Oct. 7, 1952 C. R. TRAHAN 2,613,060

ROTARY TABLE DRIVE CONNECTION

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Fig. 1

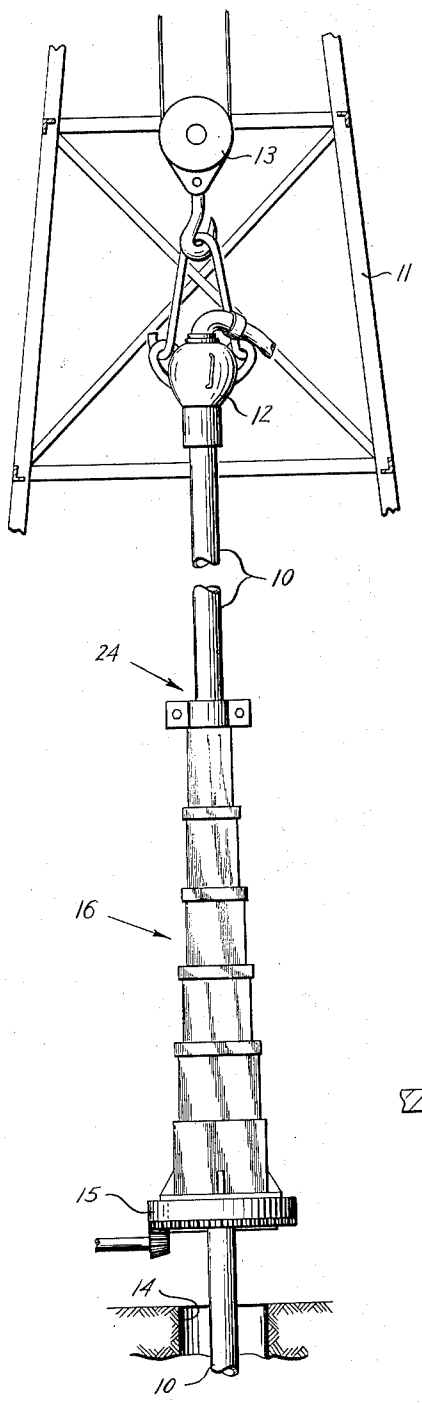


Fig. 2

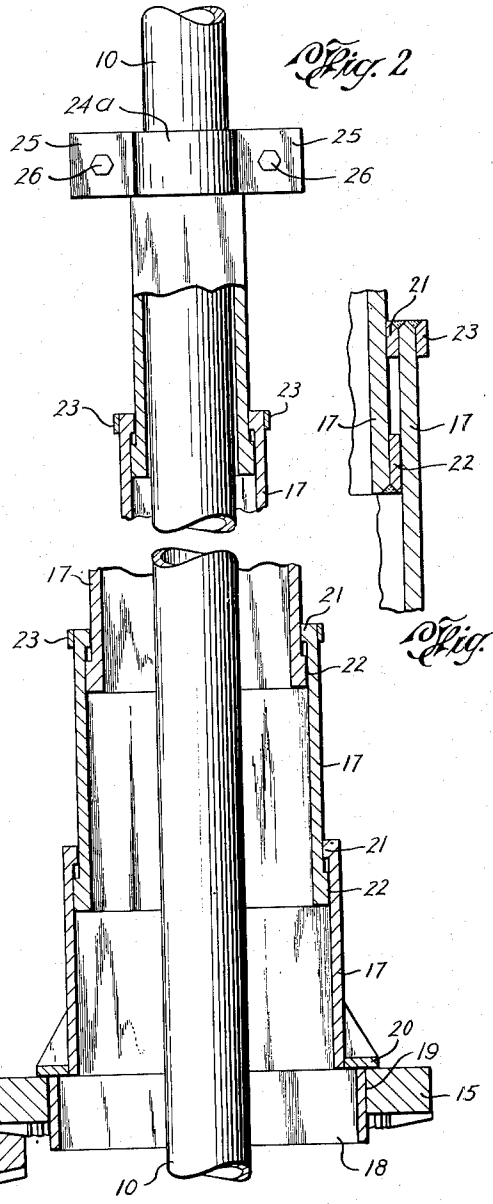


Fig. 3

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Fig. 4

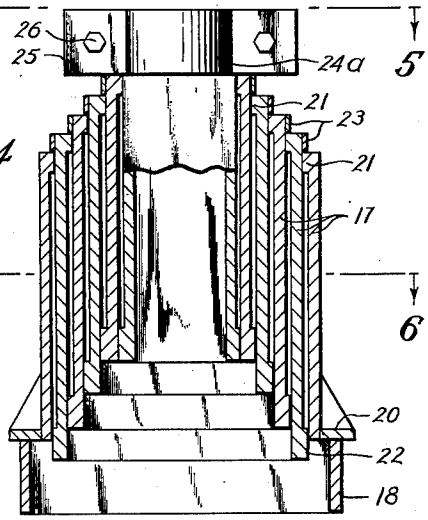


Fig. 5

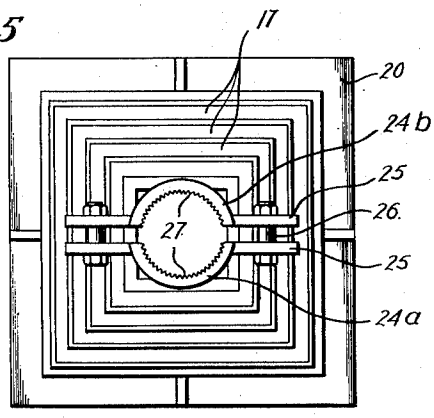


Fig. 6

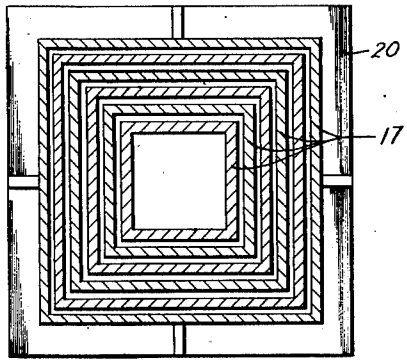


Fig. 7

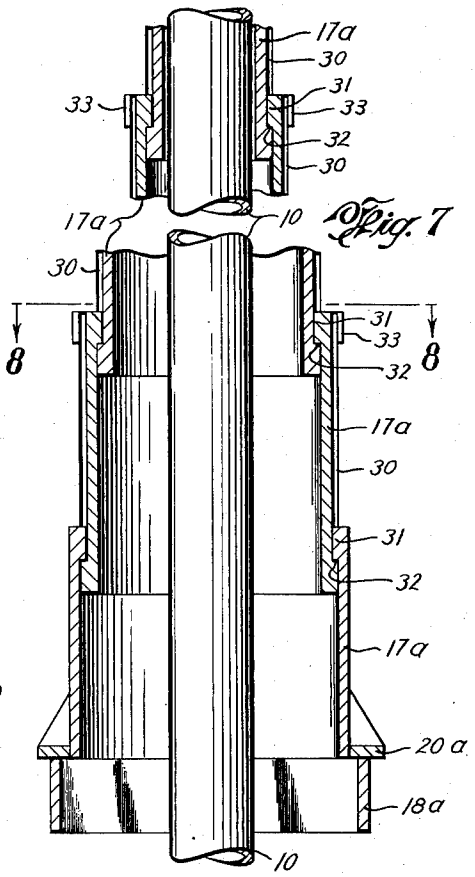
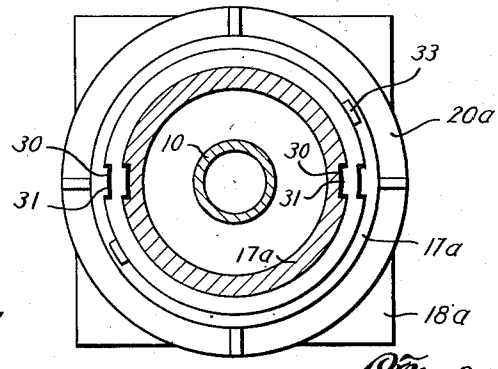


Fig. 8



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ROTARY TABLE DRIVE CONNECTION

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2 Claims. (Cl. 255—23)

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This invention relates to a drive connection for use in rotary drilling and particularly to an extendible and retractable drive connection between a rotary table and drill rods or pipe extending therethrough into a well.

In conventional rotary drilling, the usual rotary table is provided with a square or other polygonal drive bushing through which the square or polygonal Kelly joint extends, in order to provide a drive connection between the rotary table and the kelly, for rotating the latter to thereby rotate the pipe string which is connected to the kelly and extends into the well. This arrangement is entirely conventional and presents no serious complications in the ordinary case of initially drilling a well. However, once a well has been completed and equipped with usual well head fittings, it is often necessary to go back into the well for re-working and other operations which require rotation of the pipe or other string carrying a suitable tool which is run into the well for re-working purposes. In such cases it is often impractical to strip all of the surface connections and fittings from the well head and the rotary table must be placed above these fittings. It would then be necessary to run the kelly through these fittings and because of its non-round shape, it would be difficult and generally impractical to employ blow-out preventers or other seals which would be effective to seal about the non-round surfaces of the kelly in order to hold the well under control, while at the same time permitting rotation and advancement of the kelly.

Accordingly, the present invention has for its principal object the provision of a drive connection for connecting the rotary table with a pipe string extending therethrough, which may be employed above the well head fittings, and by means of which the use of a conventional Kelly joint for rotating the pipe may be eliminated.

