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WELL DRILLING APPARATUS

Filed Feb. 5, 1934

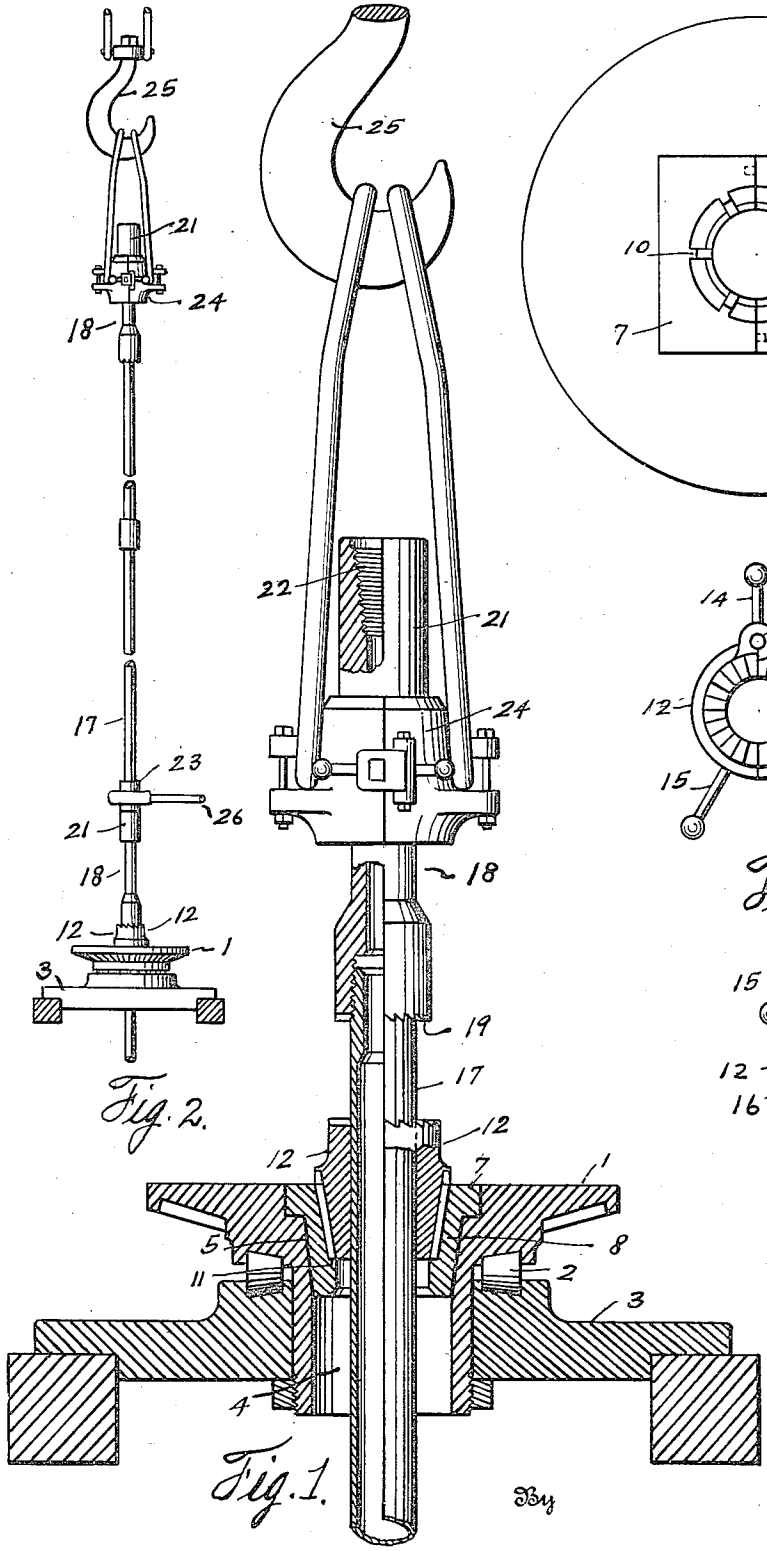


Fig. 1.

Fig. 3.

