E. E. GREVE.

DRILL STEM FOR ROTARY DRILLING MACHINES.

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1,117,835. Patented Nov. 17, 1914.

Fig. 1.

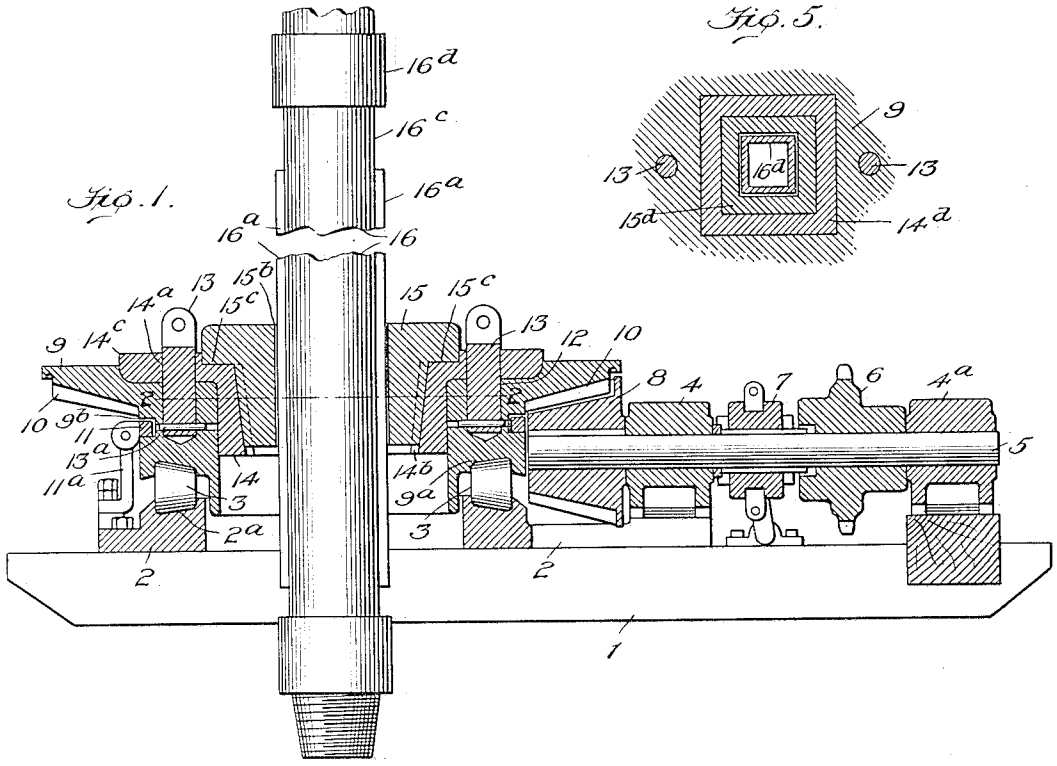


Fig. 5.

Fig. 2.

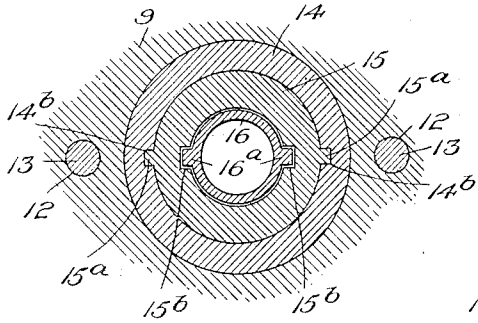


Fig. 3.

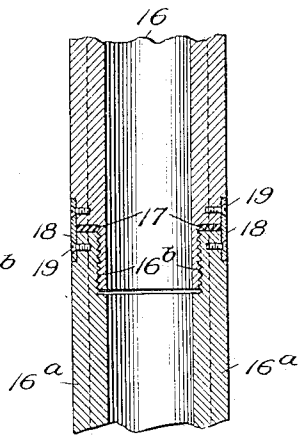
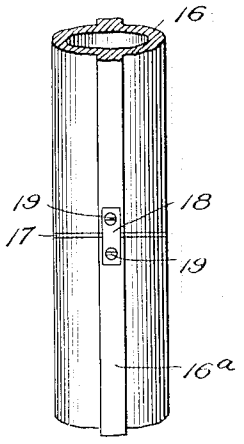


Fig. 4.



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UNITED STATES PATENT OFFICE.

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DRILL-STEM FOR ROTARY DRILLING-MACHINES.

1,117,835. Specification of Letters Patent. Patented Nov. 17, 1914.

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To all whom it may concern:

Be it known that I, EDGAR E. GREVE, a citizen of the United States, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Drill-Stems for Rotary Drilling-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to the construction of sectional drill stems for rotary drilling machines, and especially to such stems where employed in connection with a rotary table, or turn-table, and devices for imparting the rotary motion of the table directly to the drill stem and drilling string as in drilling Artesian or oil wells.

