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C. E. BRINTON

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WELL DRILLING TOOL

Filed March 31, 1926

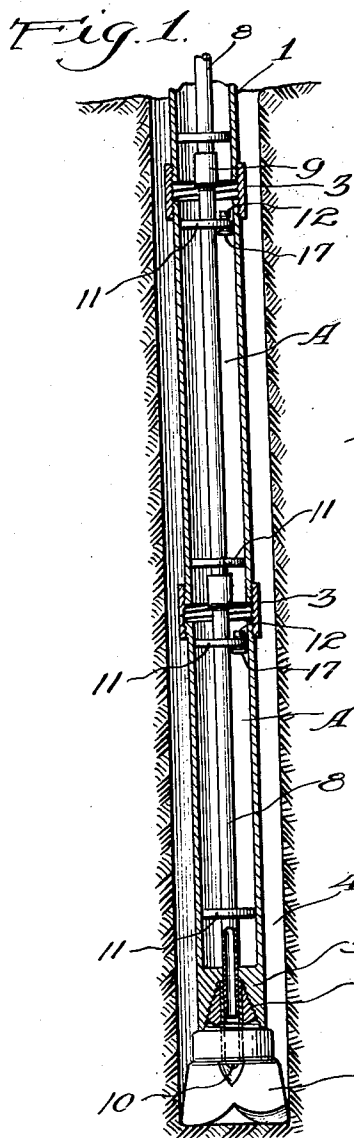


Fig. 2.

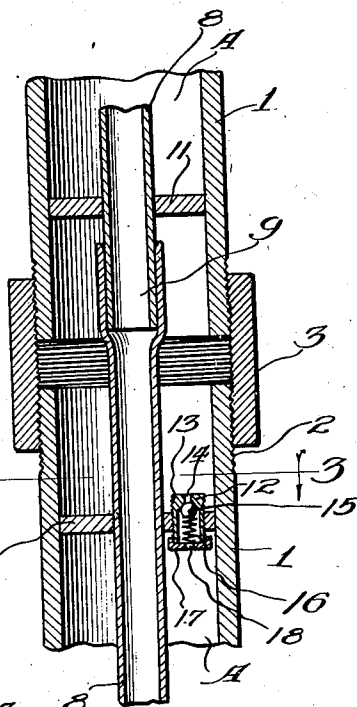


Fig. 4.

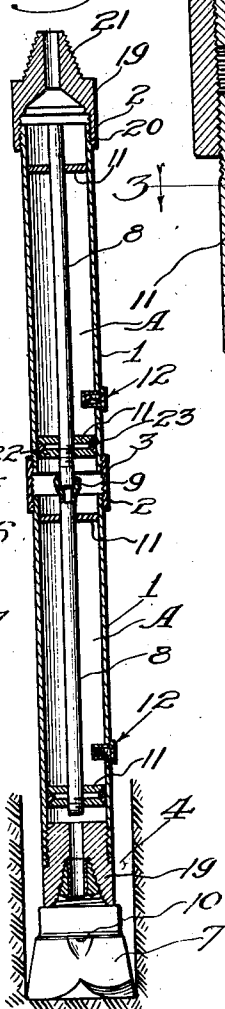
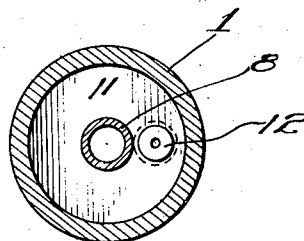


Fig. 3.



Witness:
Stephen J. Pebara

Inventor:
Charles E. Brinton
by *Frank L. Belknap*
Att'y:

UNITED STATES PATENT OFFICE

CHARLES E. BRINTON, OF LOS ANGELES, CALIFORNIA

WELL-DRILLING TOOL

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This invention relates to improvements in well drilling tool, and refers more particularly to a novel construction of well drilling tool, comprising an inner conduit and an outer casing therefor, in combination with sealing elements having sealing contact with the inner wall of the outer casing and outer wall of the inner conduit to provide buoyant chambers.

In the drilling of oil wells, for instance, the drilled hole is kept constantly filled with fluid mud. In some instances, this mud is quite thin, and in other instances, where for instance, the formation is loose or inclined to cave, the mud is maintained in a very thick condition. This practice is well known and is usual in oil well drilling. This mud, together with such water as is needed in the hole, is pumped down through the pipe forming the tool string or casing, and is ejected through the bit at the bottom of the tool string. The hole in the bit through which such mud and water is ejected, ranges from a quarter to say, an inch in diameter, whereas the hollow pipe forming the tool string or casing is many times the diameter of the hole in the bit, for instance, from 6 to 12 inches. It will thus be seen that the mud and water is forced downwardly through a 6 to 12 inch pipe, and is ejected from the bit through an outlet which is very small relative to the casing. The volume of mud or water contained in the casing has been found not only unnecessary, but it represents an ever-increasing weight as the well is deepened, probably averaging about 5 tons increase for each 1,000 feet.

One of the main objects of the present invention is to reduce the volume of mud and water used, thus materially reducing the increase in weight due to the large volume of mud and water now maintained. Another important object of the invention includes the reduction in weight of the tool strings or casing used in drilling operations. By the present invention, it will be possible to facilitate the drilling of deeper holes than is now possible and also materially reduce the difficulty and expense of drilling shallow wells.

The two above objects, and many others which will be hereinafter more specifically brought out are accomplished by the present invention in a novel manner. The buoyancy chambers heretofore described, may be filled with air or other gaseous medium and being sealed against accidental loss of air, will become so buoyant, that they will in effect neutralize the weight of the adjacent casing. The fundamental principle of air buoyancy is so thoroughly understood, that it is not deemed necessary to enter into an exhaustive discussion.

