

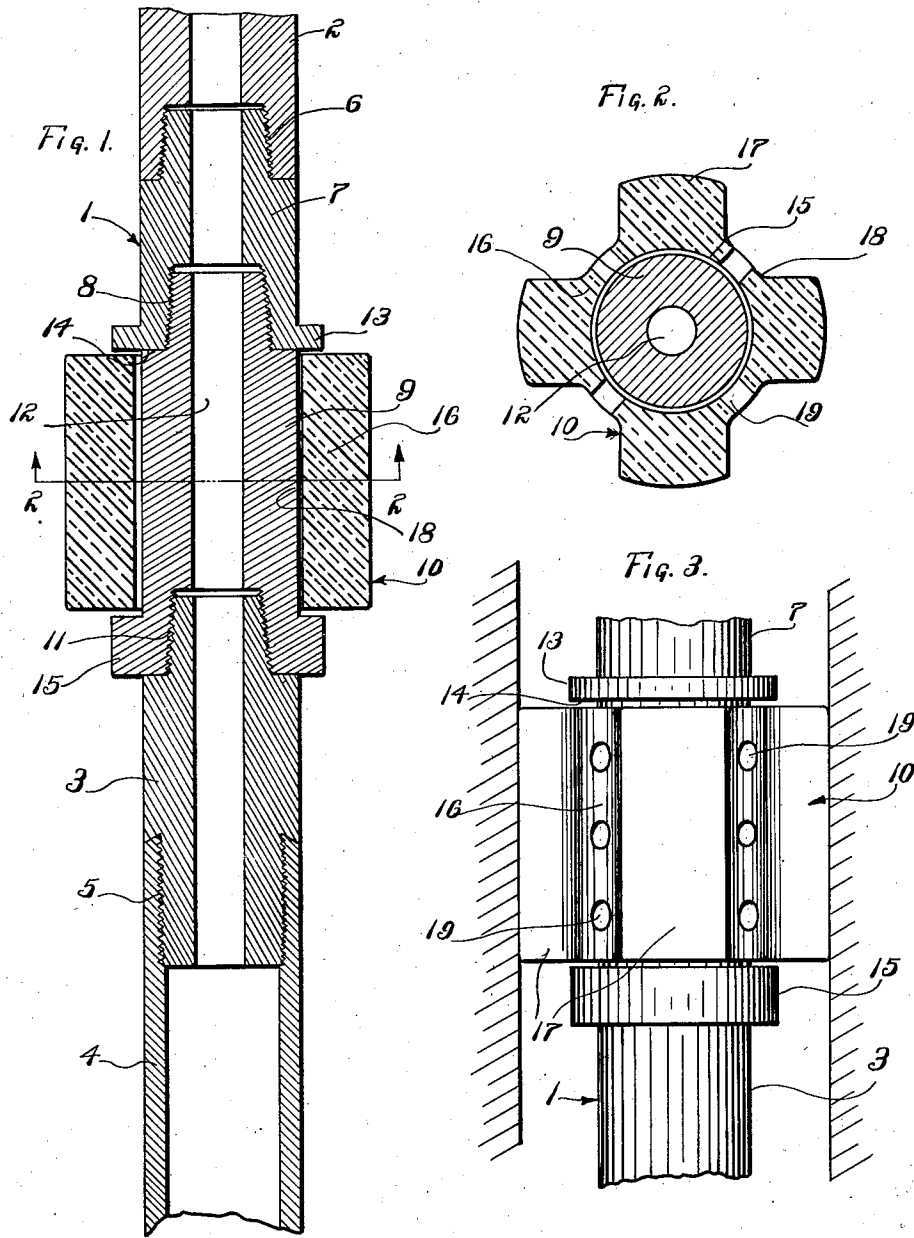
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DRILLING APPARATUS

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DRILLING APPARATUS

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11 Claims. (Cl. 308—4)

This invention relates to guiding and centering devices and more particularly, but not exclusively, to improved means for guiding and centering the tool carrying line of a drilling apparatus.

