Dec. 31, 1940. J. JOHNSON 2,227,347

WHIPSTOCK

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Fig. 1.

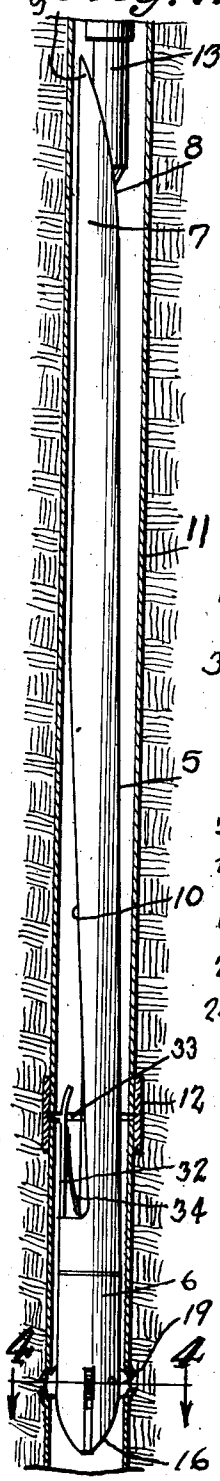


Fig. 2.

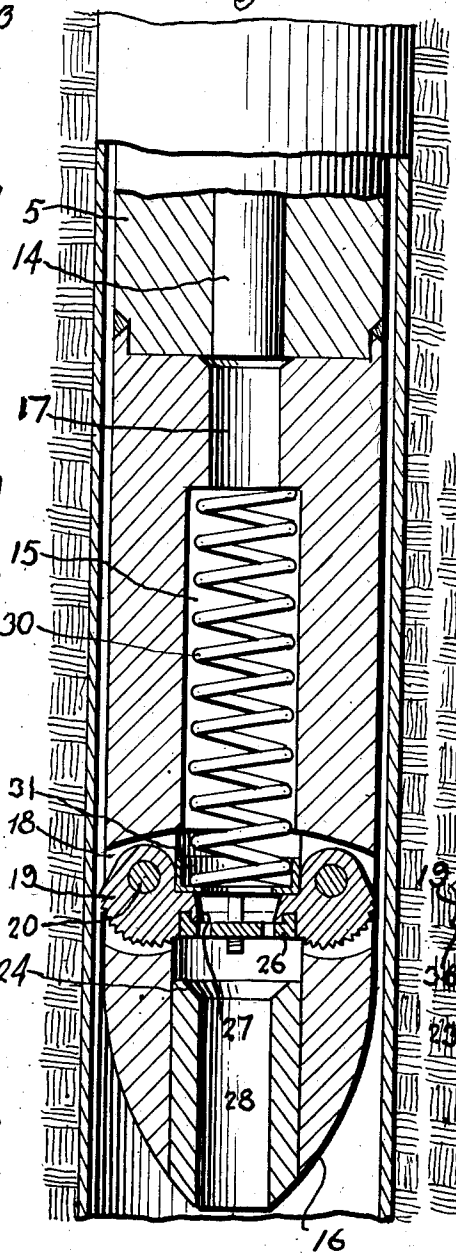


Fig. 4.

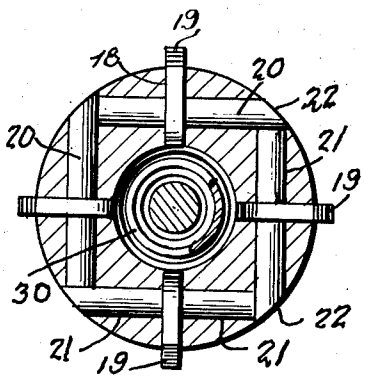
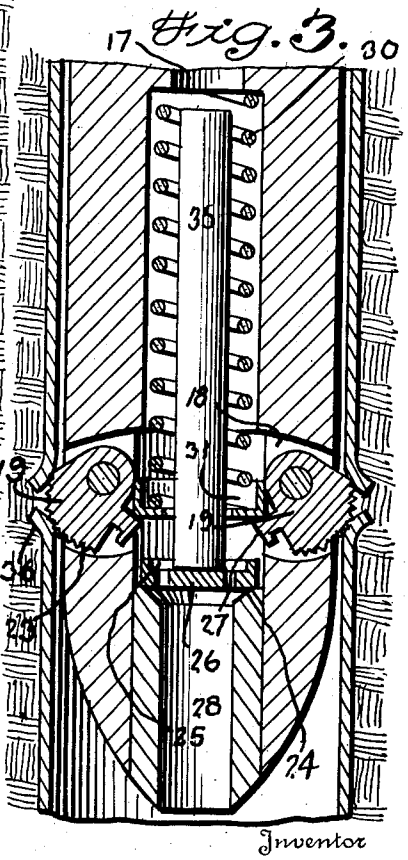


Fig. 3.



