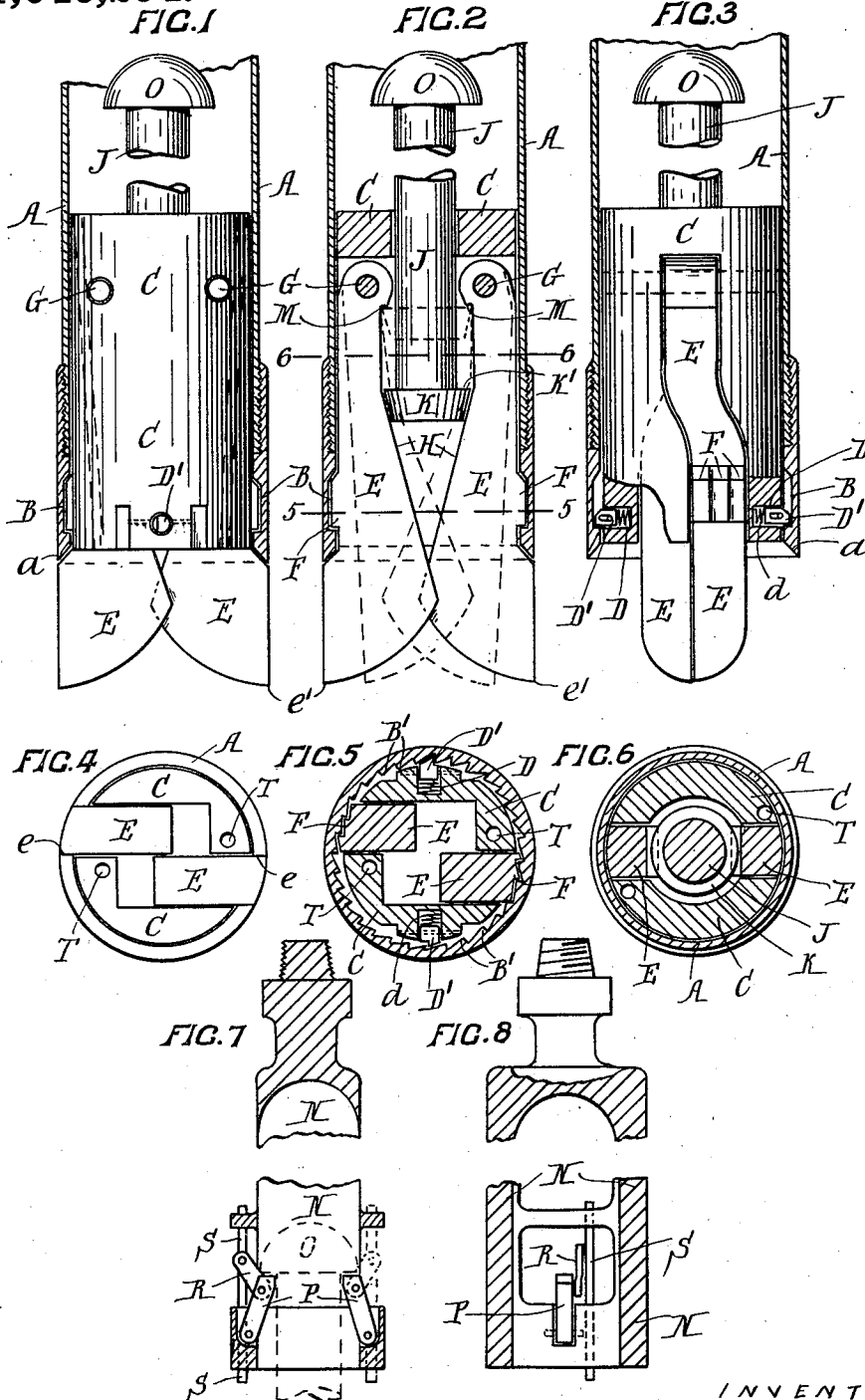


J. H. HERMAN & B. J. WEGER.
DEEP WELL BORING APPARATUS.
APPLICATION FILED DEC. 15, 1911.

1,046,294.

