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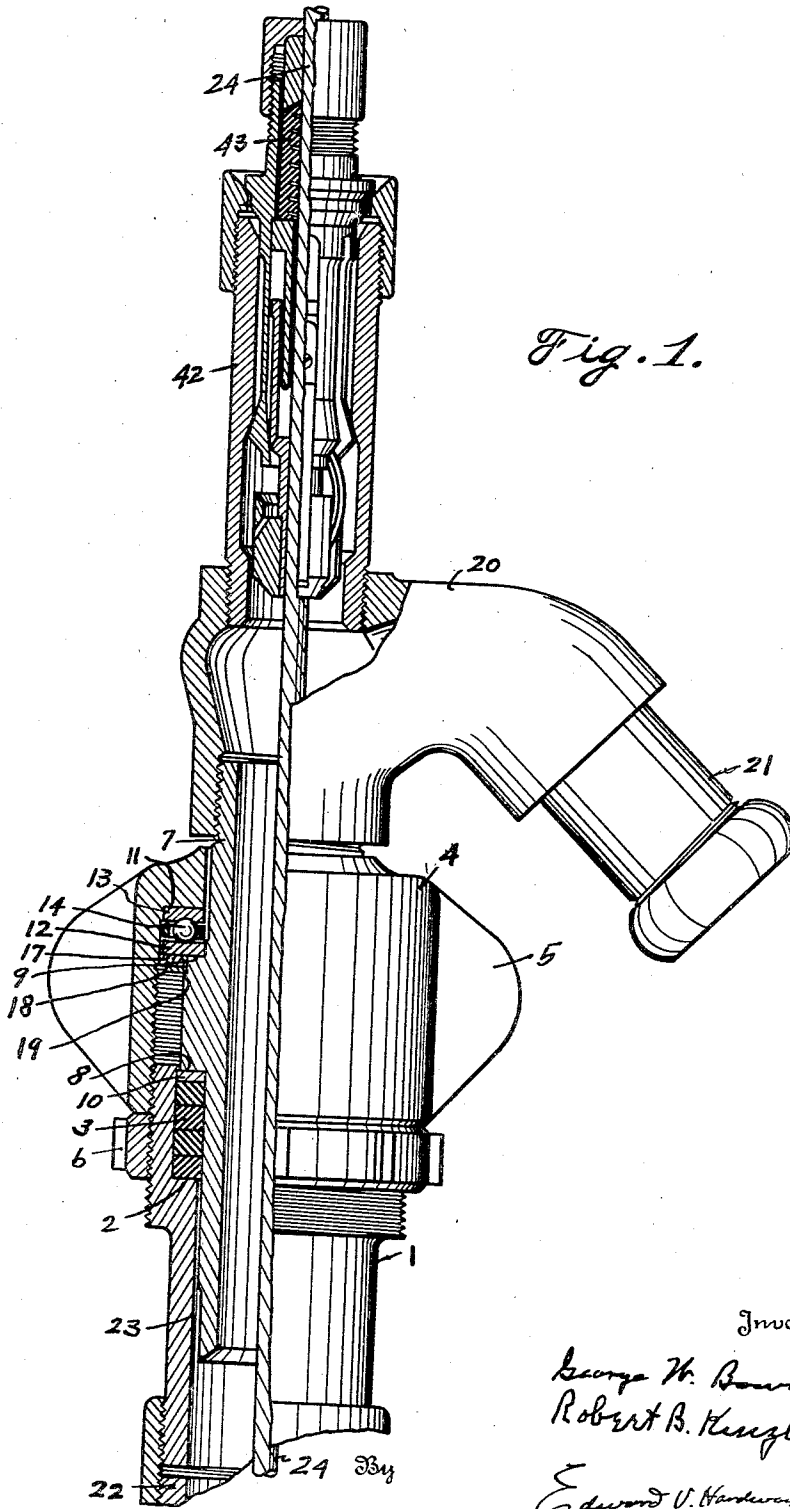
G. W. BOWEN ET AL

