Oct. 27, 1936. J. E. HAUSER 2,058,689

MEANS FOR ROTATING DRILL STEMS

Filed June 28, 1935 4 Sheets-Sheet 1

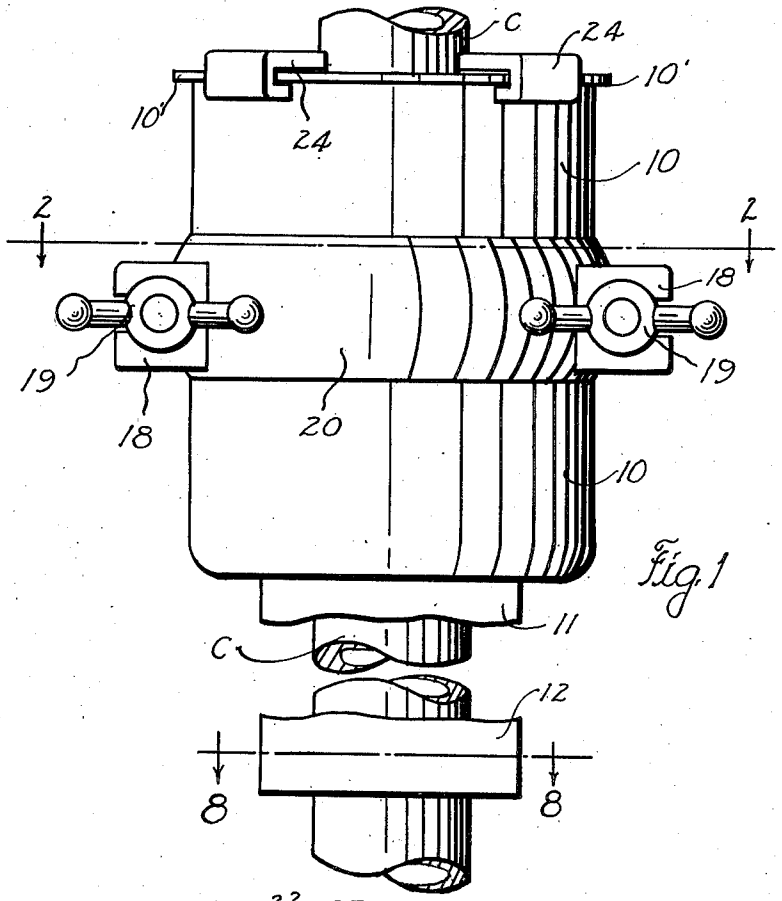


Fig. 1

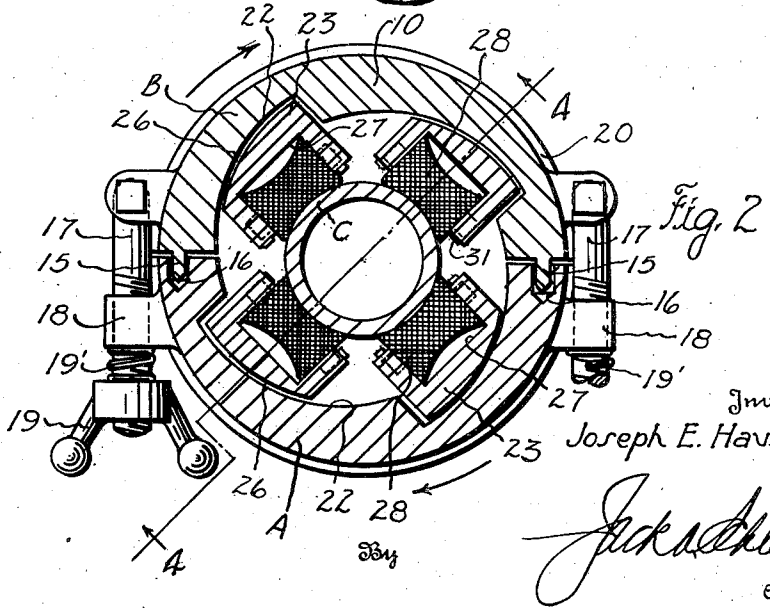


Fig. 2

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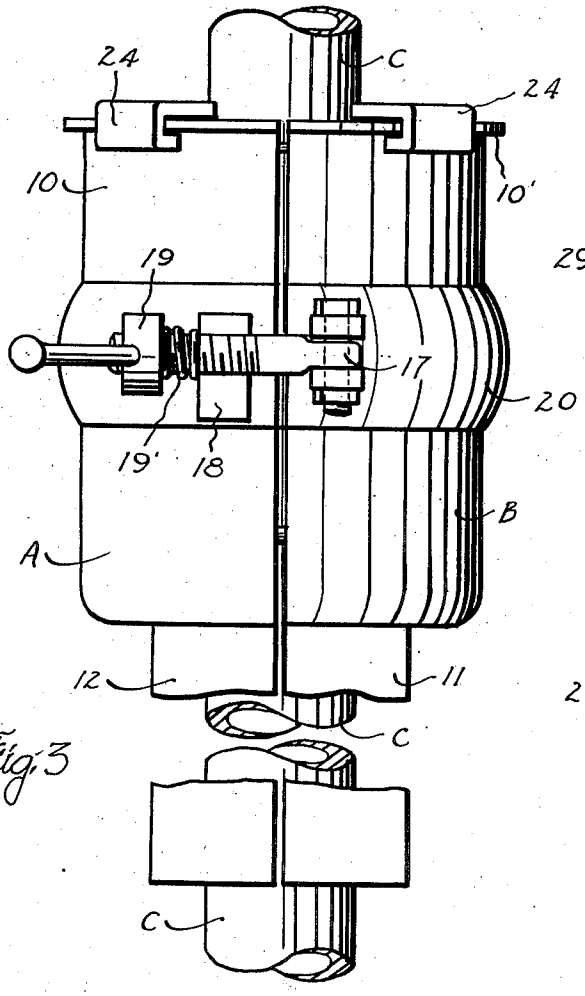


