June 9, 1931. J. C. REESE 1,809,182

BIT HAVING TANGENTIAL BLADES

Filed Feb. 18, 1929

Fig. 1.

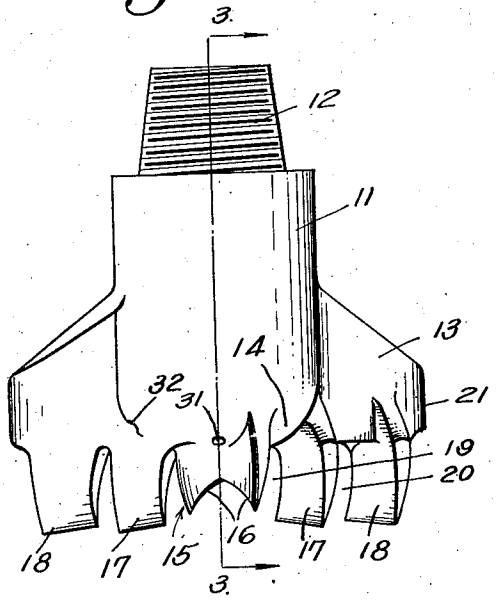


Fig. 3.

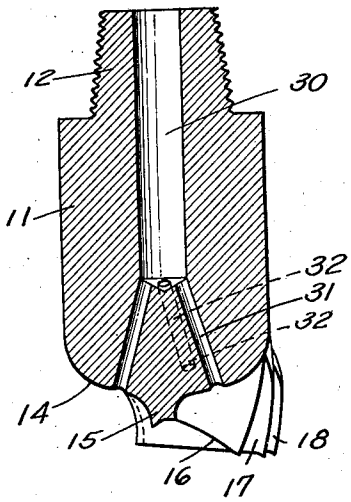
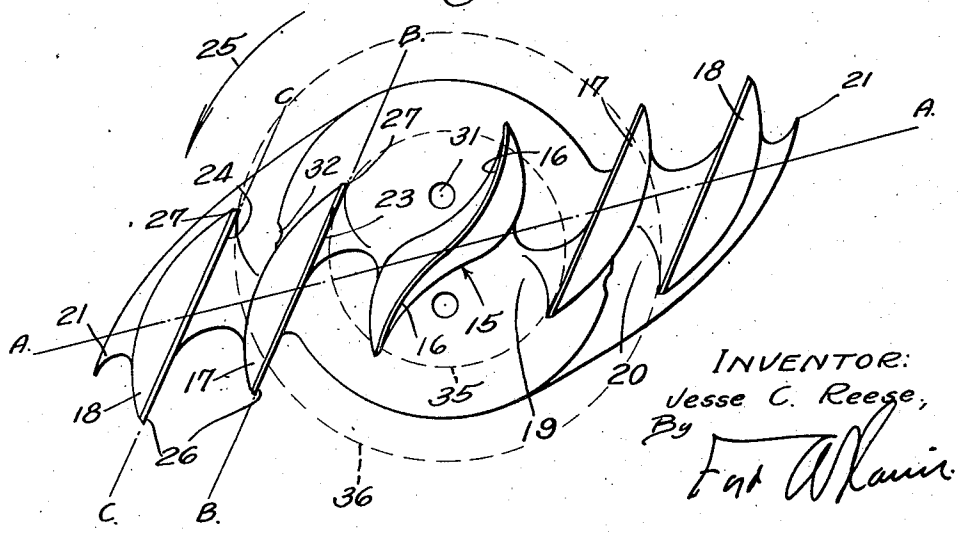


Fig. 2.



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UNITED STATES PATENT OFFICE

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BIT HAVING TANGENTIAL BLADES

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This invention relates to rotary bits which are used for drilling wells in the rotary system of drilling.

My invention consists of a bit in which one or more blades are eccentrically disposed on opposite sides of the axis of the bit. The blades are disposed so that there is a slicing cutting action and are further disposed so that the cuttings will not collect in front of the cutting edges. The preferred form of my invention presented herein combines various features which may be used separately, and I do not wish to be understood as limiting myself to a bit including every feature described.

