

Dec. 7, 1937.

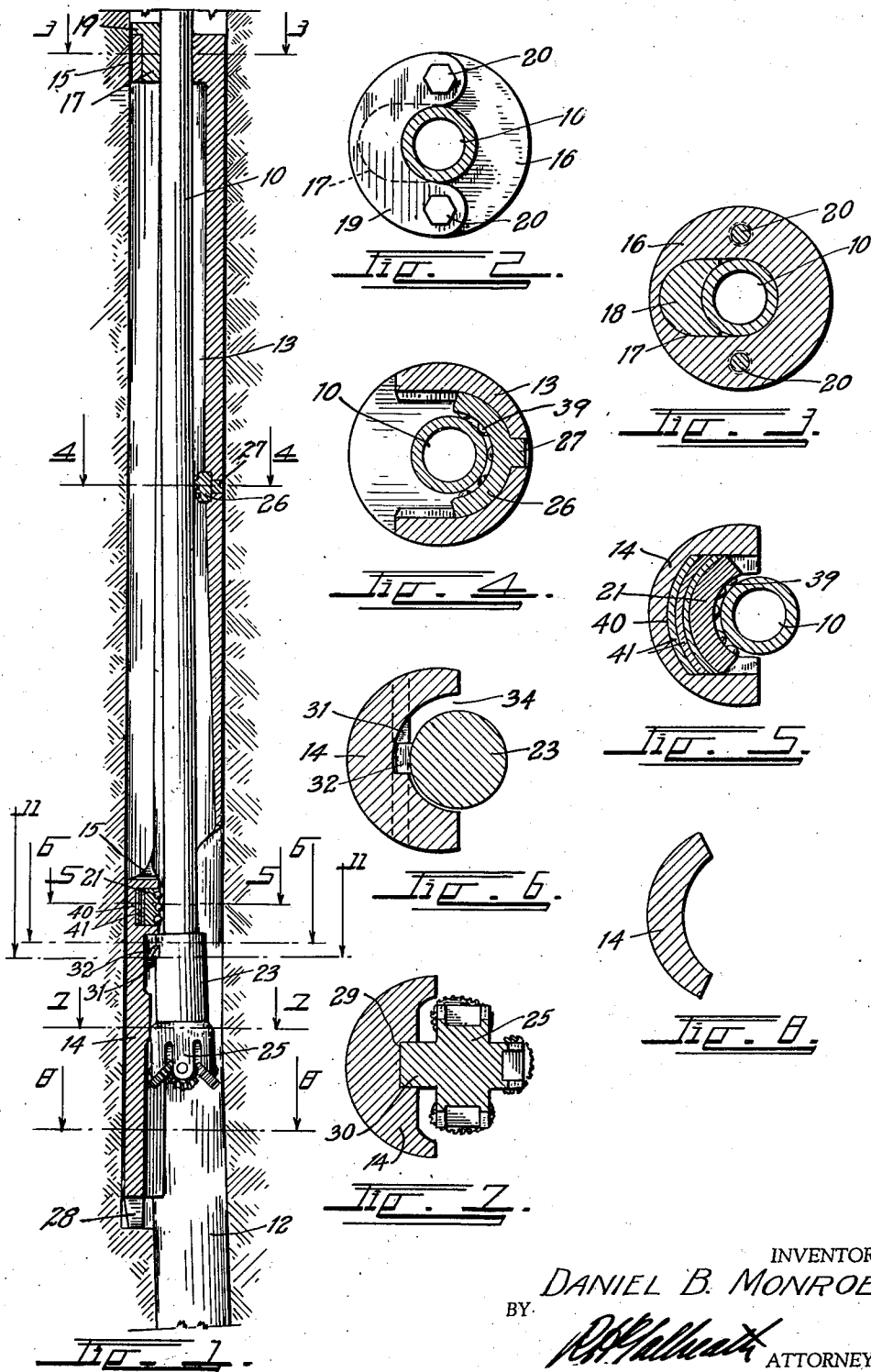
D. B. MONROE

2,101,185

WELL DRILLING WHIP STOCK

Filed Oct. 22, 1936

2 Sheets-Sheet 1



INVENTOR.
DANIEL B. MONROE.
BY *Robt. H. H. H. H.* ATTORNEY.

