Nov. 4, 1941. G. L. KOTHNY 2,261,393

TOOL REMOVING DEVICE

Filed May 9, 1940 2 Sheets-Sheet 1

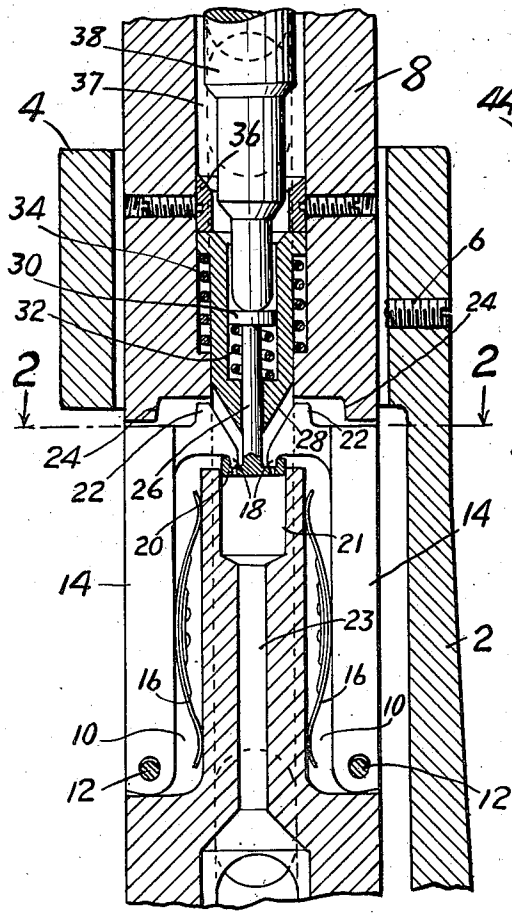


FIG. 1.

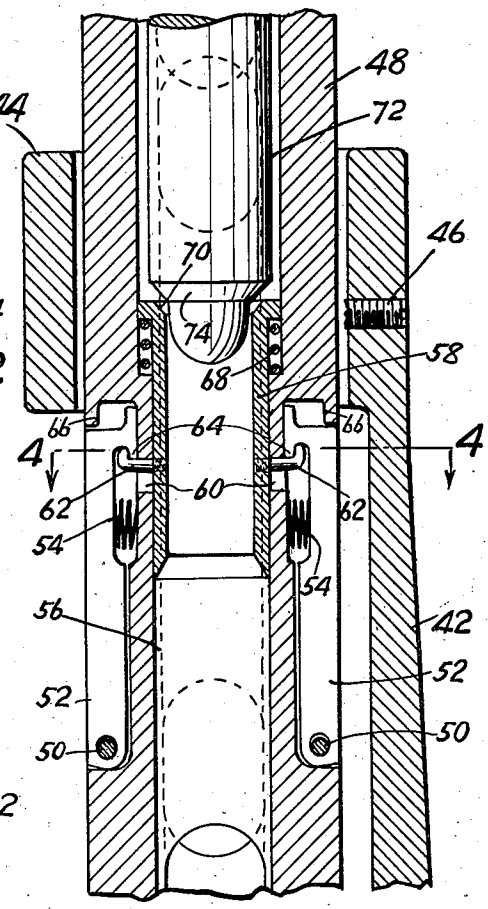


FIG. 3.

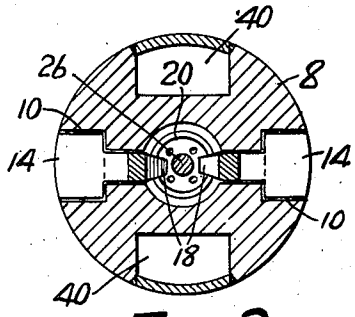


FIG. 2.

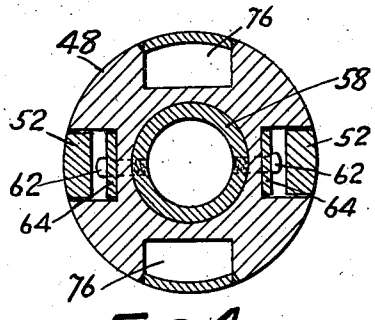


FIG. 4.

INVENTOR

Gottdank L. Kothny

BY

Busse & Harding ATTORNEYS.