An important object is the provision of a longitudinally extendible and retractable drive connection extending between the rotary table and the pipe string to be driven thereby.

A more specific object is the provision of a drive connection embodying a plurality of sections of successively reduced dimensions designed to telescope one within the other for relative extension and retraction, having means preventing relative rotation between the sections, and having clamping or gripping elements connected to the uppermost and innermost section for gripping the pipe to be driven thereby, the lowermost or outermost section having means

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forming a drive connection with the rotary table.

Other and more specific objects and advantages of this invention will become readily apparent from the following detailed description when read in conjunction with the accompanying drawings which illustrate useful embodiments in accordance with this invention.

In the drawings:

Fig. 1 is an elevational view showing one form of drive connection in accordance with this invention installed in driving relation between a rotary table and a drill pipe string of a conventional drilling rig;

Fig. 2 is a longitudinal generally sectional view of the drive connection in extended position as shown in Fig. 1;

Fig. 3 is an enlarged view in longitudinal section illustrating a detail of construction of the drive connection;

Fig. 4 is a longitudinal sectional view of the drive connection shown in collapsed or retracted position;

Fig. 5 is a top view of the drive connection looking down along line 5—5 of Fig. 4;

Fig. 6 is a transverse cross-sectional view along line 6—6 of Fig. 4;

Fig. 7 is a longitudinal sectional view of a drive connection in accordance with another embodiment of this invention, shown in extended position; and

Fig. 8 is a transverse cross-sectional view along line 8—8 of Fig. 7.

Referring first to Fig. 1, there is shown the upper end portion of a pipe string 10 supported in a derrick 11 by a conventional rotary swivel 12 suspended from the usual travelling block 13 by means of which the pipe is fed into and withdrawn from a well bore indicated at 14. The pipe string 10 passes through a conventional rotary table 15 located in the derrick above the mouth of the well which is drivingly connected to the pipe string by means of a collapsible drive connection in accordance with this invention, designated generally by the numeral 16.

Drive connection 16 is composed of a plurality of hollow tubular sections 17, which may be of square cross-section, as shown in Figs. 1 to 6, inclusive, or of other suitable non-round shape, or may be round as shown in Figs. 7 and 8. Sections 17 are successively smaller in dimensions in ascending order so that each will telescope within those below it, and the sections are dimensioned so that each will slide freely inside the sub-adjacent one. The square or other non-round configuration of the sections form spline-

type connections between the sections to prevent relative rotation therebetween while permitting relative longitudinal movement.

The lowermost and largest of the sections 17 is enlarged at its lower end to form a base 18 having a shape and dimensions such as to form a close sliding fit in the usual square drive bushing socket 19 in rotary table 15 so that when base 18 is seated in the socket it will be rotatively driven by the rotary table. An outwardly extending flange 20 or similar abutment is mounted on the exterior of the lowermost section 17 adjacent the upper end of base 18 and is adapted to engage the upper surface of the rotary table about socket 19 when the section is seated therein to prevent the base section from slipping downwardly through the rotary table.

Each of the sections 17, except the uppermost one, is provided with an inwardly extending lug 21 adjacent its upper end which is adapted to abut with an outwardly extending lug 22 mounted about the lower edge of each of the sections except the lowermost one. By means of lugs 21 and 22 it will be seen that each of the sections is thus prevented from being withdrawn upwardly from the next lower section. The inner and outer dimensions of lugs 21 and 22 are made such that they will be in close sliding engagement with the adjacent surfaces of the inter-engaged sections. The width of these lugs in the longitudinal dimension will preferably be made such that substantial areas of the sections will be engaged by the outer faces of the lugs to thereby reduce any tendency of the sections to wobble, particularly when in the fully extended positions. Ordinarily the width of lug 22 will be made greater than that of lug 21 but it is obvious that the reverse arrangement may be employed or that the lugs may be of equal width.

The drive connection is assembled by serially inserting the sections of successively smaller diameter upwardly through the interior of the lowermost section. As each section is inserted through the preceding larger section, a suitable projection means such as lugs 23 will be attached about the exterior of the upper end of the inserted section (see Fig. 3) to form an abutment which will prevent the inserted sections from slipping downwardly out of the sections in which they are inserted.

The upper end of the uppermost section 17 has mounted thereon a segmental clamping means, designated generally by the numeral 24, which may be composed of two complementary semicircular segments 24*a* and 24*b*, shaped and dimensioned to enclose pipe 10, and provided with mating ears 25—25, through which extend bolts 26 for drawing together the segments about the pipe. Toothed pipe-gripping dies 27—27 are mounted inside the segments and are adapted to tightly grip pipe 10 when the clamping means is closed about the pipe. One of the segments 24*a*—24*b* will be permanently connected to the upper end of the section 17, as by welding or other suitable connecting means, and the other will be separably connected thereto by means of bolts 26. The ears 25 extend laterally beyond the sides of the section to which they are attached and will thereby form abutments engageable with the next lower section 17 to prevent the uppermost section from falling downwardly therethrough.