2,176,323

SWIVEL

Filed Dec. 24, 1937

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

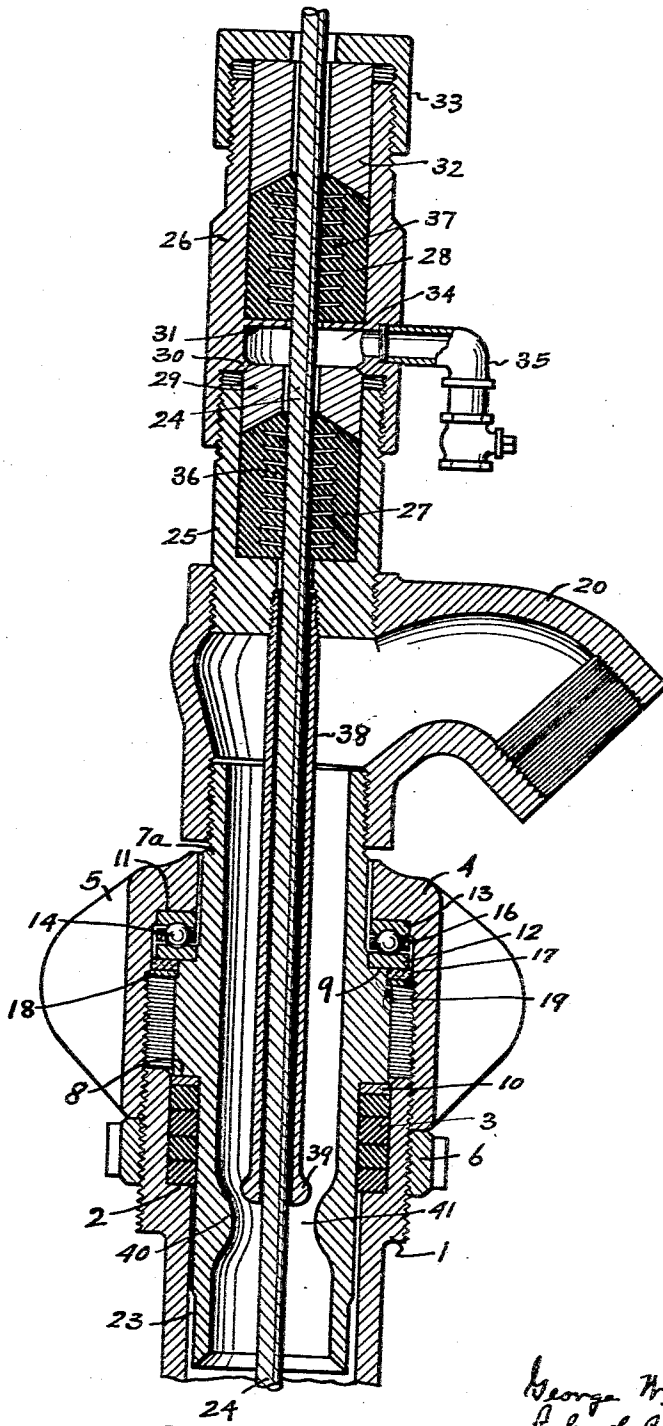


Fig. 2.

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# UNITED STATES PATENT OFFICE

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SWIVEL

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9 Claims. (Cl. 255—25)

This invention relates to a swivel.

An object of the invention is to provide a circulating swivel of such construction that wireline equipment may be run therethrough into a well.

In well drilling it sometimes becomes desirable to run wireline equipment through the drill stem into the well for the purpose of taking cores or samples of the formation being drilled and for other similar purposes. In such case the drill stem, to the upper end of which the kelly and conventional drilling swivel is attached, is elevated and hung in the table of the rotary drilling machine by conventional slips and the kelly is unscrewed from the stem and moved to one side and the circulating swivel, herein described, is attached to the upper end of the suspended stem with the wireline equipment extending into the well and the wireline or cable operating through the swivel. The suspended drill stem may, consequently, be rotated, and circulation in the well may be maintained as is often desirable while running the wireline equipment. It is one of the chief objects of the present invention to provide a swivel of the character described whereby it is possible to either rotate the drill stem, or maintain circulation in the well, or both, while operating the wireline equipment.

It is another object of the invention to provide a novel combination of swivel and line wiper for use while carrying on operations in the well through the instrumentality of the wireline or cable and whereby circulating fluid may be supplied to the well while the drill stem is being rotated and while said operations are being carried on.

It is a further object of the invention to provide in a construction of the character described, means for reducing the pressure of the fluid being forced down into the well on the swivel packing and wiper packing.

The invention further comprehends a novel type of construction more specifically hereinafter described.

