March 22, 1938. W. E. WILLIAMS 2,111,881

WHIP STOCK

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Fig. 1.

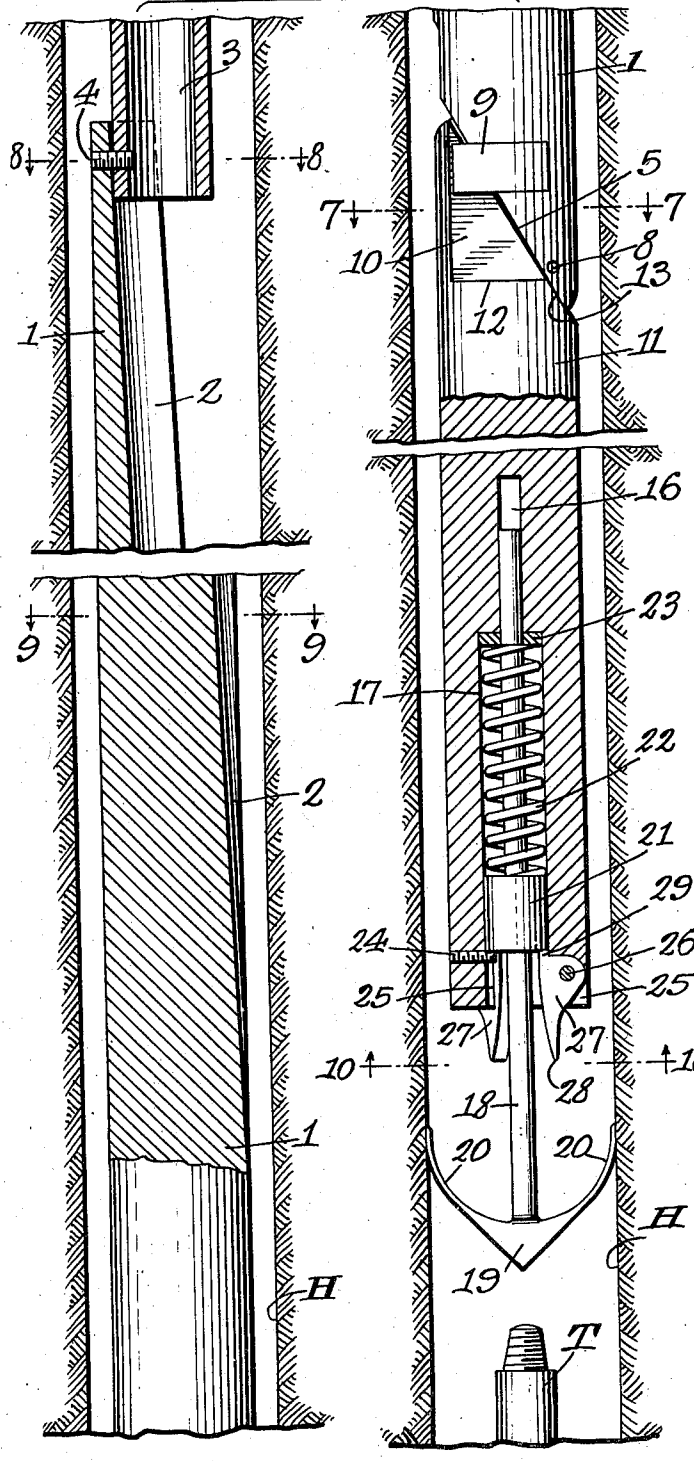


Fig. 4.

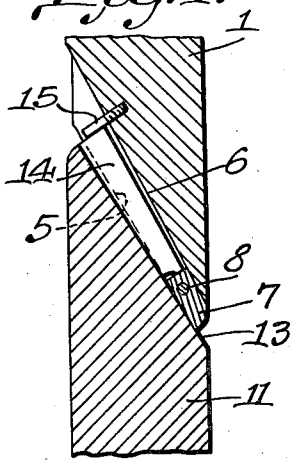


Fig. 5.

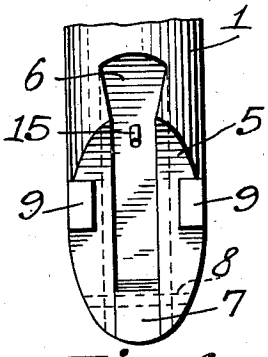
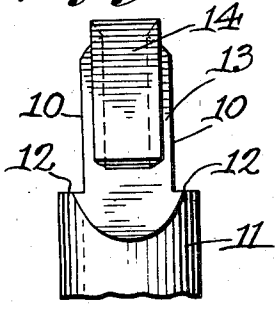


Fig. 6.



