

Feb. 8, 1938.

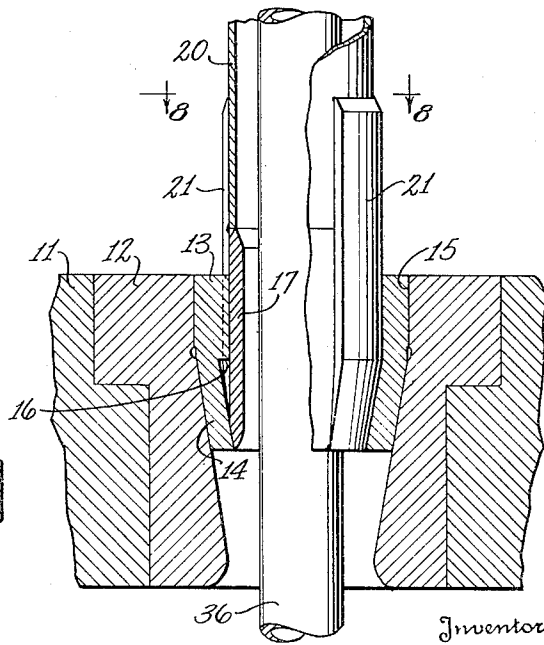
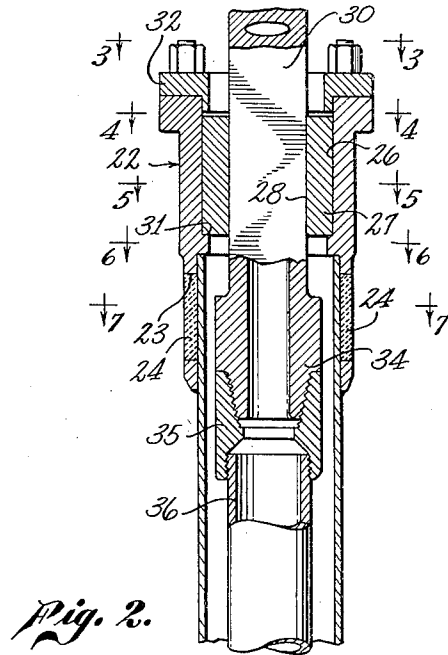
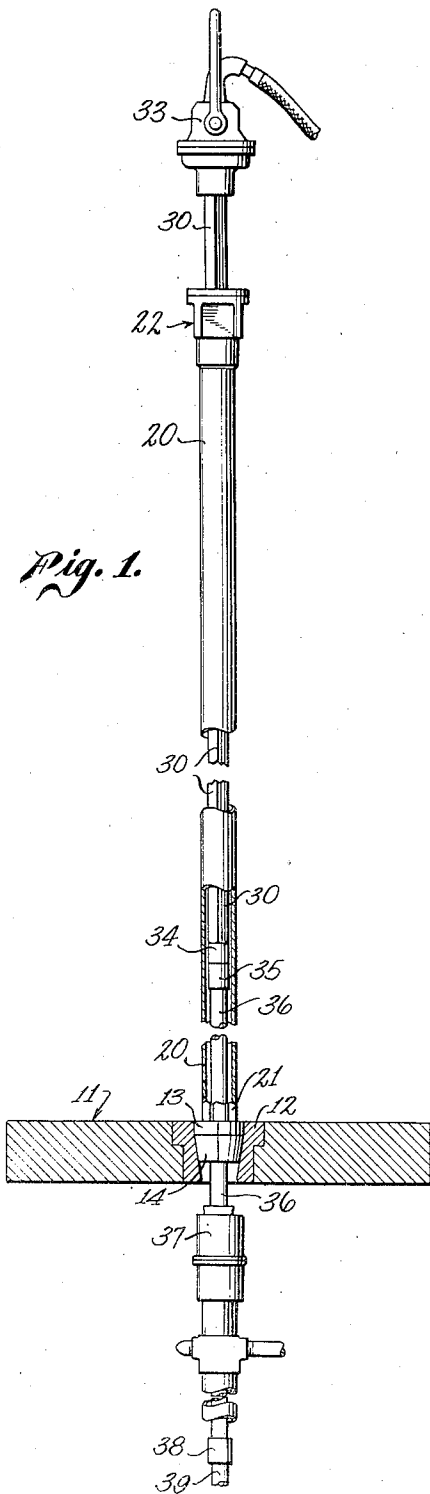
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2,107,475