The number of the sections 17 and their lengths may be varied as may be required to meet particular conditions. Normally, they will be made of approximately equal length so that when the sections are fully retracted, as shown in Fig. 4, the total length of the drive connection will be approximately that of the lowermost section so that the length of movement between fully extended and fully retracted positions will provide for an appropriate length of longitudinal movement of pipe 10.

The drive connection may be employed in the following manner: The drive connection is installed in socket 19 by inserting base 18 therein. Pipe 10 carrying a drill bit or other tool on its lower end will be inserted through the bore of the connection and lowered into the well to the point at which the tool is to begin operation. The drive connection will then be extended to its full length or to any portion thereof, as may be desired, by drawing the uppermost section 17 bearing clamping means 24 upwardly by means of any suitable hoisting mechanism. Clamping means 24 will then be closed about the pipe, the segments thereof being drawn together by means of bolts 26 to a sufficient degree of tightness to cause dies 27 to strongly grip the pipe, thereby completing the drive connection between the pipe and the rotary table. Rotation of the latter will now operate in the usual manner to rotate the pipe and thereby rotatively drive the tool attached thereto.

As pipe 10 moves downwardly with the progress of the tool in the well, sections 17 of the drive connection will be retracted correspondingly and this retractive movement will continue until the drive connection is fully retracted. Thereupon clamping means 24 will be released from the pipe and the drive connection again extended and reclamped at a higher point on the pipe and further rotation and downward movement continued for another increment corresponding generally to the length of the drive connection. These operations will be repeated until the tool driven by pipe 10 attains the ultimate depth desired.

By means of the described drive connection, it will be evident that pipe 10 may be rotated in either direction as may be required without special connections, and that any length of stroke or increment of downward movement may be provided.

Figs. 7 and 8 illustrate another embodiment in accordance with this invention wherein the sections of the drive connection are generally cylindrical rather than square in cross-section and longitudinal spline connections are provided between the sections to prevent relative rotation between the sections.

In this embodiment, the telescoping sections 17*a* are cylindrical and may conveniently be constructed from lengths of pipe of successively smaller diameters. The lowermost section is provided with a hollow square base 18*a*, adapted to fit in the rotary table socket 19, and a flange 20*a* for engaging the top of the rotary table. In order to prevent relative rotation between the sections 17*a*, one or more angularly spaced spline grooves 30 are cut longitudinally in the exterior wall of each of the sections except the lowermost one and a corresponding number of short spline teeth 31 are formed or mounted inside the upper ends of each of the sections to project into the grooves. The lower ends of the spline grooves are closed at 32 to form abutments which engage the lower ends of the spline teeth to prevent upward withdrawal of one section from the other. The upper ends of the spline grooves are open to receive the teeth when the sections are assembled by the insertion of one section upwardly through the lower end of the next

larger section. After assembly of the sections, lugs 33 or other suitable stop means are welded or otherwise suitably connected at the upper ends of each of the sections except the lowermost one to project outwardly therefrom in order to engage the upper ends of the sub-adjacent sections to thereby prevent the sections from falling through one another. In all other respects, this embodiment is substantially identical in construction and operation with the previously described embodiment.

It will be understood that various alterations and modifications may be made in the details of construction and operation of the described embodiments within the scope of the appended claims but without departing from the spirit of this invention.

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

1. A drive connection for drivingly connecting a rotary table to a pipe extending therethrough, comprising, a plurality of concentric tubular sections telescopically connected together for longitudinal extension and retraction adapted to surround the pipe, each of the sections except the outermost one, having a plurality of angularly spaced spline grooves in the exterior thereof extending longitudinally from the upper end thereof to points spaced from the lower end thereof to define upwardly facing shoulders at the lower ends of the grooves, each of the sections except the innermost one having mounted adjacent its upper end inwardly extending lugs projecting into the grooves of the adjacent section for engagement with said shoulders to thereby limit outward relative movement of the adjacent sections, and each of the sections except the outermost one having mounted adjacent its upper end outwardly projecting lug means engageable with the upper end of the next larger section to limit relative inward movement of the adjacent sections, a base member of polygonal shape mounted on the lower end of the outermost section for insertion in a correspondingly shaped socket in a rotary table, an outwardly extending flange about said base member engageable with the upper end of said rotary table, and releasable pipe gripping means mounted on the upper end of the innermost section for connection to said pipe.

2. A drive connection according to claim 1 wherein said pipe gripping means comprises a pair of complementary semi-circular segments adapted to be closed about said pipe, one of said segments being fixedly connected to the upper end of said innermost section and the other of said segments being releasably connected thereto, said segments having arcuate pipe-gripping dies mounted on their inner faces.

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