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JOHN HENRY HERMAN AND BERNARD JACOB WEGER, OF NAPIER, NEW ZEALAND.

DEEP-WELL-BORING APPARATUS.

1,046,294.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, JOHN HENRY HERMAN and BERNARD JACOB WEGER, citizens of the United States of America, residing at Napier, New Zealand, have invented a new and useful Improvement in Deep-Well-Boring Apparatus; and we do hereby declare the following to be a full, clear, and exact description of the same.

This invention relates to appliances used in the boring of oil and like wells and it has been designed in order to provide for such being sunk with greater ease and expedition than is at present the case.

With the appliances at present in use it is customary when boring through different natures of strata to change from the "cable" to the "rotary" system of boring and vice versa and in making the change from the "rotary" to the "cable" it is required to withdraw an inner tubular casing from the bore and in re-commencing the "rotary" to replace such casing.

The present invention has been designed to obviate the necessity for using this inner casing and the consequent necessity of its withdrawal and replacement when making the changes mentioned, and to utilize the bore casing itself for driving the rotary drilling head by providing a special construction of drill head that is adapted to be lowered through the casing and locked within its bottom end and to be withdrawn therefrom at will. The drill head carries the boring bits and means whereby, when the head has been lowered to the bottom of the casing, the bits will extend below it and be expanded to extend beyond the outer periphery of the casing and thus to bore the necessary clearance for the sinking of the casing. These means are also such that when the drill head is raised the bits will be drawn inward radially so as to lie within the compass of the head to permit of the head being raised through the casing. Special means are also provided for lowering the drill head into position, and for raising it when required.

In fully describing the invention, reference will be made to the accompanying sheet of drawings, in which:—

Figure 1 is a front elevation of the drill head in position within the bore casing, which is shown in section. Fig. 2 is a sectional elevation thereof. Fig. 3 is a side elevation, partly in section, of the drill head

in position in the casing which is shown in section. Fig. 4 is an underneath plan of the drill head and casing. Fig. 5 is a sectional plan taken on the line 5—5 of Fig. 2 and looking upward from said line. Fig. 6 is a sectional plan taken on the line 6—6 of Fig. 2. Figs. 7 and 8 are longitudinal sections, respectively on lines at right angles to each other, of the appliance for use in lowering and raising the drill head.

In carrying out the invention the bore casing A is made with the usual reinforced lower end having a chisel edge *a* on its bottom. This lower end is, however, formed with a groove B in its inner periphery, near the bottom and the surface of this groove is made with ratchet teeth or notches B' thereon and extending right around it.

The drill head C is formed of a circular block of metal of a size to neatly fit the casing A so that it may pass freely up and down therein. Within small recesses D (Figs. 3 and 5) made to extend inward from the head surface, toothed blocks D' are fitted and spring cushioned by the springs *d* so as to be kept normally projecting beyond the peripheral edge of the drill head. The teeth of these blocks are adapted to engage with the teeth B' upon the inside of the casing and thus when the head is lowered through the casing and the blocks reach the position of these teeth, to spring out into engagement therewith and lock the head to rotate with the casing when rotation is imparted to it in one direction by the usual means employed for such purpose. The upper edges of the groove B and of the blocks D' are inclined as shown in Fig. 3 in order that when the drill head is raised, the blocks will be forced back into their recesses and permit of the head sliding up within the casing.

The drill head is formed with a slot extending diametrically through it and within this slot a pair of drilling bits E are pivotally hung on cross pins G to swing radially within the head. These bits are so shaped that when swung inward, their lower ends will overlap each other within the compass of the head. The outer edge of each bit is shaped to fit beneath the chisel edge *a* of the casing and to extend downward for a suitable distance below such edge. This portion is also formed with a cutting edge *e* (Fig. 4) and the lower end of the bit is curved upward and inward, as shown in Figs. 1

and 2, to form a cutting point e' for the bit. Each bit is also formed with teeth F on its outer edge adapted to engage with the teeth B' in the casing A when the bit is swung outward on its pivot G, and thus also to lock the bits to revolve with the casing and thereby to lessen the strain upon the cross pins G. Each bit is formed on its inner edge with a face H inclining upward and outward so that the faces H of the two bits together form a wedge shaped opening as shown in Fig. 2. A rod J is mounted to slide in a central bore in the head and this rod is provided with a wedge shaped block K on its lower end. This block, when the rod is moved down in the head is adapted to engage with the faces H of the bits and to force the bits apart so that they will swing outward. The block K is formed with a shoulder K' on its top and each bit is provided with a tooth M on its inner surface adjacent to the pin G.