Fig. 3

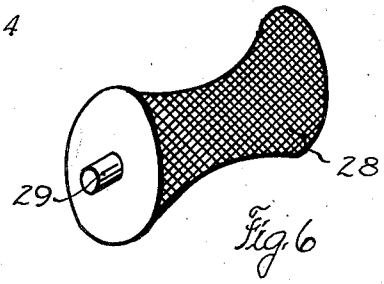


Fig. 6

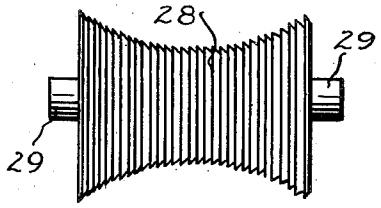


Fig. 7

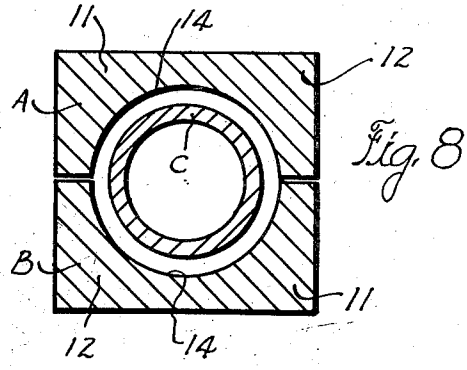


Fig. 8

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MEANS FOR ROTATING DRILL STEMS

