Jan. 13, 1931. J. H. BISHOP 1,788,377

DRILLING BIT

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FIG. 1.

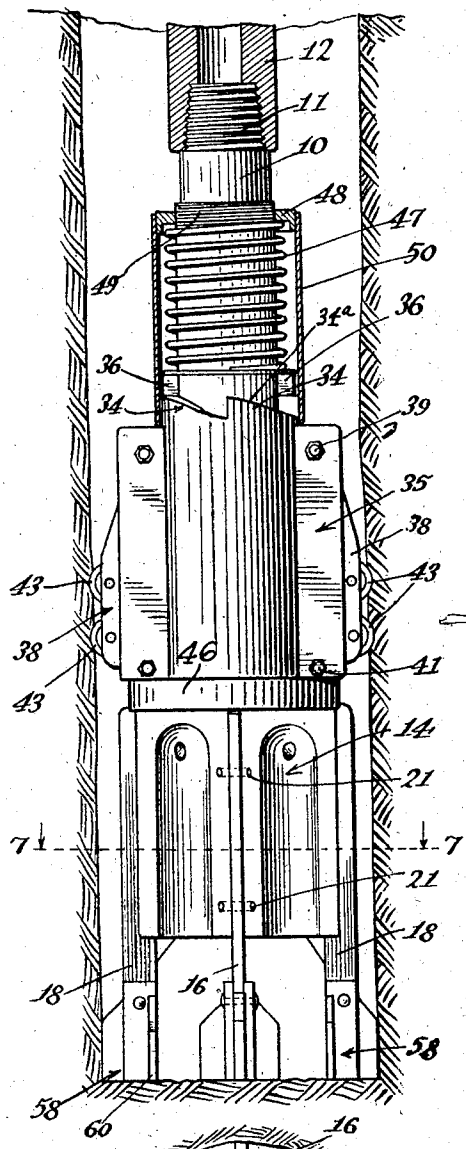
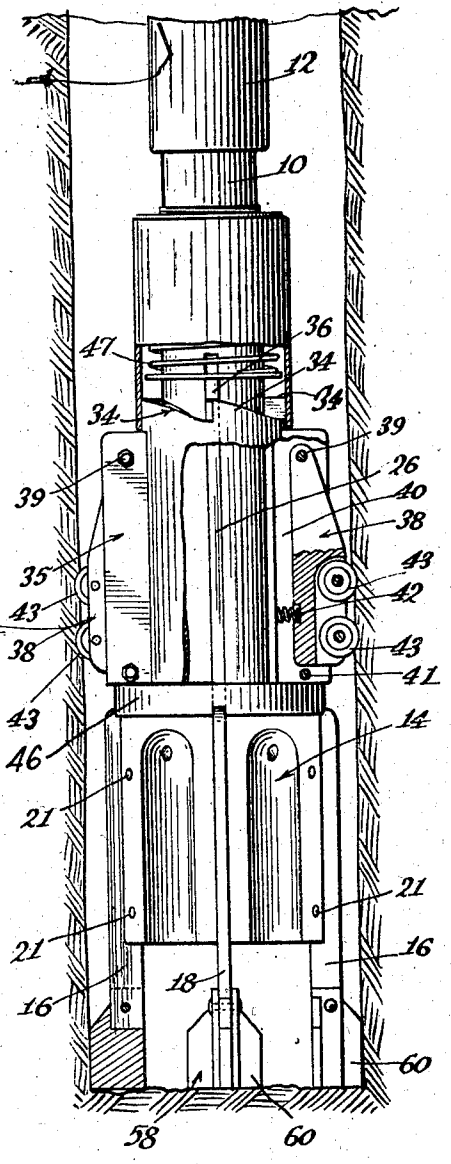


FIG. 2.



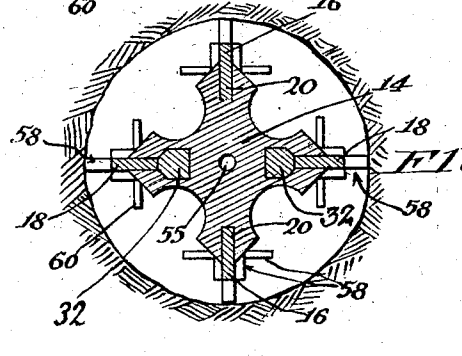


FIG. 7.

