Feb. 26, 1929. 1,703,823

H. C. JOHANSEN

DRILLING APPARATUS

Filed Sept. 5, 1924

Fig. 1.

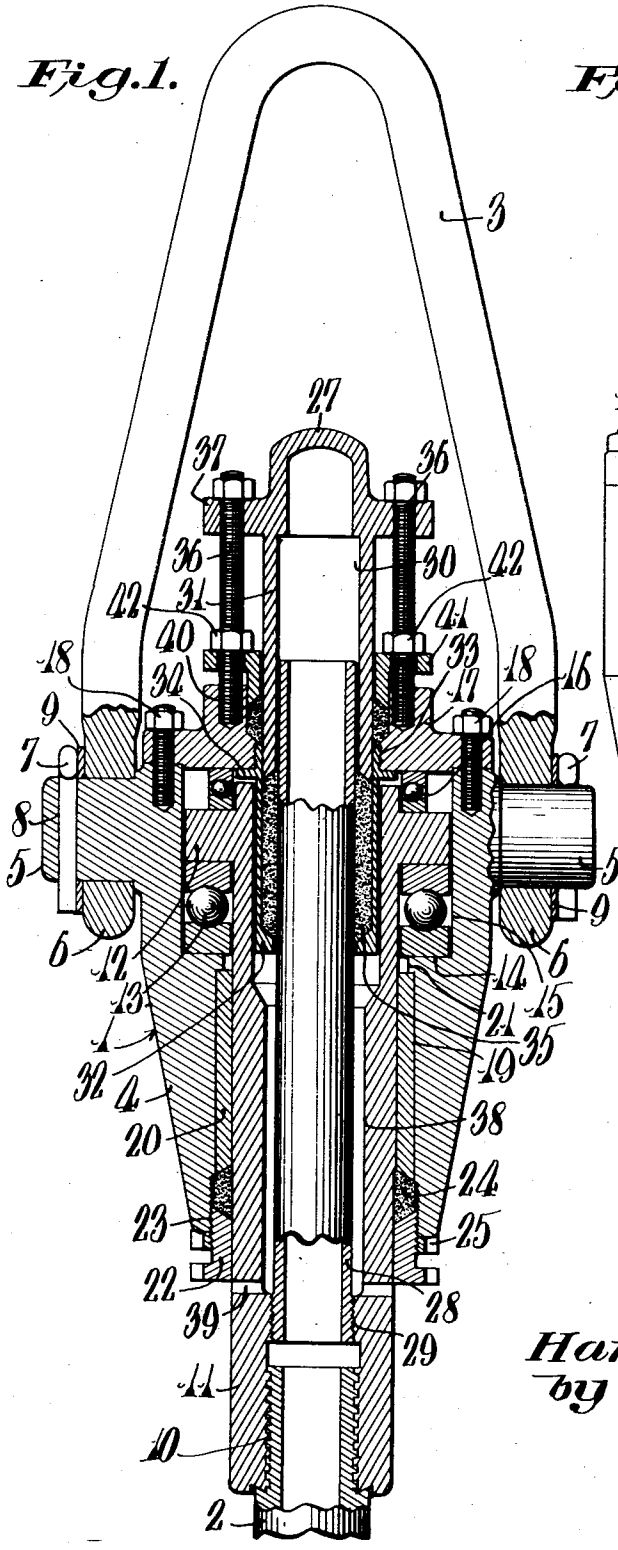
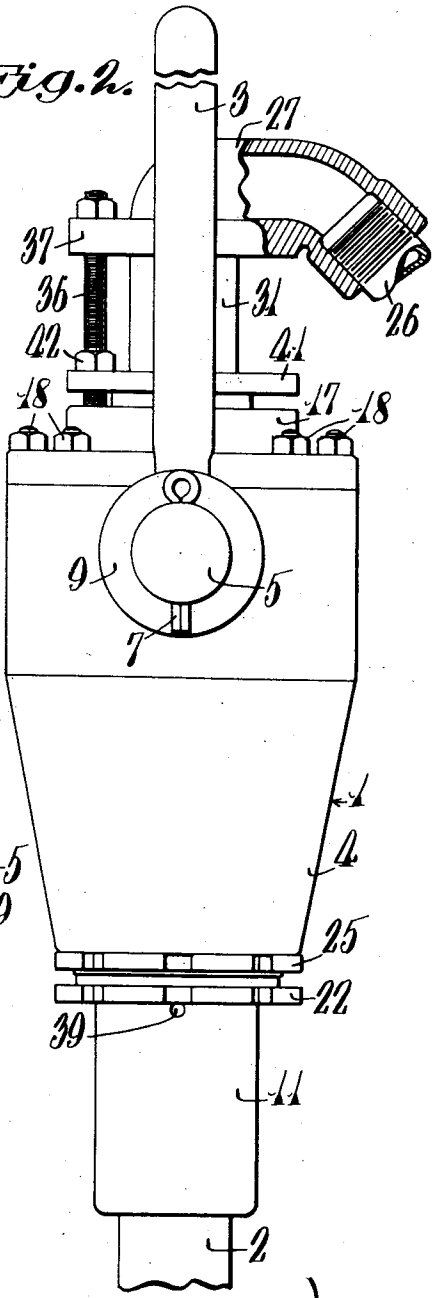