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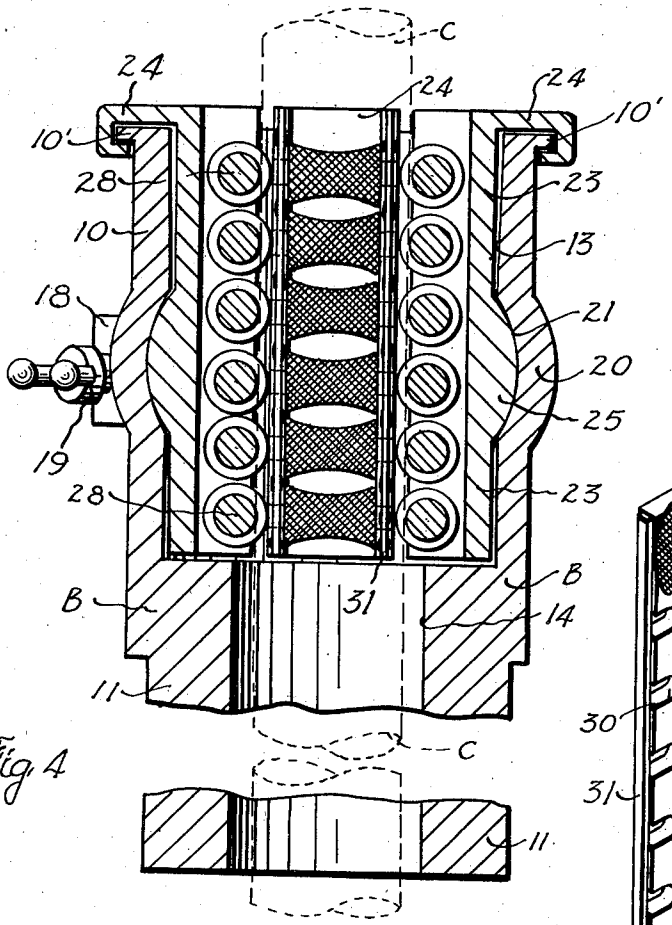


Fig. 4

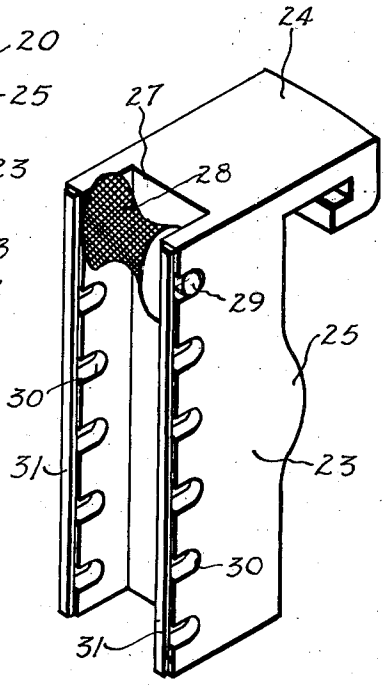


Fig. 5

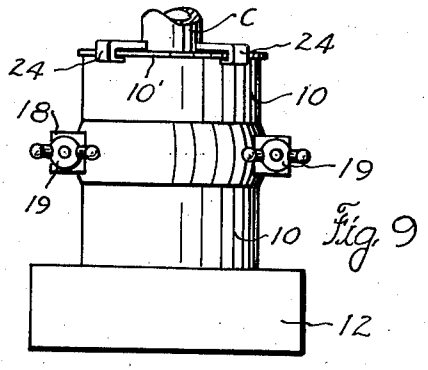


Fig. 9

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MEANS FOR ROTATING DRILL STEMS

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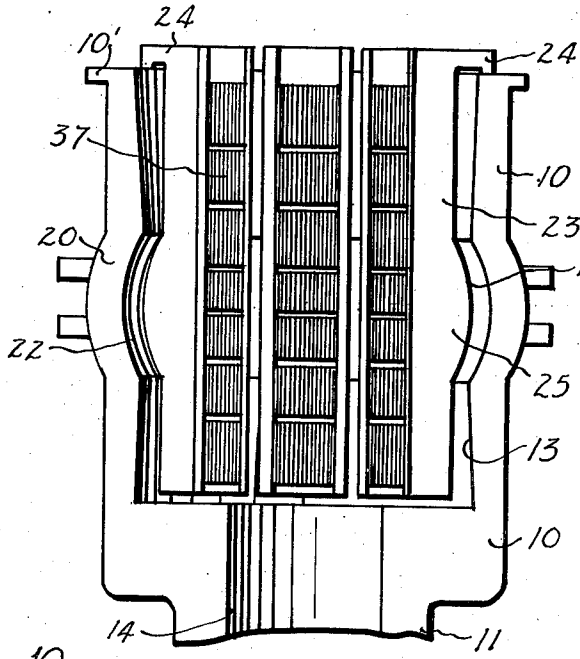