WITNESS:

Robt. W. Mitchell

Nov. 4, 1941. G. L. KOTHNY 2,261,393

TOOL REMOVING DEVICE

Filed May 9, 1940 2 Sheets-Sheet 2

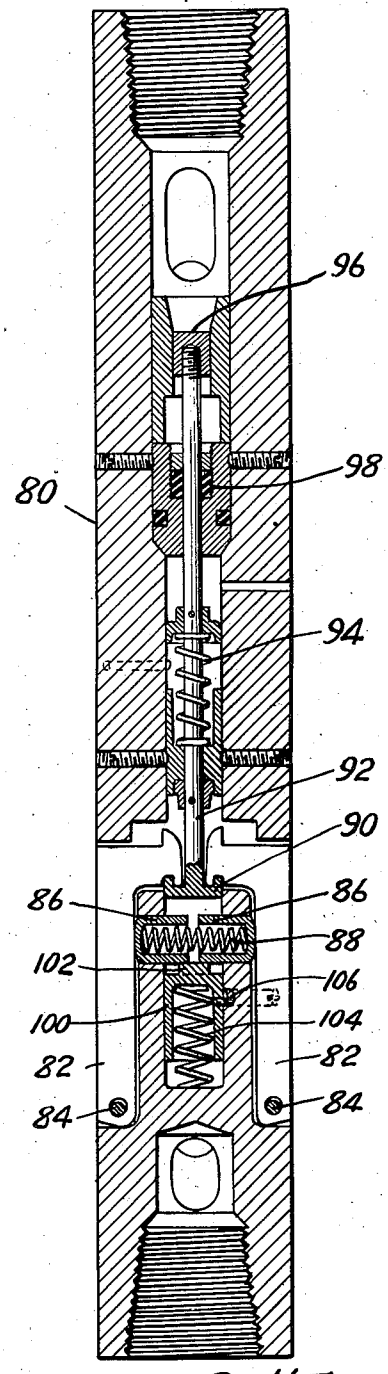


FIG. 5.

INVENTOR

Gottdank L. Kothny

BY

Bussin & Harding

ATTORNEYS.

WITNESS:

Robt. R. Mitchell

Patented Nov. 4, 1941

2,261,393

UNITED STATES PATENT OFFICE

2,261,393

TOOL REMOVING DEVICE

Gottdank L. Kothny, Strafford, Pa., assignor to Sperry-Sun Well Surveying Company, Philadelphia, Pa., a corporation of Delaware

Application May 9, 1940, Serial No. 334,120

6 Claims. (Cl. 294—95)

This invention relates to a device for removing whipstocks or other tools from bore holes, and more particularly to a device adapted to be included within a drill string above a bit for effecting such result.

In my prior Patent No. 2,107,420, dated February 8, 1938, there is disclosed means whereby a whipstock may be removed from the bore hole with the drill string, but need not necessarily be removed with the drill string, so that the latter, if need arises, may be removed from the bore hole to replace a bit or for other purposes while the whipstock remains in its original position to serve for the guidance of another bit.

It is the object of the present invention to improve the apparatus of said patent to secure a more desirable type of operation and to insure longer life of the sub which contains the elements involved in the removal of the whipstock or other tool. In the arrangement of the prior patent, passages are present through which mud must pass or may pass during the drilling operation. Drilling mud is of a highly abrasive nature, and if it passes even for relatively short times through openings of limited cross-section, wear occurs with extreme rapidity. In the case of the device of the prior patent, for example, there are clearances in the vicinity of the movable members through which the mud may circulate with abrasive action. The abrasion may be such as to weaken the structure to such extent after repeated use that failure may occur, with the possible lodging of apparatus within the bore hole necessitating fishing. Thus the safe life of the apparatus of the patent may be relatively short.

In accordance with the present invention, the parts may be so arranged that only slight clearances are afforded through which no appreciable flow can take place to cause damage.

The above and other objects of the invention, relating particularly to details will be apparent from the following description, read in conjunction with the accompanying drawings, in which:

Figure 1 is a fragmentary axial section taken through the improved sub and its associated parts;

Figure 2 is a section taken on the plane indicated at 2—2 in Figure 1;

Figure 3 is a fragmentary axial section taken through a modified form of sub and its associated parts;

Figure 4 is a section taken on the plane indicated at 4—4 in Figure 3; and

Figure 5 is a fragmentary axial section taken through another modified form of sub.

Referring first to the modification of Figures 1 and 2, there is illustrated at 2 a whipstock which may be taken as typical of the type of tool to be removed through employment of the invention. At its upper end this whipstock is provided with a collar 4 of usual construction. A pin 6, shown as having been sheared off, originally secured the whipstock to the lower portion of the drill stem in the vicinity of the bit. The bit used in this arrangement will, in general, be of a size sufficiently small to enable it to pass freely through the collar 4 of the whipstock so that, if desired, after the whipstock is set the drill stem may be removed without removing the whipstock until desired.

The invention embodies a sub indicated at 8 forming a part of the drill stem above the bit. This sub may be either close to the bit or quite substantially spaced therefrom, as will be evident from my prior patent referred to above. As illustrated, the parts are shown in the position they would occupy immediately prior to actuation of the elements in the sub to engage the collar 4 of the whipstock, a go-devil illustrated at 38 being shown just prior to completion of its downward movement in which it will effect tripping of engaging elements in the sub.