Fig. 2.



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UNITED STATES PATENT OFFICE.

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DRILLING APPARATUS.

Application filed September 5, 1924. Serial No. 736,151.

My invention relates to drilling apparatus.

An object of my invention is to provide an improved drilling apparatus and more particularly an improved oil well drilling apparatus of the rotary diamond core type having improved means permitting the raising, lowering and rotation of the tubular drill rods without interrupting the rotation of the rods or the pumping of liquid or mud fluid through the rods. Still another object of my invention is to provide an improved oil well drilling apparatus having an improved combined lifting bail and hydraulic swivel means which is of a heavy, rugged and a readily accessible construction. A still further object of my invention is to provide improved means for taking the thrust of the drill rods due to the weight of the rods when supported by the hoisting cable and for receiving the weight of the water swivel when the hoisting cable is detached from the lifting bail. Still another object of my invention is to provide improved means for removing excessive friction from the rapidly revolving drill rods when the latter are being raised from or lowered into the well. These and other objects and advantages of my invention will, however, hereinafter more fully appear.

In the accompanying drawings I have shown for purposes of illustration one form which my invention may assume in practice.

In these drawings,—

Fig. 1 is a central longitudinal sectional view through my improved lifting bail and hydraulic swivel.

Fig. 2 is a side elevation of Fig. 1, the gland elbow being shown partially in section.

In this illustrative form of my invention I have shown a combined lifting bail and hydraulic swivel generally designated 1, of improved form, which is carried at the top of the tubular sectional drill rods 2, which are rotated in any suitable manner during drilling. A lifting bail 3 is provided to which a hook and cable connection, not shown, is adapted to be connected and which cable passes upwardly around a pulley or sheave carried by the well derrick and then downwardly to the hoisting drum of the drilling mechanism, in a well known manner. Water or mud fluid under pressure is adapted to be admitted to the hollow drill rods and to the cutting tool to wash away the cuttings and to seal the hole, in the usual manner. The drill rods are adapted to be raised and lowered, for instance when it is desired to move the core from the core barrel or to lengthen the drill rods by the addition of another rod section, without interrupting the rotation thereof or the pumping of the fluid therethrough.

The lifting bail and hydraulic swivel 1 comprises a body normally non-rotatable portion or casing 4 having laterally projecting circular lugs 5 formed integral with the upper end thereof on which the free ends 6 of the lifting bail are pivotally mounted. Split pins 7 are disposed in transversely extending apertures 8 formed in the bosses 5 which hold the ends of the lifting bail from lateral displacement, washers 9 being disposed between the ends 6 of the bail and the pins 7. The upper end of the drill rods 2 threadedly engages, as at 10, the lower end of a rotatable sleeve 11 which is provided at its upper end with a radially extending flange 12. The flange 12 and consequently the drill rods 2, are supported on an anti-friction bearing 13 disposed between the flange and a shoulder 14 formed at the bottom as of a bore 15 formed in the casing 4. As illustrated, an anti-friction bearing 16 is interposed between the upper surface of the flange 12 and a closure or head member 17 secured as by bolts 18 to the casing 4. It will herein be observed that the bearings 13 remove excessive friction from the rapidly revolving drill rods when the latter are being raised or lowered in the well. The lower end of the casing 4 is provided with a bore 19 in which a bronze bushing 20 is disposed between the casing 4 and the sleeve 11, the upper end of the bushing 20 engaging an inwardly projecting shoulder 21 formed by a reduced bore through which the sleeve 11 passes. A gland plug 22 threadedly engages the lower end of the casing 4, as at 23, and is adapted to press packing material 24 tightly into engagement with the rotating sleeve 11. A lock nut 25 is provided for holding the gland 22 in its adjusted position. It will herein be noted that the packing 24 prevents any leakage of lubricant from the bearing chamber 15 between the stationary casing 4 and the rotating sleeve 11.

