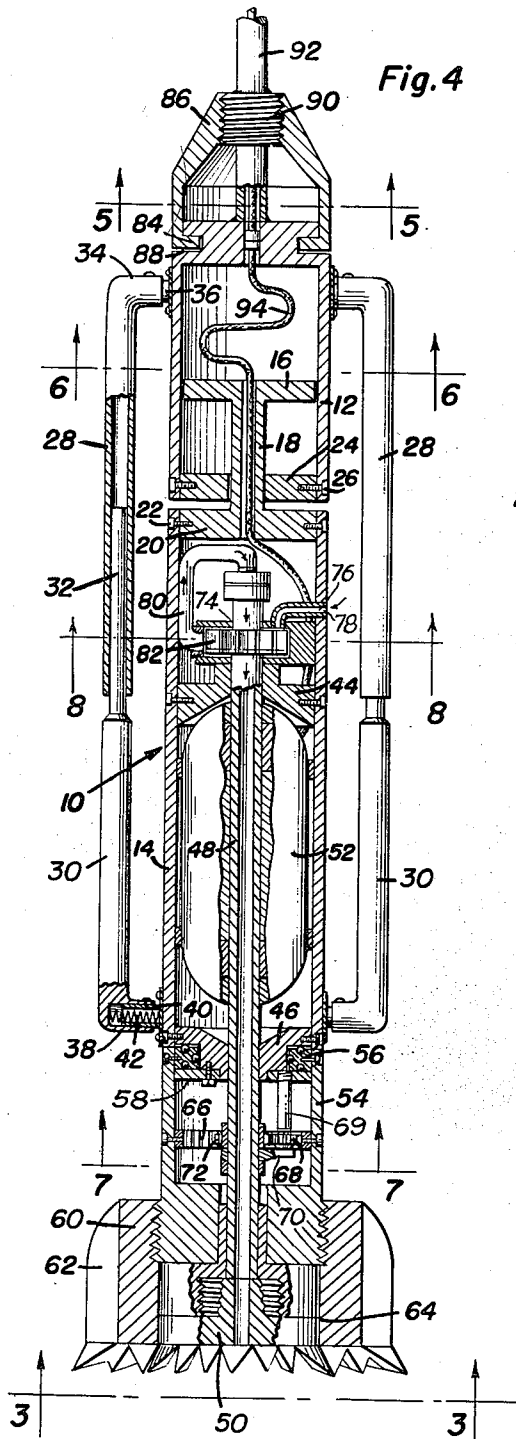


Fig. 4

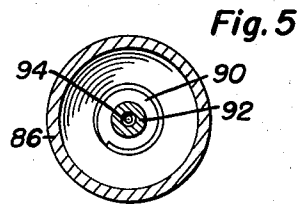


Fig. 5

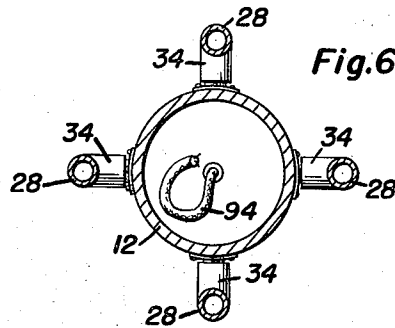


Fig. 6

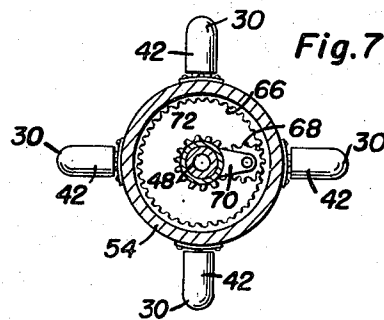


Fig. 7

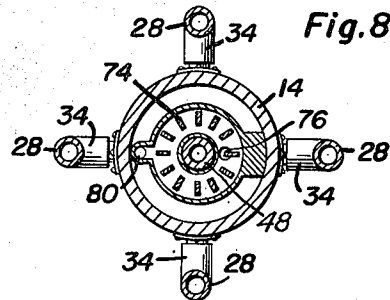


Fig. 8

Joe P. Caldwell
INVENTOR.

BY *Clarence A. O'Brien*
and Harvey B. Jacobson
Attorneys

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2,708,566

DRILLING UNIT

Joe P. Caldwell, Tulsa, Okla.

Application November 26, 1951, Serial No. 258,128

7 Claims. (Cl. 255-4)

This invention relates to new and useful improvements in drilling units and the primary object of the present invention is to provide a drill unit void of a drill pipe, casing and complicated machinery which is capable of drilling deep holes without excessive weight induced in the hole or upon the derrick operatively connected to the unit.

Another important object of the present invention is to provide a drilling unit that is so constructed as to remove cuttings from a hole without complicated tools and which unit involves a pair of oppositely rotating cutter bits that will tend to retain the unit centered in a hole into which the unit is lowered.

