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SWIVEL.

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1,114,835.

Patented Oct. 27, 1914.

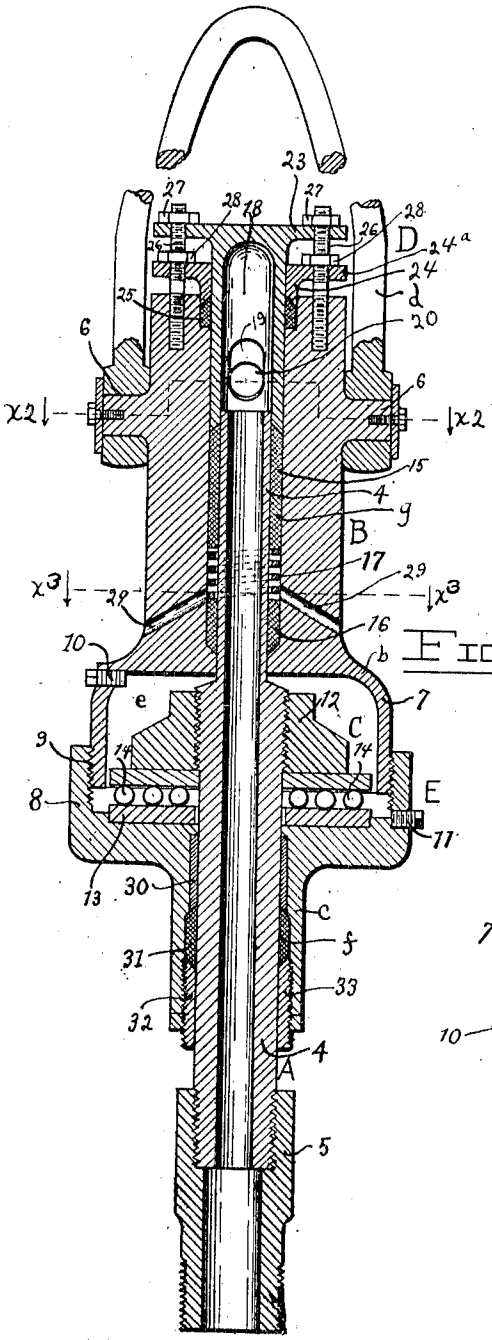


Fig. 1.

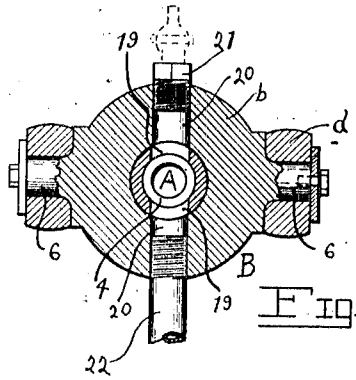


Fig. 2.

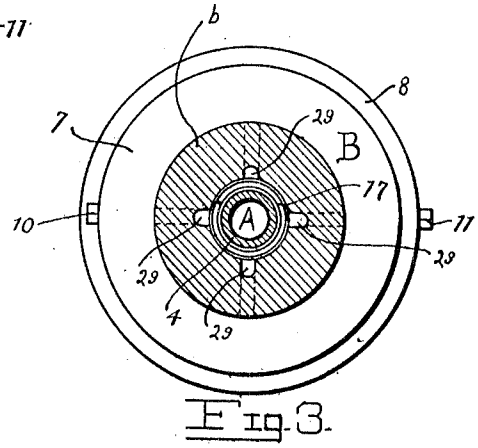


Fig. 3.

WITNESSES

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SWIVEL.

1,114,835. Specification of Letters Patent. Patented Oct. 27, 1914.

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To all whom it may concern:

Be it known that we, CHARLES E. WILCOX and WILLIAM G. KNAPP, citizens of the United States, residing, respectively, at Bakersfield, in the county of Kern and State of California, and at Alhambra, in the county of Los Angeles and State of California, have jointly invented new and useful Improvements in Swivels, of which the following is a specification.

