April 15, 1941. A. R. MAIER 2,238,654

SWIVEL

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FIG. 1.

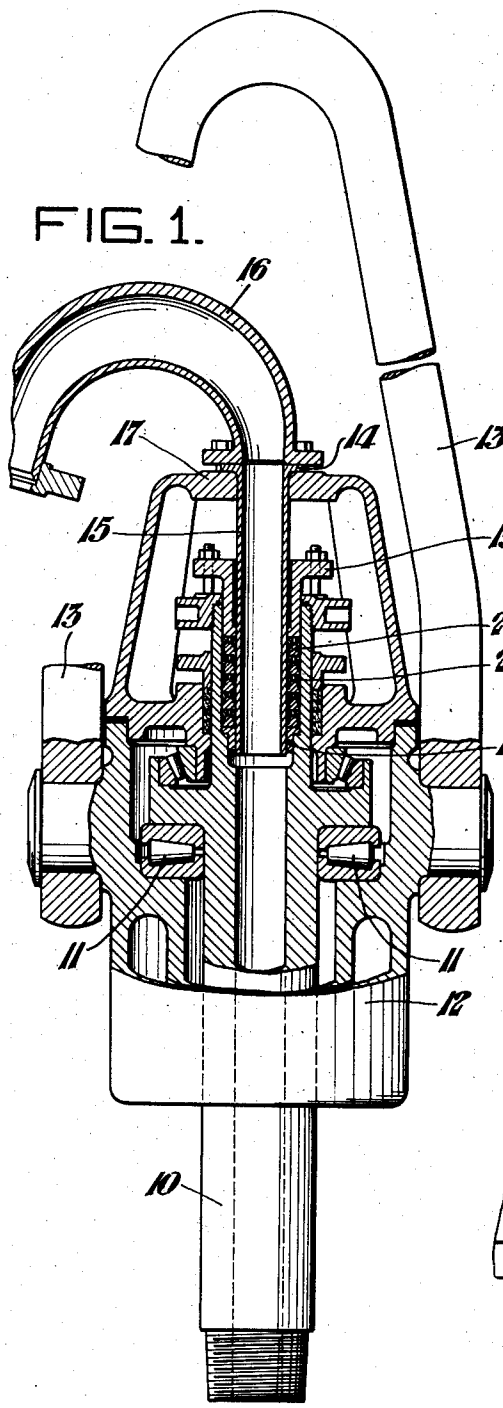
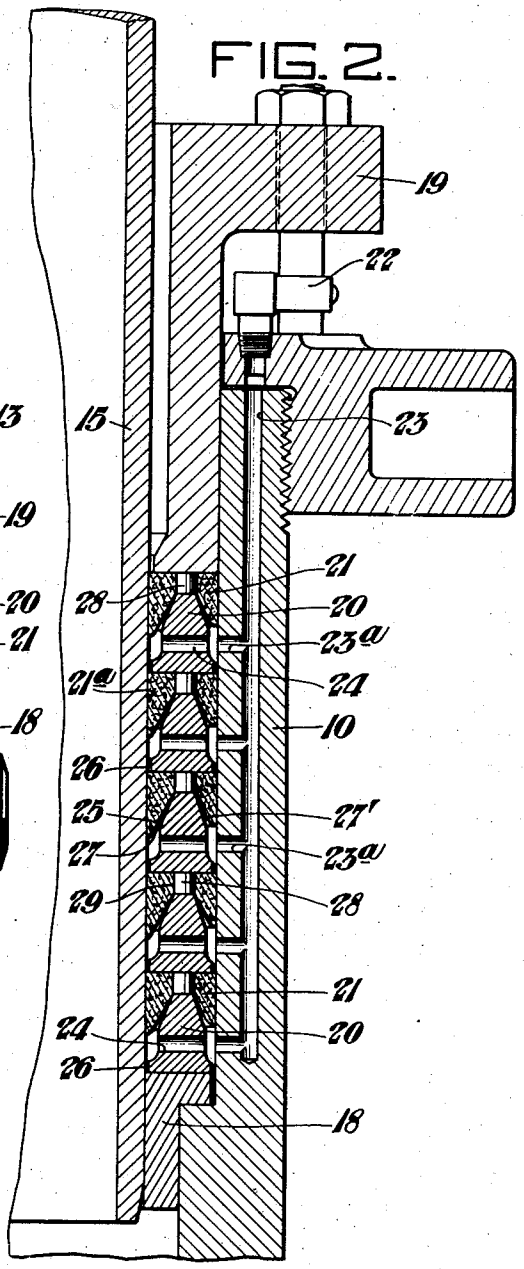


FIG. 2.