A further object of the present invention is to provide a drilling unit composed of upper and lower slidably connected section with means between the sections having the threefold capacity of connecting the sections, preventing relative rotation between the sections and centering the sections in a hole into which the sections are lowered.

A still further aim of the present invention is to provide a drilling unit of the aforementioned character that is simple and practical in construction, strong and reliable in use, small and compact in structure, efficient and durable in use, inexpensive to manufacture, assemble, repair and replace, and otherwise well adapted for the purposes for which the same is intended.

Other objects and advantages reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming part hereof, wherein like numerals refer to like parts throughout, and in which:

Figure 1 is an elevational view of the invention lowered in a hole;

Figure 2 is a perspective view of the basket used in the present invention and with parts thereof broken away;

Figure 3 is a bottom plan view taken on the plane of section line 3-3 of Figure 4;

Figure 4 is an enlarged longitudinal vertical sectional view of Figure 1, the basket being removed.

Figure 5 is a transverse longitudinal sectional view taken substantially on the plane of section line 5-5 of Figure 4;

Figure 6 is a transverse longitudinal sectional view taken substantially on the plane of section line 6-6 of Figure 4;

Figure 7 is a transverse horizontal sectional view taken substantially on the plane of section line 7-7 of Figure 4; and,

Figure 8 is a transverse horizontal sectional view taken substantially on the plane of section line 8-8 of Figure 4.

Referring now to the drawings in detail, wherein for the purpose of illustration, there is disclosed a preferred embodiment of the present invention, the numeral 10 represents an elongated hollow body composed of upper and lower cylindrical sections 12 and 14, the upper flanged end 16 of a tubular member 18 is slidably received in the upper section 12 and the lower flanged end 20 of the member 18 is secured in the upper end of section 14 by fasteners 22. A centrally apertured disk 24 is secured in the

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lower end of section 12 by fasteners 26 and its central aperture slidably receives element 18 whereby the sections 12 and 14 are slidably connected together.

Additional means is provided for slidably connecting the sections 12 and 14. This means will also prevent relative rotation between the sections and will center the body 10 in a hole H into which the present invention is lowered. This means consists of a plurality of upper and lower slidably connected arms 28 and 30. The upper arms 28 are tubular and slidably receive the upper reduced ends 32 of the lower arms 30.

The upper laterally projecting ends 34 of the arms 28 are slidably over horizontal lugs 36 on the section 12, and the lower laterally projecting hollow ends 38 of the arms 30 are slidably received over horizontal lugs 40 projecting radially outwardly from the lower end of section 14. A coil spring 42 is positioned in each of the hollow lugs 36, 40 and the ends 34 or 38 fitted thereover to yieldingly urge the arms 28, 30 from the outer periphery of body 10. Suitable stop means may be employed for limiting sliding movement of the ends 34 and 38 on their supporting lugs, such as pins carried by the ends 34 and 38 slidably received in slots in the lugs, as shown in Figure 4.

Upper and lower bearings 44 and 46 are removably supported in section 14 and rotatably support a tubular shaft 48 whose lower end projects outwardly below the section 14 to removably support an inner bit 50. An electric motor 52, supported in the section 14, is operatively connected to the shaft 48 to rotate the same.

A tubular member 54 supports a ball-bearing unit 56 at its upper end that engages the bearing 46. Unit 56 is supported upon a plate 58 removably secured to the underside of bearing 46 which retains the section 14 connected to the member 54.

Member 54 is externally threaded at its lower end to receiveably engage an outer bit 60 having vertical exterior grooves 62, whereby material may rise from the hole over the bit 60. Shaft 48 extends through an axial bore in member 54 and the bit 50 carried thereby is positioned in a recess 64 in the lower end of bit 60.

An internally toothed ring gear 66 is removably secured to the inner periphery of member 54 and meshes with a pinion 68 carried by a bracket 70, which bracket is journaled on tubular shaft 48; anchor post or shaft 69 is fixed to member 58 at its upper end and to bracket 70 at its lowered end to prevent relative rotation between bracket 70 and bit casing 54. A second ring gear 72 fixed to shaft 48 also meshes with pinion 68, whereby rotation of shaft 48 will cause rotation of bit 60 in an opposite direction.

A housing 74 is supported in section 14 above bearing 44 and its upper and lower walls are provided with central openings accommodating the upper end of shaft 48. A nipple 76 connects the central portion of housing 74 to an opening 78 in section 14 and a conduit 80 connects the upper end of hollow shaft 48 to the periphery of housing 74. Impeller blades 82 fixed on shaft 48 are positioned in housing 74 for rotation and will draw mud through opening 78 in housing 74, and direct the mud through conduit 80 down through shaft 48 and out through bit 50.