Water or mud fluid under pressure is adapted to be admitted from the pumps to the hollow drill rods 2 through a hose connection 26 and a gland elbow 27. A tubular stem 28

is threadedly secured, as at 29, at its lower end to the sleeve 11 and which stem projects upwardly and terminates in a bore 30 formed in a sleeve portion 31 formed integral with the gland elbow 27. A hollow packing box 32 into which the sleeve 31 projects is threadedly secured, as at 33, at its upper end to the closure member 17 and is provided with a radially extending flange 34 which is adapted to be tightly held against the lower surface of the closure member 17. The packing box 32 is provided with a suitable packing material 35 which is adapted to be tightly pressed against the stem 28 by the lower end of the sleeve 31 which may be held in the desired position by means of a plurality of studs 36 which engage the upper surface of a flange 37 formed on the elbow 27 and the closure member 17. It will herein be noted that the packing material 35 reduces the leakage of water between the stationary sleeve 31 and the rotating stem 28 but if any leakage does occur the water may pass downwardly through a reduced bore 38 formed in the stem 11 and laterally out through drain ports or vents 39. Packing material 40 is provided between the closure member 17 and the sleeve 31 which is pressed tightly in position by means of a gland plug 41 and nuts 42 carried by the studs 36, thereby preventing leakage of liquid past the outside of the sleeve 31.

From the foregoing description it will be noted that an improved lifting bail and hydraulic swivel is provided which is readily accessible and which is of a heavy and rugged character consistent with the nature of the work encountered in oil well drilling. It will further be noted that improved means are provided for raising and lowering the drill rods without interrupting the rotation of the latter or the pumping of fluid under pressure therethrough and for removing excessive friction from the rapidly revolving drill rods caused by the weight of the rods.

While I have in this application specifically described one form which my invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a hydraulic swivel, a non-rotatable casing, a rotatable hollow sleeve journaled thereon adapted to support the drill rods, a stem secured to said sleeve, a fluid supply connection, and packing means adapted to project within said hollow sleeve and disposed between said stem and said connection.

2. In a hydraulic swived, a non-rotatable outer casing having a lifting bail mounted thereon, a rotatable hollow sleeve projecting downwardly from within said casing and adapted to support the drill rods, said sleeve being journaled within said casing, a stem secured to said sleeve, a fluid connection provided with a depending sleeve portion adapted to project within said rotatable sleeve, and packing means disposed between said stem and said sleeve portion of said fluid connection.

3. In a hydraulic swivel, a non-rotatable casing having a lifting bail pivotally mounted thereon, a rotatable hollow sleeve adapted to support the drill rods and to which the latter are secured, a stem carried by said sleeve, and a fluid supply connection secured to said casing provided with a sleeve portion, said sleeve portion adapted to project within a space between said rotatable sleeve and said stem having telescopic engagement with the latter.

4. In a hydraulic swivel, a non-rotatable casing having a lifting bail pivotally mounted thereon, a flanged sleeve journaled on said casing to which the drill rods are secured and having a drill rod connection at its lower end, said flange being interposed between anti-friction bearings, a stem disposed above the drill rod connection and detachably secured to and rotatable with said sleeve, a fluid supply connection having a sleeve portion into which said stem extends, and a fluid tight connection preventing leakage of fluid between said stem and the sleeve portion of said fluid supply connection.

5. In a hydraulic swivel, a non-rotatable casing provided with a bore, a cover member for said bore, a rotatable hollow sleeve journaled in said casing to which the drill rods are connected, a stem secured to said sleeve, a fluid supply connection, a packing box secured to said cover member and projecting within said rotatable sleeve, and packing means disposed between said cover and said connection and between said packing box and said stem.

6. In a hydraulic swivel, a non-rotatable casing, a rotatable hollow sleeve journaled thereon adapted to support the drill rods, a stem disposed concentrically within and secured to said sleeve, a packing box carried by said casing, and a fluid supply connection provided with a depending sleeve portion, said stem projecting through said packing box and within said sleeve portion of said fluid supply connection.

7. In a hydraulic swivel, a non-rotatable casing provided with a chamber adapted to receive lubricant, a rotatable hollow sleeve provided with a flange journaled in said chamber, means for preventing leakage of lubricant from said chamber between said casing and the sleeve, a stem disposed concentrically and secured to and rotatable with said sleeve, there being an annular space between said sleeve and stem, a fluid supply connection having a sleeve portion projecting within said sleeve, and packing means dis-

posed in the space between said stem and said sleeve for preventing leakage of fluid between said supply connections and said stem.