Dec. 7, 1937.

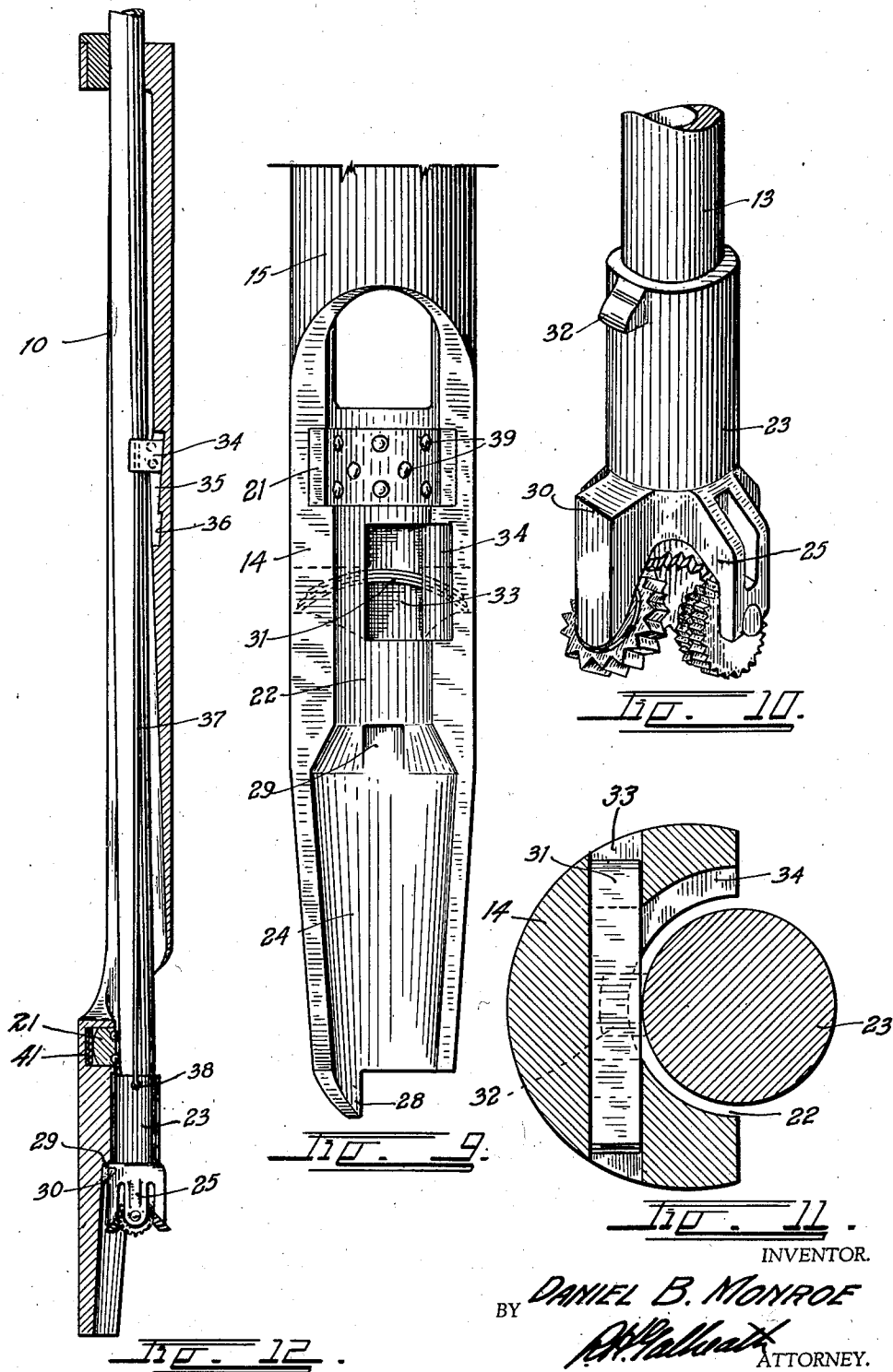
D. B. MONROE

2,101,185

WELL DRILLING WHIP STOCK

Filed Oct. 22, 1936

2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

2,101,185

WELL DRILLING WHIP STOCK

Daniel B. Monroe, Denver, Colo.