Fig. 10

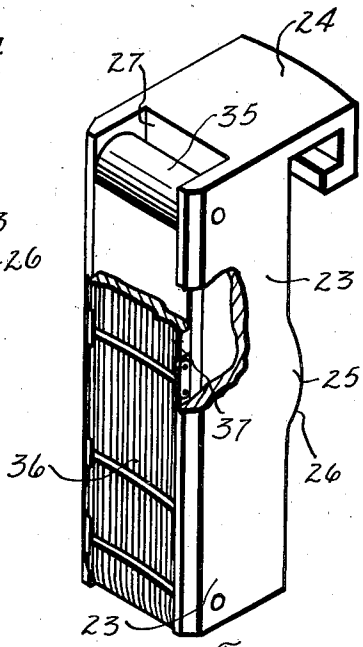
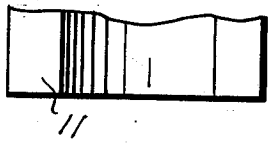


Fig. 12



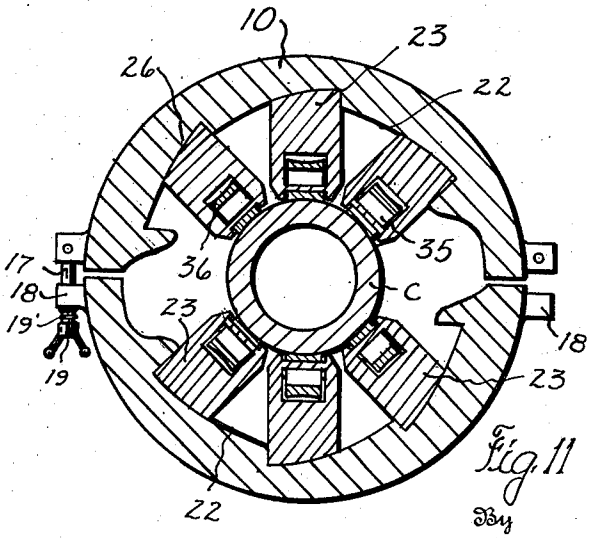


Fig. 11

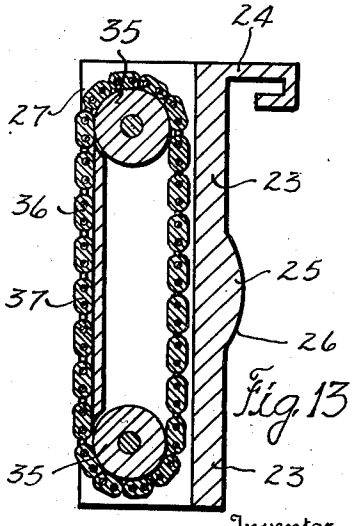


Fig. 13

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Patented Oct. 27, 1936 2,058,689

UNITED STATES PATENT OFFICE

2,058,689

MEANS FOR ROTATING DRILL STEMS

Joseph E. Hauser, Monahans, Tex.

Application June 28, 1935, Serial No. 28,844

15 Claims. (Cl. 255—23)

This invention relates to new and useful improvements in means for rotating drill stems.

This application is filed as a continuation in part of my co-pending application, filed on or about the 10th of April, 1935, Serial No. 16,241.

One object of the invention is to provide improved means for imparting motion from the rotary table to the drill stem, said means being so arranged as to permit rotation of said stem while drilling under pressure.

An important object of the invention is to provide improved means, connected with and drawn by the rotary table, which is arranged to frictionally engage the drill stem to impart motion thereto, the frictional engagement eliminating danger of said means marring or cutting the surface of said stem.

Another object of the invention is to provide improved means arranged to engage a drill stem to impart a rotary motion thereto, said means being so mounted as to compensate for any irregularities in the surface of said drill stem, as well as to permit a limited lateral movement of said stem.

A further object of the invention is to provide driving mechanism for a drill stem which includes a rotatable split housing having its sections yieldably connected to each other whereby the diameter of the housing may be increased a limited distance, and friction rollers for engaging the drill stem being mounted to rock within said housing, the rocking of said rollers, together with the yieldable connections between the sections of the housing providing means for compensation for irregularities in the surface of the drill stem as the same moves downwardly therethrough when rotated.

A still further object of the invention is to provide friction rollers for engaging around a drill stem to rotate the same, the rollers being so mounted as to permit the stem to move downwardly therebetween without interfering with the driving connection.

