Oct. 25, 1938. P. F. MATLOCK 2,134,287

WHIPSTOCK

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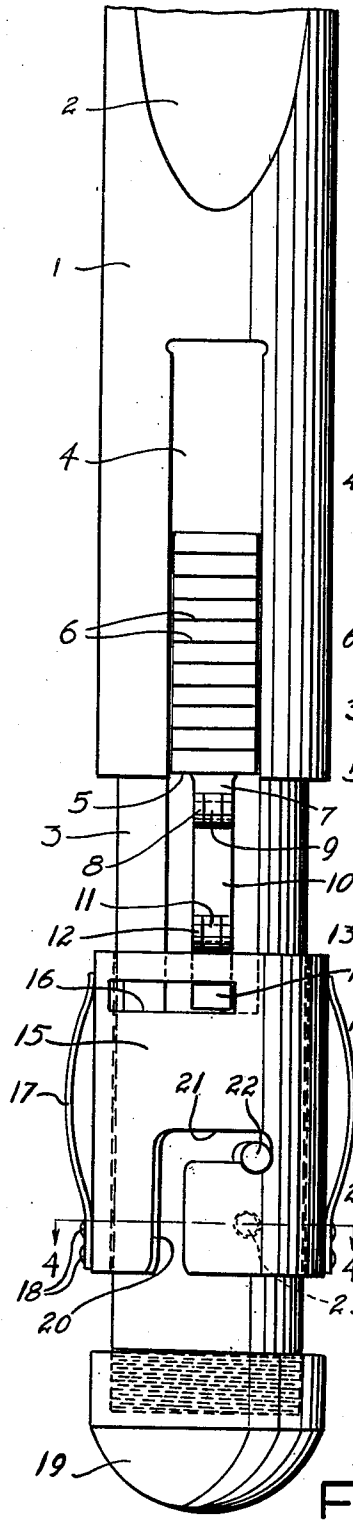


Fig. 1.

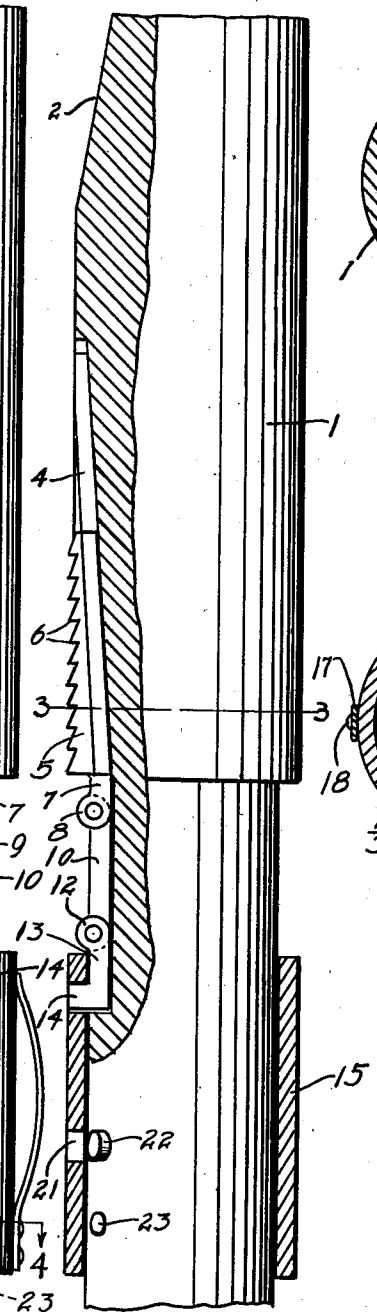


Fig. 2.

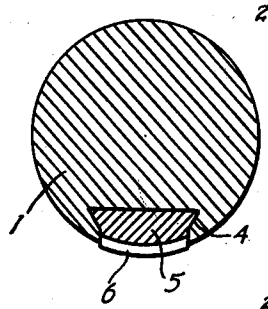


Fig. 3.

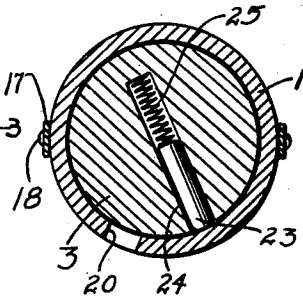


Fig. 4.