Application October 22, 1936, Serial No. 106,955

7 Claims. (Cl. 255—1)

This invention relates to a whip stock for directional control of the course of an oil well drilling bit, and has for its principal object the provision of an accurate, highly efficient device by means of which the course of an oil well drilling bit can be accurately deviated in any desired direction and to any desired degree.

Another object of the invention is to provide a whip stock which can be rotated while being lowered in the well casing without affecting its deviation setting.

A still further object is to provide a whip stock which will not assume its deviation angle until it has reached bottom so that it may be easily lowered in the original drill casing.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention reference is had to the accompanying drawings which forms a part hereof. Like numerals refer to like parts in all views of the drawings and throughout the description.

In the drawings:—

Fig. 1 is a vertical section through a drill hole, illustrating a vertical section through the improved whip stock in position for use.

Fig. 2 is a plan view of the whip stock with the drill pipe in place therein.

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

Figs. 4, 5, 6, 7, and 8 are similar cross sections taken on the lines designated by their figure number.

Fig. 9 is an enlarged face view of the lower extremity of the whip stock with the drill pipe removed.

Fig. 10 is a perspective view of the lower extremity of the drill pipe, tool joint and drill.

Fig. 11 is an enlarged cross section, taken on the line 11—11, Fig. 1.

Fig. 12 is a vertical section through an alternate form of the invention.

In Fig. 1, a typical drill pipe is indicated at 10, its tool joint at 23, and drill at 25. The original bore is shown at 11 and the deviated bore caused by use of the whip stock at 12.

The improved whip stock consists of relatively long, channel-like member, the upper portion of which, designated by the numeral 13, faces in one direction and the lower portion of which, designated by the numeral 14, faces in the opposite direction. The upper and lower portions

13 and 14 are joined by means of a joining section 15 to form a complete, longitudinally, extending, integral unit.

The upper extremity of the portion 13 terminated in a completely cylindrical sleeve 16 having an elongated drill pipe passage 17. The passage 17 is formed so that its inner extremity will be concentric with the axis of the whip stock and its outer extremity will be eccentric with the axis. When the drill stem 10 is in operating position, the eccentric portion of the passage 17 may be filled by a crescent shaped lug 18 extending downwardly from a cap member 19 which is secured to the top of the whip stock by means of suitable cap screws 20.

The lower portion of the whip stock 14 is formed with a semi-cylindrical pocket 40 for receiving a semi-circular thrust bearing 21 and with a semi-cylindrical channel 22 for receiving the tool joint 23 of the drill pipe 13, and with a channel 24 for receiving the drill 25. The lower extremity of the lower portion 14 terminates in a bottom-engaging tooth 28.

A semi-circular fulcrum bearing 26 is inset in a suitable receiving pocket at the approximate middle of the upper portion of the whip stock, as shown in Fig. 1. The fulcrum bearing 26 is preferably formed with a stud 27 for maintaining it in place.

As thus far described, the tool is in its simplest form and ready for use in correcting the deviation of a drill hole.

Let us assume that it is desired to correct the course of the drill hole 10 of Fig. 1 to the course of the drill hole 12. The operator passes the drill pipe 10 through the passage 17 in the collar 16 and through the joining section 15, then places the tool joint and drill thereon. He then slides the whip stock down against the drill to the position shown in Fig. 1, and positions the fulcrum bearing 26 in place. At this time, the drill pipe 11 is resting in the eccentric portion of the passage 17 so that the bearing 26 can be easily positioned in its receiving pocket.

He now places a jack between the drill pipe and whip stock and bends the former rearwardly until it rests in the concentric portion of the channel 13. This enables him to slip the lug 18 into position and lock it by means of the cap screws 20. The drill pipe is now bent across the fulcrum bearing 26, and is exerting pressure on the thrust bearing 21 and the lug 18.