A construction designed to carry out the invention will be hereinafter described, together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings in which an example of the invention is shown, and wherein:

Figure 1 is a side elevation of the driving means for a drill stem, constructed in accordance with the invention.

Figure 2 is a horizontal, cross sectional view, taken on line 2—2 of Figure 1,

Figure 3 is an elevation, taken at right angles to Figure 1,

Figure 4 is a transverse, vertical sectional view, taken on the line 4—4 of Figure 2,

Figure 5 is an isometrical view of one of the roller hangers,

Figure 6 is an isometrical view of one of the serrated rollers,

Figure 7 is a side elevation showing another form of roller,

Figure 8 is a horizontal, cross-sectional view, taken on the line 8—8 of Figure 1,

Figure 9 is a side elevation of another form of the invention,

Figure 10 is a side elevation of one half of the split housing of another form of the invention,

Figure 11 is a horizontal cross sectional view taken midway through this housing,

Figure 12 is an isometrical view of one of the hanger members of this form, and

Figure 13 is a transverse, vertical sectional view of said hanger.

In the drawings, the numeral 10 designates a split housing including two complementary semi-circular halves or sections A and B, which are arranged to fit together to form the housing. The lower end of each section is formed with a reduced portion 11, whereby a square shank 12 is provided at the lower end of the housing. This shank is arranged to fit the square socket within the rotary table or other driving device (not shown), so that motion may be imparted to the housing. It is not absolutely essential that the shank 12 be reduced for in some cases it may be larger than the diameter of the housing, as clearly shown in Figure 9. The housing is provided with a vertical bore 13 throughout its length while the shank is provided with a reduced bore 14. The drill stem or other drive for the well tools extends downwardly through the bores, as will be hereinafter explained.

The section B of the housing 10 is provided with lugs 15 which are arranged to engage recesses 16 in the section A, when said sections are placed together. For securing the sections to each other, a threaded bolt 17 is hinged to each side of the section B about mid-height thereof and is arranged to swing between ears 18 on each side of the section A. The outer end of each bolt receives a wing nut 19 and a coiled spring 19' surrounds said bolt between the outer side of said ears and the nut. As clearly shown in Figure 2, this arrangement provides a yieldable connection between the sections A and B and the sections may undergo a limited lateral movement away from each other, which action increases the diameter of the bore 13 of the housing. During such movements the engagement of the lugs 15 in the recesses 16 serve to guide and align the sections with each other.

Approximately at mid-height, the housing is provided with an annular outwardly curved or convex rib 20, whereby a concave annular seat 21 is formed within the bore 13 of its housing. This

seat is provided with cam faces 22 which are formed around the inner periphery of said seat, as is clearly shown in Figure 2.

A plurality of vertical hangers 23 are arranged to be mounted within the bore 13 of the housing. Each hanger is provided with a hook member 24 at its upper end and this member is arranged to engage over an outwardly extending annular flange 10' at the upper end of the housing. Each hanger is formed with a convex rib 25 on its outer face and this rib is arranged to engage the concave seat 21 within the housing. It is pointed out that when the rib is engaging the seat the hanger is supported thereby, and the outer face, as well as the underside of said hanger is not in engagement with the inner wall of the bore 13 of the housing. Therefore, each hanger is suspended within the housing and may undergo a limited rocking movement.

The convex rib 25 is the only point of engagement between each hanger and the housing and this outer face 26 of each rib conforms to one of the cam faces 22, whereby movement of the hanger with relation to the housing will cause a lateral movement of said hanger.

Each hanger is formed with a vertical channel 27 (Figure 5) in its inner face and a plurality of concave rollers 28 are suitably mounted within the channel. The channel is of such depth that the inner edge of each roller extends beyond the inner vertical edge of the hanger. Thus, when the housing is engaged around the drill stem C (Figure 2), the cancave face of the rollers will frictionally engage the surface of said stem. The face of each roller may be knurled (Figure 6) or the roller may be formed with annular teeth, as shown in Figure 7. However, the invention is not to be limited to any particular gripping surface on the roller and so long as said surface is of such construction as to provide a frictional hold on the stem the invention will be carried out.

The rollers may be mounted in the hangers in any suitable manner but I have shown them as having trunnions 29 which are engaged in horizontal slots 30 formed in the inner vertical edge of the hanger. After all the rollers are positioned within their respective slots, a vertical bar 31 is welded to each inner edge of the hanger and as clearly shown in Figure 5, this bar closes the slots and holds the rollers within the channel.

