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KEY SEAT ENLARGER

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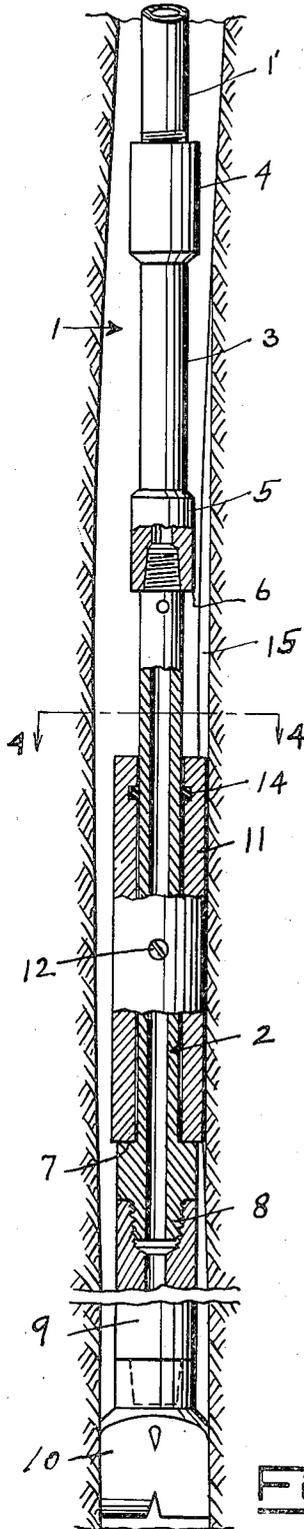


Fig. 1.

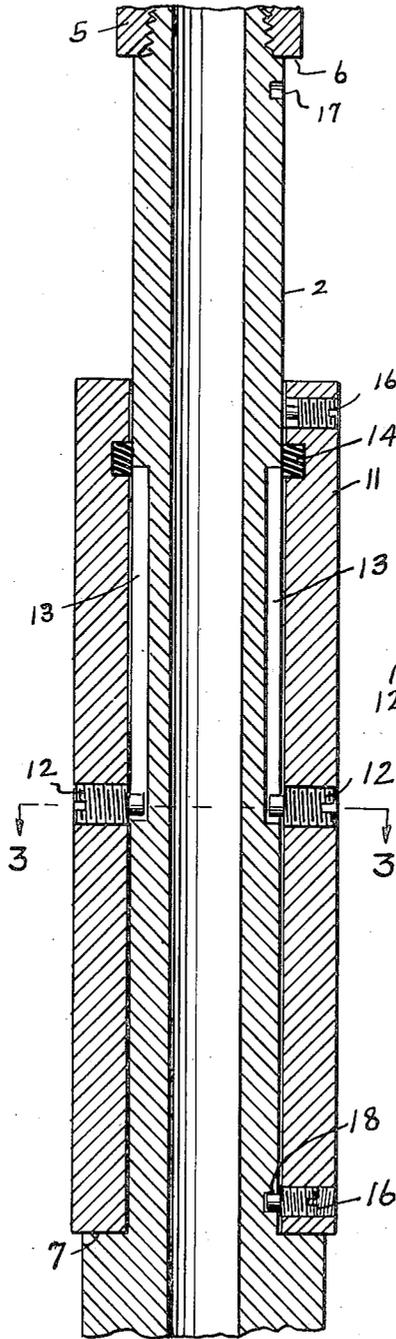


Fig. 2.

334

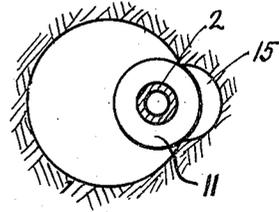


Fig. 4.

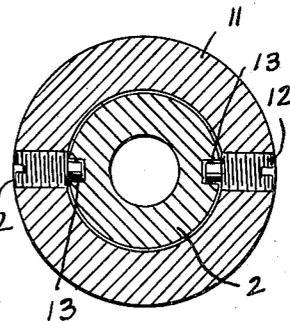


Fig. 3.

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KEY SEAT ENLARGER

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3 Claims. (Cl. 255-5)

1

This invention relates to a key seat enlarger for drilling strings.

In drilling wells, particularly deep wells, by the rotary drilling process wherein the drill is driven by a drill stem extending to the ground surface the drill stem, particularly in bores that are not straight, often wears a groove in the side wall of the bore of less diameter than the diameter of the drill collar and when it is attempted to pull the drill stem and drill from the bore, as must often be done, the drill stem will follow said key seat, or wall groove, and the drill collar will become stuck therein so that it is very difficult, and sometimes impossible, to withdraw the drill from the bore.

It is an object of the present invention to provide means for enlarging, or "wiping" said groove, or key seat, so that the drill collar and drill will readily pass upwardly therethrough when it is attempted to withdraw the drill.

It is another object of the invention to provide a device of the character described including the combination with the drill stem of an impact member which is slidably mounted thereon and which is rotatable therewith together with impact faces spaced apart and on opposite sides of said impact member provided for the purpose of jarring the impact member loose, by the reciprocation of the stem, should it become stuck in said groove, or key seat.

By repetition of this operation the key seat, or groove, will be gradually enlarged so that the drill collar and drill will readily pass there-through.

It is another object of the invention to provide a device of the character described adapted, in case the impact member should become stuck in said groove, or key seat, to release the drill stem for rotation independent of the impact member to the end that the drill stem and drill may be manipulated to release the impact member.

With the above and other objects in view the invention has particular relation to certain novel features of construction, operation and arrangement of parts, an example of which is given in this specification and illustrated in the accompanying drawings, wherein:

Figure 1 is a side view of a drill stem and drill located in a well bore showing the impact member thereon, all partly in section.