W. E. Williams
INVENTOR.

BY C. A. Snow & Co.

ATTORNEYS.

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Fig. 2.

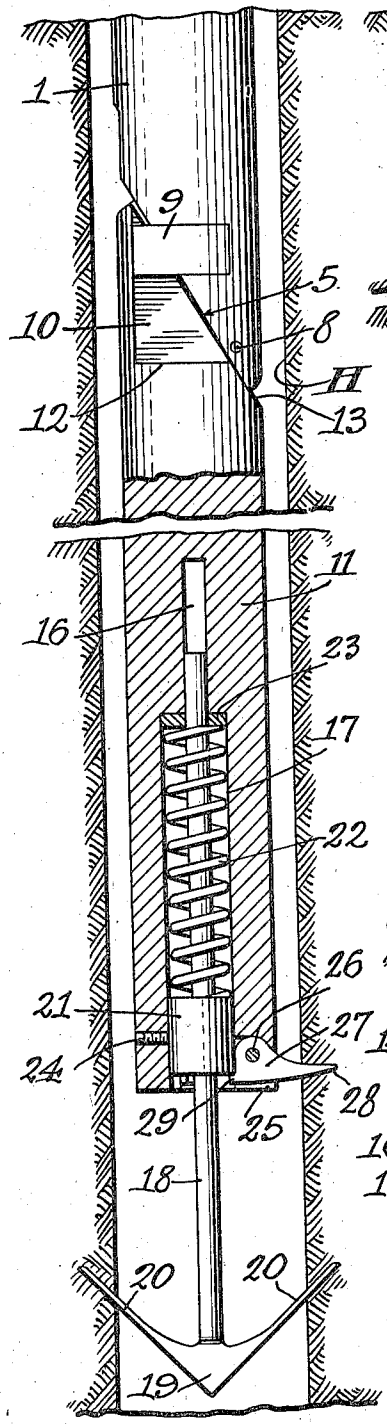


Fig. 3.

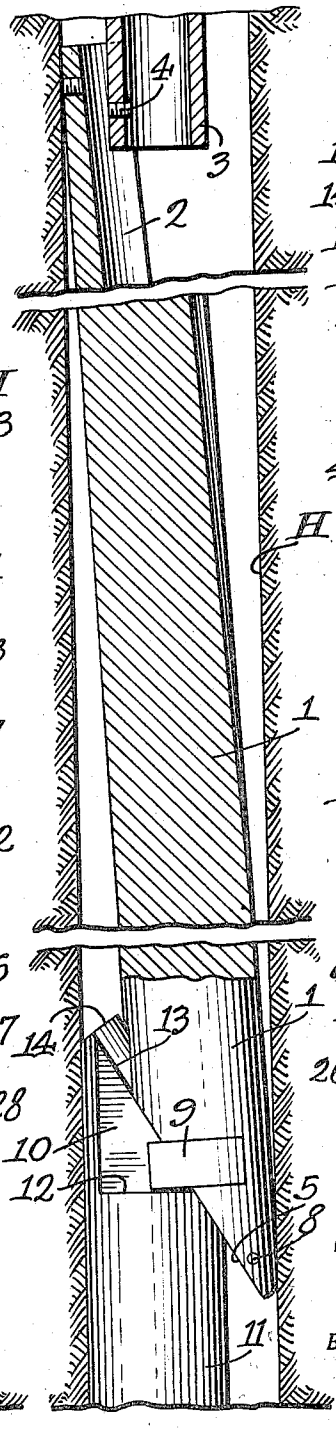


Fig. 7.

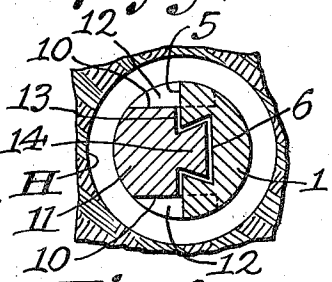


Fig. 8.