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FIG. 5.

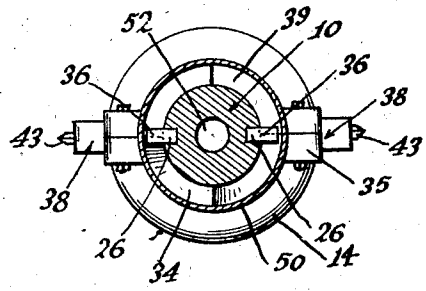


FIG. 6.

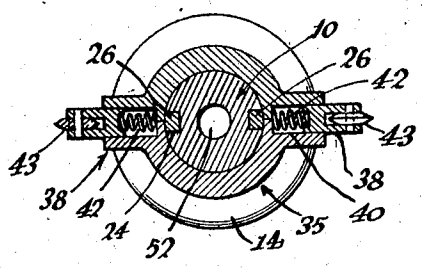


FIG. 3.

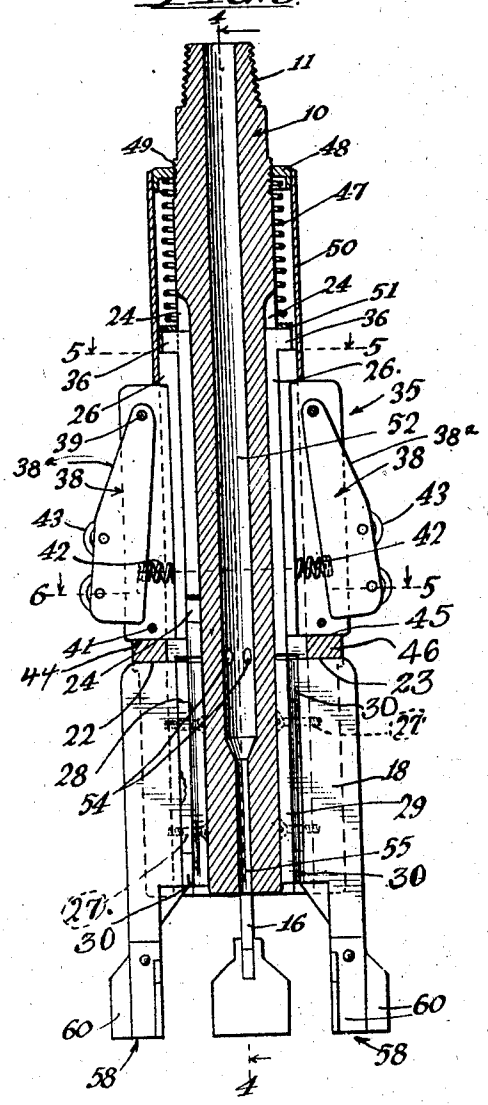
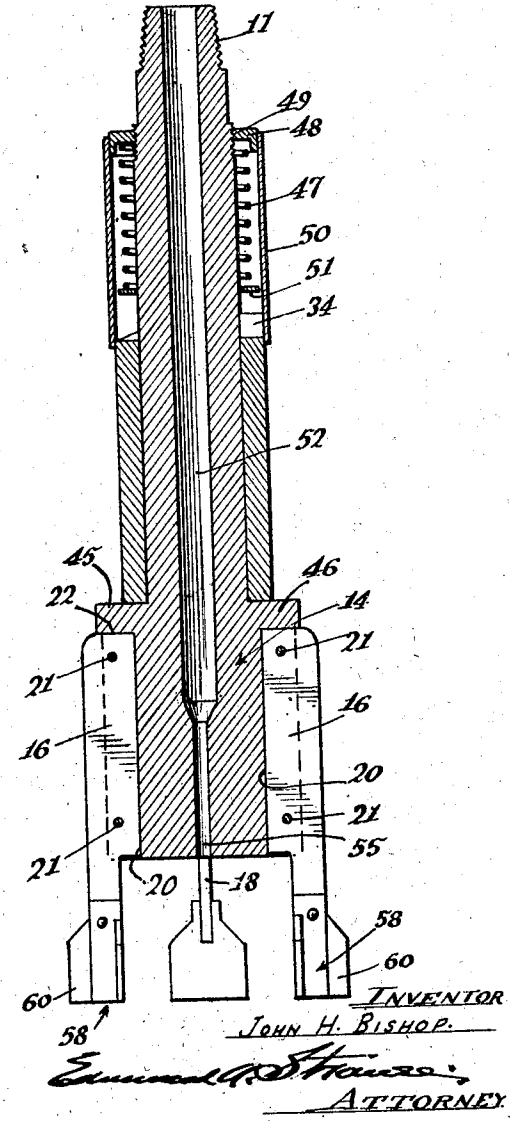