This invention relates to swivels, and more particularly to hydraulic swivels included within the hydraulic circulatory systems employed in the drilling of oil and other deep wells. As is well known in this art, it is customary to keep up circulation of liquid through the boring or drilling string to and from the drill tool for the purpose of assisting in the drilling operation and removing the cuttings or drillings from the hole as it is produced. The swivel in such circulatory systems is used in the operation of rotary drills, to the end that water may be supplied to and passed through the rotating drilling string.

Apparatus of this type as heretofore constructed and used has been open to a number of objections, the elimination of which constitutes an object of the present invention as will fully hereinafter appear.

The invention has for further object the provision of improved hydraulic swivels for well drilling apparatus which will be superior in point of relative simplicity and inexpensiveness of construction and organization in connection with safety and convenience in use, positiveness in operation, length of life, and freedom from wear of parts, and the fit and adjustment and working inter-relation of the parts of which will be effectively maintained through long periods of service.

With the above and other objects in view, the invention consists in the novel and useful provision, formation, construction, combination, association and relative arrangement of parts, members and features, all as hereinafter described, shown in the drawing, and finally pointed out in claims.

In the drawing: Figure 1 is a central vertical sectional view, partly in full lines, of a hydraulic swivel for well drilling apparatus, the same being constructed and organized in accordance with the invention; Fig. 2 is a detail transverse sectional view of the same taken upon the lines x^2—x^2, Fig. 1, and looking in the direction of the appended arrows; and, Fig. 3 is a similar view taken upon the lines x^3—x^3, Fig. 1, and looking in the direction of the appended arrows.

Corresponding parts in all the figures are designated by the same reference characters.

Referring with particularity to the drawing, A designates the swivel stem and B the carrier or carrying means therefor of an improved swivel for hydraulic systems for rotary drilling apparatus, the same being organized in accordance with the invention. The swivel stem comprises a tubular body 4 at the lower end of which is provided a coupling 5 whereby the swivel stem is joined with the boring or drilling string, the same not being shown in the drawing as not entering into the invention in its construction or any other aspects. The swivel stem is rotatively supported by the carrier B through the agency of a bearing device C interposed between the two.

The carrier B is provided with a two-part body, preferably tubular, and surrounding the swivel stem A, one part of such body, *b*, being above the bearing device C and the other part, *c*, being beneath such bearing device. Through the agency of the bearing device C the swivel stem is free to rotate, with the boring or drilling string, in the two part tubular body of the carrier. At the upper end of the carrier is provided suspension means D, preferably consisting of a single bail *d*, the ends of which are engaged at opposite points of the tubular portion *b*, with trunnion 6, whereby the swivel may swing pendant from the bail, the bail being in use engaged with and suspended by the hook and rope or cable in the rig. Packing devices *g* and *f* are respectively disposed between the swivel stem and the tubular body parts *b* and *c*; and the bearing device C is installed within a suitable housing E between the body portions *b* and *c*, within which housing an oil bath is provided for such bearing device. This housing is produced by enlarging the lower end of the body portion *b* into an annular hood 7, and enlarging the upper portion of the body portion *c* into a cup 8, which cup and the hood which matches the same are threaded together, as at 9. At one side of the housing E, at the top of the oil bath chamber *e* is provided a plugged opening 10, and at

the other side of the housing and at the bottom of the chamber *e* is provided a plugged opening 11. Oil or other lubricant may be introduced in to the chamber *e* through the plugged opening 10, and withdrawn therefrom through the plugged opening 11, upon the removal of such plugs, and a blast or steam jet may be applied to the contents and interior of the chamber *e* to cause the cleaning and evacuation thereof.