The object of my invention is to insure an uninterrupted and unimpeded feed of the drill stem and string as well as to facilitate the jumping of the drill when required.

Heretofore the drill stems commonly employed have been of two general characters, viz., in the form of pipe having a circular cross section, in which case the means for transmitting the movement of the table to the drill stem has been of a character to grip, bite into, or indent the stem, thus impeding the drilling feed of the stem as well as causing a deterioration of the stem, or else the drill stem has been of non-circular or polygonal cross section to provide means on the drill stem whereby the drill stem might be loosely held and the rotation of the table imparted thereto. In the latter case, the means for transmitting the motion of the rotary table to the drill stem and string has, where it engaged the drill stem, required to be of a configuration corresponding with the periphery of the drill stem, consequently any irregularities on the surface of the drill stem, other than those provided for, tend to interfere with and impede the feed and jumping of the drill.

Drill stems as commonly employed with rotary drilling machines are required to be of from thirty to thirty-six feet in length, more or less, and for convenience in manufacture as well as in use are comprised of sections having screw thread connections. As a consequence, if the cross section of the stem is non-circular or polygonal it frequently happens that the abutting sections when screwed together do not coincide and produce the uniform exterior surface of the stem necessary to permit an uninterrupted feed of the drill string and an unimpeded jumping of the drill. To overcome these objections in sectional drill stems for rotary drilling machines, I interpose between the sections of a drill stem a filler, preferably a compressible gasket of any suitable material whereby the coincidence of the abutting sections may be secured without straining the threaded connections of the sections and without lost motion between the sections, and such a construction embodies the main feature of my invention.

There are other, minor, features of invention involving particular combinations and elemental features of construction, all of which will hereinafter more fully appear.

As a matter of illustration, and without intent of limitation thereby, I have chosen to show that form of my invention wherein are employed a drill stem of general cylindrical form with diametrically disposed ribs on its exterior and a rotary drilling machine having a rotary table with drive pins, a drive-ring and a bushing having a central aperture of non-circular cross section for the drill stem, said central aperture of the inner bushing corresponding with the cross section of the drill stem, but it is to be understood that the drill stem may be of any other cross section which provides means for enabling the rotary movement of the table to be imparted to the drill stem, and the central opening of the bushing will correspond to the cross-section chosen for the drill-stem.

In the drawings chosen for the purpose of illustrating my invention, the scope whereof is pointed out in the claims, Figure 1 is a vertical sectional view of a hydraulic rotary drilling machine, and a view in elevation of a drill stem embodying my invention, parts of the drill stem broken away, showing the relations of the drill stem and the rotary table by which it is actuated. Fig. 2 is a horizontal sectional view of a portion of the rotary table, the drive-ring, the bushing, and the drill stem, taken in the plane of the line 2—2, Fig. 1. Fig. 3 is a longitudinal central section of a portion of a drill stem of

the character shown in Figs. 1 and 2, showing the manner of connecting the sections thereof in accordance with my invention. Fig. 4 is a view in elevation of the portions of the two drill sections shown in Fig. 3; and Fig. 5 is a horizontal sectional view of a modified form of drill stem and the central bushing of the rotary table required to operate the same.

Like symbols refer to like parts wherever they occur.

I will now proceed to describe my invention more fully so that others skilled in the art to which it appertains may apply the same.

In the drawings, 1 indicates suitable skids or sills for the support of the bed-plate 2 of a rotary table 9 with which a sectional drill stem is employed. The bed-plate 2 has an annular race-way 2^a for the rolls 3 which support the rotary table, and on said bed-plate 2, radially disposed with relation to the annular race-way 2^a, is a pillow block or bearing 4 for the inner end of a driving shaft 5, the outer end of said driving shaft having a bearing in a second pillow block 4^a. On the shaft intermediate of the pillow blocks or bearings 4, 4^a is a loose sprocket wheel 6 and a clutch 7 for connecting the loose sprocket wheel to the shaft. The inner end of drive shaft 5 is provided with a pinion 8 secured to said shaft, which pinion engages an annular rack on the under surface of the rotary table.

9 indicates a rotary table provided with a central opening for the reception of bushings and for the passage of a drill stem, and surrounding said central opening on the dependent portions of the table is an annular race-way 9^a corresponding to the race-way 2^a for the reception of rolls 3 on which said rotary table 9 rests and travels. At the upper part and under surface of the rotary table 9 is an annular rack 10 with which the pinion 8 on driving shaft 5 meshes to cause the rotation of the table 9, and in the periphery of the table intermediate of said rack 10 and race-way 9^a is an annular groove 9^b for the reception of a thrust ring 11. The thrust ring 11 may be made in sections bolted or otherwise connected when in place in groove 9^b and is provided with pendent straps or foot extensions 11^a by which it is bolted to the bed-plate 2 to support the rotary table 9 under the thrust of the drive shaft 5.