The sub 8 is provided with a pair of openings 10 in the lower portions of which are located pins 12 serving to maintain within the openings levers 14, which are urged outwardly by strong leaf springs indicated at 16. The pins pass through openings in the levers of substantially larger size than the pins so that when the levers engage a whipstock to lift it the forces do not act on the pins but rather the levers rest on the bottoms of the openings, being shaped as shown so that a broad area of contact results, giving rise to great strength of the construction. Thus the pins provide loose pivoting means for the levers in the sub.

The levers 14 are provided at their upper ends with hooks 18 engageable in an annular groove in a detent member 20, which takes the form of an annular disc slidable within a chamber 21. When the levers 14 are released to be forced outwardly under the action of springs 16, their outward movement is limited by engagement of ears 22 with shoulders 24 provided in the sub.

The member 20 is provided with a stem 26 which extends through a bore in a member 28 provided with a conical lower end adapted to serve as a wedge. The upper portion of the

bore of the member 28 is enlarged to receive a head 30 on the stem 26 and a spiral spring 32 normally urging the stem 26 upwardly relative to member 28. The member 28 is provided with a flange slidable in the enlarged bore of the sub 8 and urged upwardly by a spring 34 therein. This upward movement is limited by means of a collar 36 secured in the bore and arranged so as to maintain the spring 34 under substantial compression.

Mud is by-passed about the elements just described within the sub by the provision of passages indicated at 40, which communicate at their upper and lower ends with central passages in the sub communicating with the usual bores of the sections of the drill stem above and below the sub. The bore 37 within which the parts above described are located communicates with the upper portions of the passages 40, while a smaller equalizing passage 23 communicates with their lower portions and with the cylinder 21 in which the member 20 slides. By reason of this arrangement and since the passages 40 are of considerable size, relatively little difference in pressure will exist between the bore 37 and the bore 23. Thus mud pressure is normally ineffective to produce tripping of the engaging levers 14.

With the exception that the go-devil 38 is not present, the parts during a drilling operation are located in the positions illustrated in Figure 1. When removal of the whipstock or other tool is to occur, the elements 14 are brought below the member they are to engage, for example, the collar 4, and a go-devil 38 may then be dropped through the drill stem to pass through the collar 36 and into the opening of member 28, therein to engage the head 30 of the stem 26. The weight of the go-devil is sufficient to compress the spring 32 to such extent as to move the member 20 downwardly to release the hooks 18 of the levers 14 so that they will be pressed outwardly by the springs 16. If this occurs, it will be evident that a lifting movement imparted to the drill string will cause the levers 14 to engage collar 4 and thereby lift the whipstock.

It may be found, however, that, on lifting the weight indicator may show that engagement has not occurred because, for some reason, the levers 14 may have failed to move outwardly. While this would generally be impossible, since very strong springs may be provided at 16, a positive pressure may be applied to these levers by forcing mud under the highest available pressure through the drill string. The go-devil 38 is preferably of such length as to block off the entrances to the passages 40 to a substantial extent, so that increase of the mud flow will create a high pressure upon the go-devil. The go-devil will then seat upon the member 28 and force this member downwardly. Its conical lower surface will then act as a wedge to force outwardly the upper ends of the levers 14. Thus a positive engagement may be insured.

It will be noted that if, for example, the members 14 fail to move outwardly under the initial action of the go-devil, but then happen to move outwardly after some lifting had occurred, so that they were above the collar 4, their position is such that, upon subsequent downward movement of the drill stem, they will be cammed inwardly by the collar 4, being again free to snap outwardly as soon as their upper ends clear this collar. Accordingly, it is possible to engage and remove the whipstock despite the indicated accident without removing the entire string from the hole to reset the removing sub.

It will be evident that with the parts constructed as indicated, no substantial amount of mud can leak by the member 28 and stem 26. Accordingly, wear through passages of small size will not occur.

The modification of Figures 3 and 4 is somewhat similar in its tripping operation and avoidance of flow of mud through small passages, without, however, involving the possibility of positively forcing outwardly engaging levers. In this second modification, the whipstock is illustrated at 42 and is provided with a collar 44 and shear pin 46, as in the case of the preceding modification. The sub 48 is provided with side slots across which are located the mounting pins 50 for the levers 52, which correspond to the levers 14 of the preceding modification. In this case, strong spiral springs 54 urge the levers outwardly. In the central bore 56 of the sub, there is arranged to slide a sleeve 58 having close sliding engagement with the walls of the bore. Through side slots 60 there extend from this sleeve hooks 62 engageable with the hooks 64 formed on the levers 52. As in the preceding modification, stop shoulders 66 limit outward movement of the levers 52 after release by hooks 62.