In drilling to relatively great depths, particularly in oil and gas well drilling, it is highly desirable to make the hoe vertical and straight, otherwise drilling to a considerable depth is very difficult, if not impossible, because of the friction of the tools caused by increasing deflection of the hole. Great precautions are taken in order to keep the hole straight, but notwithstanding these precautions, many holes go crooked, especially when the earth formations are creviced and the structural planes inclined at an angle of only a few degrees from the vertical, for the tool tends to follow the crevices or the structural planes, resulting in a crooked hole. Under these conditions, a hole may not depart greatly from the vertical when drilling at relatively shallow depths, but when deep holes are drilled, the accumulative result of the angle of deflection is so great as to interfere seriously or render impossible continued deeper drilling.

An object of this invention is to provide improved guiding and centering means for a tool carrying line of a drilling apparatus for maintaining the tool true to its course, thereby reducing the possibility of lateral deflection of the tool. Another object is to provide an improved guiding means for the drill pipe of a drilling apparatus for maintaining the drill pipe centered in the hole. A further object is to provide an improved drill pipe guide for centering the drill pipe in the hole, the guide being so formed and constructed that while the drill pipe is guided in the hole unimpeded flow of circulating fluid is maintained. A further object of this invention is to provide an improved guiding and centering device for a drilling tool whereby the hole cut by the tool is maintained substantially straight. Yet another object is to provide a guiding means for a drill pipe having one or more guiding collars which engage the walls of the hole, thereby holding the drill pipe and bit in a substantially straight path. A further object is to provide a drill pipe guiding collar preferably composed of rubber or similar material. These and other objects of this invention will hereinafter more fully appear in the course of the following description and as more particularly pointed out in the appended claims.

In the accompanying drawing there is shown

for purposes of illustration one form which the invention may assume in practice.

In this drawing,—

Fig. 1 is a central longitudinally extending sectional view through a section of drill pipe having associated therewith the illustrative form of the improved guiding and centering means.

Fig. 2 is a transverse sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is a side elevational view showing a fragment of the drill pipe and the improved guiding and centering means for the drill pipe.

In this illustrative embodiment of the invention there is shown a drill pipe generally designated 1 comprising a flush joint tool joint box 2, a flush joint tool joint pin 3, and a flush joint drill pipe 4. As illustrated, the drill pipe 4 is connected by a tool joint thread as at 5 to the tool joint pin, while the tool joint box 2 is connected by a tool joint thread as at 6 to a sleeve or tubular retainer 7 connected as by a pipe thread at 8 to the body 9 of the improved guiding device generally designated 10. The body 9 is threadedly connected at 11 as by a tool joint thread to the tool joint pin 3. The tool joint box 2, retainer sleeve 7, guide body 9, and tool joint pin 3 are made hollow as indicated at 12 throughout their length and mud fluid is adapted to be conducted through the interior of these members and through the hollow drill pipe to the usual drill bit in a well known manner. As shown, the retainer sleeve 7 is flanged at 13 and is provided with a shoulder 14 against which the top surface of the guide body 9 abuts. This guide body is provided with a similar flange 15 at its lower end. Loosely mounted on the exterior of the body 9 is a rubber sleeve 16 having radial guide wings 17 and straight longitudinal flutes or grooves 18 formed externally thereon between the guide wings. In the present construction sufficient clearance is provided between the external periphery of the guide body and the interior of the guide sleeve to permit flow of mud fluid between the sleeve and the body to lubricate the sleeve. The rubber guide is further provided with a plurality of suitably located openings 19 traversing the sleeve portion thereof for the passage of mud fluid to facilitate lubrication of the sleeve. The sleeve and drill pipe are freely relatively rotatable. Although but one of the rubber guide sleeves is shown it will be understood that, if desired, a plurality of these sleeves may be utilized at spaced points along the length of the drill pipe or between each section of drill pipe. It will also be evident that although the guide is

shown connected between the tool joint box and pin of a drill pipe, it may be connected in various other manners to the drill pipe.