The bearing device C may comprise an upper annular bearing member 12 threaded onto the stem body 4 and opposed to an annular lower bearing member 13 resting upon the cup 8, both bearing members being within the housing E, and co-acting with interposed anti-friction devices 14. Above the bearing device C the body 4 is preferably of reduced over-all diameter although the internal diameter is preferably maintained uniform; and the packing *g* is interposed between the body portion *b* of the carrier and this reduced portion of the stem body 4, in a suitable annular space which extends to the top of the body portion *b* and terminates above the chamber *e*. The packing *g* comprises two parts, an upper part 15 and lower part 16, separated by an expansion or compression coil spring 17 acting to force the packing part 16 downward and the packing part 15 upward, the latter against a tubular gland 18 which fits at its lower end down between the body part *b* and the upper end of the stem body 4; said gland being provided with opposed elongated openings 19 above the upper end of the stem body 4, and respectively registering with threaded openings 20 in the body portion *b*, to which openings may be applied a plug 21 and a water supply pipe 22, or other adjuncts or fittings in accordance with the service to which the apparatus is to be subjected. The upper end of the gland 18 is provided with an annular cap plate 23 within the bail *d* above the body portion *b* of the carrier and also above an auxiliary annular gland 24 surrounding the gland 18 and fitting against a packing ring 25 set in an annular space between the upper end portion of the body portion *b* and the outer wall of the gland 18. Threaded rods 26 pass through the cap plate 23 and a cap plate 24ª upon the gland 24, and are screwed into the upper end of the body portion *b* of the carrier. Lock nuts 27 and 28, respectively, above the cap plates 23 and 24ª enable the gland 18 to be adjusted upon the packing *g* and the members and parts thereof, against the spring 17, and enables the auxiliary gland 24 to be adjusted upon the packing 25.

From the region of the spring 17 of the packing *g*, extend laterally and downwardly inclined ducts 29, said ducts being formed in the carrier body portion *b* at different heights.

Should any water pass the packing *g* from the ports 19 and 20 above the swivel stem body 4, or get beneath the packing member 15 of such packing, it would enter the ducts 29 and drip from the same onto the hood 7 at the lower end of the body portion *b* of the carrier, indicating the necessity of further adjusting the gland 18 in the manner above described.

Within an annular space formed between the lower body portion *c* and the stem body 4, beneath the bearing device member 13, are disposed a metallic, preferably bronze, bushing 30, a packing member 31 beneath the same, and a gland 32 beneath the packing member 31, all constituting the packing *f*. The gland 32 is screwed into the lower end of the body portion *c*, as at 33, and it may be adjusted to tighten up the packing member 31, and prevent any leakage of lubricant from the bath within the chamber *e* for the bearing device C.

The trunnions 6 suspend the carrier B from the bail *d* at points above the center of gravity of such carrier and of the swivel stem, whereby the entire swivel device is stably pivotally suspended, obviating any danger of inversion of the device when disconnected from the boring or drilling string. This danger is present in the use of the ordinary swivel device, and is frequently injurious to person and property.

It will be noted that all of the packings, such as at 25, *g* and *f* are adjustable from the exterior of the swivel, the first and the second of the same by means of the glands 24 and 18, and the third by means of the gland 32, this resulting in great convenience to the operator. The packing 25 keeps a tight joint between the upper end of the body portion *b* and the gland 18. The packing *g* keeps a tight joint between the upper end of the stem, beneath the ports 19 and 20, and the chamber *e* for the oilbath for the bearing device C, effectually withholding any water drip or seepage from the bath. The packing *f* prevents any leakage of the bath beneath the bearing device. The tell-tale ducts 29 will accurately indicate the passage of any water past the packing member 15 of the packing *g*, and when water is observed leaking from such ducts the gland 18 is adjusted to tighten up the packing *g*. Thus, any improper action of the packing *g*, internally located, will be externally indicated so that correction of the faulty working condition of the packing may be made. If such condition is not corrected, water and the like, or water with the usual content of fine sand, will find its way into the chamber *e* and the lubricant therein and cut the parts of the bearing device C.

By means of the upper and lower plugged openings 10 and 11 leading to and from the chamber *e*, the lubricant may be readily in-

troduced to said chamber for the bath, and said chamber may be effectually drained and also cleaned by subjection to a blast or steam bath.