With the above and other objects in view the invention has particular relation to certain novel features of construction, operation and arrangement of parts, an example of which is given in this specification and illustrated in the accompanying drawings, wherein:

Figure 1 shows a side view, partly in section, of the swivel and line wiper combined as a unit, and

Figure 2 shows a vertical, sectional view of another embodiment,

Referring now more particularly to the drawings wherein like numerals of reference designate the same parts in each of the figures, the numeral 1 designates the tubular swivel body whose upper end is enlarged and externally threaded and provided with an inside, upwardly facing, annular shoulder 2 to support the annular packing assembly 3 which fits closely within the upper end of the swivel body. The numeral 4 designates a swivel head whose lower end is internally enlarged and threaded to be screwed on to the upper end of the body as shown. This head has the lateral wings 5 forming grip members, or impact faces, for convenience in assembling the head with the body. A jam nut 6 is screwed on to the body beneath, and in abutting relation with, the head to maintain the parts securely assembled. The numeral 7 designates a tubular swivel spindle which fits downwardly through the head and into the body and which is stationary relative to the head and body. In Figure 2 this swivel spindle is indicated by the numeral 7a. An intermediate portion of the spindle is enlarged externally forming the external, downwardly facing shoulder 8 and the external, upwardly facing shoulder 9. Beneath, and in abutting relation with, the shoulder 8 there is an annular wear ring 10 which is fitted between the packing 3 and the shoulder 8 and which is also fitted closely within the upper end of the body 1.

The upper end of the head 4 is inwardly thickened forming an inside, annular, downwardly facing shoulder 11 opposite, and spaced from, the shoulder 9.

Abutting the respective shoulders 9 and 11 are the annular raceway rings 12, 13 between which are the anti-friction balls 14 which are mounted in the ball cage 16.

Beneath and in abutting relation with, the raceway ring 12 there is the annular packing 17 which surrounds the spindle and forms a fluid tight joint between the spindle and head and this packing is supported on the annular ring 18 beneath and which, in turn, is supported upon the external, annular shoulder 19 of the spindle.

Attached to the upper end of the spindle there is a goose neck 20 having the hose connection 21 thereon through which fluid may be supplied, under pressure, said fluid passing downwardly through the swivel and through the well pipe 22 into the well, and back up around the stem.

It will be noted that the lower end of the spindle 7 is of such outside diameter that there will be a clearance space 23 between it and the

body 1. As fluid is forced, under pressure, down through the spindle 7 a suction will be created through the space 23 which will materially reduce the pressure against the packing 3 so that said packing will not be subjected to the severe wear it would otherwise be subjected to while the body 1 rotates through the drill pipe. In other words, the packing is relieved of a material portion of the pressure of the circulating fluid during operations.

During well drilling operations if it be desired to run wire line equipment into the well the drill stem 22 may be elevated and hung in the rotary table by the use of conventional slips and the grip stem, carrying the drilling swivel, may be broken out and the circulating swivel, shown in the drawings, substituted for the drilling swivel. As shown in Figure 1 the circulating swivel is equipped with a packing assembly for packing about the wire line 24. This assembly comprises the lower and upper, tubular, packing retainers 25, 26, the former of which is screwed into the goose neck 29 in alignment with the swivel spindle, and the latter of which is screwed on to the upper end of the former. In the retainer 25 and closely surrounding the line 24 there is the pressure rubber 27 and fitted in the retainer 26 there is the wiper rubber 28 which closely surrounds said line. Fitted against the upper end of the pressure rubber 27, and surrounding the line 24 there is a gland 29 against the upper end of which the inside, annular rib 30, of the upper retainer 25 rests to hold said gland in clamping relation with the rubber 27. The wiper rubber 28 is seated on the annular, inside ledge 31 of the upper retainer 26 and fitted into the upper end of said upper retainer, and surrounding the line 24, there is a gland 32 which is clamped in place by the retainer cap 33 screwed on to the upper end of the upper retainer. Between the ledge 31 and the gland 29 there is a chamber 34. This chamber is provided with a stop-cock 35 for drainage purposes. The rubbers, or packing glands 27, 28 are formed with the inside, spaced lips 36, 37 whose inner margins fit closely about, and wipe, the line 24. The lower gland 27 may be subject to the required amount of pressure when installed and the upper gland 28 may be adjusted to pack off the pressure leaking by the lower gland. The pressure fluid collecting in the chamber 34 may be bled off through the drain-cock 35 if required; a pressure gauge of conventional construction may be substituted for the drain-cock 35 for ascertaining the pressure of the fluid against the packing.

There is a suction nozzle pipe 38 which surrounds the cable 24 and whose upper end is attached to the retainer 25. This suction nozzle pipe extends down into the spindle, and if desired, its lower end 39 may be externally enlarged and the opposite portion of the spindle may be contracted as at 40, thus forming a Venturi passageway whereby the velocity of flow of the circulating fluid under pressure through the Venturi passageway will be materially increased creating a reduction in pressure through the nozzle pipe 38 and in the packing assembly thus relieving the line wiper packings 27, 28 of a portion of the pressure that would otherwise be exerted against them by the circulating fluid. This packing will thus be relieved of the severe frictional wear to which it would otherwise be subjected while manipulating the cable. Instead of the packing assembly illustrated in Figure 2 the line wiper assembly, designated generally by the nu-

meral 42 may be substituted and mounted on the goose neck 20. This line wiper may be of any selected construction but it embodies a packing 43, similar to the upper packing 28 arranged to closely surround the operating cable 24 through which the wire line equipment in the well is manipulated.

