June 24, 1930. J. F. BOZEMAN ET AL 1,766,326

DRILL STEM

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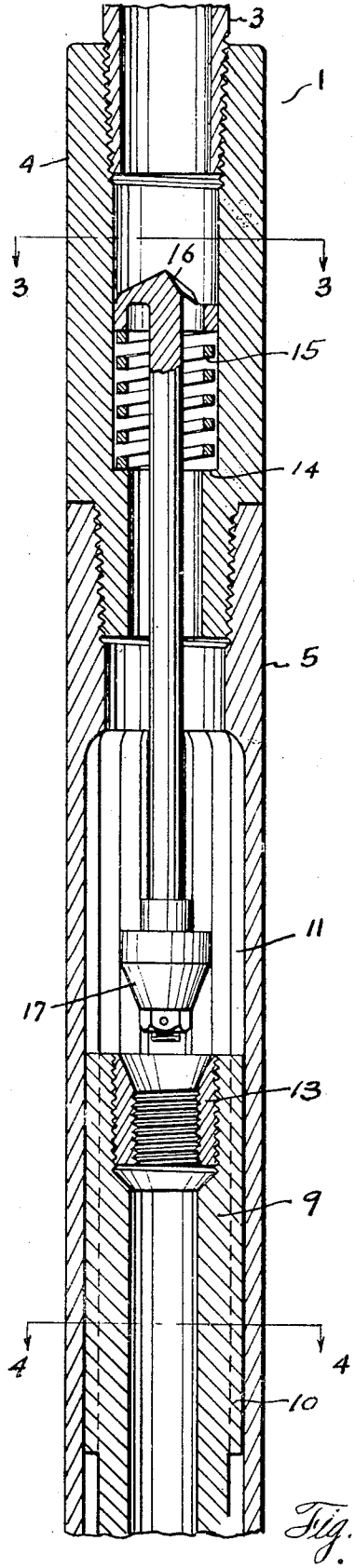


Fig. 1.

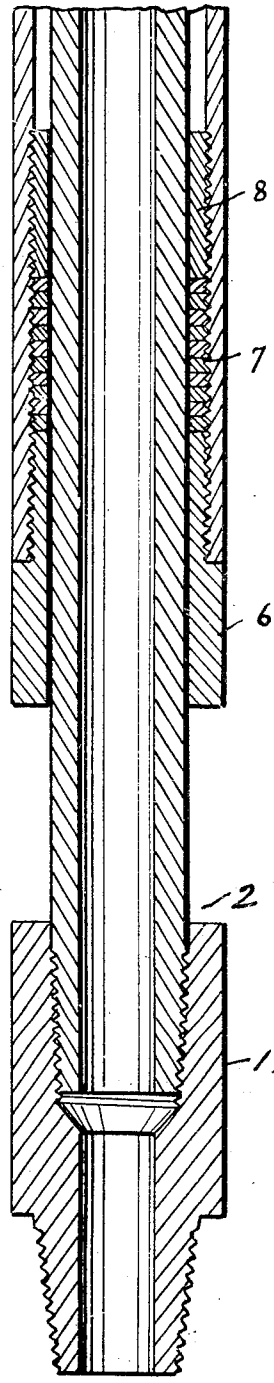


Fig. 2.

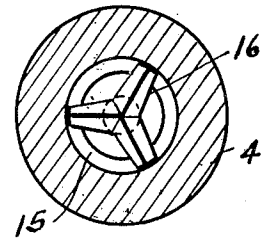


Fig. 3.