Inventor

Jack Johnson,

By Bryant & Lowry

Attorneys

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Fig. 5.

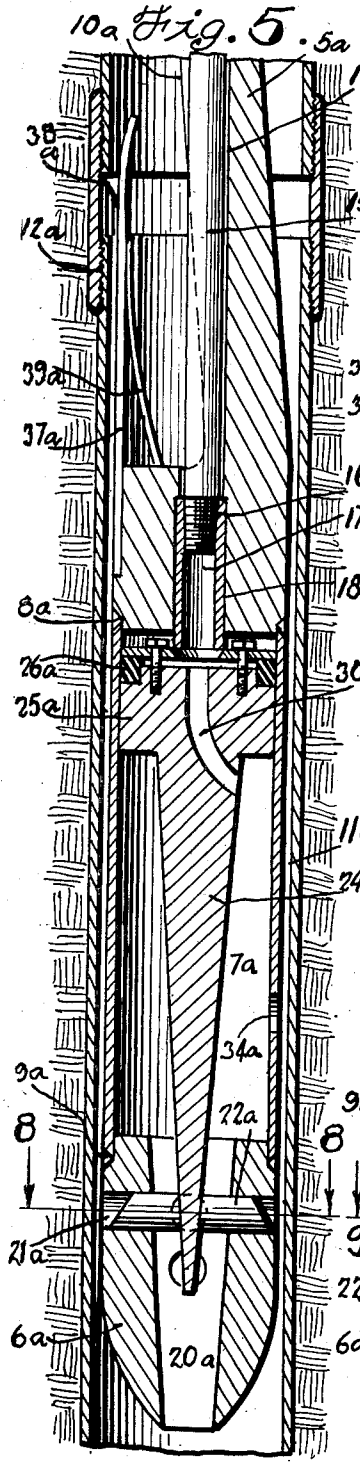


Fig. 6.

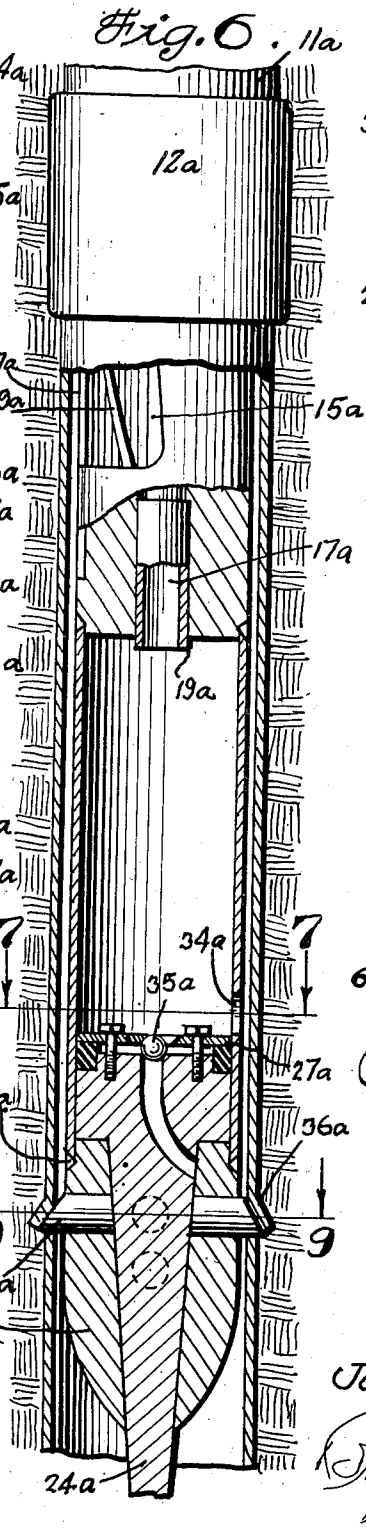


Fig. 7.

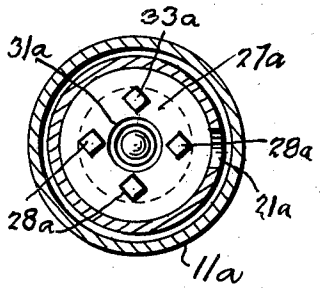


Fig. 8.