FIG. 4.



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1,788,377

UNITED STATES PATENT OFFICE

JOHN H. BISHOP, OF LONG BEACH, CALIFORNIA, ASSIGNOR OF ONE-THIRD TO GEORGE G. OSBORN, OF LONG BEACH, CALIFORNIA, AND ONE-THIRD TO CLARENCE H. REED, OF NEWPORT BEACH, CALIFORNIA

DRILLING BIT

Application filed March 30, 1929. Serial No. 351,197.

In drilling deep wells through faulty formation with the usual "fish tail" or disk bits considerable difficulty has been experienced in forming a straight bore, especially so when the bit contacts with a fault of gradual inclination, the tools tend to follow the fault and in some instances the bore becomes so much out of plumb as to prevent bailing operations.

The primary object of this invention is to provide a bit for rotary well drilling which will maintain a straight bore.

Another object of this invention is to provide a bit that will not accumulate mud or become (so called) balled up.

A further object of this invention is to provide a bit having a combined scraping and chopping action.

Other objects and advantages will subsequently appear from the following description of the accompanying drawings in which:

Fig. 1 is a sectional view through a well showing the improved bit in side elevation therein, parts being broken away and shown in section;

Fig. 2 is a view similar to Fig. 1 showing the rotating portion of the bit after it has been turned one quarter revolution from the position shown in Fig. 1;

Fig. 3 is a vertical sectional view taken through the bit;

Fig. 4 is a sectional view taken on line 4—4 of Fig. 3 in the direction indicated by the arrows;

Fig. 5 is a transverse sectional view taken on line 5—5 of Fig. 3;

Fig. 6 is a transverse sectional view taken on line 6—6 of Fig. 4;

Fig. 7 is a sectional view of the lower end of the bit taken on line 7—7 of Fig. 1.

Referring to the drawings, the shank or rotating portion of the bit is designated at 10 and is provided at its upper end with a threaded portion of pin 11 adapted to threadedly engage the drill collar 12 of the drill pipe. The shank is cylindrical from the pin 11 downward to an enlarged head or stock 14 which serves to carry a plurality of blades, in the present instance four, two of which are rigidly secured to the stock as indicated at 16, while the other pair 18 is mounted for vertical reciprocating movement in the stock hereinafter referred to as "chopping blade".

Preferably the pairs of rigid blades 16 and the reciprocating blades 18 are oppositely disposed and set in the stock at right angles to the rigid blades in order to evenly space the blades. Each of the rigid blades 16 are mounted in a recess 20 formed in the stock 14 and are held in place by rivets 21, the upper ends 22 of the blades engage the horizontal face 23 of the recess, thereby relieving any strain on the rivets. If desired the rigid blades may be formed integral with the stock 14 in a similar manner to the usual "fish tail" bit construction.

Oppositely disposed grooves 24 are formed in the shank and stock which are adapted to receive sliding keys 26 to which are secured the chopping blades 18 as clearly shown in Fig. 3. The blades 18 are secured to the keys 26 by screws 27, the keys having tongues resting in recesses 28 formed in the blades in order to prevent shearing of the screws 27. The lower ends 29 of the keys and the inner faces 30 of the blades are enlarged at 32 to prevent any outward displacement. The grooves are also enlarged at their lower end to receive the enlarged portions 32.