In the drawings, Fig. 1 is a vertical cross sectional view of an oil well drilling tool embodying the present invention.

Fig. 2 is an enlarged cross sectional view showing a connection between two lengths of the tool string or casing.

Fig. 3 is a cross sectional view taken on line 3-3 of Fig. 2.

Fig. 4 is a view similar to Fig. 1, of a slightly modified form of construction.

Referring more particularly to the drawings, 1 designates a length of steel tubing having a diameter between say 5 and 12 inches, which will hereinafter be referred to as the outer casing. The outer casing may be manufactured in standard 20 foot lengths and is provided at both ends with external screw-threads 2 adapted to register with the screw-threaded collar or joint 3, which connects two joints or lengths of casing 1. The lower end of the lowest casing in the hole 4 may be provided with a suitable reinforced portion 5 and internally screw-threaded as shown at 6 to register with the screw-threads on the pin end of a drilling bit 7.

I have illustrated and I shall describe the present invention as being applied to the rotary type of drilling tools. It is to be understood of course, that the invention is applicable to any type of drilling tool now in use.

Mounted within the outer casing 1 and preferably spaced from the walls thereof is an inner conduit 8, which is relatively smaller in diameter and cross sectional area than the outer casing 1. This inner conduit 8 may be

manufactured in standard 20 foot lengths having any suitable joining connection at 9. This inner conduit 8 of reduced cross sectional diameter is adapted to receive the mud and water, delivering same from the lowermost conduit 8 through the aperture 10 onto the face of the bit. It will be thus instantly obvious that there is maintained in the lengths of inner tubing 8 only a relatively small volume of mud and water, which, of course, materially reduces the weight of the inner string of tools normally imposed on the derrick. This is one of the important features of the present invention.

As another feature of the present invention, in each length of casing or in certain predetermined lengths, there are provided spaced disks or sealing elements 11, having sealing contact and surrounding the inner conduit 8 and having sealing contact with the inner wall of the outer casing 1. Thus, there is provided in certain or all of the lengths of casing 1 sealed buoyant chambers A. There may be any number of these chambers in each casing, and these chambers may be formed in any or all lengths of the casing. It is obvious that other sealing means than the disk 11 may be utilized.

For the purpose of introducing a buoyancy creating medium, such as air or other gaseous medium which is introduced under pressure to each chamber A, I provide an inlet designated as a whole 12, which comprises an externally screw-threaded valve 13, having a restricted inlet 14, which inlet is normally closed by the ball or other closure element 15 held against its seat by the coil spring 16 anchored in the removable cap 17, which cap is also apertured at 18. This arrangement allows the buoyancy-creating medium to be readily introduced to the chamber, but prevents any accidental escape of air or gas from the chamber A.

For the purpose of illustration, the pipe 8 may be from say 1 to 2 inches in diameter and the casing 1 may be from say 6 to 12 inches in diameter. This inner conduit 8 may be welded into fixed position by means of the sealing elements 11, if desired. The intake valves 12 may be positioned in one or both of the sealing disks 11. The cubic area of the buoyancy chambers A will depend, of course, upon the dimensions of pipe used, and the pressure maintained on the buoyancy creating medium therein may be regulated at will.

In assembling, as each length of casing is joined to the one below, air or gas may be introduced through the intake valve to the desired quantity. In operation, it will be found that the deeper the entire tool string is submerged, the greater this buoyancy will become.

Referring more particularly to the modification shown in Fig. 4, it will be noted that every other joint of the casing is provided

with what is known commercially as a tool joint 19, which is internally screw-threaded as shown at 20 on one end, and externally screw-threaded on the taper as shown at 21 on the other end. The tool joints 19 alternate with the collars 3. The lower half of the tool joint is shown at the lower portion of Fig. 4. It is to be noted also in the modification shown in Fig. 4 that the valve 12 is located in the wall of the casing 1 rather than in the disk. It may be found advisable in certain instances, to place the valve in the wall instead of placing it in the disk.

The sealing arrangement in Fig. 4 comprises the disk 11 welded to the wall of the casing and also to the small mud pipe 8 and adjustable disk 22, between which is adapted to be interposed a flexible gasket 23, the arrangement being such that I compensate for difference in expansion and contraction between the line 8 and the casing 1. The adjustable disk 22 may screw onto the lower end of each joint of pipe 8.

I claim as my invention:

1. A well drilling tool, including in combination outer and inner conduits, said inner conduit being spaced from the wall of the outer conduit, sealing elements surrounding the inner conduit and having sealed contact with the inner wall of the outer conduit longitudinally inwardly of its ends to form sealed buoyant chambers containing gas and means carried by some of the sealing elements for introducing a buoyancy creating gas to said chambers.

2. A well drilling tool, including in combination a closed inner conduit and an enlarged casing surrounding same, said conduit and casing each comprising intercoupled sections with the couplings for the same occurring at substantially the same points, sealing disks surrounding the end portions of each section of the closed inner conduit and having sealing contact with the inner wall of the outer casing to form air chambers, and means carried by the upper disk for each section of the conduit for introducing air to said chambers.

3. A well drilling tool, including in combination a closed inner conduit and an enlarged casing surrounding same throughout its length, sealing disks surrounding the closed inner conduit and having sealing contact with the inner wall of the outer casing longitudinally inwardly of its ends to form air chambers, and valves in said disks for introducing air to said chambers.

CHARLES E. BRINTON.