The drawings and description disclose what are now considered to be preferred forms of the invention by way of illustration only, while the broad principle of the invention will be defined by the appended claims.

What we claim is:

1. A swivel comprising a tubular body, a head thereon, a tubular spindle in the head and body whose lower end forms a nozzle within the body, packing forming a seal around the spindle above the nozzle, said swivel having a suction passageway and having means whereby fluid under pressure may be forced through the spindle and nozzle, said nozzle being effective to create suction through the passageway to reduce the pressure of the fluid against the packing.

2. A swivel comprising a tubular body having an inside upwardly facing shoulder, a tubular head thereon having an inside downwardly facing shoulder, a tubular spindle in the head and extended into the body and having an external shoulder facing the shoulder in said body, a packing between said last mentioned shoulders, said spindle also having an external shoulder facing the shoulder in the head and anti-friction means between said last mentioned shoulders, said swivel having means for reducing the fluid pressure on the packing by suction.

3. A swivel comprising a tubular body, a tubular head thereon, a tubular spindle in the head and body, packing between the spindle and body, anti-friction means between the spindle and head, a hose connection on the spindle, a packing assembly on the hose connection having a packing therein shaped to closely surround a cable, a tubular suction nozzle anchored at its upper end and aligned with the packing assembly and depending into the spindle and adapted to receive a cable working through said packing.

4. A swivel comprising a tubular body, a tubular head on the body, a tubular spindle in the head and extended into the body, packing between the spindle and body, the lower end of the spindle, forming a nozzle in the body, below the packing of less outside diameter than the inside diameter of the body to form a suction passageway between them, a tubular hose connection on the spindle through which liquid may be forced under pressure down through the nozzle to create suction through said passageway and a reduction of the pressure on the packing.

5. A swivel comprising a tubular body, a tubular head on the body, a tubular spindle in the head and extended into the body, packing between the spindle and body, the swivel having a passageway leading from the lower end of the spindle to the packing, a tubular hose connection on the spindle through which liquid may be forced under pressure down through the spindle to create a reduction in pressure through said passageway, a packing assembly on the hose connection having packing therein to surround a cable, a tubular suction nozzle depending from the packing assembly into the spindle through which the cable is adapted to work, said suction nozzle and packing assembly having a suction passageway leading to the packing.

6. A swivel comprising a tubular body, a tubu-

lar head on the body, a tubular spindle in the head and extended into the body, packing between the spindle and body, the swivel having a passageway leading from the lower end of the spindle to the packing, a tubular hose connection on the spindle through which liquid may be forced under pressure down through the spindle creating a reduction of pressure through said passageway, a packing assembly on the hose connection having upper and lower packing therein to surround a cable, a tubular suction nozzle depending from the packing assembly into the spindle through which the cable is adapted to work, said suction nozzle and wiper assembly having a suction passageway leading to the packing, and the packing assembly being provided with a stage pressure chamber between the upper and lower packing.

7. In well equipment, a tube having a Venturi passageway, a packing assembly above the tube shaped to receive an operating cable there-through, a suction nozzle in the tube about the cable extending from the packing into said Venturi passageway.

8. In equipment of the character described a tube, a connection through which fluid under pressure may be forced downwardly through the tube, a packing assembly above the tube shaped

to receive an operating cable, a cable extended through the packing and tube, a tubular nozzle about the cable anchored to the assembly and extended into the tube, the passageway through the nozzle extending to the packing, the nozzle forming, with the tube, a restricted passageway for the fluid whereby the flow of fluid downwardly through the tube will effect a reduction of pressure in the nozzle passageway and against the packing.

9. A swivel comprising a tubular body, a tubular head thereon, a tubular spindle in the head and body, packing forming a fluid tight joint around the spindle, the lower end of the spindle forming a nozzle in the body beneath the packing, there being a passageway leading from the packing into the body beneath the lower end of the spindle through which suction will be created by fluid flowing downwardly through the spindle and body to reduce the fluid pressure against the packing, a line wiper assembly on the spindle shaped to receive an operating cable and removable upon contact therewith of an object attached to the cable, upon upward movement of the cable.

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