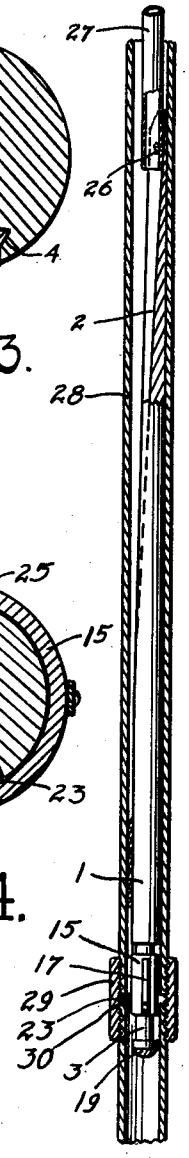


Fig. 5.

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2,134,287

WHIPSTOCK

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4 Claims. (Cl. 255—1)

This invention relates to an improvement in whipstocks for use in sidetracking oil and water wells, and more particularly to mechanism for setting such whipstocks.

It is the present practice when it is desired to sidetrack a well, to place within the well bore an elongated wedge-shaped block of iron, and to lock the same in place just below the point where it is desired to sidetrack the well. This block of iron deflects the bit or other drilling tool against one side of the casing, thereby causing it to cut through the casing wall and take a new direction with respect to the previously drilled hole. These wedge-shaped blocks are known as whipstocks, and are secured in place at the desired point in the well casing by one of several methods.

One method of securing the whipstock in place is by lowering a supplementary string of pipe into the well of such length that it will extend from the bottom of the hole up to the position where the whipstock is to be located. The whipstock is then lowered into the upper end of this string of pipe and the sidetracking of the well may then proceed.

Another method of positioning the whipstock in the well is by the use of a tripping and locking mechanism, which is carried by the whipstock itself, and by which the whipstock is locked in place at the desired point by contact with the side walls of the casing. For this purpose, a wedge or slip serves to wedge the whipstock tightly in the casing.

The second mentioned method of setting whipstocks is the more common, because the expense involved in a secondary string of pipe is usually too great for the first method to be used.

In the second method, the tripping mechanism has in the past depended upon the action of a trigger which catches between the ends of adjacent sections of the well casing within the recess of the ordinary casing coupling. This trigger serves to release a spring actuated slip which in turn locks the whipstock in the well casing. This mechanism ordinarily works with a fair degree of satisfaction, but is entirely dependent upon the couplings of the casing for the purpose of operating the trigger. It has recently been found desirable to weld together the ends of the sections of well casing, thus eliminating the couplings which have been customary in the past. In such an instance, the present tripping mechanism as above described is ineffective because it depends upon the recess in the old type of coupling. In setting casing it is also the present practice to pump cement through the casing to give a solid seat for the casing shoe and to shut off surface water above the formation. This cement often fills the center of the couplings between the ends of the pipe, thus preventing the trigger from catching at the desired depth which necessitates pulling the whipstock out of the hole. When this occurs the tripping trigger almost invariably catches in some other coupling far above the desired point in the well which releases the locking mechanism and causes the whipstock to set at the wrong depth. In this case the only procedure is to shear loose from the whipstock and remove it later with fishing tools. Thus it is seen that even though it is very desirable to trip the mechanism at the desired depth and with correct position with respect to the casing couplings, it is not always possible to do so with the previously used mechanism.

It is the purpose of this invention to provide a mechanism for setting whipstocks which will function equally well in casing with couplings, or in welded casing without couplings. It is a further object to provide a means whereby when the whipstock is to be set in a casing with couplings, the couplings may be located with respect to the whipstock before the whipstock is set, so that the whipstock can be set at a point at which the bit will drill through without striking a coupling. It is a further object to provide a device for setting whipstocks which will not depend for its action upon the contour of the inner surface of the well casing in which it is to be set. With the above and other objects in view, this invention consists of the various parts and combinations set forth in the following description and the accompanying drawing. It is to be understood, however, that such description and drawing are by way of illustration and example only, and are not to be taken as in any way a limitation upon the spirit or scope of this invention. Such limitation is to be only by the prior art and by the terms of the appended claims.

