July 24, 1928. 1,678,201

J. P. SAMUELSON

ROTARY DRILL BIT

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Fig. 1

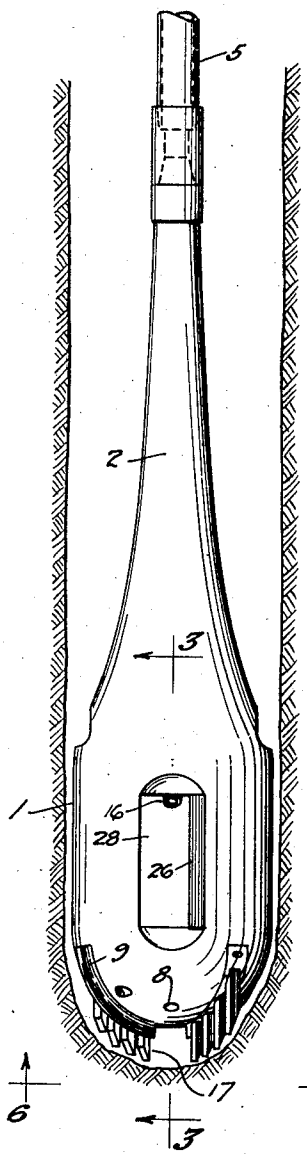


Fig. 2

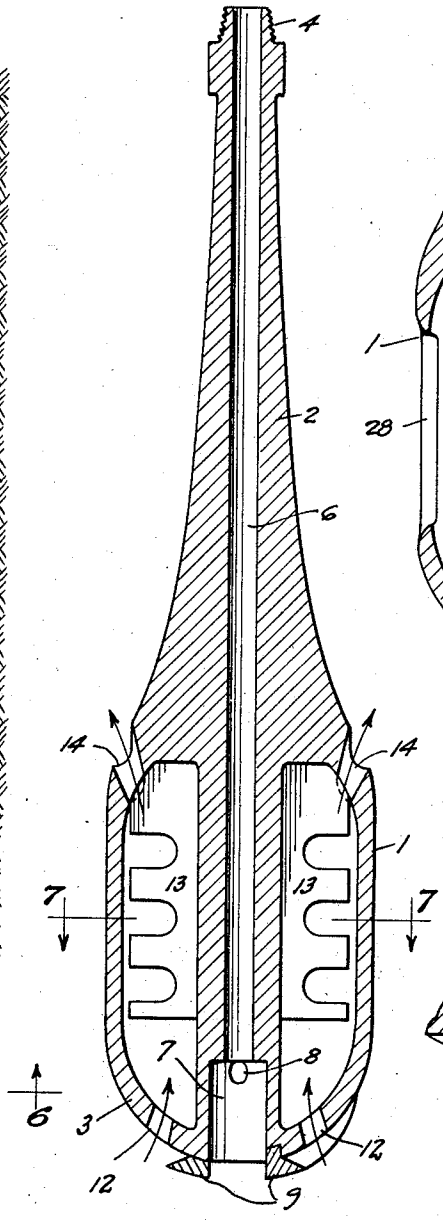


Fig. 3

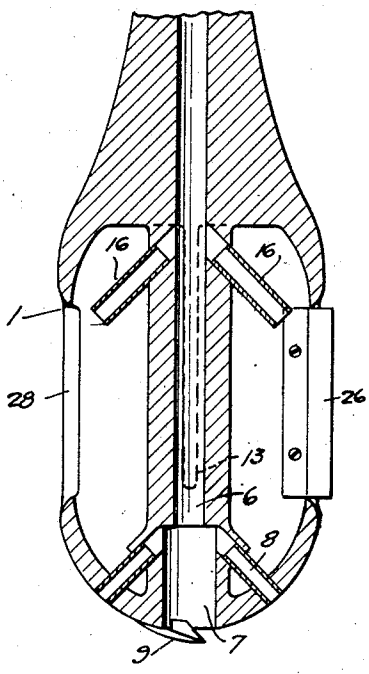


Fig. 4

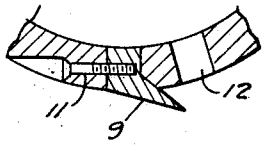
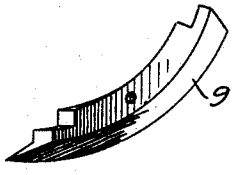