8. In a hydraulic swivel, a non-rotatable casing having a lifting bail pivotally mounted thereon, a rotatable sleeve journaled in said casing adapted to support a drill rod and having a drill rod connection at its lower end, anti-friction bearings for said sleeve carried within said casing, and a fluid connection comprising telescopically arranged elements through which and said sleeve fluid flows to the drill rod and carried by said casing and rotatable sleeve respectively, the element carried by said sleeve being detachably connected thereto above said drill rod connection, and packing carried at the top of said casing and disposed between said telescopic elements.

9. In a hydraulic swivel, a non-rotatable casing having a lifting bail pivotally mounted thereon, a rotatable flanged sleeve journaled in said casing adapted to support a drill rod and having a drill rod connection at its lower end, anti-friction bearings carried within said casing engageable with the flange on said sleeve, and a fluid connection comprising telescopically arranged elements through which and said sleeve fluid flows to the drill rod and carried by said casing and rotatable sleeve respectively, the element carried by said sleeve being detachably connected thereto above said drill rod connection, and packing carried at the top of said casing and disposed between said telescopic elements.

10. In a hydraulic swivel, a non-rotatable casing having a lifting bail pivotally mounted thereon, a rotatable sleeve journaled in said casing adapted to support a drill rod and having a drill rod connection at its lower end, said sleeve having a radial flange formed thereon, anti-friction bearings carried by said casing and between which said flange is interposed, and a fluid connection comprising telescopically arranged elements through which and said sleeve fluid flows to the drill rod and carried by said casing and rotatable sleeve respectively, the element carried by said sleeve being detachably connected thereto above said drill rod connection, and packing carried at the top of said casing and disposed between said telescopic elements.

11. In a hydraulic swivel, a non-rotatable outer casing having a lifting bail pivotally mounted thereon, a rotatable inner hollow sleeve journaled in said casing adapted to support a drill rod and having a drill rod connection at its lower end, a hollow stem arranged concentrically within said sleeve and detachably secured thereto above said drill rod connection, a fluid supply connection, and packing means disposed between said stem and said connection.

12. In a hydraulic swivel, a non-rotatable casing having a lifting bail pivotally mounted thereon, a rotatable sleeve journaled in said casing adapted to support a drill rod, a hollow stem arranged concentrically within said sleeve and secured thereto, there being an annular space between said stem and sleeve, a fluid supply connection having a depending hollow sleeve portion within which said stem extends, and packing means disposed in the space between said stem and said sleeve for preventing leakage of fluid between the depending sleeve portion of said supply connection and said stem.

13. In a hydraulic swivel, a non-rotatable casing having a lifting bail pivotally mounted thereon, a rotatable hollow sleeve journaled in said casing adapted to support a drill rod, a hollow stem arranged concentrically within said sleeve and secured thereto, there being an annular space between said stem and sleeve, a fluid supply connection, packing means disposed between said stem and said connection, and means comprising a passage in the lower end of said sleeve for venting the lower end of the space between said sleeve and said stem to discharge any fluid that leaks between said fluid connection and stem.

14. In a hydraulic swivel, a non-rotatable casing having a lifting bail pivotally mounted thereon, a hollow sleeve member rotatably mounted within said casing and to which drill rods are connectible, a radial flange formed on said sleeve, anti-friction bearings carried by said casing and between which said flange is interposed, a fluid supply connection having a hollow depending sleeve portion, a hollow stem secured to said rotatable sleeve and extending upwardly within said depending sleeve, there being an annular space between said stem and sleeve, and packing means disposed in the space between said sleeve and said stem for preventing leakage of fluid between the depending sleeve portion of said supply connection and said stem.

15. In a hydraulic swivel, a non-rotatable casing having a lifting bail pivotally mounted thereon, a hollow sleeve member rotatably mounted within said casing and to which drill rods are connectible, a radial flange formed on said sleeve, anti-friction bearings carried by said casing and between which said flange is interposed, a fluid supply connection having a hollow depending sleeve portion, a hollow stem secured to said rotatable sleeve and extending upwardly within said depending sleeve, packing means disposed between said depending sleeve portion and said stem, and packing means carried by the lower end of said casing and disposed between the latter and said rotatable sleeve.