The inturned flange 84 of a coupling element 86 is suitably rotatably engaged in an annular groove 88 in the upper closed end of section 12 and removably supports the threaded portion 90 of an outer tubular cable 92 in which conductive cable 94 is enclosed. Cable 94 extends downwardly through an axial opening in member 18 and is connected to the motor 52.

A cylindrical basket 96 is slidably received on cable 92 and its cylindrical wall is formed with slots 98. The lower perforated wall 100 of the basket faces a spider 102 at the upper end of the basket and the spider supports a central guide sleeve 104 slidable on the cable 92 and an ear 106

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to which is attached a cord 108, whereby the basket may be selectively raised or lowered.

The mud established in cutting circulates upward through the hole until a peak is maintained then it descends into the bailer or basket. The slots 98 enable the mud to ooze down while the bailer retains the cuttings.

Since bits 50 and 60 rotate in opposite directions the entire unit will be held against rotation. The diamond bits 50 and 60 will effectively cut the formation and the cut material will be forced up the hole and will descend in the basket.

As previously noted, sections 12 and 14 are slidably related for longitudinal extension of one with respect to the other. During the use of the device, when the same is lowered into a hole, the upper section 12 may therefore remain in a predetermined lowered position and as the bits 50, 62 cut the ground, the lower section 14 may move downwardly relative to the upper section 12 without the necessity of lowering the entire device as the cutters progress downwardly.

Having described the invention, what is claimed as new is:

1. A drilling unit including an elongated hollow body section, upper and lower ends secured in said hollow body, said lower end having a bearing aperture therein, a tubular shaft journaled in said bearing aperture and extending axially within said hollow body, the upper end of said tubular shaft terminating adjacent and below the upper end of said body, the lower end of said shaft projecting outwardly from the lower end of said body, an electric motor mounted within said hollow body, said motor being operatively connected to said tubular shaft for rotating the shaft with respect to the body, a support member rotatably mounted on the lower end in said hollow body, said support member having a bearing aperture therein, said tubular shaft extending through said bearing aperture, an inner bit secured on said tubular shaft, an outer bit secured on said support member, said outer bit having a recess receiving said inner bit, gear means operatively connecting the tubular shaft to said support member for producing opposite rotation of said inner and outer bits, a pump housing mounted in said body adjacent the top thereof, said tubular shaft extending through said housing, impeller blades mounted on said shaft in said housing, a first conduit connecting the periphery of said housing to said tubular shaft, said body having an aperture therein, and a second conduit communicating said aperture with an inner portion of said housing.

2. The combination of claim 1 including an upper hollow body section, means providing a sliding connection between said body sections whereby said first-mentioned section may move downwardly relative to said upper body section as said bits cut a hole.

3. The combination of claim 1 including an upper hollow body section, means providing a sliding connection between said body sections whereby said first-mentioned section may move downwardly relative to said upper body section as said bit cuts a hole, said means providing a sliding connection including arms mounted exteriorly on each body section and extending longitudinally thereof,

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said arms of the sections telescopingly slidably connecting to one another.

4. The combination of claim 1 including an upper hollow body section, means providing a sliding connection between said body sections whereby said first-mentioned section may move downwardly relative to said upper body section as said bit cuts a hole, said means providing a sliding connection including arms mounted exteriorly on each body section and extending longitudinally thereof, said arms of the sections telescopingly slidably connecting to one another, and resilient means mounting said arms on said body sections urging said arms outwardly away from said body sections to permit the arms to ride against the wall of a hole into which the body is lowered to center the body in the hole.

5. The combination of claim 1 and a lowering cable swivelly connected to the body and being hollow to receive electrical wires that are adapted to be connected to said electric motor in said body.

6. A drilling unit comprising a tubular body including upper and lower sections and means slidably connecting the sections together, additional means slidably connecting the sections and preventing relative rotation between the sections and adapted to center the body when the body is lowered into a hole, bearings mounted in said lower section, a tubular shaft rotatably supported in said bearings and having a lower end projecting below the lower section, an outer bit, bit supporting means rotatably supported on the lower end of the lower section, an inner bit fixedly supported on the lower end of the shaft, said outer bit having a recess in its bottom accommodating the inner bit, an electric motor supported in the lower section and operatively connected to the shaft for rotating the shaft with respect to said body, gears connecting the shaft to the outer bit supporting means for rotating the outer bit opposite to the direction of rotation of the shaft and inner bit, said inner bit having a central bore aligned with the shaft, a housing in the lower section, said shaft extending through said housing, a conduit communicating the upper end of the shaft and the outer portion of said housing, an inlet nipple projecting from the inner portion of said housing and extending outward through said lower section, and impeller blades secured to the shaft and rotatably positioned in said housing.

7. The combination of claim 6 and a perforated cylindrical basket supported over the upper section.

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