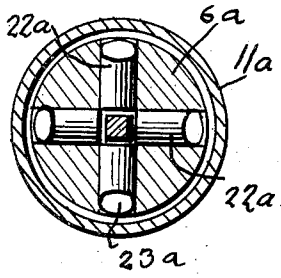
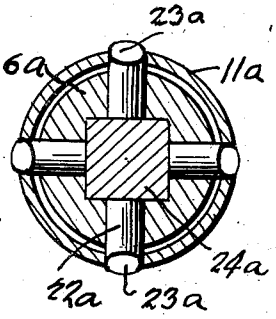


Fig. 9.



Inventor

Jack Johnson.

by

Bryant & Lowry

Attorneys.

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Fig. 10.

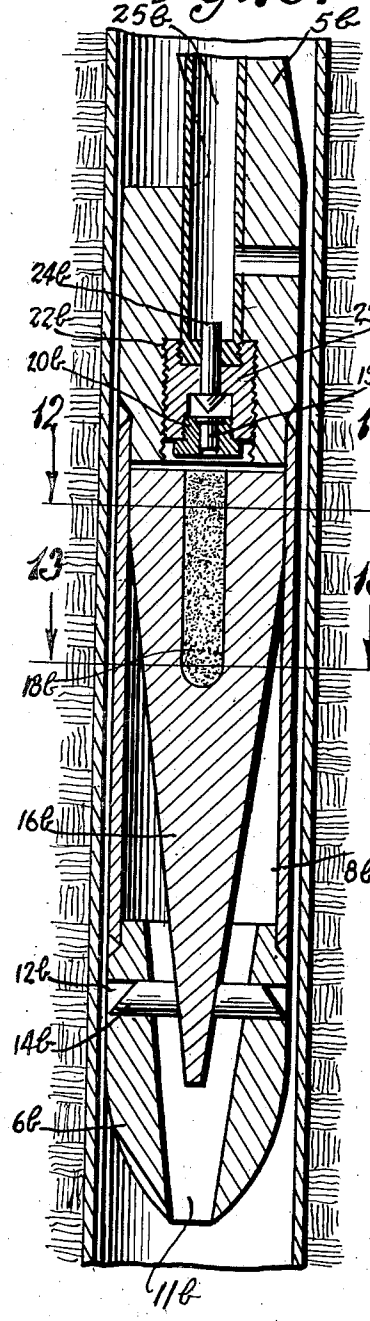


Fig. 11.

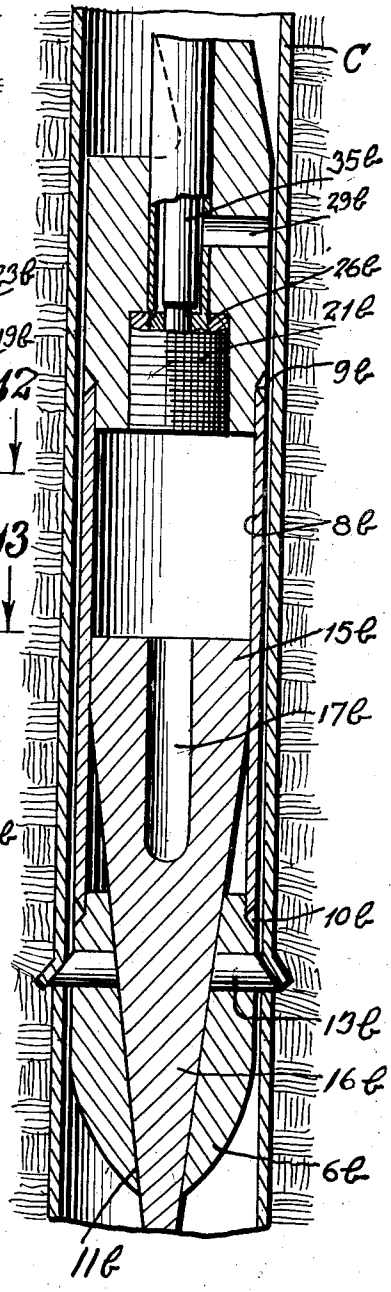


Fig. 12.

