This invention relates to new and useful improvements in anchoring means for whippstocks.

As is well known, whippstocks are used in well drilling operations for guiding a drill bit into the formation at an angle with respect to the main well bore, their use being particularly valuable in side-tracking or directional drilling. Because the whippstock must be lowered and set in proper position within the well bore, the outer diameter of said whippstock must necessarily be smaller than the inner diameter of the well bore, whereby there is a clearance or space between the whippstock and wall of the bore after said whippstock is in its set position. When drilling off of the whippstock occurs, the resistance of the formation to the bit’s entry causes the bit to exert a pressure against the lower portion of the whippstock and this results in the whippstock being forced against the wall of the bore at a point opposite that at which the bit is engaging the formation. This lateral shifting of the whippstock is undesirable because it obviously causes a loss of the full deflecting value of the whippstock. It is particularly disadvantageous when drilling off a cement plug or when drilling in the harsher subsurface formations.

One object of the invention is to provide an improved means which may be attached to the lower portion of thewhippstock and whereby parts of the whippstock may be effectively prevent lateral shifting or displacement of said whippstock, whereby maximum deflection of the bit within the limits of the whippstock is assured.

Another object of the invention is to provide improved means for preventing lateral shifting or displacement of a whippstock, which means may be constructed in the form of an attachment so as to be readily applied to the usual whippstock without any change in the whippstock construction; such arrangement making it possible to utilize said means when the drilling conditions require it.

Another object of the invention is to provide an improved means, of the character described, which includes a pivoted leg or support which is attached to and depends below the lower end of the whippstock, whereby said leg engages the formation or plug, as the case may be, prior to engagement of the whippstock, with the result that subsequent continued lowering of said whippstock causes the whippstock to fulcrum or swing toward that wall of the bore through which drilling is to occur; said leg or support also acting to lock the whippstock against lateral displacement after the drilling operation is begun.

Still another object of the invention is to provide an improved means of the character described, wherein the anchoring leg or member is pivotally connected to the whippstock and also wherein the construction is such that any thrust or load imposed on said member is carried solely by the member and no load or undue strain is imposed upon the pivotal connection between the member and whippstock.

A further object of the invention is to provide an improved device, of the character described, which comprises a minimum number of parts and which is so constructed that normally it does not project beyond the outer diameter of the whippstock, whereby said means does not interfere with lowering of the whippstock within the well bore.

The 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 drawing, wherein an example of the invention is shown, and wherein:

Figure 1 is a view of a whippstock having a device, constructed in accordance with the invention attached thereto, the whippstock being in a position just prior to setting the drilling bit.

Figure 2 is a similar view with the whippstock in its set position.

Figure 3 is an enlarged, transverse sectional view of the device, and

Figure 4 is a cross-sectional view, taken on the line 4—4 of Figure 3.

In the drawings, the numeral 10 designates a whippstock which is constructed in the usual manner. The whippstock includes an elongate body 11 having a collar 12 at its upper end. The collar encircles the drill stem 13 and is suitably connected thereto by a shear pin 14. The lower end of the drill stem carries a drill bit 15 which is disposed below the collar 12 and which is of a larger diameter than said collar, whereby the bit may be utilized to retrieve the whippstock after the drilling operation is complete. The whippstock is formed with an elongate inclined guide surface 16 which is arranged to guide the drill bit 15 outwards into the formation at an angle to the main well bore A. The whippstock is generally semi-cylindrical in cross-section and the rear or trailing side 17 extends substantially parallel to the longitudinal axis of the body. The lower end of the whippstock is pointed as indicated at 18, such point being formed by angu-
lar surfaces 19 and 20 which are cut in the lower portion of said whipstock. The above is the usual construction in whipstock and is described in detail merely for the purposes of a better understanding of the present invention.