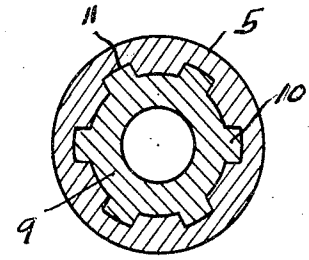


Fig. 4

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DRILL STEM

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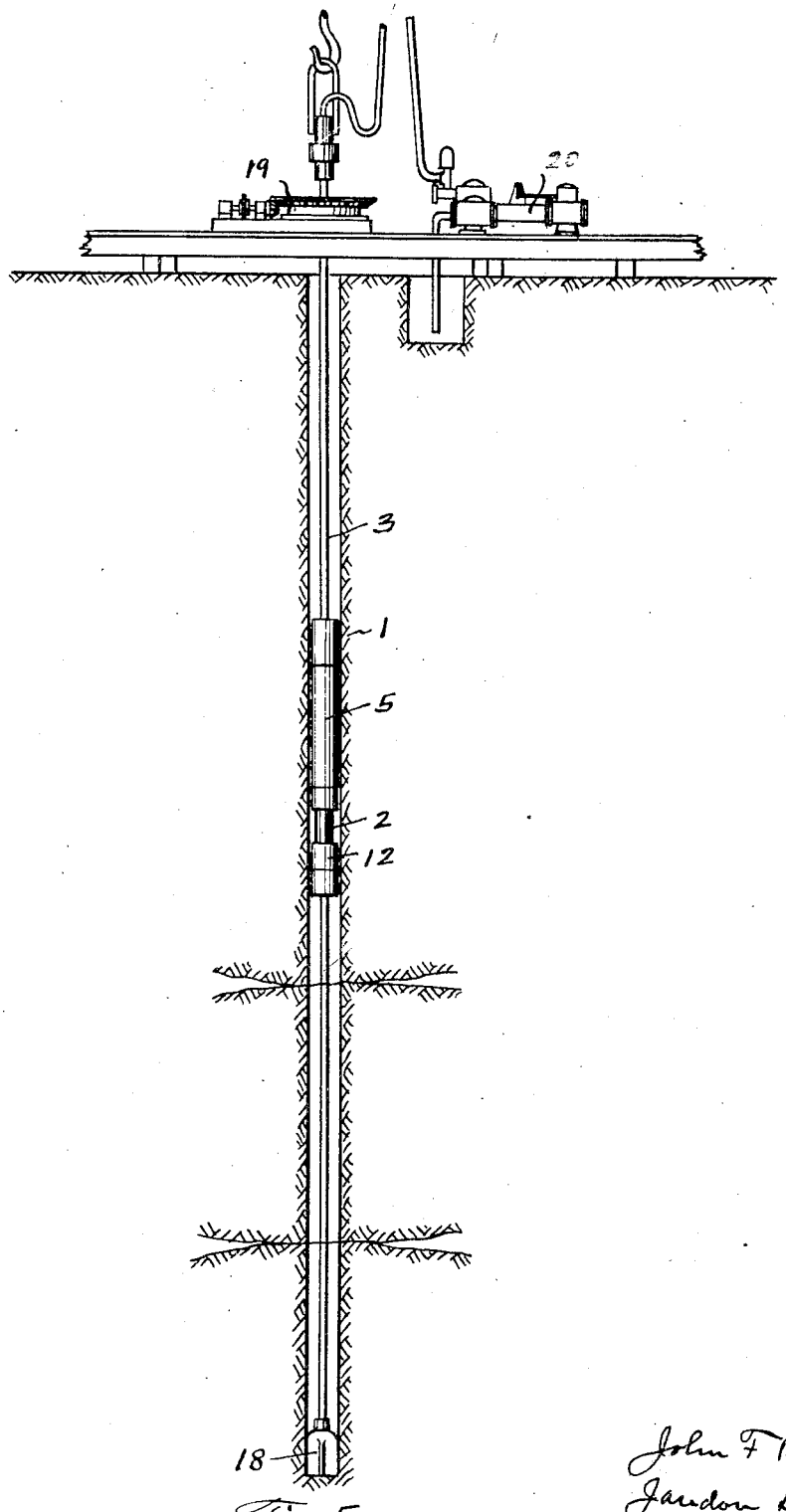


Fig. 5.

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UNITED STATES PATENT OFFICE

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DRILL STEM

Application filed April 7, 1928. Serial No. 268,192.

This invention relates to new and useful improvements in a drill stem.

One object of the invention is to provide an improved type of drill stem through which the drill bit may be rotated, with only a portion of the weight of the entire stem on the bit, at the bottom of the bore.

Another object of the invention is to provide a drill stem, formed of two sections, the weight of the lower one of which is normally carried by the bit, in drilling, said stem being equipped with a novel type of valve whereby the flow of fluid downwardly through the stem, from the pump, is stopped when the upper section of the stem is lowered, and before its weight is imposed on the section beneath.

This retarding of the flow of fluid will react on the pump and thereby the operator will be notified of the relative positions of the two sections, before the upper section is lowered sufficiently to impose its weight on the section beneath, and the bit. The bit will thus never be subjected to the entire weight of the stem, and liability of crushing the bit or twisting off the stem thus is avoided.

A further feature of the invention is to provide a sectional drill stem so constructed that the upper section may be used as a jar or hammer against the lower section to dislodge said lower section in case it becomes stuck in the bore.

With the above and other objects in view this 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:—

Figures 1 and 2 show vertical sectional views of the upper and lower parts, or sections, respectively, of the drill stem.

Figure 3 shows a cross sectional view taken on the line 3—3 of Figure 1.

Figure 4 shows a cross sectional view, taken on the line 4—4 of Figure 2, and,

Figure 5 shows a side elevation of a complete stem, as in operation in a well bore.

