

Aug. 10, 1926.

1,595,922

O. C. PRINDLE

RIGHT ANGLE DRILL

Filed Sept. 9, 1925

2 Sheets-Sheet 1

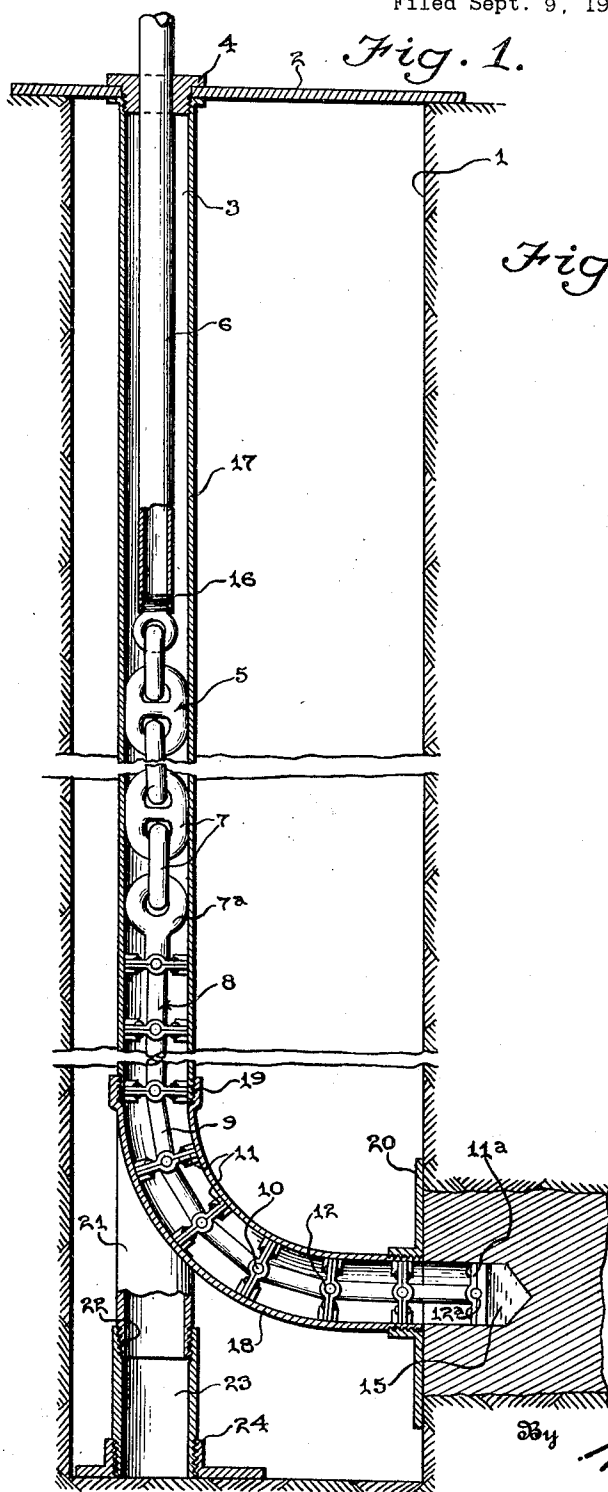
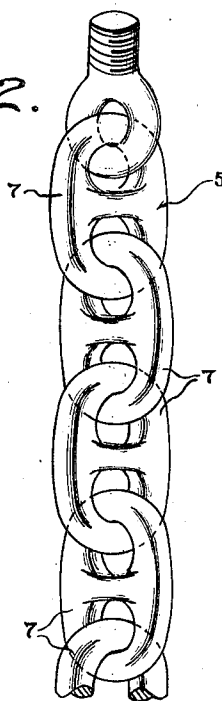


Fig. 2.



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Fig. 3.

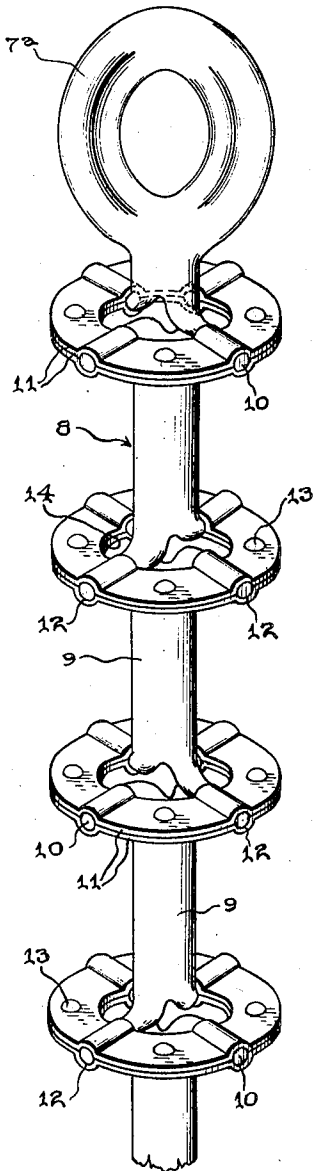


Fig. 4.