Fig. 5



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Fig. 6

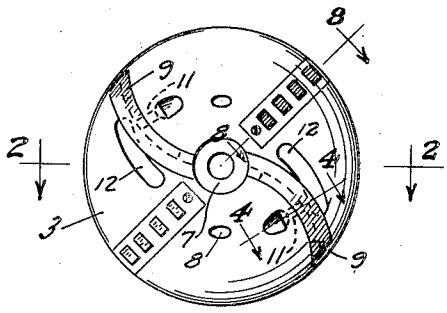


Fig. 7

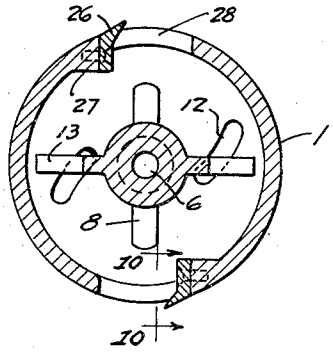


Fig. 8

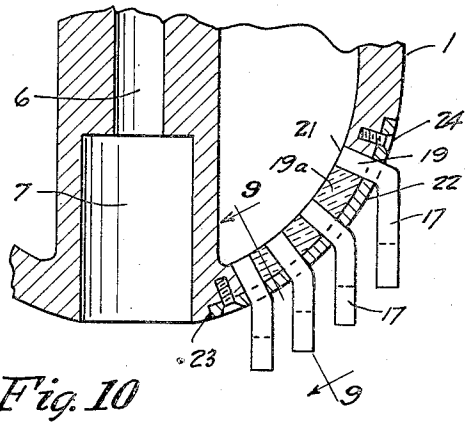


Fig. 9

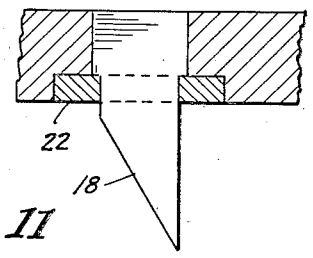
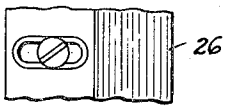


Fig. 11

Fig. 10



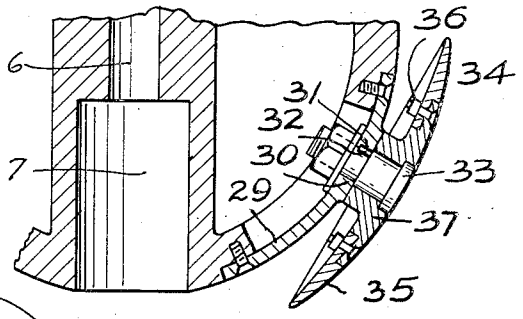


Fig. 12

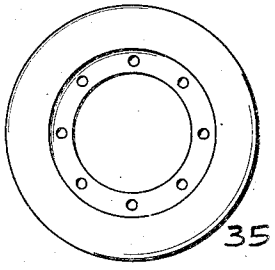
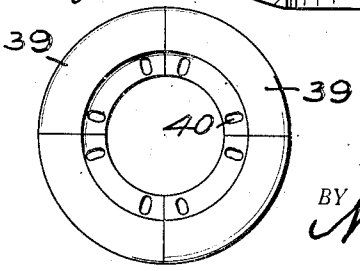


Fig. 13



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Patented July 24, 1928. 1,678,201

UNITED STATES PATENT OFFICE.

JOHN P. SAMUELSON, OF COMPTON, CALIFORNIA.

ROTARY DRILL BIT.

Application filed September 17, 1923. Serial No. 663,291.

The present invention relates to improvements in rotary drill bits for boring oil wells and the like, and its particular object is to provide a bit that will allow of the free circulation of water during the drilling action, providing a series of paths for the entering water, and a separate passage for the rising water carrying the mud. It is also proposed to provide a particular construction allowing bit blades to be secured to the best advantage and allowing at the same time reamer blades to be attached to the same units so that the bit drills and reams simultaneously. Further objects and advantages of my device will appear as the specification proceeds.