In operation, the hangers are first mounted in the housing, and said housing positioned around the drill stem C, whereby the inner faces of the rollers engage the surface of the stem. The shank 12 at the lower end of the body is engaged in the socket of the rotary table (not shown) so that the housing is rotated.

The housing rotates in a clockwise direction (Figure 2) and it is obvious that the cam faces 22 force the hangers outwardly into tight frictional engagement with the drill stem. This frictional engagement causes the housing to impart motion to the stem. As the drilling operation continues, the drill stem moves downwardly through the housing, and the rotatable friction rollers permit an easy downward movement thereof.

It has been found that irregularities are present in the surface of the drill stem and as said stem moves downwardly through the housing, these irregularities contact the rollers in the hangers. Since the hangers are suspended within the housing as shown, they are capable of undergoing a rocking movement within the housing which compensates for these irregularities in the stem. This compensation permits the stem to move uninterrupted downwardly through the housing without breaking the driving connection between the stem and housing. If the rocking motion of the hangers is insufficient to take care of the irregularities, then the sections A and B being yieldably connected will separate sufficiently under tension of the springs 19' to compensate for such irregularity. It is pointed out that since the connection between the rollers 28 and drill stem C is frictional only, the surface of said stem is not marred or damaged. In removing the housing from the stem, the nuts 19 are loosened and the bolts 17 swing from between the ears 18, whereby the sections A and B may be separated.

In Figures 10 to 13, another form of the invention is shown. In this form, each hanger 3 is provided with idle rollers 35 which are journaled within the channel 27 at the upper and lower ends thereof. An endless chain 36 including a plurality of links 37 is passed over the rollers. The face of each link is concaved to snugly engage the surface of the drill stem, and it is obvious that the links frictionally engage the stem in the same way as the roller 28. For reinforcing and bracing the inner side of the chain, a transverse panel extends across the channel between the rollers 35. This panel affords a flat reinforcing surface which holds the chain in engagement with the stem through the length of one side of the chain. As the drill stem moves downwardly during drilling the chain is rotated.

It is pointed out that in both forms, an increased gripping surface is had. The contact between the stem and rollers or chain is frictional, thereby eliminating danger of marring the surface of the stem. The suspension of the hangers which permits their rocking movement compensates for irregularities in the surface of the stem, as does the yieldable connection between the sections A and B of the housing.

What I claim and desire to secure by Letters Patent is:

1. A rotary drill stem driver including, a split housing comprising two complementary sections yieldably connected together, the housing having a vertical bore through which the drill stem extends, means for connecting the housing with a rotary table to rotate said housing, and means mounted to wobble within the bore of the housing and arranged to engage the drill stem to impart motion from the housing to the stem, the mounting of said last-named means and the yieldable connection between the sections of the housing compensating for irregularities in the surface of the drill stem as the same moves downwardly through the housing.

2. A rotary drill stem driver including, a rotatable housing having a bore through which the drill stem extends, hangers suspended from the top of the housing within the bore between the housing and stem and mounted to undergo a rocking movement, and means carried by the hangers arranged to engage the stem to impart motion from the housing to the stem when said housing is rotated.

3. A rotary drill stem driver including, a rotatable housing having a bore through which the drill stem extends, hangers suspended from the top of the housing within the bore between the housing and stem and mounted to undergo a rocking movement, and frictional rollers carried by the hangers arranged to frictionally engage the surface of the stem to impart rotary motion

from the housing to the stem when said housing is rotated.

4. A rotary drill driver including, a housing having a bore through which the drill stem extends, means on the housing for connecting said housing with a rotary table to impart rotation thereto, hangers suspended from the top of the housing within the bore between the housing and stem and mounted to undergo a rocking movement, and means carried by the hangers arranged to engage the stem to impart motion from the housing to the stem when said housing is rotated.

5. A rotary drill stem driver including, a split housing comprising two complementary sections yieldably connected together, the housing having a vertical bore through which the drill stem extends, hangers suspended within the bore between the housing and stem and mounted to undergo a rocking movement, and means carried by the hangers arranged to engage the stem to impart motion from the housing to the stem when said housing is rotated.