The whipstock is usually set upon a cement plug B or in said bracket in the formation at the lower end of the well bore A. Because said whipstock must be lowered through the well bore the size of the whipstock body 11 must necessarily be smaller than the inner diameter of said bore; thus when the whipstock is in its set position there is a clearance or space between the outer surface of said whipstock and the inner wall of the well bore. In order to obtain maximum deflecting efficiency of the whipstock it is desirable that the lower end of the inclined guide surface 16 be maintained in engagement with the wall of the formation so that as the bit 15 moves downwardly, the entry of the bit into the formation at an angle from the bore A is assured. Since the usual whipstock has a space between its outer surface and the wall of the well bore, it has been found that the resistance of the formation to the entry of the bit will cause the bit to exert a pressure against the whipstock whereby said whipstock is shifted laterally within the bore until the rear surface 17 abuts the wall of the bore. Obviously such lateral shifting moves the inclined guide face 16 away from the wall of the bore with the result that some of the effectiveness or deflecting value of the whipstock is lost.

In order to assure the disposition of the lower end of the inclined face 16 of the whipstock in close proximity to the wall of the well bore and also to prevent lateral shifting or displacement of said whipstock when drilling begins, an improved anchoring means is provided. Said means includes a channel shaped bracket 21 which is secured to the inclined surface 28 at the lower end of the whipstock by suitable stud bolts 22. An elongate anchoring member or leg 23 is formed with a slot 24 in its upper portion and a pivot pin 25 which is mounted in the bracket 21 and extends through the slot to pivotally mount the member on said bracket. The lower end of the anchoring member is pointed or sharpened as shown at 26 and this end is adapted to engage the plug B or formation on which the whipstock is set.

The member or leg 23 is normally held against a stop pin 27 which extends across the bracket by a flat spring 28. As is clearly shown in Figure 3, the spring has one end secured to the bracket with its other end overlying the edge of the member 23. The stop pin 27 limits the inward movement of the member 23 while a stop web 29 which is preferably made integral with the bracket is secured in one end of the bracket and limits movement of the member in an opposite or upward direction. In its normal position the member is disposed at a slight angle (Figure 1) with respect to the longitudinal axis of the whipstock body and in such position the lower pointed end of the member is disposed in a plane well below the pointed end 18 of said whipstock. With such arrangement the member 23 will first engage the plug prior to engagement of the whipstock when said whipstock is lowered through the well bore.

In the operation of the device the parts are in the position shown in Figure 1 and as the whipstock is lowered into position, the pointed end 26 of the member first engages the plug. This pointed end imbeds itself in the plug and forms a fulcrum point so that upon continued lowering of the whipstock said whipstock is urged in a direction away from the outer end member 22, and in the direction of the arrow in Figure 1. At the time that the pointed end 18 of the whipstock has engaged the plug the member 23 has assumed the position shown in Figure 2, in which position the inner or upper end of the member has engaged the stop web 28 whereby the thrust imposed upon the member by the pivot pin 25. As the pivoting action occurs between the whipstock and the member 23 the lower end of the whipstock is shifted so that the inclined guide surface 16 of said whipstock is moved into engagement with the wall of the well bore. Of course, after the pointed end 18 of the whipstock has engaged the plug a two point contact of the whipstock with the formation is had. Because of its inclination with respect to the longitudinal axis of the whipstock, the member 23 forms a brace which will prevent the whipstock from being shifted laterally during subsequent drilling operations. Thus the arrangement provides not only for locating the lower end of the inclined surface 16 in close proximity to the wall of the well bore but also prevents lateral displacement of said whipstock after the same has been set.

The device is very simple in construction and includes a minimum number of parts. One of its main features is the fact that it may be readily used with ordinary whipstocks without changing the construction of said whipstock. Thus, it may also be used as an attachment and may be secured to the whipstock if the subsurface conditions require its use. The member or leg 23 may be constructed of any suitable material and it has been found that hard wood is satisfactory although any metal material may be employed.

The foregoing description of the invention is explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claims, without departing from the spirit of the invention.