The preferred form of my invention is illustrated in the accompanying drawings in which Figure I shows a side view of my drill bit; Figure II a vertical section through the same; Figure III, a vertical section taken at right angles to that of Figure II, along line 3—3 of Figure I; Figure IV a section on the line 4—4 of Figure VI; Figure V a perspective view of one of the cutter blades; Figure VI a bottom plan view of my drill; Figure VII a horizontal section taken along line 7—7 of Figure II; Figure VIII, a detail view taken along line 8—8 of Figure VI; Figure IX, a sectional detail view taken along line 9—9 of Figure VIII, and Figure X, a detail section taken along the line 10—10 of Figure VIII.

Figure XI is a view similar to Figure VIII, showing a modified form of my invention;

Figure XII is a detail view showing in side elevation the plate shown in Figure XI;

Figure XIII is a view similar to Figure XII, showing a slightly modified form of plate.

While I have shown only the preferred form of my invention, it should be understood that various changes or modifications may be made within the scope of the claims hereto attached without departing from the spirit of the invention.

My drill bit consists of the shell (1) terminating at the top in the shank (2) and being rounded at the bottom as shown at (3). The shank (2) is threaded at the top as shown at (4) to receive a suitable tool (5) for transmitting rotary motion to the drill. The shank is formed with an axial core (6) which extends clear to the bottom of the shell and terminates in an enlarged recess (7) provided with lateral perforations (8) so as to allow water introduced into the core under pressure to be delivered at the bottom of the drill bit and at the rounded side of the same. This latter feature is particularly provided in case the main recess (7) becomes clogged so that such clogging does not fatally interfere with the free circulation of the water.

The rounded bottom portion of the shell has preferably two arcuate blades (9) secured thereto, which latter mutually constitute a screw formation and are disposed at an angle to radial lines. They may be fastened by means of screws (11). In front of each blade I provide a slot (12) through which the formation cut loose by the blades may be forced into the shell, together with the water delivered to the bottom of the well. This mixture of formation and water known as mud after entering the shell, is agitated by means of paddles or webs (13), extending outwardly from the shank (12) in radial direction or by any other suitable agitating means and is allowed to leave the shell through holes (14) in the top portion of the latter so that complete circulation is assured, the water descending through the core (6) to the bottom of the well mixed with the formation and rising in the form of mud through the slots (12) enters the shell and leaving the shell through the holes (14) to rise to the top of the well.

Within the shell two downwardly slanting pipes (16) communicate with the core and allow water to enter the shell directly for agitating and thinning the mud. At the bottom of the shell and opening onto the curved surface there are similar pipes (16ª).

Between the two blades (9) I provide means for scratching or tearing up the formation to be attacked by the blades to make it easier for the blades to perform their cutting action. This means consists in arcuate sets of teeth (17) extending from the rounded bottom portion of the shell and formed in the manner illustrated in Figures VIII and IX, from which it appears that each tooth is formed with a point (18) and with a head (19), the heads being separated by inserts (19ª), adapted to be received in a groove (21) in the shell and to be held in place by means of a plate (22) adapted to lie in a wider groove (23) and to be secured by means of screws (24), these teeth prefer-

ably extending slightly beyond the blades so as to loosen the formation before the blades reach the same.

The body portion of the shell is provided with lateral blades (26) for reaming purposes. The latter lie against an embossment (27) in the shell and have wide slots (28) in front of the same so that any formation scratched loose by the reamers enters the shell through said slots.

The operation of my drill will be readily understood from the foregoing description. The water enters through the core (6) and the enlarged recess (7) tends to prevent the lower end of the core from becoming clogged. If too much mud assembles in the lower end of the core, the perforations (8) allow the water to still reach the bottom of the well until the situation is relieved. When the drill is rotated, the teeth (17) scratch the surface to be attacked and the blades (9) following the teeth cut off a slice and feed the same mixed with water into the shell where the mud is agitated and finally forced rearwardly through the holes (14). At the same time the reamer blades (26) enlarge the hole and maintain the hole's diameter, while they also feed the formation scratched loose by them into the shell.