Inventor:
AUGUST R. MAIER,
by John E. Jackson
his Attorney

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FIG. 5.

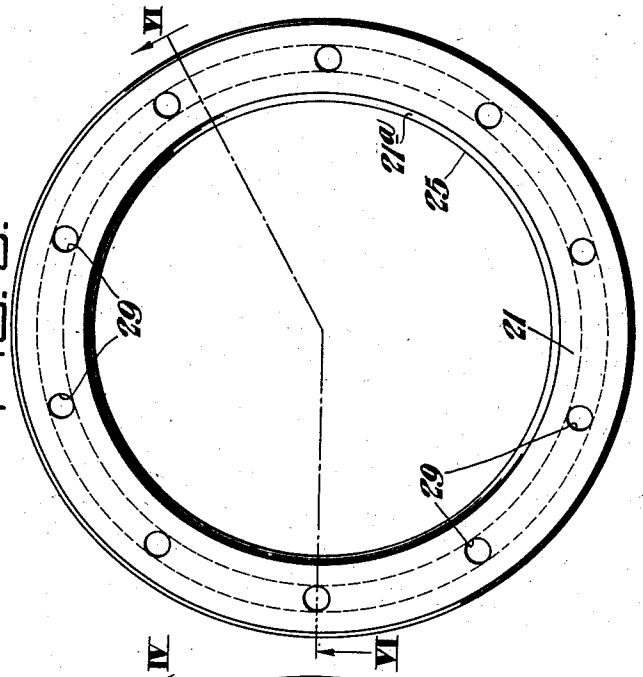


FIG. 6.

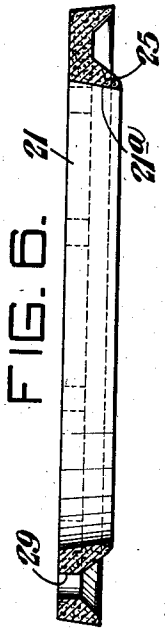


FIG. 3.

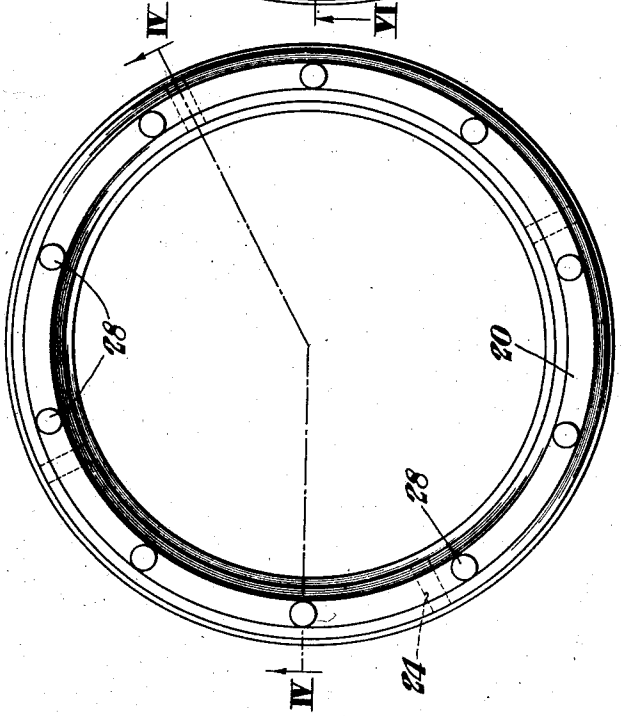
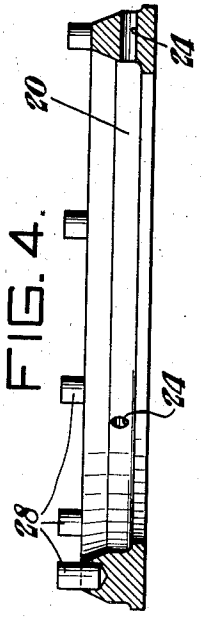


FIG. 4.



Inventor:
AUGUST R. MAIER,
by: John E. Jackson
his Attorney.

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UNITED STATES PATENT OFFICE

2,238,654

SWIVEL

August R. Maier, Dallas, Tex., assignor to Oil Well Supply Company, a corporation of New Jersey

Application February 27, 1940, Serial No. 321,117

8 Claims. (Cl. 285—97.1)

This invention relates to rotary swivels used in the oil-producing industry, and more particularly to an improvement in the wash pipe packing.