The drill pipe is now lowered in the well without rotating, the operator noting on the drill pipe the exact direction of the whip stock. When the

bottom is reached, the tooth 28 will engage therein. This engagement is facilitated by the lowering of the drill pipe, due to its excessive frictional engagement with the whip stock, to resume drilling.

The bend which the whip stock maintains in the drill pipe causes the drill to deviate from its original course and assume the course as indicated by the bore 12. The amount of this deviation can be preset by positioning by means of suitable shim plates 41 of the desired thickness in the receiving pocket 40 to give the desired bend to the drill pipe. The deviation can also be regulated by replacing the fulcrum bearing 26 with bearings of various thickness.

As thus far described, the device has been highly efficient in actual drilling operations. However, at times it is desired to rotate the whip stock while lowering it, in order to work past cramped sections and sharp turns in the casing and other obstructions. Any rotation of the drill pipe without locking it to the whip stock would result in a loss of position which would make it impossible for the operator to determine the direction of the new hole without instruments.

To provide a construction which will enable the whip stock to be rotated with the drill pipe, a receiving socket 29 is formed in the lower portion 14 and a shoulder 30 is formed on the drill 25, so that, when the whip stock is slid down over the drill it can be rotated until the shoulder 30 slips into the socket 29 to accurately key the drill pipe to the whip stock. As soon as the whip stock bottoms, the shoulder 30 can be forced out of the socket 29 so that the drill may be freely rotated for drilling while the whip stock remains stationary.

It is possible, however, that the shoulder might move out of the socket 29, while the drill is being lowered, should the whip stock strike obstinate obstructions. This is prevented in the form of the invention illustrated by providing a relatively heavy convex leaf spring 31 which extends across the whip stock as shown in Figs. 6 and 11 in a suitable spring channel 33 adjacent the tool joint 23. The tool joint is provided with a lug 32 which, while the tool is being lowered, rests upon the spring 31 and holds the shoulder 30 in its socket 29.

When the bottom has been reached, the driller can place sufficient weight upon the drill pipe to force the spring 31 downwardly to the bottom of its channel 33. This allows the drill to move downwardly a sufficient distance to release the shoulder 30 from the socket 29. The drill can now be rotated to the right, the channel 22 being cut away as shown at 33 to allow for rotation of the lug 32. This will turn the lug 32 off of the spring 31 allowing the latter to snap back to its former position and allowing the drill to be dropped to the bottom and rotated for drilling. When the drill is again raised, the shoulder 30 will again enter the depression 29 so that the entire assembly may be rotated while being withdrawn if desired.

Thus the whip stock and drill pipe remain firmly locked together for rotation through tight positions and this lock is not released until the whip stock has been bottomed, the tooth 28 engaged, and the drilling pressure has been placed upon the drill pipe 13.

In Fig. 12, an alternate form of the invention is shown which is designed so that the drill pipe will not be under any bending stress while being lowered. This form of the invention consists of

an outer enclosing shank similar to the previously described form. In this form, a wedge fulcrum bearing 34 is employed which rests against a wedge surface 35 in the whip stock. In the lower extremity of the wedge surface 35 is a pocket 36 for eventually receiving the fulcrum bearing 34. The bearing 34 is tied by means of suitable tie rods 37 to the tool joint 33. The tie to the latter may be made by welding the rods 37 to the coupling as shown at 38. The locking shoulder 30 and the receiving socket 29 are employed in this form to prevent rotation while descending.

When the bottom is reached, the operator places sufficient weight upon the drill pipe to cause the tie rods 37 to pull the fulcrum bearing downwardly into the receiving pocket 36, thereby bending the drill pipe 10 at this point to the required deviation. When the thrust fulcrum is in its final position, rotation of the drill will break the rods 37 at the welded joints 38 so that the usual drilling operations can be resumed. The thrust and fulcrum bearings are preferably formed with imbedded bearing balls 39 to relieve the excessive friction thereon.