Referring now more particularly to the drawings, wherein like numerals of reference designate similar parts in each of the Figures, the numerals 1 and 2 designate the respective upper and lower sections, as a whole, of the drill stem. These sections have a limited lengthwise movement relative to each other, for a purpose and in a manner to be hereinafter stated.

The upper section of the stem embodies the string of pipe, as 3, having the separable coupling 4 connected to the lower end thereof, and whose lower end is reduced and threaded into the upper end of the tubular joint 5. The lower end of this joint has a tubular gland 6, threaded therein whose upper end supports the packing 7, and said packing is held in place by the ring nut 8 which abuts the upper end thereof, thereby forming a stuffing box through which the upper end of the lower section 2, of the stem telescopes. This section 2 comprises a string of pipe to the lower end of which the drill bit 18 is attached.

The upper, or telescoping end of the lower section 2 has an enlarged head which is clutched for rotation with the upper section 1 by means of the vertical ribs 10, of the head 9, which fit into corresponding grooves 11, in the joint 5 and the relative movement of the sections is limited by the ring nut 8 and the coupling 12 of the lower section 2. The stem is of tubular construction throughout to permit the flow of flushing fluid downwardly through it to the drill bit. This fluid is forced down through the stem by means of a pump 20 at the ground surface. The upper end of the head 9 has an upwardly flared valve seat 13 screwed therein, for a purpose to be hereinafter explained.

The coupling 4 has an internal annular shoulder 14, on which is seated a coil spring 15. There is a valve stem 16, whose upper end carries a spider 16 which rests on said spring and said stem depends through said spring and its lower end carries a downwardly tapering valve 17 normally spaced above and adapted to seat within and close said seat.

In drilling it is usually not advisable to permit the entire weight of the stem to rest on the bit, at the bottom of the bore, as in such case the bit may be crushed, or may require

too severe torsion on the stem, to drive it, causing the stem to twist off.

The stem is consequently usually suspended from the rotary, 19, with only the weight of the lower section 2 on the bit.

In drilling, the stem is gradually let down as the work progresses but it is not desirable, in lowering the stem, to permit the upper section of the stem to be lowered far enough to rest its weight on the lower section. As the upper section 1 moves downwardly relative to the lower section the valve 17 will approach the seat 13, and when the said seat is partially restricted, by said valve, the pressure above the valve will build up thus causing the valve to overcome the resistance of the spring 15 and suddenly seat and close the passageway through the seat 13, before the weight of the upper section of the stem has been assumed by the lower section. This will block the flow of the fluid down through the stem and stall the pump and thus indicate, to the driller that the upper section should not be lowered further. The upper section then should be slightly elevated to lift the valve clear of said seat so as to again permit circulation and drilling may then proceed.

In case the lower section of the stem becomes stuck in the bore, the upper section may then be dropped, successively, against the coupling 12 until the stuck stem is jarred loose.

What we claim is:—

1. A drill stem comprising two sections connected by a slip joint and having a fluid course therethrough, a seat in one section, a yieldably mounted means carried by the other section adapted to be actuated by fluid pressure to close said seat and block said fluid course when said sections are relatively moved in one direction and to unblock the same when relatively moved in the other direction.

2. A drill stem including two telescoping sections having a limited lengthwise movement relative to each other, means for interlocking said sections against relative rotation, a projection carried by one section and disposed to form an abutment for the other section, said stem having a fluid course therethrough, and a yieldably mounted valve attached to one section and arranged to be actuated by the fluid flowing through said course and adapted to block said fluid course when said sections are relatively moved, in one direction, and operable by said section to which said valve is attached to unblock the same when said sections are relatively moved in the other direction.

3. In combination: a string of rotary drill pipe comprising an upper and a lower section; means for supporting said upper section; a device secured at the lower end of said lower section, said device supporting the weight of said lower section; means for attaching said upper and lower sections together, said means being so arranged that said upper and lower sections will rotate together and may have relative axial movement; valve means suspended from the upper section and operable by fluid pressure for obstructing a flow of fluid through said string of drill pipe when said upper section is lowered and a yieldable support, sustaining said valve means.

4. In combination: a string of rotary drill pipe comprising an upper and a lower section; means adapted to support said upper section; a cutting tool secured to the lower end of said lower section and adapted to support said lower section; means for slidably connecting said upper and lower sections together; means for creating a flow of fluid through said drill pipe; an inside shoulder in the upper section, valve means for obstructing said flow when said upper section is supported by said cutting tool and a coil spring supported on said shoulder and supporting said valve means.

In testimony whereof we have signed our names to this specification.

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JAUDON D. COLE.