Oct. 3, 1933. V. W. ZILEN 1,929,183

ROTARY

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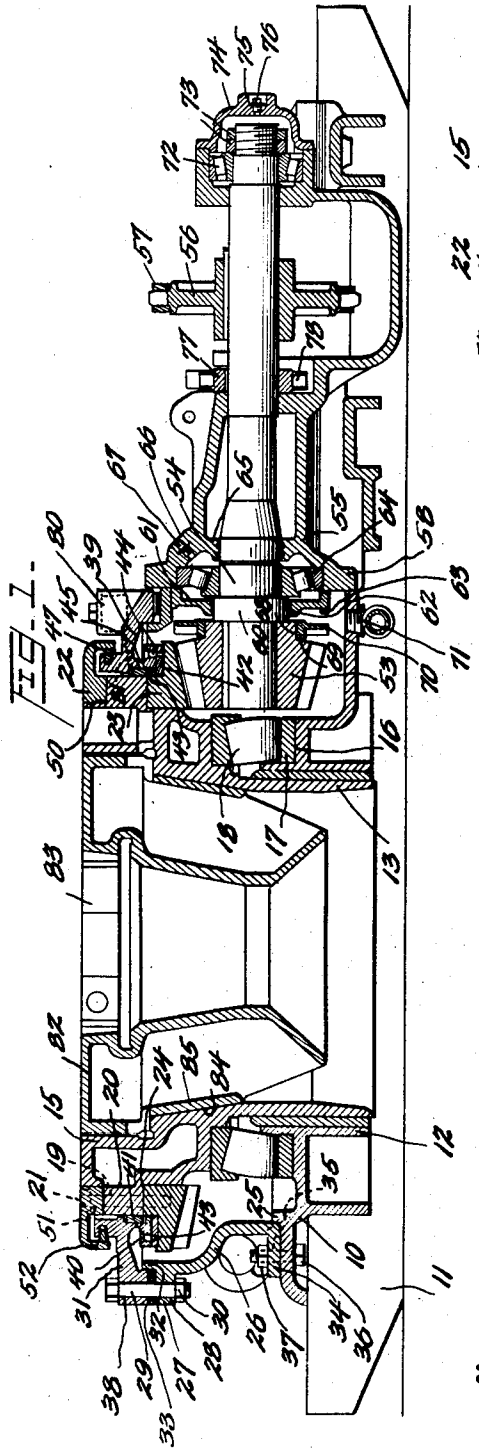

FIG. 1.

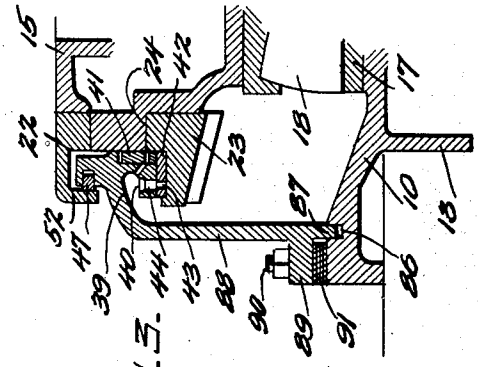

FIG. 3.

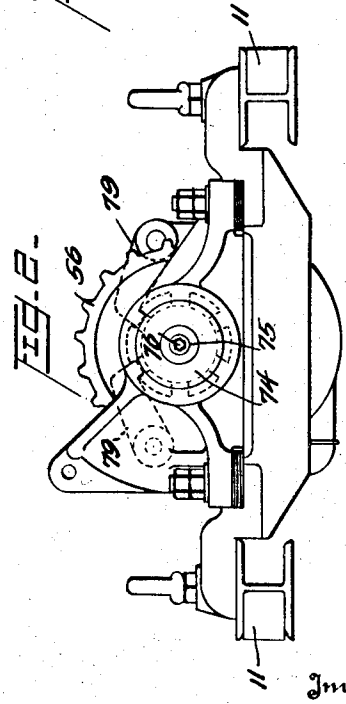

FIG. 2.

