Oct. 11, 1932. B. K. APPLEMAN 1,882,268

DRILL BIT

Filed March 30, 1928

Fig. 1.

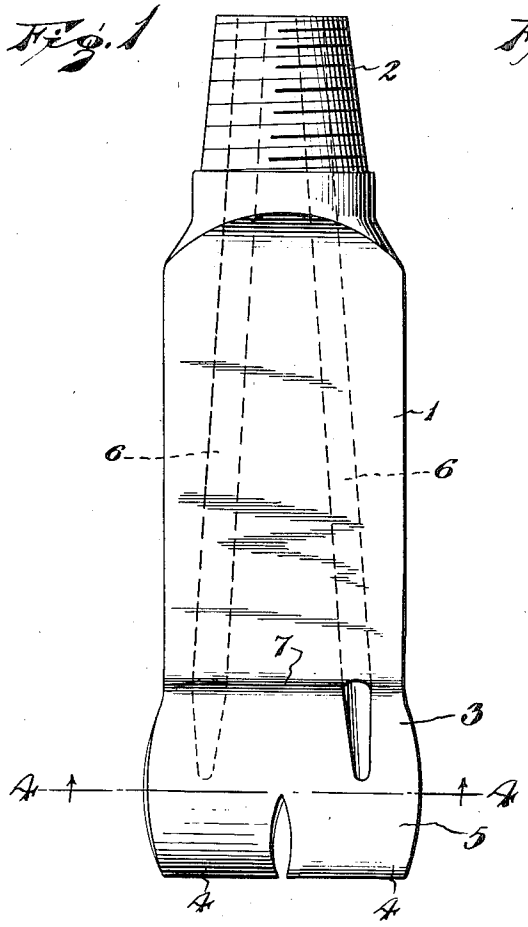
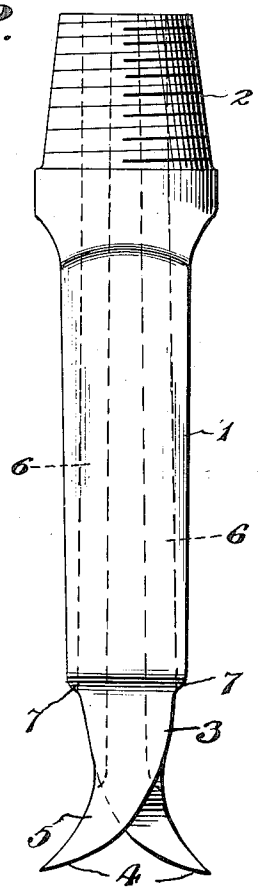


Fig. 2.



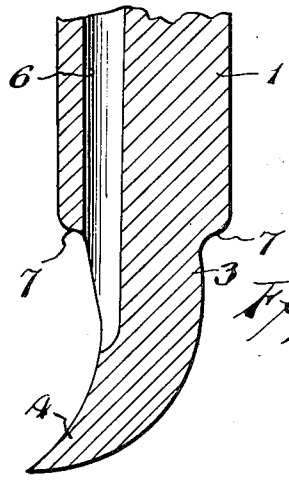


Fig. 3.

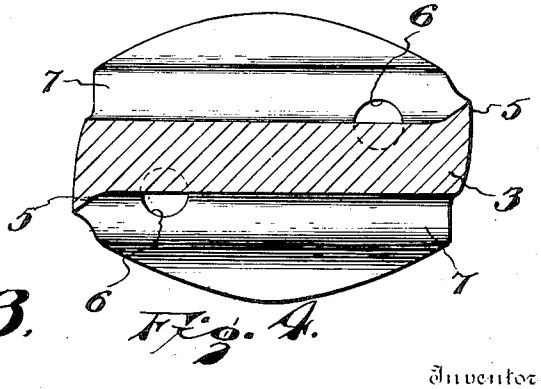


Fig. 4.

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UNITED STATES PATENT OFFICE

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DRILL BIT

Application filed March 30, 1928. Serial No. 265,978.

This invention relates to bits for drilling deep wells, such as oil, gas and artesian, and aims to provide an article of the nature stated which will cut rapidly through gumbo and other heavy and sticky strata without gumming or choking, and which will not tend to bind under the varying conditions encountered in drilling through the different strata.

The invention provides a bit which may be resharpened, as occasion may require, and which includes a fish-tail point and straight water passages arranged to deliver jets adjacent the cutting edges of the blades or cutting members to break up gumbo and like material and prevent its adhering to the blades and impairing the action of the bit, the jets spreading and carrying off the chips or cuttings.

The invention furthermore provides a bit which in action forms a bore having smooth walls, thereby obviating the necessity of reaming when lining the well, or in subsequent operations.