12 indicates pin holes in the upper surface of the rotary table 9 for the reception of drive-pins 13 which drive pins are secured to the table by cross-pins 13^a passed through radially disposed pin holes in the plane of the thrust groove 9^b. The drive-pins 13 serve to cause the drive-ring or outer bushing 14 to revolve with the table, and may also, when desired, be utilized as fulcrums on which to pivot levers for actuating slips.

14 and 15 indicate nested bushings for the central opening of the rotary table, the outer bushing 14 being a drive-ring for communicating the movement of the rotary table to the drill stem through the intermediary or inner bushing 15, which latter engages the drill stem. These bushings are loosely connected with each other and with the table so as to be readily removable from the table and from each other. In the preferred form these bushings are annular, the outer bushing or drive ring 14 having openings 14^a for the passage of drive-pins 13, and vertical grooves 14^b for the reception of ribs or feathers 15^a on the periphery of the inner bushing 15, and the inner bushing 15 having on its interior grooves 15^b for the reception of ribs or feathers on the drill stem. The outer bushing 14 is supported on the rotary table by the flange 14^c through which the drive-pins 13 pass, and the inner bushing 15 is supported in the outer bushing 14 by reason of the flange 15^c, the tapering form of the central opening of bushing 14 and the exterior tapering form of bushing 15, as indicated in Fig. 1 of the drawings. While the drill stem is preferably of the cross section shown in the principal figures of the drawing, and the bushings annular, as shown in said figures, this is not essential, as the drill stem and bushing may be of any form which will cause the drill stem to rotate with the bushings and the bushings to rotate with the table, as for instance, polygonal in cross section as shown at 14^d, 15^d and 16^d in Fig. 5 of the drawings, provided always that the drill-stem opening is in the axis of rotation of the table.

16 indicates one form of a sectional drill stem embodying my invention and adapted for use in connection with a rotary table having a bushing such as shown in Figs. 1 and 2 of the drawings. Of course, the cross section of the drill stem must be of a character to be engaged by the inner bushing if it is to be rotated thereby, therefore the drill stem 16, in the present instance, is shown as cylindrical, having at diametrically opposite points on its periphery longitudinal ribs or feathers 16^a adapted to slide in the vertical grooves 15^b of the inner bushing 15. The drill stem as an entirety is usually some thirty feet in length, more or less, and is made up of sections about ten feet long, said sections having male and female threaded connections as at 16^b, Fig. 3. In order to obtain an uninterrupted feed of the drill-stem and drill during the rotation thereof by the rotary table, and an unimpeded vertical movement of the drill stem in the jumping of the drill it is essential that the abutting sections should be coincident, or the longitudinal elements of the abutting drill sections should be in alinement.

In order to permit of the proper alinement of the rib portions 16^a, or the coincidence of the abutting sections of a drill stem when the parts are screwed together, I insert in the joint between the sections a filler 17, preferably of a compressible nature, as for instance, a lead gasket. With such a gasket or filler interposed between the sections there will be no difficulty experienced in alining the ribs 16^a, or causing the abutting sections of the drill stem to coincide if sufficient force is exerted, and this can be effected without injury to the screw thread connections of the parts, and without sacrificing the coincidence of the longitudinal elements, or the rigidity, of the drill stem.

To prevent any tendency of the sections to unscrew, the sections may be recessed at the joints and a plate 18 inserted and secured by screws 19 as indicated in Figs. 3 and 4 of the drawing. At the upper end of the upper section of the drill stem the ribs 16^a may be discontinued, as at 16^c, or a suitable plain surface provided just below the collar 16^d for attaching an elevator to the drill stem.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A drill stem comprised of sections having a non-circular cross section and screw-threaded connections, and fillers interposed between the stem sections, whereby a stem having the corresponding elements of its surface in longitudinal alinement is obtained without straining the threaded connections of the sections which comprise the stem.

2. A drill stem comprised of sections having a non-circular cross section and screw-thread connections, and compressible fillers interposed between the stem sections, whereby a stem having the corresponding elements of its surface in longitudinal alinement is obtained without straining the threaded connections of the sections which comprise the stem.

3. A drill stem comprised of sections having a non-circular cross section and screw threaded connections, fillers interposed between the stem sections whereby a stem having the corresponding elements of its surface in longitudinal alinement is obtained without straining the threaded connections of the sections, and means whose outer surfaces are flush with the surface of the drill stem for connecting the drill stem sections to prevent creeping and loss of alinement of the corresponding elements of the surface of the drill stem.

In testimony whereof I affix my signature, in the presence of two subscribing witnesses.

EDGAR E. GREVE.

Witnesses:

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SAMUEL E. SWARTZ.