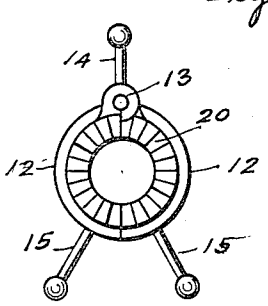


Fig. 4.

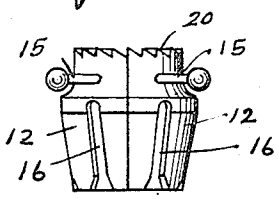


Fig. 5.

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WELL DRILLING APPARATUS

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6 Claims. (Cl. 255—23)

This invention relates to well drilling apparatus.

An object of the invention is to provide means for supporting a drill stem, or other pipe, in a well bore without the use of the conventional slips.

In carrying on well drilling operations, by the rotary method, it is common practice to support the drill stem suspended from the rotary table by means of wedge shaped slips which are seated in a downwardly converging seat in the rotary table and which grip the stem and hold it suspended while making up the stem in going into the bore, or while breaking out the stem in withdrawing it from the bore. These slips usually cut, or indent, the stem and injure and weaken it, causing it to deform and often causing it to twist off.

It is one of the objects of this invention to provide means for supporting said drill stem or other pipe in a well bore, which will not injure, deform, or weaken the stem or pipe.

Another object of the invention is to provide means for holding the suspended pipe against rotation without the use of back up tongs when it is desired to break out the stem or pipe, in withdrawing the stem from the bore. At the present time it is common practice in rotary well drilling, to use two pair of tongs, one a back up tong, to hold the suspended string against rotation, and the other to unscrew the joint above to be broken out. There is considerable danger to the workmen in the use of back up tongs for this purpose for the reason that if the back up post on the rotary table should become broken or the back up tong should become disengaged therefrom, said back up tongs will rapidly revolve about the derrick floor and will be liable to injure the workmen. The apparatus herein described dispenses with the use of said back up tongs.

Another object of the invention is to provide, in apparatus of this character, a pipe holder which is seated and keyed in the bushing of the rotary table and with which the drill stem or other pipe suspended may be clutched and which not only supports the string of pipe but which holds the suspended string against rotation while breaking out the joint above.

With the above and other objects in view, this invention has particular relation to certain novel features of construction, operation and arrangement of parts, an example of which is given in this specification and illustrated in the accompanying drawing, wherein:—

Figure 1 shows a side view of the apparatus partly in section, showing conventional elevators applied to the string or stem in the process of elevating the same while the string or stem is being broken up and withdrawn from the bore.

Figure 2 shows a side elevation of the apparatus showing the string suspended from the rotary drilling machine, and a break out tong applied to the suspended string.

Figure 3 shows a plan view of the rotary table showing the drive bushing seated therein.

Figure 4 shows a top plan view of a pipe holder, and

Figure 5 shows a side elevation thereof.

In the drawing the numeral 1 designates a rotary table of the conventional rotary drilling machine, and which is mounted on the cone bearings 2, which run in a raceway in the base 3 of the drilling machine. The rotary table has the central opening or passageway 4 for the drill stem or other pipe. The upper end of this opening is downwardly tapered forming the seat 5. Above the seat 5, around the opening 4, the upper face of the rotary table is counter-sunk, forming a polygonal depression 6, preferably square, to receive the correspondingly shaped upper end 7 of the drive bushing 8. This bushing is downwardly tapered to fit closely into the seat 5 and said bushing has the inside downwardly converging seat 9 which is provided with the keys 10 spaced apart therearound. The lower ends of these keys terminate at the inside annular shoulder 11 of the drive bushing.

There is a pipe holder formed of the arcuate sections 12, 12 which are hinged together on one side by the hinge 13 and at said last mentioned side said holder has the outwardly extended handle 14. At the opposite side the sections have the handles 15, 15 whereby the holder may be swung open or closed. The holder is shaped to be seated in the drive bushing 8 and has the external keyways 16, whose lower ends are flared to readily receive the keys 10 when the holder is seated in said bushing. This holder is shaped also to fit closely about the drill stem 17 to be handled.