In the use of the improved drill pipe guide for centering the drill pipe in the hole, it will be noted that as the hole is deepened by the drill bit the guiding devices 10 are attached to the drill pipe at suitably located points preferably between the tool joint box and the tool joint pin as shown in Fig. 1 of the drawing. Any desired number of these guide devices may be attached to the drill pipe although in the present construction one guide is used with each section of drill pipe. The external diameter of the rubber sleeve is somewhat greater than the diameter of the drill hole cut by the bit so that the guide wings 17 must be forced or squeezed into the hole as the drill pipe is lowered. As the bit progresses forward and the drill pipe follows it down the hole, the flange 13 on the steel retainer 7 forces the rubber sleeve down along the walls of the hole, while the guide body 9 secured to the drill pipe rotates inside the sleeve. During the drilling operation, mud fluid flows through the drill pipe to the drill bit to wash away the cuttings from the bottom of the hole and the return fluid flows upwardly externally between the drill pipe and the wall of the hole and through the flutes 18 formed on the guide sleeves. The mud fluid also flows through the openings 19 from the guide sleeve and along the space between the inner surface of the guide sleeve and the exterior periphery of the guide body 9, to thereby lubricate the guide sleeve. It will also be noted that the surfaces of the guide wings 16 which engage the walls of the hole are lubricated by the mud fluid thereby permitting the guides to slip easily into the hole. Although in the present construction the guide sleeves are shown as composed of rubber, it will be understood that if desired the guide sleeves may be made of different materials and that under certain conditions metal guide sleeves may be employed, although in this instance guide sleeves composed of rubber are preferred. When the drill pipe is being withdrawn from the drill hole the flange 15 on the lower end of the body 9 engages the guide sleeve and forces the latter upwardly from the hole.

As a result of this invention it will be noted that an improved drill pipe guide is provided for centering the drill pipe in the drill hole whereby the possibility of the drill bit being deflected laterally is substantially diminished. It will further be noted that an improved guiding and centering device is provided for a drill pipe which is of an exceedingly rugged and simple construction readily attachable to a standard drill pipe. It will further be evident that by providing a rubber sleeve for a drill pipe wear is reduced to a minimum, the mud fluid acting as a lubricant for the guide sleeve, permitting the latter to slide smoothly within the drill hole.

While there is in this application specifically described one form which the 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. The combination with drill pipe sections adapted to be joined together, of a drill pipe guide including a body member connected between said

pipe sections, a rubber guide sleeve, means on the drill pipe and body member for journaling said rubber sleeve on said body member and for precluding substantial relative axial movement between the sleeve and drill pipe, said rubber sleeve having projecting guide wings adapted to engage slidably and non-rotatably the walls of a drill hole for centering the drill pipe in the hole and having fluid conducting passages formed between the wings thereon for conducting drilling fluid past the guide, and fluid passages formed in the guide sleeve body between the wings thereof for supplying fluid to the interior of said guide sleeve to lubricate the journal means therefor.

2. The combination with a tool joint box and tool joint pin for connecting the sections of a drill pipe together, of a drill pipe guide including a body member connected between said joint box and pin, a rubber guide sleeve, journal means for rotatably supporting said rubber guide sleeve on said body member, said guide sleeve having projecting wings adapted to engage slidably and non-rotatably the walls of a drill hole to center the drill pipe in the hole and having fluid conducting passages formed thereon between the wings thereof for conducting drilling fluid past the guide, and fluid passages formed in the body of the guide sleeve between the wings thereof for supplying fluid to the interior of said guide sleeve to lubricate the journal means therefor.

3. A drill pipe guide comprising a rubber sleeve adapted to be mounted for free rotation on a drill pipe and engaging the walls of a drill hole for centering the drill pipe in the hole, said sleeve being maintained under compression and against rotative movement in the hole during its guiding function, and mounting means for said sleeve on the drill pipe for precluding substantial relative axial movement between the sleeve and pipe.

4. A drill pipe guide comprising a rubber sleeve adapted to be mounted for free rotation on a drill pipe and engaging the walls of a drill hole for centering the drill pipe in the hole, said sleeve being maintained under compression and against rotative movement in the hole during its guiding function, and having means for conducting fluid between the same and the drill pipe for lubricating the same during rotation of the drill pipe relative thereto, and mounting means for said sleeve on the drill pipe for precluding substantial relative axial movement between the sleeve and pipe.