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

1. A whipstock including, an elongate body having an inclined guide surface and also having a pointed lower end, and an anchoring member pivotally secured to the lower portion of the whipstock at a point spaced above the lower end, said member having its lower end normally projecting below the extremity of said whipstock whereby said member engages the formation or support on which the whipstock is set within the well bore prior to the engagement of the whipstock, the pivotal mounting of the member permitting swinging thereof upon continued downward movement of the whipstock to form an inclined brace for preventing lateral movement of the whipstock when drilling off of said whipstock occurs.

2. A whipstock as set forth in claim 1, wherein the anchoring member is mounted on the rear or trailing edge of the whipstock body which is substantially one hundred and eighty degrees opposite the inclined guide surface of said body.

3. A whipstock as set forth in claim 1, together with resilient means for normally urging the anchoring member toward a position inwardly of the body, whereby said member will not interfere with lowering of the whipstock within a well bore.
4. The combination with a whipstock having an elongate inclined guide surface, of an anchoring means including a support having means for attaching said support to the rear or trailing edge of the whipstock, and an anchoring member pivotally mounted in the support, said member being elongate and having its lower end projecting below the plane in which the lower end of the whipstock is disposed, said member being normally disposed at an angle with respect to the longitudinal axis of the whipstock, whereby when the member engages the formation or plug within the bore, the subsequent lowering of the whipstock causes said whipstock to be urged in a direction away from the lower end of the member and also whereby after setting of the whipstock said whipstock is prevented from lateral shifting within said bore.

5. The combination as set forth in claim 4, with spring means attached to the support and engaging the member to hold the member inwardly of the whipstock body whereby said member will not interfere with lowering of said whipstock within the well bore.

6. The combination with a deflecting tool having an inclined face of an attachment adapted to engage said support in the rear or trailing edge including, a bracket having means for connecting said bracket to the deflecting tool, an anchoring member having one end pivoted to the bracket, resilient means mounted on the bracket and engaging the member for urging the member in a direction inwardly of the deflecting tool, and stop means mounted in the bracket and engaged by the member for limiting the inward movement of said member.

7. The combination as set forth in claim 6, wherein the resilient means is a flat spring having one end secured to the bracket with its opposite end overlying and engaging one side of the anchoring member.

8. The combination with a whipstock having a lower pointed end of an anchoring means comprising, a bracket attached to the rear lower portion of the whipstock, an elongate anchoring member having its lower end pointed and having its upper end pivoted to the bracket, the lower end of said member extending below the lower end of the whipstock, and resilient means carried by the bracket and engaging the member for urging the member inwardly toward the whipstock.

9. The combination with a whipstock having a lower pointed end of an anchoring means comprising, a bracket attached to the rear lower portion of the whipstock, an elongate anchoring member having its lower end pointed and having its upper end pivoted to the bracket, the lower end of said member extending below the lower end of the whipstock, resilient means carried by the bracket and engaging the member for urging the member inwardly toward the whipstock, and a stop element carried by the bracket and engaged by the member for limiting inward movement of said member, said stop being so located that the member is normally disposed at an angle with respect to the longitudinal axis of the whipstock.

10. A whipstock as set forth in claim 1, wherein the pivotal mounting between the anchoring member and whipstock body comprises a pin and slot connection, whereby after both the body and member engage the formation a slight relative movement of these parts to permit their direct engagement is possible so that any forces against the body are transmitted directly to the anchoring member.

11. The combination set forth in claim 8, wherein the pivotal connection between the anchoring member and bracket comprises an elongate slot in the member and a transverse pin in the bracket, said slot and pin allowing relative movement of the bracket and whipstock with respect to the anchoring member, whereby after both the whipstock and member engage a formation or support within a well bore, relative movement of the parts is possible to allow the whipstock to directly engage the member and thereby transmit forces directly thereto rather than through the pivotal connection.

STANLEY WRIGHT.

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