16. In a hydraulic swivel, a non-rotatable casing having a lifting bail pivotally mounted thereon, a hollow sleeve member rotatably

mounted within said casing and to which drill rods are connectible, a radial flange formed on said sleeve, anti-friction bearings carried by said casing and between which said flange is interposed, a fluid supply connection having a hollow depending sleeve portion, a hollow stem secured to said rotatable sleeve and extending upwardly within said depending sleeve, packing means disposed between said depending sleeve portion and said stem, packing means carried by the lower end of said casing and disposed between the latter and said rotatable sleeve, and means for venting the space between said rotatable sleeve and said stem.

17. In a hydraulic swivel, a non-rotatable casing having a lifting bail thereon, a rotatable sleeve journaled in said casing and adapted to support a drill rod, anti-friction bearings in said casing and on which said sleeve is rotatably mounted, a fluid supply connection having a hollow depending sleeve portion, a hollow stem secured to said rotatable sleeve and extending upwardly within said depending sleeve portion, there being an annular space between said sleeve and stem, and packing means projecting downwardly within said space and disposed between said depending sleeve portion and said stem for preventing leakage of fluid between said supply connection and stem.

18. In a hydraulic swivel, a non-rotatable casing having a lifting bail connected thereto, a hollow sleeve rotatably mounted in said casing and to which drill rods are connectible, a fluid supply connection having a hollow depending sleeve portion, a hollow packing box secured to said casing and within which said depending sleeve portion projects, fluid tight packing between said casing and said depending sleeve portion, a hollow stem secured to said rotatable sleeve and extending upwardly through said packing box and within said depending sleeve portion of the fluid connection, said packing box containing fluid tight packing disposed between said depending sleeve portion and said stem, and fluid tight packing carried by the lower end of said casing and disposed between the latter and said rotatable sleeve.

19. In a hydraulic swivel, a non-rotatable casing having a lifting bail connected thereto, a hollow sleeve rotatably mounted in said casing and to which drill rods are connectible, a fluid supply connection having a hollow depending sleeve portion, a hollow packing box secured to said casing and within which said depending sleeve portion projects, said packing box projecting downwardly within said rotatable sleeve, fluid tight packing between said casing and said depending sleeve portion, a hollow stem secured to said rotatable sleeve and extending upwardly through said packing box and within said depending sleeve portion of the fluid connection, said packing box containing fluid tight packing disposed between said depending sleeve portion and said stem, and fluid tight packing carried by the lower end of the casing and disposed between the latter and said rotatable sleeve.

20. In a hydraulic swivel, a non-rotatable casing having a lifting bail connected thereto, a hollow sleeve rotatably mounted in said casing and to which drill rods are connectible, a fluid supply connection having a hollow depending sleeve portion, a hollow packing box secured to said casing and within which said depending sleeve portion projects, fluid tight packing between said casing and said depending sleeve portion, a hollow stem secured to said rotatable sleeve and extending upwardly into said packing box and within depending sleeve portion of the fluid connection, said packing box containing fluid tight packing disposed between said depending sleeve portion and said stem, fluid tight packing carried by the lower end of said casing and disposed between the latter and said rotatable sleeve, and means for venting the space between said rotatable sleeve and said stem.

21. In a hydraulic swivel, a non-rotatable casing having a lifting bail connected thereto, a hollow sleeve rotatably mounted within said casing and to which drill rods are connectible, said rotatable sleeve having a flange thereon interposed between anti-friction bearings carried within said casing, a fluid supply connection having a hollow depending sleeve portion, a hollow packing box secured to said casing and within which said depending sleeve portion projects, fluid tight packing between said casing and said depending sleeve portion, a hollow stem secured to said rotatable sleeve and extending upwardly through said packing box and within said depending sleeve portion of the fluid connection, said packing box containing fluid tight packing disposed between said depending sleeve portion and said stem, and fluid tight packing carried by the lower end of said casing and disposed between the latter and said rotatable sleeve.

In testimony whereof I affix my signature.

HARRY C. JOHANSEN.

CERTIFICATE OF CORRECTION.

Patent No. 1,703,823. Granted February 26, 1929, to

HARRY C. JOHANSEN.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, line 65, strike out the word "body" and insert the same to follow after the compound word "non-rotatable" in the same line; page 2, line 62, claim 2, for the misspelled word "swived" read "swivel", and line 126, claim 7, after the syllable "centrically" insert the word "within"; page 4, line 83, claim 20, after the word "within" insert the word "said"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 2nd day of April, A. D. 1929.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.