By providing two inlets to the swivel, each including one of the ports 19 and one of the ports 20, a variety of uses of the swivel are permitted, in accordance with the different kinds of service. Water can be introduced through either or both inlets; or, should a producing stratum or producing sand be encountered in drilling while the swivel is connected up for use, the flowing oil may be permitted to pass out through one inlet as the water is cut off, and a pipe fitted to the other inlet to lead the oil to a tank, after which fitting job the oil-accommodating inlet may be closed by a gate-valve or the like. This is but one instance of the adaptability of the swivel. Ordinarily, swivels are provided with what is known as a goose-neck leading to the upper end of the swivel, and to which in turn leads the water pipe, a wash pipe leading down from the goose-neck into the stem. Our improved swivel obviates the necessity of using such goose-neck. The pipe, such as 22, is simply connected up with one inlet. and the stem is itself the conduit for the water, no wash pipe being employed.

It will be understood that the use of the swivel permits the water pipe to be attached at a stationary part, namely the upper portion *b* of the carrier, whereas the swivel stem A is rotated in the usual manner in the drilling or boring operation, the entire device being suspended from the hook, not shown, by the single bail *d* above the center of gravity of the entire device. All of the packings being adjustable exteriorly of the device, the swivel may be kept in smooth running order for a long period of time without disconnection of its parts or features, by simple and convenient manipulation of the several described means for adjusting the packings.

In assembling the device, it will be understood that the packing devices *g* and *f* are placed within the carrier B, the stem A is then passed up through the body portion *c* and the bearing member 13, and the bearing device member 12 is then screwed on to the stem, the stem is then passed at its upper end into the body portion *b*, the body portions *b* and *c* are then screwed together at 9 to complete the housing F, the several packings are then adjusted, and the entire device is hung up by the bail *d* when ready for use and connected with the boring or drilling string by the coupling 5.

We do not desire to be understood as limiting ourselves to the particular provision, formation, construction, combination, association and relative arrangement of parts, members and features shown and described; but reserve the right to vary the same in adapting the apparatus to varying conditions of use and service, without departing from the spirit of the invention or a fair interpretation of the following claims.

Having thus described our invention we claim and desire to secure by Letters Patent:

1. A swivel of the character stated, comprising a swivel stem, a carrier within which the stem is rotatably mounted; there being a bearing device between the stem and the carrier, the carrier being provided with a chamber within which the bearing device is installed, a lateral water inlet through the carrier above the stem, and a packing between the stem and the carrier and beneath the water inlet and above said chamber.

2. A swivel of the character stated, comprising a swivel stem, a carrier within which the stem is rotatably mounted, there being a bearing device between the stem and the carrier, the carrier being provided with a chamber within which the bearing device is installed, a lateral water inlet through the carrier above the stem, and a packing between the stem and the carrier and beneath the water inlet and above said chamber; there being an opening in the carrier leading to the packing.

3. A swivel of the character stated, comprising a swivel stem, a carrier within which the stem is rotatably mounted; there being a bearing device between the stem and the carrier, the carrier being provided with a chamber within which the bearing device is installed, a lateral water inlet through the carrier above the stem, and a packing between the stem and the carrier and beneath the water inlet and above said chamber; there being a downwardly inclined opening in the carrier leading from the packing.

4. A swivel of the character stated, comprising a swivel stem, a carrier within which the stem is rotatably mounted; there being a bearing device between the stem and the carrier, the carrier being provided with a chamber within which the bearing device is installed, a water inlet through the carrier above the stem, and a packing between the stem and the carrier and beneath the water inlet and above said chamber; said packing comprising a packing member and a spring acting upon the same, and means for varying the efficiency of the spring exteriorly of the carrier.

5. A swivel of the character stated, comprising a swivel stem, a carrier within which the stem is rotatably mounted, there being a bearing device between the stem and the carrier, the carrier being provided with a chamber within which the bearing device is installed, a water inlet through the carrier above the stem, and a packing between the stem and the carrier and beneath the water inlet and above said chamber; said packing

comprising two spaced packing members, and a spring interposed between the same, and means for varying the efficiency of the spring.