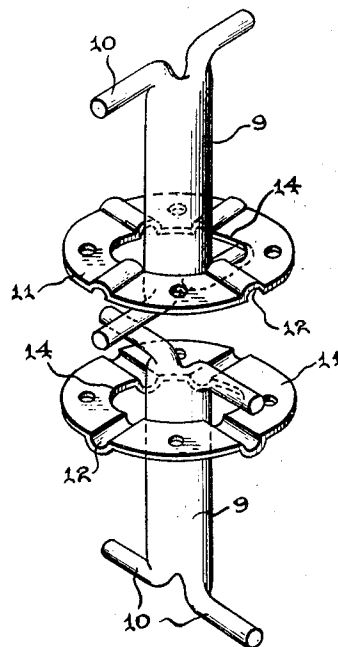
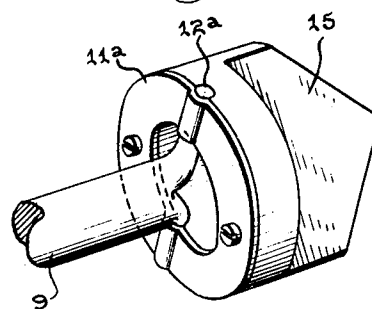


Fig. 5.



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UNITED STATES PATENT OFFICE.

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RIGHT-ANGLE DRILL.

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It is a purpose of the present invention to provide a right angle drill, the construction and arrangement of which being such that after drilling a substantial distance for oil, for instance anywhere from one to three thousand feet into the earth, in various localities, a stratum of oil sand is reached at such depth and at this depth it is the purpose to use the present type of right angle drill for drilling through this stratum for oil. In many wells this stratum is reached at about sixteen hundred feet and in drilling it is the aim to drill a short distance below the oil sand stratum for the purpose to be hereinafter explained.

After drilling the perpendicular portion of the well to the oil sand stratum, it is the purpose to lower the herein disclosed structure of drill, the aim being to drill the oil sand stratum at right angles to the perpendicular portion of the well, and to accomplish this result, the invention consists in a perpendicular guide tubing terminating at its lower end adjacent the oil sand stratum with an elbow having an abutment plate bearing against the wall of the perpendicular part of the well and a projection from the elbow in axial alignment with the vertical well tubing to provide a substantial support for the tubing, as pressure is exerted upon the drill.

Another purpose is to mount the drill in the guide tubing, the drill consisting of a flexible shaft which will withstand the pressure exerted upon it, all the while guiding it through the elbow in order to force the bit through the oil sand stratum.

Still another purpose is to provide a drill which, after operating beyond the elbow into the oil sand stratum, will act to maintain its own direction of travel substantially in axial alignment with the horizontal portion of the drill.

A further purpose is to construct the elbow of hardened metal, such as steel, the elbow being relatively heavy and capable of withstanding considerable wear, as there is substantial pressure on the drill during its action as the flexible shaft of the drill will at all times be frictionally bearing upon the outer wall of the elbow.

A still further purpose is the provision of a drill having a drive tubing connected to the upper part of the flexible shaft of the drill and to which substantial power may be applied for imparting revoluble

movement to the drive tubing to force the drill's flexible shaft through the guide tubing and through the oil sand stratum. Such substantial power is necessary to overcome the friction resulting from the flexible shaft working against the curved wall of the elbow of the guide tubing.

It is also the aim to provide a flexible shaft which will maintain its shape and will not bind throughout its length, especially where it operates through the elbow and yet enable the shaft to rotate relatively easy.

It is to be understood that the particulars herein given are in no way limitative and that, while still keeping within the scope of the invention, any desired modifications of detail and desired proportions may be made in the apparatus according to the circumstances.

The invention comprises further features and combinations of parts to be hereinafter set forth, shown in the drawings and claimed.

In the drawings:—

Figure 1 is a view in section of a portion of an oil well, showing the improved drill operatively mounted therein.

Figure 2 is an enlarged detail view in perspective of one portion of the flexible shaft which constitutes the drill proper.