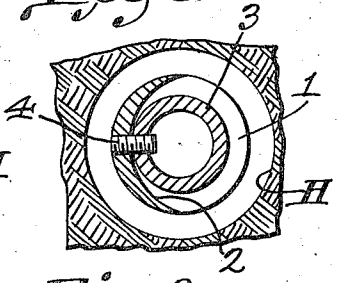


Fig. 9.

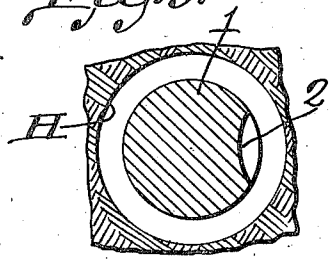
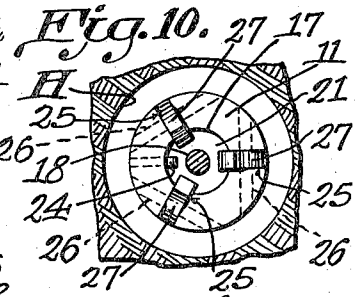


Fig. 10.



W. E. Williams
INVENTOR.

BY C. A. Snow & Co.
ATTORNEYS.

Patented Mar. 22, 1938

2,111,881

UNITED STATES PATENT OFFICE

2,111,881

WHIP STOCK

William E. Williams, Paducah, Tex.

Application October 18, 1937, Serial No. 169,696

8 Claims. (Cl. 255—1)

This invention relates to a whipstock of the "full hole" type by the use of which it becomes possible to drill around a lost tool or the like within a partly completed well, all danger of the drilling tool working back into the original hole to a point above the obstruction being eliminated.

A further object is to eliminate the usual practice of cementing the hole.

A still further object is to provide a whipstock which can be readily lowered to the proper point in the hole and there anchored and released, the whipstock, when brought to its ultimate position, operating as an efficient deflecting means for the drill or bit whereby it will be directed laterally to form a continuation of the upper portion of the hole downwardly past the obstruction in the original hole.

With the foregoing and other objects in view which will appear as the description proceeds, the invention consists of certain novel details of construction and combinations of parts hereinafter more fully described and pointed out in the claims, it being understood that changes may be made in the construction and arrangement of parts without departing from the spirit of the invention as claimed.

In the accompanying drawings the preferred form of the invention has been shown.

In said drawings

Figure 1 is a view partly in section and partly in elevation, showing the whipstock positioned in a hole directly above the obstruction and immediately prior to being anchored and set in the hole.

Figure 2 is a view partly in elevation and partly in section of portions of the whipstock following the operation of anchoring it in the hole.

Figure 3 is a view partly in elevation and partly in section showing the upper portion of the whipstock after it has been set in its final or ultimate position preparatory to the continuation of the drilling operation.

Figure 4 is a vertical section through the meeting portions of the upper and lower members of the whipstock, the same being shown in their initial or normal positions relative to each other, said section being taken in a plane extending transversely of Figure 1.

Figure 5 is an elevation of the lower end portion of the upper member of the whipstock.

Figure 6 is an elevation of the upper end portion of the lower member of the whipstock.

Figure 7 is a section on line 7—7, Figure 1.

Figure 8 is a section on line 8—8, Figure 1.

Figure 9 is a section on line 9—9, Figure 1.

Figure 10 is a section on line 10—10, Figure 1.

Referring to the figures by characters of reference 1 designates the elongated upper member of the whipstock provided with a transversely concave channel 2 which gradually increases in depth from a point adjacent to the lower end of said member upwardly to the upper end thereof so that said upper end thus can constitute a seat for the lower end of a drill pipe 3 adapted to be fastened thereto by a screw 4 constituting a shear pin. When the pipe is attached to the whipstock, it is substantially coaxial therewith as will be noted by referring to Figure 1.

The lower end of the upper section 1 is beveled at approximately thirty degrees as shown at 5 and formed with a longitudinal dove-tailed groove 6 open at its upper end while its lower end is normally closed by a block 7 held in place by a tie-pin 8 extending transversely therethrough and through the walls of the slot.

The upper member 1 has lock blocks 9 fitted in the sides of its tapered end portion and adapted to lap the flattened sides 10 of the lower member 11 of the whipstock, there being shoulders 12 formed at the lower ends of these flattened faces 10 constituting abutments for the blocks 9 when the upper member 1 slides downwardly to a predetermined point relative to the lower member 11.

