June 1, 1926. 1,587,266

J. A. ZUBLIN

MEANS FOR FORMING A WELL BORE

Filed Nov. 14, 1922

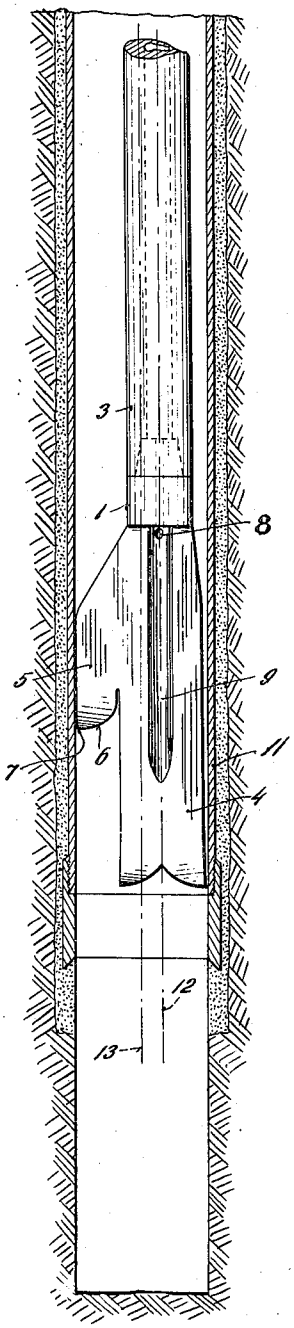


Fig. 1.

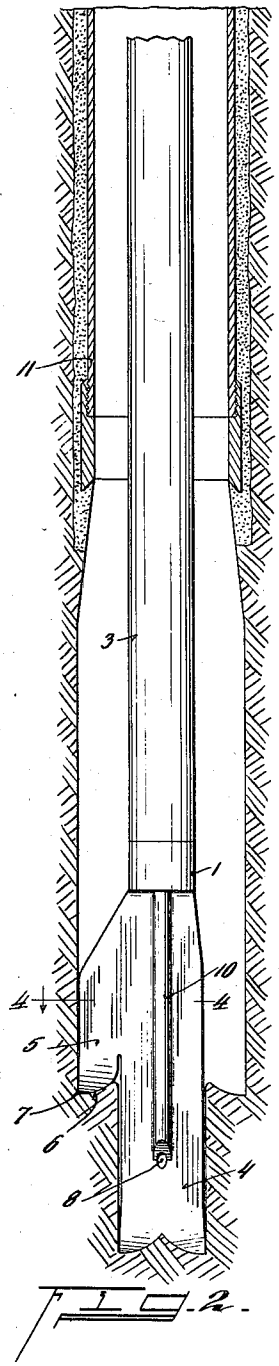


Fig. 2.

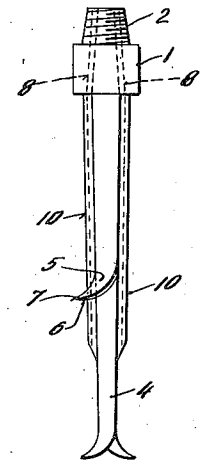


Fig. 3.

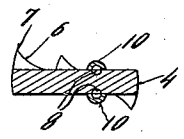


Fig. 4.

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Patented June 1, 1926. 1,587,266

UNITED STATES PATENT OFFICE.

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MEANS FOR FORMING A WELL BORE.

Application filed November 14, 1922. Serial No. 600,840.

This invention relates to a means for forming a well bore, and has for an object to provide means which is particularly adapted to the rotary system of well drilling and by which it is possible to produce a bore having an increased diameter throughout a selected zone, without increasing the diameter of the bore above said zone.

Another object is to provide a drill for forming, by rotary means, a bore extending beyond the lower end of a well casing and having a diameter greater than the internal diameter of the casing.

Another object is to provide a rotary non-collapsible underreaming drill.

A further object is to provide a rotary underreaming drill having no moving parts and which is eccentrically disposed on the drill stem, whereby the drill may be lowered into the well bore with its axial center out of registry with the axis of the bore, the drill functioning upon rotation to automatically center itself and the drill stem in the bore and subsequently form an enlarged continuation of the bore.

Various other objects and advantages will be more fully apparent from the following description of the accompanying drawings which form a part of this disclosure, and which illustrate preferred forms of embodiment of the invenion.

