April 9, 1940. J. D. HUGHES 2,196,528

KNUCKLE ANCHOR FOR WHIPSTOCKS

Filed Oct. 28, 1937

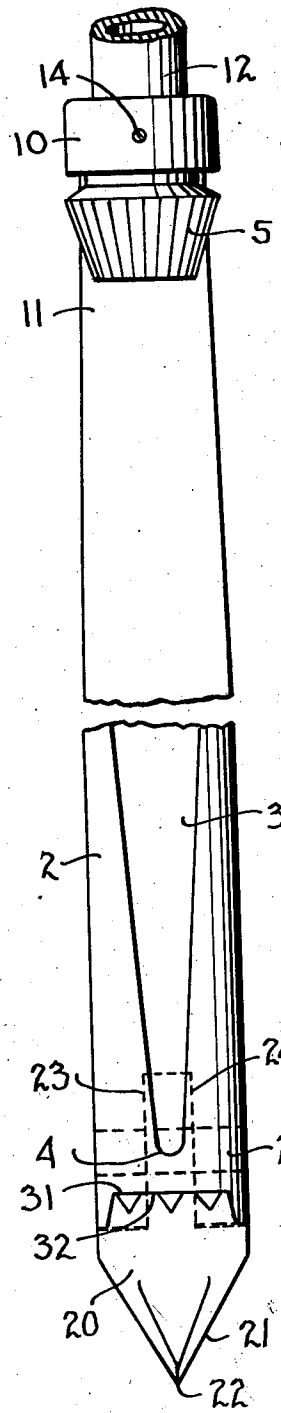


Fig. 1.

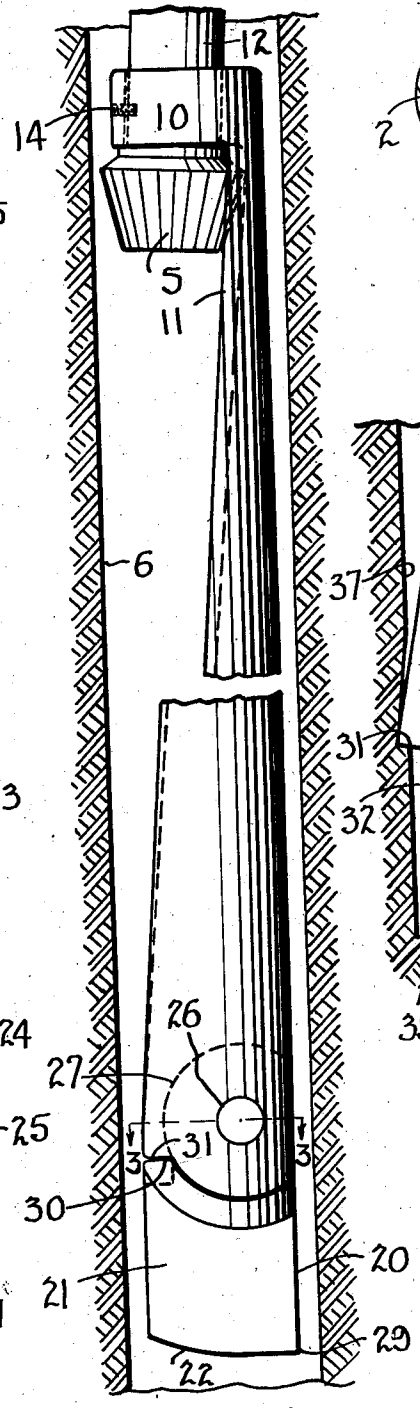


Fig. 2.

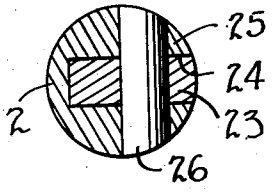


Fig. 3.

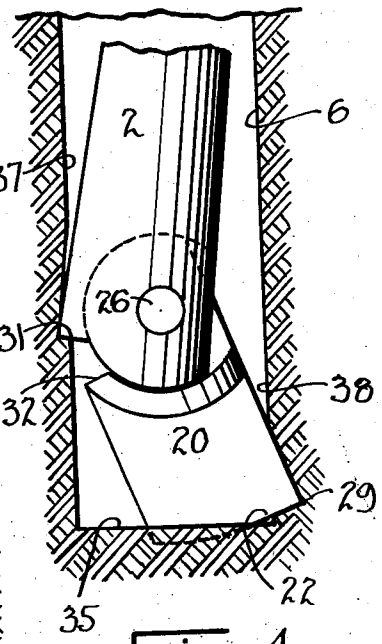


Fig. 4.

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KNUCKLE ANCHOR FOR WHIPSTOCKS

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Application October 28, 1937, Serial No. 171,464

3 Claims. (Cl. 255—1)

The invention relates to a particular type of whipstock which is capable of being securely anchored in the well bore against rotation but which is also readily removable after the deflecting operation has been performed.

It is one of the objects of the invention to provide a knuckle joint anchor for a whipstock bottom.

Another object of the invention is to provide an off center shoe for whipstocks so that when weight is applied to the whipstock the shoe will seat itself due to this applied weight and in this manner anchor the whipstock against rotation.

Still another object of the invention is to provide in combination with a removable whipstock an anchoring device which will be set by applying weight to the whipstock.

Another object of the invention is to provide an anchoring device for whipstocks which will tilt the lower end of the whipstock in the direction in which the deflection is to be made so as to increase the angle of deflection which may be obtained by the use of the whipstock.