The upper end of the lower member 11 is beveled as at 13 to constitute a bearing for the beveled end 5 of the upper member 1. There is a difference in pitch of approximately two degrees between these two beveled faces so that the upper member 1 is thus permitted to have a limited rocking movement relative to the lower member 11. There is formed on the beveled end 13 a dovetail 14 which is loosely fitted in the dove-tail groove 6 so as to slide therein and have a limited rocking movement. Normally the lower end of the dovetail 14 bears against the block 7 as shown in Figure 4 and a shear pin 15, which is engaged in the lower beveled end of member 1, locks the upper end of the dovetail 14 so as to prevent relative sliding movement of the two beveled ends.

The lower member 11 of the whipstock is formed with an axial bore 16 the lower portion of which is counterbored as at 17. A stem 18 is slidable within the bore 16 and counterbore 17 and is provided at its lower end with a spear head 19 formed with flexible upwardly diverging arms 20. A collar 21 is secured to the stem 18 and slidable within the counterbore 17, there

being a coiled spring 22 in the counterbore and interposed between collar 21 and a thrust ring 23 at the inner end of the counterbore. The spring is held normally under compression and the collar 21 and stem 18 is held normally against downward movement relative to member 11 by a shear pin 24 which is extended through the wall of the counterbore 17 and into position under the collar 21, as shown in Figure 1.

Radial slots 25 are provided in the lower end of member 11 and communicate with the lower end of the counterbore 17. In each of these slots there is located a pivot pin 26 on which is mounted a dog 27 which has a pointed portion 28 normally extending downwardly beyond the member 11. A lug 29 is extended upwardly from each dog under normal conditions and into the path of the collar 21, as shown in Figure 1.

Assuming that a tool or other obstruction T has been lost in the lower portion of a hole H and it is desired to continue the drilling of the well by extending the hole around the obstruction, the parts of the whipstock are all assembled as shown in Figure 1 with the several shear pins in position. The whipstock is then lowered gradually into the hole, the flexible arms 20 of the spear head wiping downwardly along opposed portions of the hole until the spear head has reached a point close to the upper end of the obstruction T. During the lowering of the whipstock the two members 1 and 11 have been coaxial with the pipe 3 so that the tool has been properly centered within the hole. When the whipstock is brought to desired positions it is given an upward pull and this will cause the arms 20 of the spear head to bite into the wall of the hole and resist the upward movement of stem 18. As pin 24 is not as strong as pins 4 and 15, the resistance thus encountered will cause the collar 21 to shear off the inwardly projecting end of pin 24 with the result that the spring 22 will project collar 21 downwardly and cause the dogs 27 to swing outwardly into the wall of the hole as shown in Figure 2 where they will be locked securely by the collar 21 which, at this time, becomes seated on the lugs or projections 29. The dogs are of course limited in their upward movement under these conditions by the upper walls of the slots in which they are located. This action results in the firm anchoring of the member 11 within the hole H. The next step consists in relieving the member 1 from the pull exerted through pipe 3 so that the weight of this member 1 and the pipe will be sufficient to shear off pin 15 and cause the lower beveled end 5 of member 1 to slide downwardly along the upper beveled end 13 of member 11. This movement will continue until member 1 wedges between the wall of hole H and the upper portion of member 11, as shown in Figure 3. This relative movement will be limited by the blocks 9 coming against the shoulders 12. As the pitch of the two beveled ends is not the same, the upper member 11 is free to rock slightly relative to member 1 so that it can assume an inclined position in the hole with its lower end thrusting tightly against the wall of the hole at one point while the upper end will bear outwardly against the wall of the hole at a point on a line diametrically opposite the lower point of contact.

After member 1 has thus been placed, the pipe 3 is forced downwardly with sufficient force not only to tightly wedge the parts in the hole but also to shear off the pins 4 after which pipe 3 can be removed from the hole and the usual drilling tool or bit inserted in the hole. As this tool comes against the concave surface or channel 2 of the upper member 1, it will be deflected within the hole H so as to drill into the wall of the hole and ultimately downwardly past the obstruction T so that the drilling of the well thus can be completed.