In the oil-producing industry, it is common practice to drill oil wells by means of a rotary bit secured to the lower end of a string of drill pipe. The drill pipe is rotated by means of a rotary at the surface and a slush pump is provided which forces mud downwardly under relatively high pressure through the revolving drill pipe and bit. A swivel is provided on the surface through which this mud flows, one end of the swivel being connected by a wash-pipe and flexible hose connection to the pump, while the other end is connected to the revolving drill pipe. Since the mud carries a substantial quantity of abrasive particles, care must be exercised in designing the swivel so that the packing will have a relatively long life. It is also desirable from the standpoint of operating efficiency that the parts be so constructed and arranged that they may be quickly taken apart and then quickly reassembled when the repair or replacement required is done, in order that the idle unproductive time on the drilling rig is kept at a minimum.

It is an object of this invention to provide a sealing means between the stationary wash-pipe and the revolving swivel, which has an increased life. Another object is the provision of such a sealing means that minimum time is lost on the rig due to replacement of the packing element. An additional object is to provide sealing means which cooperates with the wash-pipe in such a manner that a minimum amount of wear takes place, yet an effective sealing contact is maintained.

It is a still further object of this invention to provide a rotary swivel sealing means so arranged that a thin layer of grease is maintained between the contacting stationary and revolving surfaces in order to reduce to a minimum the frictional contact necessary for effectively sealing against the high pressures exerted by the slush pump.

It is an additional object of this invention to provide a seal which is automatically operated by pressure obtained from the supply of drilling fluid passing therethrough.

Heretofore it has been the practice to provide the swivel with a packing between the stationary wash-pipe and the revolving body, wherein wear was compensated for by making a longitudinal adjustment of the packing members.

Under the teachings of the present invention, a self-sealing ring is utilized which is so constructed and arranged that while it cannot be compressed longitudinally it can be expanded transversely by hydraulic pressure.

The invention will be fully apparent from the following detailed disclosure when read in connection with the accompanying drawings, in which:

Figure 1 is a view of my novel swivel, partly in elevation and partly in longitudinal section;

Figure 2 is an enlarged detail illustrating the improved self-sealing means constructed and arranged to be expanded transversely by hydraulic pressure;

Figure 3 is a plan view of one of the component parts of the improved sealing means;

Figure 4 is a sectional view on line IV—IV of Figure 3;

Figure 5 is a plan view of another component part of the sealing means; and

Figure 6 is a sectional view on line VI—VI of Figure 5.

Referring to the embodiment of the invention illustrated, the rotary body 10 is mounted on bearings 11 carried by a housing 12 to which a bail 13 is attached for suspending the swivel assembly when desired. The upper flange 14 of a non-rotary water tube 15 is held between the gooseneck 16 and housing cap 17 as shown. Sealing elements 20 and 21 (best shown in Figures 2 to 6) surround this water tube and are held in nested position by the upper and lower glands 19 and 18, respectively.

As shown in Figures 1 and 2, the plurality of sealing elements 21 is provided between the upper and lower glands 19 and 18 respectively. In this disclosure, five are shown, but two will serve the purpose just as well, as each sealing ring is self-sealing and will wear for a long time, provided the face thereof is properly lubricated. A water-repellant grease preferably is forced under pressure through an external fitting 22 connected to a cored passage 23 in the rotary body 10 of the swivel. Each ring member 20 has openings 24 extending laterally therethrough so that lubricant can be forced via lateral port 23^a onto the inner contacting surface 21^a of the sealing member 21. The metallic spacer ring member 20 can have considerable clearance 26 on its inside diameter relative to the wash-pipe 15 so that grease can pass freely thereby. The sealing member 21 makes a working pressure fit in such manner that the inner surface of its end portion 25 fits snugly against the wash-pipe 15 so that upward pressure of the drilling fluid can further seal the ring 21. As so arranged, an

annular clearance space 27 is provided between the inner side of the inner portion 25 of the surface of the sealing member and the face adjacent this portion of spacer ring 20, so that fluid can enter said clearance space to make a pressure seal. Similarly, an annular clearance space 27' is provided on the other side for the same purpose.

Pins 28, provided on the upper side of the metallic ring member 20, extend through holes 29 in the sealing member 21 and contact the under side of the adjacent metallic member in such a manner that the metallic rings always maintain a fixed spaced relationship to each other, so that the flexible or resilient sealing member 21 is never placed under longitudinal compression at any time. This deviates from the prior art devices in which the sealing members always have a compression force applied thereon which has a tendency to prematurely wear or tear the packing. My novel arrangement herein disclosed and claimed overcomes the disadvantages which are inherent in the prior art device and furthermore provides an effective sealing assembly which can be easily and quickly tightened up as a unit by adjustment of the glands 18 and 19. The contact between the adjacent axially aligned ring members which is secured by coaction of the pins 28 positively prevents the exertion of longitudinal compressive force on the resilient sealing members 21, thus they are free to flex laterally under influence of the pressure exerted on the lubricant by the fluid being pumped.