The sleeve 58 is maintained in its upper position by means of a spring 68 reacting between the lower portion of an enlarged section of the bore and a flange provided on the upper end of the sleeve.

In the case of this modification, it will be evident that during the drilling operation the mud may pass directly through the bore 56 and inside the sleeve 58 without possibility of substantial leakage through the slots 60 and past the levers 52. Thus wear by the mud is substantially avoided. By-pass passages 76 are also provided communicating at their upper and lower ends with the upper and lower portions of the bore 56 above and below the sleeve 58.

When it is desired to effect tripping of the levers 52, a go-devil 72 may be dropped through the drill stem so that a seat portion 74 thereon engages a seat 70, with the result that the weight of the go-devil will force the sleeve downwardly, thus releasing the members for upward movement under the springs 54. In the event that sticking prevents such downward movement of the sleeve, mud pressure may be applied, so that the go-devil closing off the bore of the sleeve 58 will form with it a piston positively forced downwardly under the pressure. To secure this result, the go-devil 72 is arranged to restrict substantially the communication between the upper portion of the bore 56 and the by-pass passages 76. While in this modification the levers 52 are not positively moved outwardly by mud pressure, the necessity for such action is very rare and, in fact, only on rare occasions would there be any failure of action under the weight of the go-devil.

In the modification of Figure 5, a similar tripping arrangement is again provided, but in this case provision is also made for locking the engaging members in their outer positions. In this modification, a sub 80 is provided with levers 82 which, like the levers 14 and 52, are maintained in suitable slots by pins 84, which loosely pass through openings in the lever. A pair of hollow plungers 86 engage the levers and, under the action of a compression spring 88, tend to move the levers outwardly. This outward movement is prevented by a latching member 90 carried by a

spindle 92, normally urged upwardly, but adapted to be moved downwardly by a go-devil engaging a member 96 on the upper end of the spindle. To prevent flow of mud through the region of the moving parts, a packing arrangement for the spindle 92 is provided at 98.

Sliding in a bore below the plungers 86 is a member 100 having a reduced upper end 102 and urged upwardly by a spring 104.

In the operation of this apparatus, downward movement of the plunger 92 under the action of a go-devil releases the latch 90 from the hooks of levers 82, so that they may be forced outwardly by expansion of spring 88. As soon as the plungers 86 move outwardly, the member 100 moves up, bringing its reduced end 102 between the plungers 86 so that they cannot return, and hence the levers 82 are maintained in their outer position despite any accidental camming action of the whipstock or any other part they may engage which might result in their dropping the whipstock.

To reset the apparatus, the member 100 must be withdrawn, and to this end it is provided with one or more openings in which there may be engaged an eccentric pin carried by a cylindrical tool 106 which may be inserted through a side opening in the sub. By rotation of 106 and the action of the eccentric pin, the member 100 may be moved downwardly against the action of spring 104 to release the plungers 86 so that they may be moved inwardly.

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

1. Means for effecting removal of a tool such as a whipstock or the like from a bore hole comprising a body arranged to be included in a drill string above the bit, means carried by said body and yieldingly urged outwardly to engage and lift a tool with the drill stem, and means restraining the last named means from outward movement, said restraining means being yieldingly held in restraining position and movable therefrom by action of a go-devil.

2. Means for effecting removal of a tool such as a whipstock or the like from a bore hole comprising a body arranged to be included in a drill string above the bit, means carried by said body and yieldingly urged outwardly to engage and lift a tool with the drill stem, and means restraining the last named means from outward movement, said restraining means being yieldingly held in restraining position and movable therefrom by action of liquid pressure.

3. Means for effecting removal of a tool such as a whipstock or the like from a bore hole comprising a body arranged to be included in a drill string above the bit, and a plurality of opposed levers pivoted to said body and spring urged outwardly to engage and lift a tool with the drill stem.

4. Means for effecting removal of a tool such as a whipstock or the like from a bore hole comprising a body arranged to be included in a drill string above the bit, and a plurality of opposed levers pivoted to said body at their lower ends and spring urged outwardly to engage and lift a tool with the drill stem.

5. Means for effecting removal of a tool such as a whipstock or the like from a bore hole comprising a body arranged to be included in a drill string above the bit, a plurality of opposed levers pivoted to said body and spring urged outwardly to engage and lift a tool with the drill stem, and means for positively retaining said levers in such outer position.

6. Means for effecting removal of a tool such as a whipstock or the like from a bore hole comprising a body arranged to be included in a drill string above the bit, means carried by said body and yieldingly urged outwardly to engage and lift a tool with the drill string, means restraining the last named means from outward movement, and means for positively maintaining the last named means in its outer position.

GOTTDANK L. KOTHNY.