6. A swivel of the character stated, comprising a swivel stem, a carrier within which the stem is rotatably mounted, there being a bearing device between the stem and the carrier, the carrier being provided with a chamber within which the bearing device is installed, a water inlet through the carrier above the stem, and a packing between the stem and the carrier and beneath the water inlet and above said chamber; said packing comprising two spaced packing members, and a spring interposed between the same, and means for varying the efficiency of the spring; said last named means comprising an adjustable gland acting upon the packing between the stem and the carrier.

7. A swivel of the character stated, comprising a swivel stem, a carrier within which the stem is rotatably mounted, there being a bearing device between the stem and the carrier, the carrier being provided with a chamber within which the bearing device is installed, a water inlet through the carrier above the stem, and a packing between the stem and the carrier and beneath the water inlet and above said chamber; said packing comprising two spaced packing members, and a spring interposed between the same, and means for varying the efficiency of the spring; said last named means comprising an adjustable gland acting upon the packing between the stem and the carrier; said gland and said carrier having registering openings.

8. A swivel of the character stated, comprising a swivel stem, a carrier within which the stem is rotatably mounted, there being a bearing device between the stem and the carrier, the carrier being provided with a chamber within which the bearing device is installed, a water inlet through the carrier above the stem, and a packing between the stem and the carrier and beneath the water inlet and above said chamber; said packing comprising two spaced packing members, and a spring interposed between the same, and means for varying the efficiency of the spring; there being an opening through the carrier leading to the spring.

9. A swivel of the character stated, comprising a tubular swivel stem, a two-part carrier within which the stem is rotatably mounted, a bearing device comprising a bearing member on said stem and a bearing member on said carrier, said parts of said carrier being detachably connected and provided with a chamber accommodating said bearing device and a lubricant bath for the same, a packing between the stem and the carrier beneath said chamber, a packing between the stem and the carrier above said chamber and beneath the upper end of the stem, and a lateral water inlet through the carrier above the stem.

10. A swivel of the character stated, comprising a tubular swivel stem, a two-part carrier within which the stem is rotatably mounted, a bearing device comprising a bearing member on said stem and a bearing member on said carrier, said parts of said carrier being detachably connected and provided with a chamber accommodating said bearing device and a lubricant bath for the same, a packing between the stem and the carrier beneath said chamber, a packing between the stem and the carrier above said chamber and beneath the upper end of the stem, and a lateral water inlet through the carrier above the stem; said packing device above the chamber being provided with an adjustable gland extending above the stem and carrier and provided with an opening communicating with said water inlet.

11. A swivel of the character disclosed, comprising a swivel stem, a carrier for the stem, the carrier being provided with a chamber, a bearing device between the stem and the carrier and accommodated in the chamber and within the lubricant bath therein, a packing between the stem and the carrier above said chamber, there being a vent opening from the stem through the carrier and beneath said packing.

12. A swivel of the character disclosed, comprising a swivel stem, a carrier for the stem, the carrier being provided with a chamber, a bearing device between the stem and the carrier and accommodated in the chamber and within a lubricant bath therein, packing members between the stem and the carrier above said chamber, and a vent opening through the carrier to the stem between said packing members.

13. A swivel of the character disclosed, comprising a swivel stem, a carrier for the stem, the carrier being provided with a chamber, a bearing device between the stem and the carrier and accommodated in the chamber and within a lubricant bath therein, there being a packing provided with a vent and installed between the stem and the carrier above the chamber, said vent permitting liquid passing the packing thereto to be diverted from the chamber.

In testimony whereof, we have signed our names to this specification in the presence of two subscribing witnesses.

CHARLES E. WILCOX.
WILLIAM G. KNAPP.

Witnesses:
RAYMOND IVES BLAKESLEE,
V. J. COBB.