While I have described quite specifically the embodiment of the invention illustrated, it is to be understood that various modifications may be made by those skilled in the art without departure from the invention as defined in the appended claims.

I claim:

1. In a swivel, the combination of a stationary water tube; a revolving body; a flexible self-sealing ring mounted in said body; a spacer supporting said ring and preventing its compression, and lubricating means for providing a film of lubrication between the revolving ring and stationary water tube.

2. In a swivel for rotary well drills, a conduit through which the drilling fluid passes; a swivel body rotatably surrounding said conduit; and sealing means interposed between said conduit and body, said means comprising a plurality of flexible self-sealing ring members, spacers positioned between said ring members coacting to prevent the compression of the ring members, and means for conveying a lubricant to the wearing surfaces of said ring members.

3. In a swivel for rotary well drills, the combination of a stationary water tube through which the drilling fluid passes and a revolving swivel body surrounding a portion of said tube; a plurality of resilient ring members in sealing relationship with said tube, said sealing relationship being increased by the pressure of said drilling fluid in the swivel body; spacer members interposed between said ring members and engaging each other to prevent any compression of the ring members, and conduit means traversing the spacers and extending through the swivel body to an external source for conveying a lubricant to the wearing surfaces of said water tube and said sealing rings.

4. In a rotary swivel, the combination with a water tube, of a rotatable member spaced from and surrounding a portion of the tube, a plurality of flexible sealing rings disposed between said member and tube, a plurality of spacer rings between and nesting with the sealing rings and preventing axial compression of the sealing rings, each of said spacer rings having a transverse lubricant passage therethrough, said flexible sealing rings being arranged to make a tighter seal on admission of the drilling fluid passing through said swivel; a lubricant passageway in the body of said swivel extending to the surface and cooperating internally with the transverse passageways in said spacer members for substantially filling the remaining area between said tube and swivel with a water-repellant lubricant forced through said passageways for lubricating the wearing surfaces of said sealing members, and means for holding said sealing and spacer members in nested relationship between said tube and said body.

5. A device of the character described, comprising a water tube; a rotary swivel having an annular body portion spaced from and surrounding said tube; lower and upper glands assembled in longitudinally spaced relationship between said tube and said body; a plurality of rings, each having an annular tapered portion of less transverse width than the annular space between said tube and said body portion; an annular flexible sealing member extending across the top and down both sides of the annular tapered portion of each of said rings; a lubricant passage formed in said body through which lubricant is adapted to be supplied to said annular space, said sealing member being pierced by elements secured to said rings, certain of said elements of one of said rings contacting one of said glands, and other of said elements of other rings contacting adjacent rings, whereby the said resilient sealing members are entirely relieved of longitudinal pressure.

6. A device of the character described, comprising a water tube; a rotary swivel having an annular body portion spaced from and surrounding said tube; lower and upper glands assembled in longitudinally spaced relationship between said tube and said body; a plurality of metallic rings, each having an annular tapered portion of less transverse width than the annular space between said tube and said body portion; an annular flexible sealing member extending across the top and down both sides of the annular tapered portion of each of said rings, said rings having passages extending transversely therethrough and said swivel body having a longitudinally extending lubricant passage with lateral ports opening into said annular space, said sealing members being pierced by elements secured to said rings, certain of said elements on one of the rings contacting with one of said glands, and other of said elements on other rings contacting with adjacent rings, whereby the resilient members are relieved of longitudinal pressure.

7. In a device of the character described, the combination with spaced members having relative rotative movement, of sealing means disposed therebetween, said means including a plurality of flexible sealing rings, a plurality of spacer rings between and supporting the sealing rings, said spacer rings being interengaged and preventing compression of the sealing rings thereby in a direction longitudinally of the assembly, and means for lubricating said sealing rings.

8. In a device of the character described, the combination with spaced members having relative

rotative movement, of sealing means disposed therebetween, said means including a plurality of spacer rings, flexible sealing rings between said spacers having inner and outer annular portions overlying said spacers, said sealing rings being apertured and said spacers having portions passed therethrough, the spacer portions engaging adjacent spacers to limit their relative longitudinal movement and thereby prevent compression of the sealing rings therebetween, and means for lubricating said sealing rings.

AUGUST R. MAIER.