While a specific form of the improvement has been described and illustrated herein, it is desired to be understood that the same may be varied, within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention, what is claimed and desired secured by Letters Patent is:—

1. A device for deviating the course of a drill pipe and drill in an oil well comprising: a relatively long member having a passage for said drill pipe; a lower bearing in said member forcing said drill pipe in one direction; an upper bearing in said member forcing said drill pipe in the opposite direction; a key and socket joint for preventing relative rotation between said drill pipe and said member; and a spring acting to support said drill pipe in said member to maintain said key in its socket, said spring being positioned so that a predetermined pressure on said drill pipe will compress said spring to release said key.

2. A whip stock for cooperating with the drill pipe, tool joint, and drill of a well drilling apparatus to deviate said drill from its course comprising: a shank member; a tooth on the lower extremity of said shank member to engage the bottom of the well; a lower bearing positioned in said shank member engaging one side of said drill pipe; an upper bearing in said shank member engaging the opposite side of said drill pipe to cause the latter to flex within said shank member; a shoulder projecting from said drill; and a socket in said shank member for receiving said shoulder when said drill is moved upwardly to cause said shank member to rotate with said drill pipe.

3. A whip stock for cooperating with the drill pipe, tool joint, and drill of a well drilling apparatus to deviate said drill from its course comprising: a shank member; a tooth on the lower extremity of said shank member to engage the bottom of the well; a lower bearing position in said shank member engaging one side of said drill pipe; an upper bearing in said shank member engaging the opposite side of said drill pipe to cause the latter to flex within said shank member; a lug projecting from said tool joint; a socket in said shank member for receiving said lug; and

means for supporting said lug until a predetermined pressure is placed on said drill pipe.

4. A whip stock for cooperating with the drill pipe, tool joint, and drill of a well drilling apparatus to deviate said drill from its course comprising: a shank member; a tooth on the lower extremity of said shank member to engage the bottom of the well; a lower bearing positioned in said shank member engaging one side of said drill pipe; and an upper bearing in said shank member engaging the opposite side of said drill pipe to cause the latter to flex within said shank member; a lug projecting from said tool joint; a socket in said shank member for receiving said lug; and means for supporting said lug until a predetermined pressure is placed on said drill pipe; said means comprising of a leaf spring extending across the shank member adjacent said tool joint and providing a rest for said lug.

5. Means for deviating the course of a well drill pipe comprising: a shank member surrounding the lower extremity of said drill pipe; a bearing in the lower part of said shank member engaging one side of said drill pipe; a second movable bearing in the upper portion of said shank member, engaging the other side of said drill pipe; and means for moving second bearing downwardly with said drill pipe, said second bearing resting against a wedge surface in said shank member so that when it moves downwardly it will wedge against and flex said drill pipe.

6. A whip stock for rotary well drilling rigs, of the type having a drill pipe terminating in a tool joint and a drill, comprising: a relatively long

channel member, the channel in the upper portion of which faces in one direction and the channel in the lower portion of which faces in the opposite direction, said channels providing a passage for said drill pipe; a semi-circular bearing in the upper channel engaging one side of said drill pipe; a second semi-circular bearing in the lower channel engaging the opposite side of said drill pipe; means on said channel member for preventing rotation in said well; and a circular collar projecting from the upper extremity of said channel member about said drill pipe, said collar having a concentrically elongated passage for said drill pipe.

7. A whip stock for rotary well drilling rigs, of the type having a drill pipe terminating in a tool joint and a drill, comprising: a relatively long channel member, the channel in the upper portion of which faces in one direction and the channel in the lower portion of which faces in the opposite direction, said channels providing a passage for said drill pipe; a semi-circular bearing in the upper channel engaging one side of said drill pipe; a second semi-circular bearing in the lower channel engaging the opposite side of said drill pipe; means on said channel member for preventing rotation in said well; a circular collar projecting from the upper extremity of said channel member about said drill pipe, said collar having a concentrically elongated passage for said drill pipe; and a wedge bearing member positioned in said passage to force said drill pipe against the first semi-cylindrical bearing.

DANIEL B. MONROE.