Referring now more particularly to the drawing, in which like numerals indicate corresponding parts throughout:

Fig. 1 is a side elevation of the setting mechanism of a whipstock constructed in accordance with this invention.

Fig. 2 is a view partly in section taken at right angles to Fig. 1.

Fig. 3 is a horizontal cross section of the device taken along the line 3—3 of Fig. 2.

Fig. 4 is a similar view taken along the line 4—4 of Fig. 1.

Fig. 5 is a vertical sectional view illustrating a

whipstock constructed in accordance with this invention, being locked in position within a well casing.

In the drawing the numeral 1 indicates the body of a whipstock, the upper portion of which is of substantially conventional form, being tapered as at 2 for the purpose of deflecting the bit or drilling tool toward one side of the casing.

The lower portion of the whipstock body is formed to receive the locking mechanism and comprises a lower end portion 3 of reduced diameter. Extending upwardly along the side of the whipstock body from the lower portion 3 is a dovetail slot tapering in depth from its lower end upwardly and adapted to slidingly receive a slip 5 having a cross section shape such as to engage the slot 4 and be supported thereby against radial movement away from the whipstock body. The face of this slip is provided with teeth or serrations at 6, and its lower end is formed with an extension 7 carrying ears 8. These ears 8 cooperate with an ear 9 on a link 10 to form a hinge connection with said link, and the link 10 has an ear 11 on its lower end forming a hinge connection with the ears 12 on a hook-shaped member 13. The member 13 is positioned in such a manner that the end 14 thereof projects in a substantially radial direction outwardly with respect to the whipstock.

Slidably mounted on the section 3 of the whipstock is a sleeve member 15 having a circumferentially disposed slot 16 adjacent its upper end adapted to receive the outwardly extending portion 14 of the member 13. The sleeve 15 is provided with leaf springs 17, or the like, secured thereto as by rivets 18, and adapted to at all times bear outwardly and frictionally engage the inner walls of the casing. A cap 19 is threaded onto the lower end of the whipstock, and is provided with a rounded lower surface to facilitate the lowering of the whipstock into the well.

Extending upwardly from the lower end of the sleeve 15 is a bayonet slot having a vertical or longitudinal portion 20 and a horizontal or circumferentially extending portion 21. This slot is adapted to engage with a pin 22 fixedly mounted on the portion 3 of the whipstock and serving to prevent the longitudinal movement of the sleeve 15 and the slip 5 when the parts are in the position illustrated in Fig. 1.

Directly below the pin 22 is a second pin 23 which is slidably mounted in a radially extending opening 24 formed in the whipstock body. within the opening 24 behind the pin 23 and constantly urging the same radially outwardly is a spring or the like 25. This pin 23 is normally held within its recess 24 when the parts are in the position illustrated in Fig. 1 by virtue of the fact that a portion of the sleeve 15 overlies the end of the opening 24.

When the whipstock is being lowered into the well, its upper end is secured by suitable means such as a bolt 26 to the lower end of a string of pipe 27. It is thus lowered into the casing 28 which may be of the welded type as above set forth, or the type employing couplings such as illustrated at 29. As shown, where couplings are employed, there is usually a space 30 left between the ends of the adjacent sections of casing, and these cooperate with the whipstock in a manner presently to be set forth.

In operation, the parts are first arranged as illustrated in Fig. 1 with the sleeve 15 and the slip 5 in their lowermost position, and with the sleeve held in place by the fixed pin 22, in which position the pin 23 is retained by the sleeve. The whipstock is then lowered into the well by means of a string of pipe 27 as illustrated in Fig. 5 until the approximate depth is reached at which the whipstock is to be set. If the casing in which the device is being set is of the welded type employing no couplings, the string of pipe is then simply twisted to the right so as to move the pin 22 along the horizontal portion 21 of the bayonet slot in the sleeve 15 to a position at the top of the vertical portion 20 of that slot. During this operation, the sleeve 15 is held against turning by virtue of the frictional contact between the springs 17 and the side walls of the casing. The string of pipe is then again lowered so as to cause the pin 22 to pass downwardly along the vertical portion 20 of the bayonet slot, the sleeve 15 being supported against downward movement by the frictional contact between the springs 17 and the side walls of the casing. Upon this downward movement, the slip 5 which is connected to the sleeve 15 by means of the hook-shaped member 13, is caused to slide upwardly with respect to the whipstock along its groove 4. As it slides upwardly, it will be seen that it will move radially outwardly to wedge itself firmly against the side wall of the casing until the whipstock is securely locked in position. Upon further lowering of the pipe string 27, the weight of the string will cause the bolt 26 to shear off, thus releasing the pipe string and permitting its removal from the well.