6. A rotary drill stem driver including, a split housing comprising two complementary sections yieldably connected together, the housing having a vertical bore through which the drill stem extends, hangers suspended within the bore between the housing and stem and mounted to undergo a rocking movement, and frictional rollers carried by the hangers arranged to frictionally engage the surface of the stem to impart rotary motion from the housing to the stem when said housing is rotated.

7. A rotary drill stem driver including, a rotatable housing having a bore through which the drill stem extends, the housing being formed with an internal annular seat, a plurality of hangers supported on the seat between the housing and stem, friction rollers carried by the hangers and arranged to engage the surface of the stem, said hangers being capable of undergoing a rocking movement, cam faces formed peripherally around the seat, and complementary faces on each hanger, whereby rotation of the housing will force the hangers and rollers inwardly so that the rollers will frictionally engage the stem to impart rotary motion from the housing to said stem.

8. A rotary drill stem driver including, a rotatable housing having a bore through which the drill stem extends, the housing being formed with an internal annular seat, a plurality of hangers supported on the seat between the housing and stem, friction rollers carried by the hangers and arranged to engage the surface of the stem, said rollers having concaved faces to readily fit the periphery of said drill stem, said hangers being capable of undergoing a rocking movement, cam faces formed peripherally around the seat, and complementary faces on each hanger, whereby rotation of the housing will force the hangers and rollers inwardly so that the rollers will frictionally engage the stem to impart rotary motion from the housing to said stem.

9. A rotary drill stem driver including, a split housing comprising two complementary sections yieldably connected together, the housing having a vertical bore through which the drill stem extends, the housing being formed with an internal annular seat, a plurality of hangers supported on the seat between the housing and stem, friction rollers carried by the hangers and arranged to engage the surface of the stem, said hangers being capable of undergoing a rocking movement, cam faces formed peripherally around the seat, and complementary faces on each hanger, whereby rotation of the housing will force the hangers and rollers inwardly so that the rollers will frictionally engage the stem to impart rotary motion from the housing to said stem, the rocking mounting of the hangers and the yieldable connection between the sections of the housing compensating for irregularities in the surface of the stem as the same moves downwardly through the housing.

10. As a sub-combination in a rotary drill stem driver, a hanger including an elongated vertical member having a channel in its inner wall, and friction rollers journaled in said channel, said hanger having a convex rib located on its outer face for supporting the hanger within a drill stem driver housing.

11. As a sub-combination in a rotary drill stem driver, a hanger including an elongated vertical member having a channel in its inner wall, friction rollers journaled in said channel, said hanger having a convex rib located on its outer face for supporting the hanger within a drill stem driver housing, and means at the upper end of the hanger for engaging over the housing to limit the lateral movement of said hanger.

12. A rotary drill stem driver including, an upright housing having means at its lower end for engaging in the socket of a rotary table and imparting rotation to said housing, a plurality of upright hangers mounted in said housing and having means at their upper ends for suspending them in the housing, and gripping means carried by the hangers for gripping a drill stem and imparting rotation thereto.

13. A rotary drill stem driver including, an upright housing having means at its lower end for engaging in the socket of a rotary table and imparting rotation to said housing, a plurality of upright hangers movably mounted in said housing and having means at their upper ends for suspending them in the housing, and gripping means carried by the hangers for gripping a drill stem and imparting rotation thereto.

14. A rotary drill stem driver including, an upright housing having means at its lower end for engaging in the socket of a rotary table and imparting rotation to said housing, a flange on the upper end of the housing, a plurality of upright hangers mounted in the housing, hooks at the upper ends of the hangers engaging the flanges for suspending said hangers in the housing, and gripping means carried by the hangers for gripping a drill stem and imparting rotation thereto.

15. A rotary drill stem driver including, an upright housing having means at its lower end for engaging in the socket of a rotary table and imparting rotation to said housing, a plurality of upright hangers mounted in said housing and having means at their upper ends for suspending them in the housing, gripping means carried by the hangers for gripping a drill stem and imparting rotation thereto, the hangers having rocking engagement intermediate their ends with the upright wall of the housing, whereby said hangers may rock within the limits of their suspending means.

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