A special object of my invention is to provide a drill bit of such design and construction that the flushing water is compelled to pass between the blades of the bit and the chips, and also under the chips, as the latter are pared loose and raised from the bottom of the well.

While the drawing illustrates a preferred embodiment of the invention, it is to be understood that in adapting the means to meet specific needs and requirements, the design may be varied and such other changes in the minor details of construction may be resorted to within the scope of the invention as claimed, without departing from the spirit thereof.

For a full understanding of the invention and the merits thereof, reference is to be had to the following description and the drawing hereto attached, in which,—

Figure 1 is an elevational view of the bit for boring deep wells, embodying the invention.

Figure 2 is a side view of the bit.

Figure 3 is a fragmentary sectional view.

Figure 4 is a sectional view on the line 4—4 of Figure 1, looking in the direction of the arrows, and on substantially the same scale as Figure 3.

Corresponding and like parts are referred to in the following description and designated in the several views of the drawing by like reference characters.

The numeral 1 denotes the body of the bit which is provided at one end with a threaded shank 2 and which has its opposite end reduced at 3 to form cutting members or blades 4. The threaded shank 2 provides means for coupling the bit to an operating rod. The body 1 of the bit is elongated and approximately of rectangular outline, and preferably consists of a steel forging which is reduced at one end and shaped to provide a fish-tail point. The blades or cutting members 4 curve in opposite directions and the outer portions thereof curve forwardly, as indicated at 5, to provide side cutting edges in addition to the lower cutting edges. The sides of the reduced portion 3 are outwardly curved, as indicated most clearly in Figure 1 of the drawing, and are beveled to provide side cutting edges, which result in the formation of a smooth bore. Passages 6 are formed in the body 1 and extend through the end of the shank 2 and through the shoulders 7 formed at the base of the reduced end portion 3. It will be noted that blades 4 curve abruptly and deeply forward thus providing an actual cutting tool, while the liquid passages lead directly through the entire length of the bit and finally terminate in depressions lying back of the face of the blades and at points approximately midway between the body of the bit and the lower cutting edges of the blades, whereby the chips that are undercut and pared from the bottom of the well in sheet fashion, are not only undermined by the severe deflection of the flushing water as it is driven against the bit, but are also subject to further attack upon their inner side by the action of the flushing liquid that is forced against them in escaping by way of the port recesses in the face of the blades. The rectangular cross section of the body 1 results in the provision of spaces at the four sides through which the water and cuttings pass, the spaces being

such as to insure the water traveling at a high velocity so as to carry off the cuttings and prevent choking of the bit. The blades 4 terminate in straight cutting edges, and the side cutting edges curve outwardly and forwardly, as indicated most clearly in Figures 1 and 2 of the drawing. The water passages 6 being straight, offer a minimum resistance to the flow of the water therethrough and prevent any enlargement of the passages by the cutting action of mud, sand, or like material suspended in the water.

The bit disclosed is rapid in action and insures a breaking up of gumbo and the rapid carrying off of the cuttings by the outflow of the water in its discharge from the well. The body consisting of a single steel forging admits of resharpening as occasion may require. The wearing surfaces and cutting edges are hardened so as to resist wear and prolong the period of service and the parts in the rear of the cutting edges are not treated, hence wear to some extent and thereby render the bit selfsharpening as will be readily appreciated.

It is observed that the active surfaces and cutting edges only of the bit are hardened so as to resist wear, the portions in the rear being in a natural condition or soft and subject to wear. As a result the cutting edges of the bit are maintained and a tool provided which is rapid and efficient in action. It is further observed that the body of the tool is of such dimensions as to provide restricted passages between its sides and the walls of the well through which the water and cuttings are caused to flow with a velocity which prevents any tendency to choke which would impair the efficiency and rapid action of the drill.

It will also be noted that the shank is of such dimensions that measurement taken diagonally through the body of the shank is such that when compared with the overall measure of the cutting members diametrically it is but little less than that of the cutting members. Therefore, when the drill comes in contact with material having a strata lying on an angle to the true course of the drill, the slightest shifting sidewise of the drill from its true course immediately causes the shank to contact with the walls of the well, thereby serving to so guide the drill in a true course as to produce substantially a straight hole of such uniformity as to eliminate or greatly reduce the necessity of reaming before setting the well casing.

Another feature of exceptional merit arises from the fact that the water channels through the shank of the bit are straight and lead directly from the top of the shank to the cutting members, by means of which the force arising from the water pressure at the top of the shank reaches the cutting members with the very least possible reduction and thereby exerts the maximum penetration of cuttings that have a tendency to adhere to the bit.