ROTARY WELL DRILLING APPARATUS

Filed Jan. 16, 1937

2 Sheets-Sheet 1



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ROTARY WELL DRILLING APPARATUS

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2 Sheets-Sheet 2

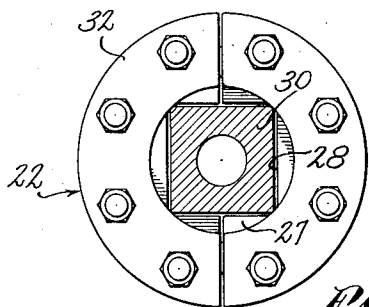


Fig. 3.

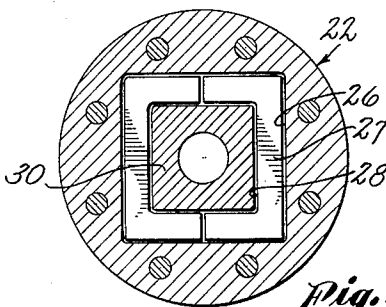


Fig. 4.

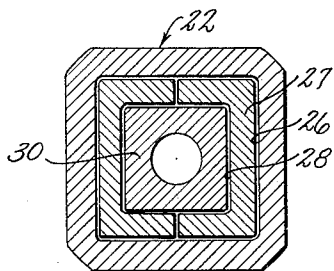


Fig. 5.

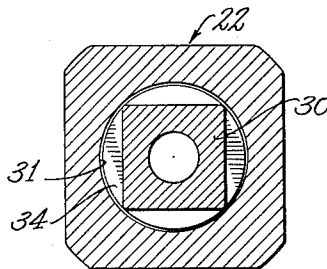


Fig. 6.

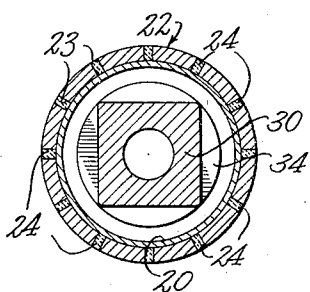


Fig. 7.

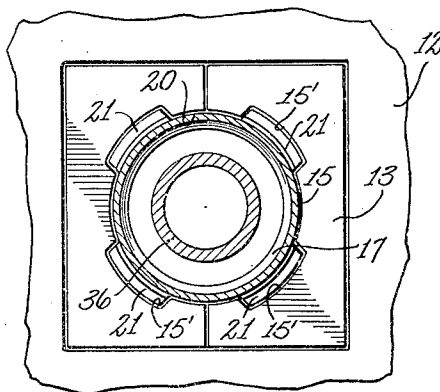


Fig. 8.

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UNITED STATES PATENT OFFICE

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ROTARY WELL DRILLING APPARATUS

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Application January 16, 1937, Serial No. 120,977

10 Claims. (Cl. 255—23)

This invention relates to improvements in the drilling of wells under pressure by the use of rotary drilling equipment in which a kelly is used.

In the common practices of pressure drilling by the rotary method the use of the common kelly presents disadvantages such as the necessity of using a kelly small enough to work through control valves, blow out preventers, oil savers and packers and due to the cross sectional shape of the kelly further difficulties arise in the problem of packing around the kelly.

It is one of the objects of this invention to overcome these disadvantages just pointed out and in so doing to raise the kelly a sufficient distance above the rotary table to permit the use of a polish pipe which forms an extension of the kelly and which slidably passes through the well head packer to a point below the control valves, blow out preventers and oil savers where it is secured to the upper end of the drill pipe.

A further object of my invention is to so arrange the parts of the device relating to the raising, lowering and rotating of the polish pipe that its polished surface does not come into engagement or contact with slips, grips, friction drive or other scarring or roughening means which would tend to mar the surface of the polish pipe with consequent undue wear of the packing means.

Further objects and advantages will appear from the following description and drawings which are for illustrative purposes only.