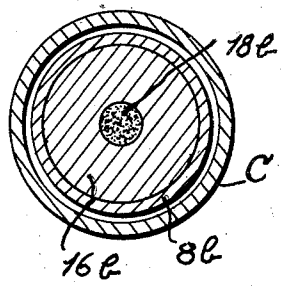
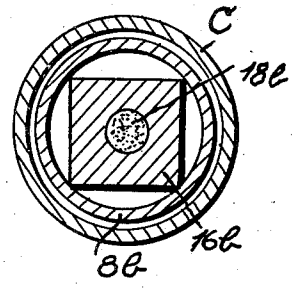


Fig. 13.



Inventor

Jack Johnson.

By Bryant & Lowry

Attorneys.

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UNITED STATES PATENT OFFICE

2,227,347

WHIPSTOCK

Jack Johnson, Long Beach, Calif., assignor to John W. Heaston

Application June 16, 1939, Serial No. 279,562

5 Claims. (Cl. 255—1)

This invention relates to improvements in whipstocks for use in oil well bore holes and particularly to anchoring means therefor.

The primary object of this invention is to provide a whipstock of the above mentioned character having laterally projected anchoring members adapted to pierce the well casing and retain the whipstock in its located position.

A further object of this invention is to provide a whipstock with locating means whereby said whipstock may be lowered to the required depth and then slightly raised so that the tapered drill engaging portion of the whipstock will be positioned between casing joints and will not create difficulty in starting the milling cutter.

A still further object of this invention is to provide a whipstock having laterally projected anchoring pins capable of being extended by means of a wedge moved downwardly in the whipstock by fluid under pressure or an explosive charge set off by dropping a go-devil from the top of the well.

A still further object of this invention is to provide a whipstock which will not slip out of position when the drill is lowered into engagement therewith to produce a lateral hole through the casing at a predetermined depth.

Other objects and advantages of the invention will become apparent during the course of the following description of the accompanying drawings, wherein,

Figure 1 is a vertical side elevational view of a whipstock embodying this invention illustrating the same arranged in a well casing;

Figure 2 is an enlarged vertical cross sectional view illustrating the gripping dogs in their retracted position;

Figure 3 is a similar cross-sectional view illustrating the gripping dogs in their operative extended position;

Figure 4 is a horizontal cross-sectional view taken on line 4—4 of Figure 1, looking in the direction of the arrows;

Figure 5 is a vertical cross-sectional view of a modified form of the invention;

Figure 6 is a vertical cross-sectional view of the same showing the anchoring pins in their extended position engaging the well casing;

Figure 7 is a horizontal cross-sectional view taken on line 7—7 of Figure 6, illustrating the valved piston for operating the gripping pins;

Figure 8 is a horizontal cross-sectional view taken on line 8—8 of Figure 5, looking in the direction of the arrows, further illustrating the anchoring pins in their retracted position;

Figure 9 is a horizontal cross-sectional view taken on line 9—9 of Figure 6, looking in the direction of the arrows, illustrating the anchoring pins in their extended position;

Figure 10 is a vertical cross-sectional view of a further modified form of the invention illustrating the anchoring pins in their retracted position and showing the expanding wedge in its uppermost position;

Figure 11 is a vertical cross-sectional view of the form of the invention shown in Figure 10, illustrating the anchoring pins in an extended position;

Figure 12 is a horizontal cross-sectional view taken on line 12—12 of Figure 10, looking in the direction of the arrows illustrating the explosive charge carried by the wedge member; and

Figure 13 is a horizontal cross-sectional view taken on line 13—13 of Figure 10, looking in the direction of the arrows, illustrating the manner in which the wedge is tapered.

In the drawings, attention is directed first to Figures 1 to 4, inclusive, wherein is shown an embodiment of the invention and wherein the reference character 5 will generally be employed to designate a whipstock having a head portion 6 and an end or tail portion 7.

The tail portion of the whipstock is tapered as at 8 to a point 9 and the intermediate portion is provided with a cut away portion 10 to reduce the overall weight of the whipstock. The diameter of the whipstock is slightly smaller than the interior diameter of the well casing 11 so that when the whipstock is in position slightly above one of the joints 12 of the casing, a milling cutter 13 may be lowered into the well to be guided laterally by the tapered tail portion 8 thereby causing the cutting mill to deviate from a straight line and cut through the casing.

Extending centrally through the body portion of the whipstock is a bore 14, having communication with a central bore 15 formed in the head 6. Said bore 15 terminates at the tip or pointed portion 16 of the head 6 and is slightly reduced adjacent the upper end as at 17.

Extending radially outwardly from the bore 15 are diametrically opposite slots 18 for pivotally receiving casing engaging dogs 19 pivotally supported by means of pivot pins 20, arranged in openings 21 as shown in Figure 4 so that alternate ends of the pins 20 engage adjacent pins while the opposite ends are curved as at 22 to conform to the circular contour of the outer head periphery.