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UNITED STATES PATENT OFFICE

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ROTARY

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13 Claims. (Cl. 255—23)

This invention relates to hydraulic rotary drilling machines and has for its principal object means for freely lubricating the gears and bearings of the rotating parts while at the same time providing means for guiding the grit-carrying mud fluid away from the lubricated parts. A further advantage of the invention is the approved means for retaining the top as well as the bottom of the revolving table effectively against horizontal and vertical displacement.

A further object of the present invention is particular construction of the housing for the gears and roller bearings which may be readily detached for cleaning the inside of the housing. A further feature is the novel construction of the mud ring for sealing the upper part of the housing and preventing the mud liquid from seeping into the gear housing and the location and positioning of the hold down ring for effective stabilization of the top of the table against its displacement by the gear in operation.

A still further object of the invention is the means for lubricating the gears and roller bearings which consists in sweating on the pinion shoulder an annular splasher ring adapted to scoop oil from the bottom of the casing and throw it against the upper section of the hold down ring whereby oil is allowed to penetrate thru the gear elements and bearing supports.

In the rotary system of drilling for oil, a vertical drill stem carrying at its lower end the drill pipe with its cutting bit, is secured to the horizontally revolving table in such a manner as to cause the drill stem to revolve with the table, the latter being so mounted as to provide free rotation. Hoisting mechanism, usually located to one side of the derrick and generally secured to the derrick floor frame, raises and lowers the drill stem as the drilling of the well progresses. The drill stem is hollow, as is the pipe, and the cutting bit has a hole drilled thru it to form a clear passage from top of stem, bit and pipe.

The mud fluid is pumped thru the drilling stem and discharged at the point of cutting at the bottom of the well into the space between the drill pipe and the walls of the well. This mud fluid then together with cuttings from the strata and other gritty matter rises to the top of the well, and in so doing plasters up the walls of the well by the rotative action of the drill pipe thereby shutting off the water or gas and preventing to a certain extent any possibility of the caving in of the walls of the well. The surplus mud and sand laden fluid overflows the well and returns into a mud pit to be subsequently pumped back forming a continuous flow. In devices now in use, this mud fluid generally finds its way to the unprotected machine parts and wears them out by grinding. This, of course, reduces the efficiency of the rotary and lowers its factor of safety and durability. In the devices now in use there is no provision made for lubrication of the exposed gearing and machine parts and if they be lubricated it must be done by manually applying lubrication to the exposed parts. This is highly inefficient because the grit and mud offsets any effect the lubrication might have on the gear elements.

In the present construction these difficulties are overcome and there is no probability of the mud fluid entering the gear housing while the gears and bearings are kept constantly lubricated due to the splash system and to the method of sealing the housing.

Further objects and advantages of this invention will become apparent as the description proceeds and reference is made to the accompanying drawing in which:

Figure 1 is a longitudinal vertical section of the present construction.

Figure 2 is an end view.

Figure 3 is a modified showing of a section of the hold down ring.

The base 10 is pivoted on a plurality of skids 11 so that the axis of the table is directly over the hole to be drilled. The base 10 and skids 11 may, if desired, be made in one piece. The central opening of the base is preferably cylindrical having a wall 12 which engages for rotative movement the skirt 13 of the gear table 15 between which and a shoulder or seat 16 of the base is an anti-friction bearing 17, preferably of the roller type shown, as the weight of the parts borne on the rollers 18 is at times very considerable. The outer edge of the gear table is provided with an opening 19 in the offset portion 20 thru which the bolts 21 extend for securing the mud ring 22 on the gear table and the bevel gear 23 against the shoulder 24 formed by the offset portion, the gear being provided with threaded openings to receive the threaded ends of the bolts.

The base 10 is provided with a shoulder 25 forming a seat with the top of the base for receiving a member 26 which constitutes the gear and bearing housing. This gear housing is provided with an outwardly extending flange 27 having an opening 28 to receive the bolt 29 to which the nut 30 is attached so as to securely retain the

gear housing and hold down ring 31 together. The upper face of the flange 27 is provided with a shoulder 32 whereby a plurality of shims 33 may be placed so as to adjust the height of the hold down ring 31. The lower portion of the member constituting the gear housing is provided with an outwardly extending flange 34 having suitable openings 35 for receiving bolts 36 which also pass thru openings in the base and being thereby readily secured together and held by the lock nut 37.