Fig. 1 is a diagrammatic elevation of rotary well equipment embodying a form of the invention.

Fig. 2 is an elevation partly in section of an apparatus embodying the invention, as shown in Fig. 1.

Fig. 3 is a cross sectional view on line 3—3 of Fig. 2.

Fig. 4 is a cross sectional view on line 4—4 of Fig. 2.

Fig. 5 is a cross sectional view on line 5—5 of Fig. 2.

Fig. 6 is a cross sectional view on line 6—6 of Fig. 2.

Fig. 7 is a cross sectional view on line 7—7 of Fig. 2; and

Fig. 8 is a cross sectional view on line 8—8 of Fig. 2.

Referring more particularly to the drawings which illustrate a preferred form of this invention, 11 designates the ordinary rotary table which it will be understood is rotated in the usual man-

ner. 12 designates the ordinary rotary table master bushing having a square opening to receive a split bushing 13. This bushing 13 is provided with a conical end 14 which is received in a corresponding portion of the opening in the master bushing.

The bushing 13 at its upper portion is provided with a circular opening 15 having vertically extending slots or ways 15'. The opening 15 is undercut as indicated at 16 and extends downwardly and inwardly forming a conical seat to receive the tapered lower end of a cylindrical shoe 17. The shoe 17 at its upper end is welded to the lower end of a length of casing or pipe which constitutes a torque tube 20. Welded to the sides of the torque tube 20 are splines or ribs 21 formed on the shoe 17 which ribs extend into and are engaged in the slots or ways 15 in the bushing 13 so that any rotary movement imparted to the bushing 13 from the rotary table through the master bushing 12 is imparted to the torque tube 20.

It is to be noted that with the construction just described relating to the connection between the torque tube and the bushing 13 the torque tube may simply be lifted out of engagement with the bushing thereby freeing the table entirely from mechanism in the well.

The upper end of the torque tube 20 extends into and is secured to the lower end of a head or kelly bushing housing 22, the lower end of which is provided with a plurality of slots 23 through which the upper end of the torque tube is welded to the head, the weld being indicated at 24.

The head 22 is provided at its upper end with a square opening 26 which receives a split square kelly bushing 27 having a square opening 28 which engages the kelly 30 so that rotative movement imparted from the torque tube to the head 22 causes the kelly to rotate.

The kelly bushing 27 is supported on a shoulder 31 formed on the inside of the head 22 and is retained in place by means of a split cap 32, the central opening through the head being sufficiently large to permit the kelly to pass freely therethrough when the cap is removed.

The upper end of the kelly 30 is attached to the ordinary swivel diagrammatically indicated at 33 in Fig. 1 and the enlarged lower end 34 of the kelly is secured by means of a tool joint 35 to the upper end of a polish pipe 36 which extends downwardly freely through the torque tube, the rotary table, and through a well head packer 37 set close under the rotary table below which it

is secured by means of an ordinary tool joint 38 to the upper end of the drill pipe 39.

By the construction above described the polish pipe 36 is raised and lowered and rotated free from engagement with any gripping, scarring or roughening means.

As the drilling operation proceeds the kelly is rotated as above described and the polish pipe fed downwardly through the packer until sufficient hole has been made to require the addition of another length of drill pipe. The kelly is then raised until the enlarged lower end of the kelly contacts the bottom of the kelly drive bushing 27, this upward movement of the kelly being continued, lifts the torque tube from engagement with the split table bushing 13 in the rotary table high enough to permit the tool joint 38 to be engaged by tongs in the common manner and an additional length of drill pipe added after which the kelly is lowered permitting the torque tube to become seated in and engaged by the split table bushing in the rotary as heretofore described.

The apparatus in the form and relation of parts as above described has been made particularly with the end in view of avoiding change in any of the parts of the modern rotary equipment of wells. Its use does not require any change in control equipment and a normal cellar may be used, in fact, the arrangement of parts permits pressure drilling even in so-called open hole drilling hook-ups.

It is to be understood that the regular kelly 35 may be used and the ordinary swivel above the kelly, the additional elements being the polish pipe and torque tube assembly.