In order to actuate the chopping blades a plurality of cams 34 are formed on the upper ends of a relatively stationary collar 35, which cams are engaged by lugs 36 on the upper ends of the keys. The collar 35 is held against rotation by oppositely disposed wings 38 pivotally mounted at 39 in recesses 40 and urged outwardly by expansion springs 42, the wings carrying disks 43 which engage the formation as shown in Fig. 1 and thereby preventing rotation of the collar.

For purposes of assembly the collar 35 is formed in halves and secured together by the pivot pin 39 and bolts 41. The lower face 44 of the collar 35 engages the face 45 on the shoulder 46 of the shank 10 and is held against upward movement by an expansion coil spring 47, the lower end of which engages a washer 51 resting on the lugs 36 of

the keys, while the upper end contacts with a tension adjusting nut 48 threaded at 49 on the upper end of the shank 10, the spring being protected by a sleeve 50.

When lowering the bit through the casing the wings 38 are collapsed and rest in the recess 40 and are automatically expanded to engage the formation by action of the springs 42 when the bit is below the lower end of the casing; likewise when it is necessary to pull the string of drill pipe out of the hole the wings will be returned to collapsed position by the inelined faces 38ª of the wings 38 engaging the lower end of the casing.

Circulation throughout the bit is provided for by a bore 52 extending through the bit from which extend lateral openings 54 adapted to discharge fluid between the stationary and chopping blades, a portion of the circulating fluid discharging downwardly through a port 55 located in the center of the lower end of the shank and communicating with the bore 52. Cutters 58 formed of hardened metal are secured to the lower end of the blades 16 and 18 respectively, and are preferably formed with a plurality of cutting edges 60.

During drilling operations the weight of the drill pipe (which is lowered in the usual manner in rotary drilling) will be carried by the rigid blades 18 which function in the same manner as the usual "fish tail" bit. As the bit is rotated the chopping blades will be raised by the lugs 36 on the keys engaging the inclined face 34ª of cams 34 on the stationary collar 35 then forced suddenly downward by the action of the spring at the moment the lugs pass over the apex of the cams, thus rapidly reciprocating the chopping blades.

The chopping blades provide a downward vertical cut in the formation and also prevent mud from accumulating on the rigid blades. By employment of the improved bit due to the action of the chopping blades the revolutions of the bit may be reduced.

I claim:

1. A drilling bit comprising a shank, a plurality of blades rigid with said shank, a plurality of chopping blades carried by said shank and vertically slidable thereon, a collar on said shank having a plurality of cams thereon, keys connected to said chopping blades adapted to engage the cams on said collar for reciprocating said chopping blades, wings pivotally connected to said collar at their upper ends and springs engaging said wings and collar adapted to expand said wings into engagement with the walls of a well bore in order to hold said collar against rotation.

2. A drilling bit comprising a cylindrical shank having an enlarged stock on the lower end thereof, a pair of rigid blades carried by said stock, a pair of chopping blades slidable in grooves formed in said shank and stock, a collar on said shank resting on a shoulder on the upper end of the stock, cams on the upper end of said collar, a key connected to each chopping blade slidable in grooves on said shank and stock, lugs on the upper ends of said keys adapted to engage the cams on said collar, an expansion spring encircling said shank and engaging the lugs on said keys, and means carried by said collar adapted to hold said collar against rotation.

3. A drilling bit comprising a shank, a plurality of blades rigid with said shank, a plurality of chopping blades carried by said shank and vertically slidable thereon, a collar on said shank having a plurality of cams thereon, keys connected to said chopping blades slidable in grooves on said shank having lugs on their upper ends adapted to engage the cams on said collar, and means for holding the lugs on said keys in engagement with the cams on said collar.

4. A drilling bit comprising a shank, a plurality of blades rigid with said shank, a plurality of chopping blades carried by said shank and vertically slidable thereon, a collar on said shank having a plurality of cams thereon, keys connected to said chopping blades slidable in grooves on said shank having lugs on their upper ends adapted to engage the cams on said collar, means for holding the lugs on said keys in engagement with the cams on said collar, wings pivotally mounted on said collar, disks carried by said wings, and expansion springs adapted to force said wings radially outward to bring the disks on said wings into engagement with the walls of the well bore in order to hold said collar against rotation.

In testimony whereof I affix my signature.

JOHN H. BISHOP.