A hold down ring 31 consists of an annular member provided with a number of openings 38 thru which the bolts 29 pass so that the same may be securely held against the gear housing 26. The inner surface of this hold down ring is inclined upwardly as at 39 and at its inner edge is provided with an annular oil receiving channel 40. The inner surface engaging the gear table is recessed or cut away to form a seat for the vertical bearing ring 41 while a horizontal bearing ring 42 is positioned between the bevel gear and the hold down ring. These bearing rings are provided with openings 43 to allow for proper lubrication of the bearing surfaces and being in communication with the ducts 44 and 45 allow oil to penetrate the bearing surfaces and the gear teeth so as to thoroughly lubricate these parts during operation of the rotary, the various working parts of the present invention being enclosed within the gear housing.

The mud ring 22 rests upon the upper surface of the offset portion of the gear table and abuts the shoulder 50 thereof, and is provided with a number of openings 51 thru which the bolts 21 pass so as to snugly retain the mud ring on the gear table. The outer edge of the ring is turned downwardly to form a flange 52 the inner surface of which engages the packing ring 47 so as to prevent the mud fluid from entering the gear housing.

The gear 23 is driven by means of a pinion 53 fast on a shaft 54 which passes thru a bearing housing 55 and keyed to the shaft is a sprocket 56 receiving its power from a prime mover (not shown) by means of a chain 57.

The bearing housing 55 has at its inner end an extended flange 58 which is suitably secured to the base. Surrounding a shoulder 60 on the shaft 54 is a closure member 61 having the usual oil rings 62 for preventing accumulation of dirty oil and sediment within the gear housing from entering the bearing housing thru the shaft. This closure is bolted to the bearing housing as at 63. Abutting the shoulder 60 on the shaft is a roller bearing 64 secured in the usual raceway. The bearing housing has an inwardly projected bearing flange 65 provided with the usual packing rings and form a bearing surface for the shaft. Between the bearing flanges 65 and the roller bearing, the housing 55 is provided with an opening 66 to receive the connection 67 for a high pressure grease gun for supplying lubrication to the bearing surfaces.

The pinion which is keyed to the shaft is provided with a reduced shoulder 68 on which is sweated on or otherwise secured an annular ring 69 having laterally extending U-shaped arms 70 adapted to scoop up oil in the bottom of the gear housing and discharge the same into the annular channel 40 in the hold down ring. Secured in a threaded opening in the bottom of the base is an oil gauge connection 71.

The outer end of the shaft is journaled in suitable roller bearings 72 while the end of the shaft is threaded to receive the lock nuts 73. The outer end of the bearing housing 55 is cut away to substantially U-shaped in cross section so as to allow for free rotation of the sprocket wheel. A cap 74 is bolted to the end of the upright extension of the housing 55 and is provided with an opening 75 adapted to receive a connection 76 for high pressure grease guns for supplying lubrication to the bearing surfaces.

Keyed to the shaft 54 is an annular collar 77 having recessed portions 78 to receive the pivoted locking dogs 79 if when and as it is desired to prevent rotation of the shaft for the purpose of repairing or adding to the drill stem. There is provided a receptacle 80 for storing oil so as to lubricate the bearings and gearing preliminary to operation of the rotary. The oil is permitted to flow thru the duct 81 to the bearings 41 and 42. Positioned adjacent the gear table is the table bushing 82 provided with a central conical opening 83 substantially parallel and coaxial with the conical surface 84 of the gear table. The bushing is provided with the conical skirt 85 fitting snugly but non-rotatively on the conical surface 84 of the gear table.

If desired the gear housing and hold down ring may be combined into one piece as shown in Figure 3, in which case, the base 10 is provided with an annular recess 86 for receiving the extended flange 87 of the hold down ring 88 while the lateral flange 89 is adapted to be secured to the base by means of the bolt 90. If desired to adjust the height of this ring any desired number of shims 91 may be positioned between the ring and base.

What I claim is:

1. In a rotary, a base, a gear table rotatably mounted within said base, a gear housing secured to the base, a hold down ring secured to said gear housing and abutting said gear table above said gear, bearing rings disposed between the gear table and hold down ring, and means removably secured to said gear table and overlapping said hold down ring whereby mud fluid is prevented from flowing under the hold down ring and entering said gear housing..