5. A drill pipe guide in the form of a rubber sleeve adapted to be mounted for free rotation on a drill pipe, said sleeve being of a diameter greater than the diameter of the drill hole so that the sleeve is maintained under compression and stationary as to angular movement during its guiding function while the drill pipe is free to rotate relative thereto, the sleeve slidably engaging the walls of the hole as the drill pipe is fed axially.

6. A drill pipe guide in the form of a rubber sleeve adapted to be mounted for free rotation on a drill pipe, said sleeve being of a diameter greater than the diameter of the drill hole so that the sleeve is maintained under compression and stationary as to angular movement during its guiding function while the drill pipe is free to rotate relative thereto, the sleeve slidably engaging the walls of the hole as the drill pipe is fed axially, and having means for conducting lubricant to its journal on the drill pipe to lubricate the same.

7. The combination with drill pipe sections adapted to be joined together, of a drill pipe guide including a coupling member forming the guide

body and connected between the pipe sections, and a guide member of resilient material rotatably mounted on said coupling member and of a greater diameter than the drill hole so that the
 5 guide member is maintained under compression and against rotation during its guiding function while the drill pipe is free to rotate relative thereto, said coupling member having means thereon above and below said guide member for preventing
 10 any substantial movement of the guide member axially relative to the drill pipe, said guide member having lateral guiding projections thereon adapted to engage slidably and non-rotatably the walls of a drill hole for centering the
 15 drill pipe in the hole as the drill is fed inwardly, and fluid conducting passages between the guide projections on said guide member.

8. The combination with drill pipe sections adapted to be joined together, of a drill pipe
 20 guide including a coupling member forming the guide body and connected between the pipe sections, and a guide member of resilient material rotatably mounted on said coupling member and of a greater diameter than the drill hole so that
 25 the guide member is maintained under compression and against rotation during its guiding function while the drill pipe is free to rotate relative thereto, said coupling member having means thereon above and below said guide member for preventing any substantial movement of the guide
 30 member axially relative to the drill pipe, said guide member having lateral guiding projections thereon adapted to engage slidably and non-rotatably the walls of a drill hole for centering the drill
 35 pipe in the hole as the drill is fed inwardly, fluid conducting passages between the guide projections on said guide member for conducting drilling fluid past said guide, and fluid passages formed in the guide member body between the guide
 40 projections on said guide member for supplying fluid to the interior of said guide member to lubricate the bearing thereof on the coupling member.

9. The combination with a tool joint box and tool joint pin for connecting the sections of a
 45 drill pipe together, of a drill pipe guide including a coupling member connected between said

joint box and pin and forming the guide body, and a rubber guide sleeve rotatably mounted on said body member, said coupling member having means fixed relative thereto and respectively
 5 above and below said guide sleeve for preventing any substantial axial movement of the rubber sleeve relative to the drill pipe, said rubber sleeve having lateral projections thereon adapted to engage slidably and non-rotatably the walls of a
 10 drill hole to center the drill pipe in the hole as the drill is fed inwardly, fluid passages traversing the body of said guide sleeve between said projections for supplying fluid to the interior of the guide sleeve to lubricate the bearing thereof
 15 on the coupling member, and fluid passages on the guide sleeve between the projections thereon for conducting fluid past the guide sleeve.

10. A drill pipe guide in the form of a rubber sleeve adapted to be mounted for free rotation on a drill pipe, said sleeve being of a diameter greater than the diameter of the drill hole so that
 20 the sleeve is maintained under compression and stationary as to angular movement during its guiding function while the drill pipe is free to rotate relative thereto, the sleeve slidably engaging the walls of the hole as the drill pipe is fed
 25 axially, and means for journalling the guide sleeve on the drill pipe and for precluding substantial relative axial movement between the sleeve and pipe.

11. A drill pipe guide in the form of a rubber sleeve adapted to be mounted for free rotation on a drill pipe, said sleeve being of a diameter greater than the diameter of the drill hole so that the
 30 sleeve is maintained under compression and stationary as to angular movement during its guiding function while the drill pipe is free to rotate relative thereto, the sleeve slidably engaging the walls of the hole as the drill pipe is fed axially,
 35 and having means for conducting lubricant to its journal on the drill pipe to lubricate the same, and means for journalling the guide sleeve on the drill pipe and for precluding substantial relative axial movement between the sleeve and pipe.

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