When the whipstock is to be set in a casing having couplings such as illustrated in Fig. 5, the procedure is only slightly different. As in the previous case, when approximately the desired depth is reached the pipe string 27 and the whipstock are rotated to the right so as to move the pin 22 to its position at the top of the vertical portion 20 of the bayonet slot. In doing this, however, it is noted that the pin 23 is also moved to a position where it registers with the vertical portion 20 of the bayonet slot and is thus no longer retained within the whipstock body, but is expelled therefrom to a limited extent by means of the spring 25. This pin will be expelled until it contacts the casing wall, after which the pipe string and whipstock are drawn upwardly slowly until the pin 23 catches within a recess or space 30 between two sections of casing at the point of coupling of the same. This definitely locates the coupling with respect to the whipstock, and upon slight movement in either direction the pin 23 may be sheared off so as to permit the setting of the whipstock. If it is desired to make sure that the whipstock is set a sufficient distance above a coupling, then the whipstock will be moved upwardly to shear off the pin 23. After this is accomplished the setting of the whipstock may proceed as in the previous instance, it being only necessary to lower the whipstock to cause the slip to engage the casing wall and lock the whipstock in place. The pipe string is disconnected and removed as previously set forth.

It will be seen from the foregoing that a device has been prvided for the setting of whipstocks in well casings, which may be set wholly independently of any coupling or other peculiar contour of the inner wall of the casing. It is further apparent that it may be set with equal facility in a casing which is put together with couplings and in a casing which is welded together. In addition, it will be appreciated that the position of the whipstock with respect to any coupling which may be present in the well can be positively and accurately controlled so that when the drilling

tool is put in operation it will be certain that it will not be called upon to drill out through a coupling in the casing.

I claim:

1. In a whipstock, a body having a substantially radial opening therein, a pin slidable in said opening, resilient means behind said pin to constantly urge the pin radially outwardly, a sleeve around said body adapted to extend over said opening to confine said pin and movable to release the same so that said pin may be projected against a casing wall and to catch at a coupling between the pipe ends when the whipstock is moved longitudinally of such casing to locate such coupling with respect to the whipstock.

2. In a whipstock, a body having a substantially radial opening therein, a pin slidable in said opening, resilient means behind said pin to constantly urge the pin radially outwardly, a sleeve around said body adapted to extend over said opening to confine said pin and movable to release the same so that said pin may be projected against a casing wall and to catch at a coupling between the pipe ends when the whipstock is moved longitudinally of such casing to locate such coupling with respect to the whipstock, and means on said sleeve to frictionally engage the side wall of such casing to resist movement of the sleeve with respect thereto.

3. A whipstock comprising a body having a substantially radial opening therein, and a longitudinally extending slideway in one side thereof and extending outwardly and upwardly with respect to the body, a slip slidable in said slideway to cause locking of the whipstock in a casing, a sleeve rotatably and slidably mounted on said body, means connecting said slip to said sleeve for sliding movement therewith, means on said body for normally latching said sleeve against upward movement and releasable therefrom by rotative movement of said body with respect to said sleeve, means on said sleeve for frictionally engaging the wall of a casing to resist rotative and sliding movement of said sleeve with respect to such casing, a pin slidably mounted within said opening, and a spring urging said pin outwardly said pin being normally confined by said sleeve and releasable by the same rotative movement necessary to release said sleeve from said latching means, whereby said pin may be projected against a casing wall to catch between pipe ends at a coupling and locate the coupling with respect to the whipstock.

4. In a whipstock, a body having an opening therein, a catch movable in said opening, means constantly urging said catch outwardly with respect to said body, means on said body adapted to normally extend over said opening to confine said catch and movable to release the same so that said catch may be projected against a casing wall and catch at a coupling between the casing pipe ends when the whipstock is moved longitudinally of the casing to locate such coupling with respect to the whipstock.

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