2. In a rotary, a base, a gear table, a gear housing secured to said base, a hold down ring secured to said gear housing, a mud ring secured to said gear table overlapping and engaging said holddown ring on the outside periphery, driving means for said gear table, and means carried and driven by said driving means for lubricating said gear table and driving means.

3. In a rotary, a base, a gear table, a gear housing secured to said base and extending upwardly therefrom, an annular hold down ring secured to the top of said gear housing, a gear carried by said table, means for driving said gear, roller bearings in said housing, a mud ring secured to said gear table and overlapping said holddown ring, and means carried and driven by said gear driving means for throwing lubricant against said holddown ring above the gear thus lubricating the gears and bearings.

4. In a rotary, a base, a gear table, a gear housing secured to the top of said base, a hold down ring secured to said gear housing, a mud ring removably secured to said gear table and overlapping said holddown ring, a pinion meshing with said gear, means for driving said pinion, and means carried by said pinion to drive lubricant to the gearing.

5. In a rotary, a base, a gear table, a mud ring, a gear carried by said table, bearings between

the table and base, a gear housing secured to said base, a hold down ring adjustably mounted on said gear housing, an upwardly extending shoulder on said hold down ring provided with an annular groove in its periphery, a packing ring in said groove engaging the downturned flange of said mud ring, and means passing thru said mud ring, gear table and gear for removably securing said members together.

6. In a rotary, a base, a gear table, a gear carried by said table, bearings between the table and base, a housing adapted to enclose said gear and bearings, said housing secured to said base, a shoulder at the upper end of said housing, a hold down ring engaging said shoulder and secured to said housing, means between said housing and hold down ring for adjusting the height of the hold down ring, an annular groove on the inner face of said hold down ring, a mud ring secured to said gear table, a pinion meshing with said gear, means for driving said pinion and means carried by said pinion for supplying a lubricant to said annular groove in said hold down ring.

7. In a rotary, a base, a gear table rotatably mounted within said base, a gear housing secured to the base, an annular gear secured to said table, roller bearings secured between the base and table, a shoulder on said gear housing adapted to receive a hold down ring, means for adjusting the height of said hold down ring, an annular groove on the inner face of the hold down ring, an annular mud ring secured to said table, a pinion adapted to mesh with said gear, means for driving said pinion, and means carried by said pinion for supplying a lubricant to said groove on the hold down ring.

8. In a rotary, a base, a gear table, having an annular gear thereon, an annular member secured to said base and forming a housing for said gear, a holddown ring secured to said member and forming a sloped ceiling for said housing, said ring engaging said table on an annular bearing surface and having lubricating openings, the slope of said ceiling being of such an inclination that oil thrown thereon will flow in part to said openings and down to said bearing surface, and means for throwing oil against said ceiling during the operation of the rotary.

9. The device of claim 8 in which part of the bearing surface and the coacting part of said ring are horizontal, said part of the ring having a channel and bores therein whereby oil flowing from said ceiling will be retained in said channel and flow therefrom thru the bores to lubricate said surface.

10. The device of claim 8 in which part of the bearing surface and the coacting part of said ring are vertical, said part of said ring having bores therein whereby oil flowing from said ceiling will be carried to said vertical bearing surface.

11. In a rotary, a base, a gear table, a gear housing secured to said base and rising above the gear in said table, a hold down ring adjustably secured to the top of said gear housing, a mud ring removably secured to the periphery of said gear table and engaging such hold down ring, and means for lubricating the interior of said housing.

12. In a rotary, a base, a gear table rotatably mounted within said base, a hold down ring adjustably mounted on the base and abutting the gear table to form a gear housing, an upwardly extending shoulder on said hold down ring, an annular groove in said shoulder, a packing ring in said groove engaging a downturned flange formed on a mud ring, said mud ring secured to the gear table and overlapping said hold down ring whereby mud fluid is prevented from entering the gear housing.

13. In a rotary, a base, a gear table, a gear housing secured to said base, a hold down ring adjustably mounted on said gear housing and forming a closure for the same, a mud ring secured to said gear table and overlapping said hold down ring, and means in the interior of the housing for distributing lubricant to all bearing surfaces during operation of said rotary.

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