Each casing engaging dog 19 is sector-shaped and is provided with teeth 23 adapted to be projected beyond the outer periphery of the head 6 through the slots 18. Formed on the inner portion of each casing engaging dog is a hook-shaped lug 27 adapted to engage over the edge of an annular upstanding flange 25 formed on a disk 26 having apertured fingers 25 therein and slidably arranged in the bore 15. A cylinder 28 is mounted in the extreme lowermost portion of the bore 15 to prevent the complete displacement of disk 26 when the same is dislodged from the position shown in Figure 2 to that shown in Figure 3.

Mounted in the upper portion of the bore 15 is a coil spring having its upper end abutting the reduced bore 17 while the lower end is adapted to engage a sliding cup-shaped piston 31 having contacting engagement with the upper portion of each hook-shaped lug 27 whereby the casing engaging dogs 19 will normally be urged outwardly.

Extending into the cut away portion 10 of the whipstock 5 is an arm 32 having one end rigidly secured in place while the free end is provided with a hoop 33 adapted to engage the space formed between the joint coupling 12. A spring arm 34 is also connected at one end to the cut away portion 10 of the whipstock so that the free end may engage the free end of the spring arm 32 and further assist in urging the same outwardly. The hoop 33 is so positioned with respect to the whipstock that when lowered in a well casing 11, the tapered tail portion of the whipstock will be in a position intermediate the jointed ends of the casing 11 whereby the milling cutter 13 will start to cut that portion of the casing adjacent the tapered portion of the tail 7.

It is proposed to lower the whipstock 5 in a well casing 11 to the desired predetermined depth with the casing engaging dogs 19 in the position shown in Figure 2, after which a go-devil 35 may be dropped from the surface of the well so that it will pass downwardly through the bores 14 and 15 until it strikes the disk 26, thereby causing the release of the casing engaging dogs to be projected into engagement with the casing and become lodged in punctured portion 36 caused by the dogs 19 when further downward pressure is exerted on the whipstock by the weight of the drill 13.

In the modification of the invention shown in Figures 5 to 9 inclusive, the whipstock body 5a is formed substantially the same as that shown in Figures 1 to 4 inclusive, but the head portion 6a is spaced from the main body portion by means of a cylinder 7a connected to the body portion of the whipstock as at 8a by means of a weld joint and to the head 6a. The diameter of the whipstock 5a is slightly smaller than the well casing 11a to allow the whipstock to be easily slid in place to the desired location with respect to the point connector 12a.

The central bore 14a of the whipstock 5a is provided with a fluid pressure pipe 15a having its lower end communicating with the interior of the cylinder 7a by being threaded as at 16a in the upper end of a nipple 17a fitted in an enlarged portion of the bore 14a as at 18a. The lowermost end of the nipple 17a as at 19a projects into the cylinder 7a a short distance below the body portion of the whipstock.

Formed in the central portion of the pointed head 6a is a tapered bore 20a having the upper end in communication with the interior of the cylinder 7a and the lower portion extending through the pointed portion of the head 6a. Extending radially outward from the central bore 20a are radial bores 21a in which are slidably mounted anchoring pins 22a having the outer ends pointed as at 23a for engaging the casing 11a and causing the same to be punctured as at 36a. The inner ends of the radial anchoring pins 22a extend into the central tapered bore 20a and are adapted to abut an elongated wedge 24a extending downwardly from a sliding piston 25a reciprocably mounted in the cylinder 7a. A packing ring 26a surrounds the piston head 25a and is held in place by means of a disk 27a secured to the piston head by means of machine screws 28a. Formed in the piston head 25a is a curved duct 30a having the upper end opening through the top wall of the piston in alignment with a bevelled opening 31a formed in the disk 27a. The lower end of the duct 30a communicates with the cylinder 7a and a ball valve 33a is adapted to be seated in the bevelled opening 31a as shown in Figure 7. A bleeding port 34a is formed in the side wall of the cylinder 7a to allow the escape of mud or sediment therein when the piston 25a is forced downwardly by fluid under pressure passing through the pipe 15a into the cylinder 7a. When the piston 25a is forced downwardly in the cylinder 7a, the squared wedge 24a will expand the casing gripping pins 22a and force them into engagement with the casing 11a.