Of the drawings:

Figure 1 is a vertical section through the lower portion of a well bore showing a cemented casing and illustrating the method of lowering or raising the non-collapsible underreaming drill through the bore.

Figure 2 is a similar section showing another form of the drill in position for forming an underreamed bore.

Figure 3 is an elevation of the drill looking at its left hand edge as viewed in Figures 1 and 2.

Figure 4 is a plan section of the drill on line 4—4 of Figure 2.

In Figures 1 to 4 there is illustrated a one piece drill of more or less general fish-tail type and in this instance comprises a shank 1 having a screw-threaded tapered pin 2 adapting the drill for attachment to a tubular drill stem or collar 3 and terminating with a diametrical pilot blade or fish-tail blade 4 of fish-tail formation axially aligned with the shank. Projecting laterally from one edge of the fish-tail blade in alignment therewith is an offset underreaming blade 5 extending beyond the pilot blade, whereby the blade 5 has a permanently maintained underreaming radius greater than the boring radius of the pilot blade.

The cutting edges of the pilot blade are turned in opposite directions in the usual manner to produce a more or less shearing cut, and the blade 5 has its lower end dressed to a cutting edge 6 extending backwardly and inwardly from a lead point 7 which extends in the direction of rotation.

The shank 1 has fluid passages 8 and as shown in Figure 1 these passages may discharge at the upper portion of the drill, with the sides of the drill provided with depressions or flutes 9 directing the fluid downwardly towards the cutting end of the pilot blade, or as shown in Figures 2 to 4 may continue downwardly past the underreaming blade 5. It will also be evident that, if thought necessary or desirable, the fluid passage on one side of the drill may be extended past the underreaming blade as shown in Figure 2 and the fluid passage on the other side of the blade may terminate at the upper portion of the drill as shown in Figure 1.

One manner in which the extended fluid passages, shown in Figures 2 to 4, may be formed is to form a groove in the face of the drill and then weld over the groove, a longitudinal half section of pipe 10.

The upper ends of the fluid passages 8 communicate with the interior of the hollow drill stem through which the circulating fluid is forced during drilling.

In Figures 1 and 2, the well casing 11 is shown cemented in the well bore and the bore has been extended a short distance beyond the lower end of the casing in the usual manner.

In the herein proposed method of forming an underreamed bore beyond the lower end of the casing, the drill having been attached to the lower end of the string of drill tubing, is lowered through the casing with its axis, which is indicated by the broken line 12, to one side of or out of registry with the axis 13 of the casing.

In this manner it is possible to lower through the casing a non-collapsible underreaming drill having an offset reaming blade which is permanently maintained at an underreaming radius greater than the boring radius of the pilot blade.

By subsequently rotating the drill there

will be created a natural tendency for the drill to automatically center itself in axial alignment with the axis of the casing and to automatically effect an enlargement of the bore.

When so centered the pilot blade 4 will bore a pilot hole in advance of the underreaming blade 5, the blade 5 functioning to ream said pilot bore to a diameter larger than that of the casing (see Figure 2). One particular advantage of the pilot blade resides in the fact that it serves to positively guide the drill, in the same manner as a bearing at the end of a shaft, and thereby prevents side thrusts to which the reaming blade may be subjected, from causing a transverse deflection of the drill. As shown clearly in Fig. 3 and in Fig. 4 the underreaming blade 5 is formed integrally with the pilot blade or fish-tail blade 4 and extends laterally therefrom in the same plane and in alignment therewith. It is very desirable to have the underreaming blade 5 in the same plane as the fish-tail blade 4 because of the economy of production, the blades 4 and 5 being easy to form and requiring but a minimum of material. Another reason is that the pilot blade and the fish-tail blade both cut in the same radial plane. Therefore, the force against the pilot blade is opposed and counteracted by the force of cutting of the fish-tail blade. If the pilot blade were placed in a different plane from the fish-tail blade 4, the force of cutting would tend to drive the whole bit laterally, since there would be no direct opposition to the cutting force, and the result would probably be the drilling of a crooked hole.

I claim:

In a one-piece bit of the class described, the combination of: a shank having means whereby said bit may be secured to a drill column; a diametrical fish-tail blade integral with and depending from said shank, the lower end of said fish-tail blade being prepared for cutting; and an offset underreaming blade formed integrally with said fish-tail blade and extending laterally from one edge of said fish-tail blade and in alignment therewith so as to cut in the same diametrical plane as said fish-tail blade.

Signed at Los Angeles, California this 6th day of November 1922.

JOHN A. ZUBLIN.