Figure 2 is an enlarged, fragmentary, longitudinal, sectional view of the stem and impact member.

Figure 3 is a cross-sectional view taken on the line 3-3 of Figure 2; and

2

Figure 4 is a cross-sectional view taken on the line 4-4 of Figure 1.

Referring now more particularly to the drawings, wherein like numerals of reference designate the same parts in each of the figures, the numeral 1' designates a conventional tubular drill pipe, the numeral 1 designates a stem having a special, reduced, tubular section 2 which is connected with the stem above by the tubular section 3 whose upper end is formed with an enlarged coupling member 4 and whose lower end is formed with an enlarged coupling 5 whose lower end forms an annular downwardly facing impact face 6.

The lower end of the section 2 is outwardly enlarged forming an upwardly facing, annular, impact face 7 and said enlarged lower end is formed with a tapering, externally threaded pin 8 adapted to be screwed into the upper end of the drill collar 9 to the lower end of which the drill 10 is connected.

The diameter of the enlarged lower end of the section 2 is substantially the same as the diameter of the drill collar which is somewhat greater than the diameter of the drill stem proper.

Mounted on the section 2 of the drill stem there is a tubular, relatively heavy impact member 11 and threaded radially through the walls of said impact member are the keys 12, 12 whose inner ends are blank and project into the external elongated, longitudinal key ways 13, 13 in the section 2.

There is an inside seal ring 14 countersunk into the upper end of the impact member 11 and forming a seal with the drill stem section 2 above said key ways.

In drilling the well should the bore become crooked, or curved, the drill stem will bear against the inside of the curve and form a groove 15 in the side wall of the bore, commonly known as a key seat and this key seat may be formed in the wall of the bore some distance above the drill collar or the impact member 11.

During drilling operations it may be found desirable to key the impact member against movement relative to the drill stem and this may be done by means of a shearable pin 16 which may be screwed through the wall of the impact member with its inner end projecting into the upper socket 17 or the lower socket 18 of the drill stem section 2. When the impact member is pinned either in upper, or lower position and becomes stuck in the key seat, or groove, 15 the pin 16, if projecting into the upper socket member 17, may be sheared by an upward pull, or thrust, on the

3

drill stem; and if the pin 16 projects into the socket 13, to pin the impact member at its lower position it may be sheared by downward thrust on the drill stem and the impact member thus released for independent longitudinal movement relative to the drill stem.

It is to be noted that the impact member 11 is larger in transverse diameter than the drill collar and that it is located just above the drill collar so that in lowering the drill stem into the well bore or in elevating the same the impact member will tend to wear away and enlarge the key seat, or groove, 15 thus providing for the free passage of the drill collar when it is desired to withdraw the drill stem from the bore. This wearing away or enlarging of the groove 15 will be accomplished because the impact member is of a larger transverse diameter than the drill collar and consequently its ends form, in effect, shoulders extending out beyond the drill collar which will be effective to enlarge the key seat, or groove, 15 as the impact member passes there-through.

Since the impact member is of larger diameter than the drill collar it will become stuck rather than the drill collar when it is impossible to pull it through the key seat 15. It can be readily seen that the upper end of the impact member forms a shoulder, when the member is in its lowermost position, and this shoulder engages the shoulder at the base of the key seat formation in bore. When the sleeve and stem are pulled upwardly the key seat shoulder is wiped away, and the impact member shoulder then engages the sides of the key seat at its jointure with the bore and wipes those sides away as it moves upwardly. It is during this wiping operation that the impact member will become bound or stuck in the key seat. However it will then be possible to free the impact member by a reciprocating movement of the drill stem to allow movement of the impact face 6 or 7 into contact with the opposing ends of the impact member to jar the same loose and this operation may be repeated until the key seat, or groove, 15 is worn away, or enlarged, until the drill collar and drill may be readily moved therethrough.

It is to be noted that the keys 12 projecting into the key ways 13 will normally prevent rotation of the impact member 11 relative to the drill stem; however, should the impact member become tightly stuck and should it become desirable to rotate the drill stem independent of the impact member the inner ends of the keys 12 may also be sheared to permit such rotation. Thereupon the drill stem may be both rotated and reciprocated up and down simultaneously to effect release of the impact member from the groove.

The drawings and description are illustrative

4

merely while the broad principle of the invention will be defined by the appended claims.

What I claim is:

1. In combination with a drill string having a drill pipe and a drill collar, a tool for engaging and enlarging key seat formations in well bores comprising, a stem intermediate the drill pipe and the drill collar, an upwardly disposed impact face on the lower end of the stem, a downwardly disposed impact face on said stem opposed to and spaced from the lower impact face, a sleeve-like impact member slidably mounted on the stem between the impact faces, said impact member being of a length substantially less than the distance between the impact faces and of a greater diameter than that of said faces, and said stem being slidable through said sleeve-like member to bring the impact faces into alternate contact with the sleeve-like member upon reciprocation of the stem.

2. In combination with a drill string having a drill pipe and a drill collar, a tool for engaging and enlarging key-seats formed in well bores by the rotating string comprising, an elongated stem intermediate the drill pipe and the drill collar, an enlarged portion on the lower end of the stem, an upwardly disposed impact face on said enlarged portion, an enlarged portion at the upper end of the stem, a downwardly disposed impact face on the upper enlarged portion, a sleeve-like impact member slidably mounted on said stem intermediate the impact faces, said impact member being of a length substantially less than the distance between the impact members, the diameter of said impact member being larger than that of the drill collar, said impact member diameter being constant throughout, and said stem being slidable in said sleeve-like impact member to bring said impact faces alternately into contact with said impact member upon reciprocation of said stem.

3. A structure as defined in claim 2 wherein said impact member is keyed longitudinally on said stem.

JOSEPH J. BURRIS.

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