The kelly used in connection with larger drill pipe previously used in the well may be retained for the smaller drill pipe and control hook-up because by this invention the kelly is kept above the control devices. Such kelly is usually long enough to allow a double of drill pipe to be used at each addition above described.

The torque tube and polish pipe in such case will be of a length suited to such doubles.

The polish pipe may be of a grade of material and wall thickness different from ordinary drill pipe and surfaced to be better adapted to the duty of rotating in a packing head.

The kelly may, however, obviously be other than the conventional square kelly in cross section and other forms of engaging means may be employed for imparting rotary movement to the kelly from the torque tube and likewise modifications may be employed in the connection between the torque tube and the rotary table without departing from the scope of the present invention.

I claim as my invention:

1. In a rotary well drilling device, a rotary table, a torque tube of sufficient length to house a kelly connected to the table and rotatable therewith, a kelly non-circular in cross section, means on the torque tube engaging the kelly, and a polish pipe secured to the kelly extending downwardly through the torque tube and rotary table.

2. In a rotary well drilling device, a rotary table, a non-extensible torque tube of sufficient length to house a kelly having its lower end connected to the table and rotatable therewith, a kelly non-circular in cross section, means at the upper end of the torque tube engaging the kelly,

and a polish pipe secured to the kelly extending freely downwardly through the torque tube and table.

3. In a rotary well drilling device, a rotary table, a torque tube of sufficient length to house a kelly having its lower end detachably connected to said table, a kelly non-circular in cross section, removable connecting means engageable with the upper end of the torque tube and the kelly, and a tool driving member connected to the kelly and extending downwardly therefrom.

4. In a rotary well drilling device, a rotary table, a torque tube of sufficient length to house a kelly having its lower end connected to the table and rotatable therewith, a kelly non-circular in cross section, means at the upper end of the torque tube engaging the kelly, and a polish pipe secured to the kelly extending freely downwardly through the torque tube and table; and packing means engaging said polish tube below said table.

5. In a rotary well drilling device, a rotary table, a split bushing in said table having an inner conical seat, a torque tube of sufficient length to house a kelly, means on the lower end of said tube engaging said seat, locking means on said tube to prevent relative rotative movement between said tube and said bushing, a kelly non-circular in cross section, means on the upper end of said tube engaging said kelly and a polish pipe secured to said kelly extending downwardly freely through said table.

6. In a rotary well drilling device, a rotary table a split bushing in said table, a non-extensible torque tube of sufficient length to house a kelly, a shoe on the lower end of the torque tube seated in said bushing, interengaging means on said shoe and bushing preventing relative rotative movement between said shoe and bushing, a head on the upper end of said tube, a kelly non-circular in cross section, means in said head engaging said kelly against relative rotative movement therebetween and a polish pipe secured to said kelly extending downwardly freely through said torque tube and said split bushing.

7. In a rotary drilling equipment: a rotary table, a kelly non-circular in cross section, kelly rotating means extending upwardly from the table of sufficient length to house the kelly, means for detachably connecting said rotating means to the kelly and means for detachably connecting the lower end of the rotating means to said table, and a polish pipe on said kelly extending downwardly therefrom.

8. In a rotary drilling equipment: a rotary table, a kelly non-circular in cross section, kelly rotating means of sufficient length to house the kelly extending upwardly from the table, means for detachably connecting said rotating means to the kelly and means for detachably connecting the lower end of the rotating means to said table, and a polish pipe on said kelly extending downwardly therefrom; a drill pipe connected to said polish pipe, and well packing means engaging said polish pipe.

9. In a rotary well drilling device, a rotary table, a bushing in said table having an annular seat therein, a torque tube of sufficient length to house a kelly having its lower end supported on said seat, interengaging means on said tube for imparting rotative movement to the tube, a kelly non-circular in cross section; means on the upper end of said tube engaging the kelly to

impart rotative movement to the kelly and a polish pipe on said kelly extending downwardly therefrom.

ing means between the table and the torque tube, driving means between the torque tube and the kelly, and a polish pipe secured to the kelly extending downwardly through the torque tube and rotary table.

5 10. In a rotary drilling device, a rotary table, a kelly non-circular in cross section, a torque tube positioned above the table and of sufficient length to house the operating length of the kelly, driv-

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