Other and further objects of the invention will be readily apparent when the following description is considered in connection with the accompanying drawing wherein:

Fig. 1 is a front elevation of the whipstock with the parts assembled ready to be lowered into the well bore.

Fig. 2 is an elevation at right angles to Fig. 1 and showing the whipstock being lowered into the well bore preparatory to being set.

Fig. 3 is a section taken on the line 3—3 of Fig. 2.

Fig. 4 is a side elevation of the lower end of the whipstock and illustrating the anchor as being set into the formation.

The whipstock of Fig. 1 is made up of a longitudinal body 2 which may be of any desired length and is usually provided with a concave face 3, which gradually merges with the body of the whipstock until it disappears at the lower end 4 thereof. This concave surface is provided for the purpose of guiding the drill bit 5 in order to deflect the well bore which is indicated generally at 6.

The particular type of whipstock here shown is that disclosed in the patent to McVicar, No. 1,970,761, granted August 21, 1934. Whipstocks of this type are provided with a collar 10 at the upper end thereof, which is integral with the body 2 of the whipstock and extends laterally from the upper portion 11 of the deflecting face 3. The drill stem 12 has the drill bit 5 connected therein in such a manner that the collar 10 is disposed about the drill stem above the bit or about the shank of the bit, so that the whipstock is suspended by the drill bit as the assembly is being lowered into the well. The suspended position is shown in Fig. 2. A pin 14 is shown as passing through the collar and into the drill stem in order to secure the whipstock against displacement while it is being moved downwardly into the well bore. This is necessary because in some instances cavings or a bridge might obstruct the hole and the whipstock might be set inadvertently upon striking such a bridge, so that it is desirable to hold the whipstock in a predetermined position until it is lowered into the well bore. Another reason for holding the whipstock in a known and predetermined position with respect to the drill stem is that it may be desirable to orient the whipstock into the well bore so that the deflecting face 3 will be set in the well bore in a predetermined oriented position so as to cause the deflection in a desired direction.

The lower end or foot of the whipstock is of a particular construction as seen best in Figs. 2, 3 and 4, and comprises a shoe 20 which may have tapered faces 21 which merge in a point or blade 22. This blade is provided with a tongue or shank 23 which is of such a width that it will fit into the space 24, which is formed by the leg 25 on the lower end of the whipstock body 2. A pivot pin 26 passes through the legs and the tongue as best seen in Fig. 3, so that the shoe 20 may pivot or tilt with respect to the whipstock body. As seen in Fig. 2, the upper end of the tongue is curved at 27 so that it is confined within the whipstock body as it tilts.

It will be observed that the pivot pin 26 is off center or positioned to one side of the longitudinal axis of the whipstock and that the blade portion 22 is provided with a heel 29 thereon which is on the lower righthand corner. A shoulder 30 is provided on the shoe which is arranged to engage a cooperating shoulder 31 on the whipstock body and these interfitting shoulders may be provided with teeth 32 thereon.

In operation, as the device approaches the bottom 35 of the well bore 6 the heel 29 of the shoe will engage the bottom 35, but due to the off-center arrangement of the pivot pin, when weight is applied to the shoe the knuckle construction will permit it to tilt or kick over to assume the general position shown in Fig. 4 in that the shoe has caused the pivot pin 26 to move to the left and to throw the shoulder 31 against

the side wall 37 so that the teeth 32 will bite into the formation. At the same time the heel 29 will bite into the side wall 38 of the well bore as the shoe tilts about the pivot pin. The blade 22 of the shoe will, of course, penetrate the bottom 35 of the well bore so that there are as a matter of fact three points of anchorage for the whipstock, all of which tend to prevent it from rotating when the drill bit 5 is thereafter rotated.

Another advantage to be obtained is the fact that after the shoe 20 pivots it will move the lower end of the whipstock to the left as seen in Fig. 4, so that while the deflecting face 3 may be of a predetermined angle with respect to the longitudinal axis of the whipstock, the whipstock itself will be in this manner tilted so that the angle of deflection for the bit 5 will be increased. This angle can, of course, be increased by spudding the whipstock in position to force it a greater distance into the formation and accordingly tilt it a greater amount, or on the other hand the whipstock may be set gently so as to cause little or no tilting.

When the deflecting operation has been performed, of course, the drill bit will have moved downwardly along the deflecting face 3 and into the side wall 37 of the formation to initiate the deflected well bore. When this drilling operation has been completed the drill stem is raised until the drill bit moves upwardly into contact with the collar 18 whereupon a pull is exerted upon the whipstock and, of course, the shoe may readily pivot about the pin 26 so that it can be withdrawn from its anchored position.

Broadly the invention contemplates a whipstock which will be anchored automatically merely by applying weight thereto.

What is claimed is:

1. The combination of a drill stem, drill bit and whipstock, means to carry said whipstock on said drill stem, a shoe on said whipstock, and an off center pivot for said shoe so as to tilt the shoe; to dig into the earth formation at one side and the base of the bore to anchor said whipstock.

2. A base anchor for whipstocks comprising a shoe portion, a tongue thereon, a pair of spaced legs to receive said tongue, a pivot pin connecting said tongue and legs, said pin being positioned off center with respect to the whipstock.

3. A base anchor for whipstocks comprising a shoe portion, a tongue thereon, a pair of spaced legs to receive said tongue, a pivot pin connecting said tongue and legs, said pin being positioned off center with respect to the whipstock, and a heel portion on said shoe so as to shift the base of the whipstock as said shoe is set.

JAMES D. HUGHES.