According to present well-drilling practice, a bit is secured to the lower end of a drill pipe. This drill pipe extends through a rotary table of a rotary machine installed in a derrick of the well. A swivel head is attached to the upper end of the drill pipe which extends above the rotary table, and a traveling block is hooked thereto for supporting the drill pipe. A flexible hose extends from a stand-pipe of a high pressure pump to the swivel head for supplying rotary mud to the rotary bit, this rotary mud passing through the drill pipe.

The rotary table rotatably drives the drill pipe and the bit is revolved therewith. This bit being in engagement with the bottom of the hole, deepens the well. The rotary mud is supplied to the bit principally for carrying the cuttings to the top of the well. It also serves the purpose of preventing caveins and floating the drill pipe from engagement with the wall of the well so that friction is reduced to a minimum. From a close observation of the actions of the types of rotary bits in common use in the oil fields I have discerned that many of the difficulties encountered in drilling are a direct result of the theory on which these bits operate.

It is an object of this invention to provide a bit which overcomes many of the deficiencies of the ordinary fish-tail bit.

It is an object of the invention to provide a bit having a very long cutting edge over which the wear is distributed.

The ordinary fish-tail bit has blades located with their cutting edges in planes perpendicular to the direction of movement. The cutting edges therefore cut by a scraping action.

It is an object of my invention to provide a bit in which the cutting edges are disposed to have a shearing or slicing cutting action.

Another deficiency of the type of bit referred to is that the cuttings collect in front of the cutting edges. This prevents proper washing of the cutting edges and impedes the cutting action.

A further object of my invention is to provide a bit in which the cuttings will not collect in front of the cutting edges.

Other objects and advantages of the invention will be made to appear in the following description.

The invention is best illustrated by reference to the accompanying drawings, in which:

Fig. 1 is an elevational view.

Fig. 2 is a bottom plan view of Fig. 1.

Fig. 3 is a section taken on the line 3—3 of Fig. 1.

Referring to the drawings in detail, the bit of my invention has a body 11, the upper end of which is provided with a threaded pin 12 which serves as a means of attaching it to a string of drill pipe. Formed at the lower part of the body 11 and extending outward therefrom at the opposite sides thereof are side extensions 13. The lower end of the body 11 is rounded as indicated at 14 and projecting downward from this lower rounded end 14 is a central blade 15. In the preferred form of my invention, as illustrated herein, the central blade 15 is in the shape of a fish-tail having cutting edges 16 at the lower ends thereof, which incline upward toward the center of rotation of the bit, in order to form an inverted V.

Depending from the body of the bit adjacent to the central blade 15 are intermediate blades 17, and depending from the extensions 13 outside of and adjacent to the intermediate blades 17 are outer blades 18. The central, intermediate, and outer blades are centrally disposed on a center line A—A,

which extends in a plane perpendicular to the axis of rotation of the bit. As shown best in Fig. 2, spaces 19 are formed between the central blade 15 and the intermediate blades 17, and passages 20 are formed between the intermediate blades 17 and the outer blades 18. Formed at the outer ends of the side extensions 13 are reaming blades 21.

The blades 17 and 18 have cutting edges 23 and 24 respectively, which are arranged on planes indicated by the lines B—B and C—C respectively, each pair of these lines B—B and C—C being parallel to each other. The bit is adapted to rotate in a direction indicated by the arrow 25 of Fig. 2. It will be seen therefore that the leading end 26 of each cutting edge 23 and 24 is farther away from the axis of rotation of the bit than is the trailing end 27 of each cutting edge. The intermediate portions of the cutting edges 23 and 24 extend between the leading and trailing ends. By reason of the positions of these cutting edges 23 and 24 the cutting edges will have a shearing or slicing cutting action on the bottom of the hole. It is well recognized in various industries that a shearing or slicing cutting action is much more efficient than a scraping action.

The body of the bit is provided with a central passage 30 to the lower end of which are connected inner ducts 31 and outer ducts 32. The inner ducts connect to the lower end of the body of the bit adjacent the central blade 15 and are adapted to wash the cutting edges thereof. The outer ducts 32 connect to the bottom of the body of the bit between the intermediate and outer blades and are adapted to direct fluid against the inner faces of the outer blades in order to wash the cutting edges 24 thereof.