What is claimed is:

1. A whipstock including an upper member having an obliquely disposed deflecting surface, a lower member, anchoring means for the lower member, said members having abutting beveled ends, means joining said ends to permit relative sliding and tilting movement thereof, and a pin engaging the two members for holding them normally against relative sliding movement, said pin being proportioned to shear off when subjected to a predetermined weight from the upper member, thereby to release the upper member for movement by gravity into oblique positions to block off a hole in which it is mounted.

2. A whipstock including an upper member having an obliquely disposed deflecting surface, a lower member, anchoring means for the lower member, said members having abutting beveled ends, means joining said ends to permit relative sliding and tilting movement, a shear pin engaging the two members for holding them normally against relative sliding movement but proportioned to shear off when subjected to a predetermined weight from the upper member, and cooperating means on the members for limiting the sliding movement of the upper member when released from the sheared pin.

3. A whipstock including an upper member having an obliquely disposed deflecting surface, a lower member, anchoring means for the lower member, said members having abutting beveled ends, a tiltable and slidable dovetail connection between the beveled ends of the members, a shear pin normally engaging both members for holding them against relative sliding movement, said pin being proportioned to shear off under the predetermined weight applied thereto through the upper member, and cooperating means on said members for limiting the sliding movement of the upper member when released from the shear pin.

4. A whipstock including an upper member having an obliquely disposed deflecting surface, a lower member, anchoring means for the lower member, said members having abutting beveled ends, a tiltable and slidable dovetail connection between the beveled ends of the members, a shear pin normally engaging both members for holding them against relative sliding movement, said pin being proportioned to shear off under the predetermined weight applied thereto through the upper member, and cooperating means on said members for limiting the sliding movement of the upper member when released from the shear pin, said means including lock blocks carried by and projecting from the upper member at the beveled end thereof, and stop shoulders on the lower member for engagement by the blocks.

5. A whipstock including an upper member having an obliquely disposed deflecting surface, a lower member, anchoring means for the lower member, said members having abutting beveled ends, means joining said ends to permit relative sliding and tilting movement, a shear pin engaging the members for holding them normally against sliding movement relative to each other, said pin being proportioned to shear off under

a predetermined weight transmitted thereto from the upper member, a drill pipe, a shear pin connecting said drill pipe to the upper member and of greater strength than the first named shear pin but proportioned to shear off when subjected to excessive pressure from the drill pipe.

6. A whipstock including an upper member having an obliquely disposed deflecting surface, a lower member, anchoring means for the lower member, a shear pin for holding the anchoring means normally retracted, a friction device carried by the anchoring means, said members having abutting beveled ends, means joining said ends to permit relative sliding and tilting movement, a shear pin engaging the two members for holding them normally against relative sliding movement, means for lowering and raising the whipstock in a hole, and a third shear pin connecting said means to the upper member of the whipstock, all of the shear pins being so proportioned that when the whipstock is pulled upwardly against the action of the friction means, the shear pin of the anchoring means will be severed, and when the upper member of the whipstock is moved downwardly relative to the lower member, the shear pin connecting the same will be severed, and when the whipstock lowering means is thrust downwardly relative to the anchored whipstock, the shear pin connection therefor will be severed.

7. A whipstock including an upper member having an obliquely disposed deflecting surface, a lower member, said members having abutting beveled ends, means for slidably and tiltably joining said ends, a shear pin engaging said ends for holding them normally against relative movement, a spring-pressed stem carried by the lower member, friction means on the stem for engagement with the wall of the hole in which the whipstock is inserted, anchoring dogs pivotally connected to the lower member, a shear pin in the lower member, means on the stem for normally engaging the shear pin to hold the spring-actuated stem against movement relative to the lower member, said dogs being positioned for actuation by said means on the stem into position within the wall of said hole.

8. A whipstock including an upper member having an obliquely disposed deflecting surface, a lower member, said members having abutting beveled ends, means for slidably and tiltably connecting the beveled ends, a stem slidably mounted in the lower member, friction means carried thereby for engagement with the wall of a hole in which the whipstock is seated, dogs pivotally connected to the lower member, a shear pin in said lower member, a spring in said member and normally under compression, and means on the pin for severing the stem when the stem and lower member are subjected to excessive resistance to movement in one direction, said means being shiftable by the spring to project the dogs into the wall of the hole, and means on the dogs cooperating with said means on the stem to lock the dogs in projected positions.

WILLIAM E. WILLIAMS.