At intervals along the drill stem a special type of coupling as 18 is provided. The lower end of this coupling 18 is enlarged and screwed onto the upper end of the section of drill stem beneath, and the lower end of said coupling is provided with ratchet teeth 19 shaped to engage corresponding ratchet teeth 20 on the upper end of the pipe holder and these intermeshing teeth are so pitched as to hold the suspended string against turning when it is attempted to unscrew the

joint of the drill stem above as illustrated in Figure 2. The upper end 21 of the coupling 18 is enlarged and formed with the internally threaded box 22 to receive the pin of the tool joint member 23 connected to the drill stem section above. Between its upper and lower ends the special coupling 18 is reduced to receive the conventional elevators 24 which may be engaged around said coupling beneath the enlarged upper end 21 thereof. The hook 25 of the conventional tackle block may be engaged through the bales of the elevator and this tackle block is manipulated in the usual way by means of the usual cable operating over the crown block of the derrick whereby the drill stem may be elevated or lowered.

When it is desired to break out a drill stem or other pipe, in a well bore, the elevators 24 may be engaged around the coupling 18 and the drill stem then elevated as shown in Figure 2. The pipe holder may be then seated in the drive bushing around the drill stem and beneath the coupling 18 immediately above. The handles 14 and 15 are useful in handling the pipe holder in so seating it in the drive bushing. When so seated the keys 10 seat in the keyways 16. The drill stem may be now lowered until the teeth 19 intermesh with the teeth 20 and tong 26 may be applied to the pin member 23 and said tong then manipulated to the left to unscrew said pin member from the box 22 beneath and the suspended string will be held against turning during this operation by the intermeshing teeth 19, 20 and will also be supported in suspended position by said pipe holder. The broken out section of the stem or pipe may be then laid aside and the elevators 24 lowered and engaged about the coupling 18 immediately above the rotary table and the stem or pipe elevated as before, and another section broken out until the entire stem or string of pipe is broken up and removed from the bore.

When it is desired to make up a stem or string in lowering the same into the bore, a section may be lowered by the use of the elevators and supported on the pipe holder in the drive bushing and the elevators then removed and another section of the stem or string picked up and the pin member at the lower end thereof screwed into the box 22 of the suspended section. The string or stem may then be picked up a sufficient distance to permit the removal of the pipe holder from the drive bushing 8 and when said holder is removed the connected sections may be lowered. The pipe holder is then again seated in the drive bushing so that the coupling 18 at the upper end of the connected string may seat thereon to hold the string or stem suspended while the elevators are being removed and another section connected to the upper end of the suspended string or stem as before and this operation repeated until the string is made up.

The drawing and description disclose what is now considered to be a preferred form of the invention by way of illustration only, while the broad principle of the invention will be defined by the appended claims.

What I claim is:

1. In apparatus of the character described, a pipe holder formed of sections hinged together at one side and open at the outer side, the upper end of the holder having ratchet teeth.

2. In apparatus of the character described, a pipe holder formed of sections, arcuate in cross sectional contour, and hinged together, said holder having a tapered lower end and its upper end provided with ratchet teeth pitched in a right hand direction.

3. The combination with a support having a downwardly converging seat, of a tubular, sectional pipe holder whose lower end is tapered to fit into said seat and whose upper end is formed with ratchet teeth.

4. In combination, a support having a seat, a holder shaped to surround a pipe and whose lower end is adapted to fit into said seat, a pipe fitted through the holder and having an enlarged coupling to rest on the holder and support the pipe, said coupling and holder having intermeshing parts to prevent their relative rotation in one direction but to permit such rotation in the other direction.

5. In combination a rotary table having an opening for the passage of a pipe therethrough, a holder seated on said table and formed of sections and shaped to surround a pipe, a pipe through said holder and having a shoulder which rests on the holder whereby the pipe is suspended from the holder, said pipe and holder having interengaging means to prevent their relative rotation in one direction but to permit such rotation in the other direction.

6. In combination a rotary table having an opening for the passage of a pipe therethrough, a holder seated on said table and formed of sections and shaped to surround a pipe, a pipe through said holder and having a shoulder which rests on the holder whereby the pipe is suspended from the holder, said pipe and holder having interengaging ratchet teeth to prevent their relative rotation, and means to prevent the rotation of the holder relative to the table.

WALTER L. CHURCH.