When the bit is placed in operation the central blade cuts in somewhat the same manner as the blades in the ordinary fish-tail bit. However, in view of the fact that the central blade is only at the central part of the bit, the scraping action is not very great, and furthermore, due to its central position, the travel of the blade is much less than the travel of the blades positioned at the intermediate and outer parts of the bit. The cutting edges 23 and 24 cut with a shearing or slicing action, as previously pointed out. The cuttings of the intermediate blades 17 pass through the openings 19 to the back of the blades and the cuttings of the outer blades 18 pass through the openings 20 to the back of the blade. By the design of bit which I have provided the cuttings are prevented from balling up in front of the cutting edges and interfering with the cutting action and interfering with the washing action of the rotary mud. This is a very desirable feature of the invention because it increases the cutting efficiency of the bit and permits the rotary mud to come into contact with the cutting edges and to cool them. The reaming blades 21 act on the outer cylindrical wall of the hole and ream the hole to size.

In the appended claims the intermediate and outer blades will be referred to as having tangential cutting edges. By the term "tangential" I shall mean cutting edges disposed on the lines B—B and C—C which extend at acute angles with respect to the center line A—A and which are tangential to the imaginary circles generated around the axis of rotation of the bit such as indicated by dotted lines 35 and 36.

The design of bit shown herein is the preferred form and embodies all the features of the invention. It is possible, however, to construct the bit utilizing certain of the features; therefore, I wish my invention to be construed as defined in the appended claims which broadly cover different features which constitute my invention in its entirety.

I claim as my invention:

1. In a bit for drilling oil-wells, the combination of: a body; a central blade depending from said body; intermediate tangential blades depending from said body on opposite sides of said central blade; and outer tangential blades depending from said body on a diameter greater than the diameter on which said intermediate blades are positioned, said central, intermediate, and outer blades being disposed on a single horizontally center line and having their cutting edges so disposed that the paths traversed thereby overlap.

2. In a bit for drilling oil-wells, the combination of: a body; a central blade depending from said body; intermediate tangential blades depending from said body on opposite sides of said central blade; and outer tangential blades depending from said body on a diameter greater than the diameter on which said intermediate blades are positioned, there being spaces formed between said central blade and said intermediate blades, and other spaces between said intermediate blades and said outer blades, said central, intermediate, and outer blades being disposed on a single horizontal center line and having their cutting edges so disposed that the paths traversed thereby overlap.

3. A bit of the character described, including: a body having inner and outer tangential blades projecting downwardly, said blades having the cumulative length of their cutting edges greater than the diameter of said bit and having the leading ends of their cutting edges a greater radial distance from the axis of rotation than the trailing ends of their cutting edges, said cutting edges being disposed so that they all contain a single plane perpendicular to

the axis of rotation and said blades being formed so that the paths traversed by adjacent blades overlap, and said outer blades having vertical leading edges adapted to cut with a reaming action.

4. A bit of the character described, including: a body having inner and outer tangential blades projecting downwardly in a single diametral plane, said blades having the cumulative length of their cutting edges greater than the diameter of said bit and having the leading ends of their cutting edges a greater radial distance from the axis of rotation than the trailing ends of their cutting edges, said cutting edges being so disposed in a plane perpendicular to the axis of rotation that the paths traversed thereby overlap, and said outer blades having vertical leading edges adapted to cut with a reaming action.

5. A bit of the character described, including: a body having inner and outer tangential blades projecting downwardly in a single diametral plane, said blades having the cumulative length of their cutting edges greater than the diameter of said bit and having the leading ends of their cutting edges a greater radial distance from the axis of rotation than the trailing ends of their cutting edges, said cutting edges being so disposed in a plane perpendicular to the axis or rotation that the paths traversed thereby overlap, and said outer blades having vertical leading edges adapted to cut with a reaming action; and reaming elements projecting laterally from said body.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 11th day of February, 1929.

JESSE C. REESE.