Means for determining the location or positioning of the whipstock 5a is provided and includes a spring arm 37a having one end rigidly attached to whipstock and the opposite end extending into the cut-away portion 10a thereof. A hook 38a is formed in the free end of the spring arm for engaging the space between the joint collar 12a similar to the device shown in Figures 1 to 4 inclusive. Also, a spring arm 39a has its lower end anchored to the whipstock while the upper free end holds the spring arm 37a under tension when the hooked end is in place.

The operation of the form of the invention shown in Figures 5 to 9 inclusive is substantially the same as shown in Figures 1 to 4 inclusive except a wedge is employed for expanding the anchoring means in lieu of the coil spring and fluid pressure is employed for forcing the wedge into operative position instead of the go-devil release means.

In the modified form of the invention shown in Figures 10 to 13 inclusive, the whipstock body 5b is substantially identical to the form of the invention shown in Figures 1 to 9 inclusive and the head portion 6b is spaced from the body portion by means of a cylinder 8b connected by means of welding as at 9b and 10b.

The head 6b is provided with a central conical axial bore 11b into which extends transverse openings 12b for slidably receiving radially extending anchoring pins 13b. The free ends of the pins 13b terminate in a point as at 14b.

Slidably mounted in the cylinder 8b is a piston 15b having the lower portion tapered into a wedge-shaped point 16b adapted to extend into the tapered bore 11b and engage the inner ends of the anchoring pins 13b. Formed in the upper end of the piston 15b is a pocket 17b for receiving a charge of explosive material 18b which when the piston 15b is in its uppermost position is located in direct alinement with a detonating cap 19b carried in a screw plug 20b threaded in one end of a screw threaded thimble 21b fitted

in a correspondingly shaped screw threaded opening 22b formed in the lowermost portion of the whipstock body 5b. An apertured shelf 23b extends across the screw threaded thimble intermediate the ends thereof and is adapted to slidably receive a firing pin 24b, having its lower end presented to the detonating cap 19b.

Extending downwardly through the whipstock 5b is a tube 25b having its lower end threaded and received in the upper internally screw threaded portion as at 26b. The upper end of the tube 25b may terminate adjacent the tail portion of the whipstock 5b.

In operation, the whipstock 5b is lowered to the desired depth within the casing C, with the piston 15b in the upper end of the cylinder 8b as shown in Figure 10. After the whipstock has been so positioned, a go-devil 35b is dropped down the casing C, which is forced through the tube 25b by reason of free circulatory action when pressure is applied at the top of the casing which is made possible by the lateral duct 29b communicating with the pipe 25b and the space between the casing C and the whipstock body 5b. When the go-devil 35b contacts the firing pin 24b, the detonating cap causes the explosion of the powder charge 18b, driving the piston 15b downwardly in the cylinder 8b and forcing the anchoring pins 13b outwardly so that the free pointed end will puncture the casing C and anchor the whipstock in position with respect to the casing C.

It is to be understood that the forms of the invention herewith shown and described are to be taken as preferred embodiments of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the sub-joined claims.

What is claimed is:

1. A whipstock for use in casings in deep well bores, said whipstock comprising an elongated body including a head and a tail portion, radially extending anchoring members associated with the head portion and normally confined within the extreme diameter of the head portion, means for holding the anchoring members in retracted positions, a coil spring for projecting the anchoring members beyond the periphery of the head portion and means controllable from the top of the well for tripping the holding means for the anchoring members and moving the same away from the anchoring members whereby the latter are radially forcibly projected for puncturing the side wall of the casing for interlocking engagement therewith.

2. A whipstock for use in casings in deep well bores, said whipstock including a head and a tail portion, a serrated dog pivotally carried by the head portion with the operative face thereof normally occupying a position within the extreme diameter of said body portion and adapted to be forcibly projected radially outwardly of the body portion for puncturing contact and interlocking engagement with the casing in the bore, displaceable means carried by the body portion and engaged with said serrated dog at a point below the pivot for said dog for normally holding the dog in its retracted position, and means controllable from the top of the well for moving said displaceable means relative to the dog and forcibly moving the dog on its pivot into engagement with said casing for locking the whipstock in the casing.

3. A whipstock as set forth in claim 2, wherein said displaceable means is normally engaged with a tooth on the serrated dog.

4. A whipstock as set forth in claim 2, wherein said displaceable means includes a member slidable in the body portion and having a separable interfitting engagement with said dog.

5. A whipstock as set forth in claim 2, wherein the means controllable from the top of the well is operative to initially release the displaceable dog-retaining means and thereafter radially project the dog.

JACK JOHNSON.