The usual efficiency of my invention, however, is founded almost wholly upon the particular shaping and curvature of the cutting members in connection with and relation to the manner in which the water is led to and applied to them. It will be noted that as the points of the cutting members enter the formation at the bottom of the well, cuttings, or rather chips, are forced back and upward upon the curved portion of the cutting members by that portion of the forthcoming chip that has not yet been entirely detached from the bottom of the well. In other words, the chip is being continually undercut before being fully detached, and when the stream of water meets it, the curvature of the cutting members gives the water a pronounced tendency to under cut or penetrate from beneath the chip or cuttings, thus rendering their adhesion to the bit impossible. This result is not obtainable in bits having little or no curve except at their extreme points, inasmuch as the actual cutting part of the bit is so short that cuttings are at once brought into direct contact with the vertical portions of the bit, and the streams of water, by not being forcefully concentrated against the bit, are inclined to pass in front and over the cuttings instead of beneath them. In fact, it then does not pass between the cuttings and the bit.

Having thus described the invention, I claim:

1. A well drilling bit comprising a drill bit body, the upper end of which is adapted to engage a driving member, oppositely disposed cutting members formed at the lower end of said body and abruptly curved forward, separate liquid passages entirely enclosed within the body of the bit proper and extending in straight lines from the top of said body direct to their respective cutting members, said liquid passages terminating below the body of the bit proper in arcuate troughlike depressions in the blades of said bit, the lower ends of said liquid passages intersecting the upper portion of the forward faces of the cutting member at points within the contours of said faces, and the lower portions of said faces extending forwardly across and beyond the rectilinearly extended lines of said liquid passages, whereby any adhesive material that would have a tendency to accumulate on said blades is forced laterally away from the faces of said blades by the aid of the water that is being discharged through the groove like depressions in the faces of said blades.

2. A well drilling bit comprising a body having its upper end adapted to be connected with a driving member, the lower portion of said body being reduced in thickness to form a blade and shoulders at the top of the blade, said blade having its lower end split interme-

diate its width from its lower edge to form cutting portions, each cutting portion being curved forwardly and terminating in a lower cutting edge, said body being formed with straight water passages extending longitudinally thereof from its upper end and opening through the shoulders at opposite sides of the blade and the blade being formed in its upper portion with grooves constituting continuations of the water passages and terminating adjacent in the upper ends of the front faces of the curved cutting members of the blade.

3. A well drilling bit comprising a drill bit body the upper end of which is adapted to be connected to a driving member and oppositely disposed cutting members formed on the lower end of said body, the body and cutting members being provided with straight longitudinal liquid passages the lower ends of which intersect the upper portions of the forward faces of the cutting members at points within the contours of said faces, and the lower portions of said faces extending forwardly across and beyond the rectilinearly extended lines of said liquid passages.

4. A well drilling bit comprising a drill bit body the upper end of which is adapted to be connected to a driving member and oppositely disposed cutting members formed on the lower end of said body, the body and cutting members being provided with liquid passages the lower ends of which intersect the upper portions of the forward faces of the cutting members at points within the contours of said faces, and the lower portions of said faces extending forwardly across and beyond the rectilinearly extended lines of said liquid passages.

5. A fish tail well drilling bit comprising a shank and a relatively thick body, said body being reduced in thickness at its lower end to form shoulders and oppositely disposed relatively short cutting members, each cutting member having its lower end extended forwardly and its outer face provided with a continuous relatively deep outer curve terminating in a cutting edge so as to produce curved chips in the material when the bit is rotated, separate straight liquid passages starting at the top of said shank and extending in a straight line wholly within and through the entire length of said body and discharging on their respective cutting members only, said liquid passages passing out through said shoulders at the bottom of the body and discharging downwardly on a line substantially parallel with the vertical axis of the bit body and tangential to the upper portions of the curved faces of the cutting members and rectilinearly wholly in the rear of said cutting edges and chips whereby to dislodge said chips.

6. A fish tail well drilling bit comprising a driving shank and a relatively thick body member, the lower end of said body member being reduced in thickness to form a plurality of shoulders and oppositely disposed cutting members terminating in cutting edges, said cutting members being deeply curved and extended forward an appreciable distance so as to bring their cutting edges underneath and raise their chips upward as they are being cut, separate internal liquid passages running longitudinally the entire length of said shank and bit body on lines lying rectilinearly an appreciable distance to the rear of the cutting edges of said cutting members and tangential to the forward curvature thereof, by means of which said liquid is caused to impinge against the curved face of said cutting members behind said chips.

In testimony whereof I affix my signature.

BOYD K. APPLEMAN. [L. S.]