Figure 3 is a view in perspective of another portion of the flexible shaft, especially that portion which operates through the elbow.

Figure 4 is an enlarged detail view of two of the joining sections of the shaft, showing the sections separated for the purpose of illustrating how they operatively connect.

Figure 5 is an enlarged detail view of the drill bit.

Referring to the drawings, 1 designates an oil well which may be any diameter and any depth accordingly as may be found to reach the oil sand stratum, and 2 designates the deck or platform of an oil well drilling rig.

An oil well tubing 3 is supported on the deck or platform, as shown at 4, and said tubing constitutes a guide for the drill proper 5. The drill proper consists of a shafting of flexible type comprising a tubular driving section 6, a flexible chain section 7 and the drill bit carrying section 8. The construction and arrangement of this latter

section are such as to avoid undue binding and are capable of rotating evenly and in a manner to avoid as much friction as possible on the wall of the guide tubing. The chain section of the flexible shaft is in the form of a plurality of links so jointed as to withstand the driving pressure and will not unduly bind or twist.

The bit carrying section of the flexible shaft consists of cylindrical links 9 with lateral cylindrical prongs 10 at its opposite ends. These links are connected by circular plates 11. In connecting the links, one link is disposed so that its lateral prongs are at right angles to adjacent links and the circular plates have a plurality of radial bearing seats 12 which are semicylindrical in cross section for the purpose of receiving the lateral prongs when the plates are secured together by rivets or the like, as shown at 13. The plates have relatively large central openings 14 which receive the bodies of the links 9, the openings being of sufficient diameter to permit the bodies of the links to freely move, especially when the flexible shaft is in the act of passing through the curved portion of the guide tubing of the drill.

A drill bit 15 of conventional type is fastened to the terminal link of the flexible shaft section 8 by a single circular plate 11^a, the lateral prongs of the link engaging in bearing seats 12^a of said plate and the drill bit. The drive tubing is connected to one of the links of the chain section 7 of the flexible shaft by means of threads 16 while one of the links 7^a of the section 7 of the flexible shaft has lateral prongs to be held by a pair of circular plates similar to those previously mentioned.

The guide tubing 3 consists of the perpendicular section 17 and the elbow section 18, the two sections being threadingly connected, as shown at 19. The elbow section has on its terminal an abutment plate 20 which bears against the wall of the well adjacent where the oil sand stratum is located, and by means of this abutment plate, the guide tubing 3 is capable of withstanding pressure that may be exerted on it due to the flexible shaft passing through the elbow section.

In order to further withstand the pressure that may be exerted upon the elbow section, an extension 21 is carried by the elbow section and is threadingly connected, as at 22, to a tubing 23, the lower end of which threadingly carries a supporting abutment plate 24. This supporting abutment plate rests

upon the bottom of the oil well and through the medium of the tubing 23 and the extension 21 withstands the pressure that is exerted upon the guide tubing as the drill operates therethrough.

The flexible shaft, which really constitutes the drill itself, readily guides through the tubing 3 and conforms to the curvature of the elbow section of the guide tubing all the while that it is operating therethrough and due to the bit carrying section being constructed as herein disclosed, the drill bit takes a substantially straight course through the oil sand stratum.

The invention having been set forth, what is claimed is:—

1. A right angle drill comprising a flexible shaft consisting of a flexible chain section, a flexible bit carrying section, and a drive tubing section connecting to the chain section, a bit operatively connected to the bit carrying section, a guide tubing for the flexible shaft provided with a curved terminal at its lower end, whereby the bit carrying section may conform therewith as the bit enters the oil sand stratum, said bit carrying section comprising a plurality of links with lateral prongs, the prongs of one link being alternately at right angles to the prongs of adjacent links, and circular plates in which the bodies of the links have freedom of movement and provided with bearing seats for flexibly uniting the prongs.

2. A drill of the kind indicated comprising a guide tubing provided at its lower end with a curved terminal, and a flexible bit carrying section disposed in the curved terminal and provided with guide tubing housed means for driving the same, the bit carrying section comprising connected links having disk elements in peripheral bearing contact with the interior surface of the guide tubing.

3. A drill of the kind indicated comprising a guide tubing provided at its lower end with a curved terminal, a flexible bit carrying section housed in the closed terminal and provided with operating means, said bit carrying section consisting of a plurality of links provided with lateral prongs of which those on adjacent ends of connecting links are disposed at right angles, and circular plates engaging the prongs and coupling the links and having peripheral bearing contact with the guide tubing.

In testimony whereof he affixes his signature.

ORVILLE C. PRINDLE.