In Figures XI and XII, I show a slightly modified form of my invention in lieu of the plate (22), I substitute therefor a similar plate (29) having an opening (30) whose wall is formed with a key-way (31) for the key (32) of a stud bolt (33). On this bolt is a revolving disk cutter (34) having a detachable cutting element (35) as shown in Figure XII. This element is bolted at (36) to the central portion (37) of said disk. I have shown a cutting element (38) which is formed of identical segments (39), having elongated slots (40) to accommodate the bolts (36) and permit said segments to be adjusted radially, as understood. In this manner, I am able to substitute a cutter of one type for one of another type as required. This may be done with dispatch and should the segments (39) or said element (38) become worn or broken, same can be replaced by new parts at small cost.

I claim:

1. A rotary drill bit comprising a shell having cutting blades secured to the bottom thereof and a hollow shaft extending through the shell for admitting water to the bottom of a well to be drilled with perforations in front of the blades for allowing mud to enter into the shell and perforations in the top of the shell for allowing the mud to leave the shell.

2. A rotary drill bit comprising a shell having cutting blades secured to the bottom thereof and a hollow shaft extending through the shell for admitting water to the bottom of a well to be drilled with perforations in front of the blades for allowing mud to enter into the shell and perforations in the top of the shell for allowing the mud to leave the shell, the shell having means disposed on the inside thereof for agitating the mud while passing through the shell.

3. A rotary drill bit comprising a shell having cutting blades secured to the bottom thereof and an axially disposed hollow shaft extending through the shell for admitting water to the bottom of a well to be drilled, the shell being formed with a plurality of openings around the hollow shaft to allow mud to pass through the shell in an upward direction, and having webs fixed on the inside thereof for agitating the mud while passing through the shell.

4. A rotary drill bit comprising a shell having cutting blades secured to the bottom thereof and a hollow shaft extending through the shell for admitting water to the bottom of a well to be drilled, the pipe being formed with an enlarged recess in the bottom thereof and having auxiliary pipes secured in the wall of the recess for delivering the water at different places.

5. A rotary drill bit comprising a shell having cutting blades secured to the bottom thereof and a hollow shaft extending through the shell for admitting water to the bottom of a well to be drilled, the pipe being formed with an enlarged recess in the bottom thereof and having auxiliary pipes secured in the wall of the recess for delivering the water at different places, and the shell being formed to allow mud to pass therethrough in an upward direction.

6. A rotary drill bit comprising a shell having cutting blades secured to the bottom thereof and a hollow shaft extending through the shell for admitting water to the bottom of a well to be drilled, the pipe being formed with an enlarged recess in the bottom thereof and having auxiliary pipes secured in the wall of the recess for delivering water at different places, and the shell being formed to allow mud to pass therethrough in an upward direction, with agitating means inside of the shell for stirring the mud while in transit.

7. A rotary drill bit comprising a shell having cutting blades secured to the bottom thereof, a hollow shaft extending through the shell for admitting water to the bottom of a well to be drilled, with perforations in front of the blades for allowing mud to enter the shell, reaming blades extending laterally from the shell with perforations in front thereof for allowing mud to be forced into the shell and perforations in the top of the shell for allowing the mud to rise through the same.

8. A rotary drill bit comprising a shell having cutting blades secured to the bottom thereof, a hollow shaft extending through

the shell for admitting water to the bottom of a well to be drilled, with perforations in front of the blades for allowing mud to enter the shell, reaming blades extending laterally from the shell with perforations in front thereof for allowing mud to be forced into the shell and perforations in the top of the shell for allowing the mud to rise through the same, with pipes extending laterally from the shaft for feeding water into the inside of the shell.

9. A rotary drill bit comprising a shell having cutting blades secured to the bottom thereof, a hollow shaft extending through the shell for admitting water to the bottom of a well to be drilled, with perforations in front of the blades for allowing mud to enter the shell, reaming blades extending laterally from the shell with perforations in front thereof for allowing mud to be forced into the shell and perforations in the top of the shell for allowing the mud to rise through the same, with pipes extending laterally from the shaft for feeding water into the inside of the shell and agitating means in the shell for stirring the mud.

10. A rotary drill bit comprising a shell having cutting blades secured to the bottom thereof, means for admitting water to the bottom of the well to be drilled at the rear of the blades, means in advance of the blades for allowing mud to enter the shell, and means for allowing the mud to rise through the shell and be discharged from the shell.

JOHN P. SAMUELSON.