The block K is made capable of a limited amount of vertical movement between the faces H and the teeth M and at the upward limit of its movement engages with the teeth M and turns the bits inward to lie within the compass of the head, as shown by the dotted lines in Fig. 2. The rod J is used as the suspension rod for the drill head and when such is hung upon it, the rod will occupy the upward limit of its movement in the head and thus keep the bits swung in. The head may thus be raised or lowered in the casing while suspended on the rod.

In use, when the head is lowered and the blocks D' reach the level of the groove B, the blocks will spring out and engage with the teeth B' and the further lowering of the head thereby be prevented. When the head thus stops, the rod J will move down by its own weight causing the block K to engage with the inclined faces H of the bits and to force the bits out to their operative positions as shown by the full lines in the drawings. The rotation of the casing A will then impart a rotation to the drill head and bits so that the bits will bore the required hole for the sinking of the casing. On the withdrawal of the drill head, the raising of the rod will first turn the bits in and will then lift the head through the casing.

The means designed for use in lowering and raising the head shown in Figs. 7 and 8 are adapted to lower and release the head, or to grip and raise it, as required. These means consist of a hollow sleeve N adapted to be suspended from a cable or the like and to fit over a head O formed on the top end of the rod J. The sleeve carries within it a pair of pawls P pivoted in grooves on its inner surface and arranged to extend upward and inward from the pivot points. Each of these pawls is connected by means

of the connecting bar R with a rod S mounted to slide in the wall of the sleeve N and closely fitting in its bore so as to remain at any position to which it is moved. The upward movement of these rods S will thus cause the pawls P to be drawn out at their upper ends. When lowering the drill head, the sleeve N is passed down over the rod J and the pawls P positioned to engage beneath the head O of such rod. The rod and drill head will then be suspended from the sleeve and may be lowered. When the head reaches its working position in the casing, the sleeve will move down along the rod J until the bottom ends of the sliding rods S (which are made of such a length as to project beyond the bottom of the sleeve) engage with the drill head. The weight of the sleeve will then cause it to move down and the rods S to slide upward within it thereby drawing the pawls P outward so that when the sleeve is drawn up they will clear the head O of the rod J and thus allow for the sleeve passing clear up through the casing. To raise the drill head, the pawls P are first disconnected from the rods S so that they will fall inward by gravity. The sleeve is then lowered down so that it will pass over the head O of the rod J and the pawls slide over and engage beneath such head in order to lift the rod and drill head when the sleeve is withdrawn.

The drill head is formed with the apertures T extending up through it to permit of the escape of water and other liquids from below to above the head as it is being lowered through the casing. When the drill head has been removed, the bore casing may be used in the ordinary way, for sinking by the "cable" system.

What we claim as our invention and desire to secure by Letters Patent is:—

1. In deep well boring apparatus, the combination with a bore casing formed with a toothed groove on its inner periphery, of a drill head adapted to be lowered through the casing, spring controlled blocks mounted to slide radially in the drill head and to engage with the teeth in the casing, boring bits pivotally hung in the drill head and means whereby such bits may be swung out beyond the compass of the head or swung in within the compass thereof, substantially as specified.

2. In deep well boring apparatus, the combination with a bore casing, of a drill head adapted to pass through the casing and having means for locking with the casing, a suspension rod fitting axially in the drill head and capable of limited longitudinal movement therein, boring bits pivotally hung in the drill head and each formed with an inwardly inclined face on the lower portion of its inner edge and with an inwardly extending tooth at the upper portion of

such edge, and a wedge shaped block upon the bottom end of the suspension rod situated between the inclined faces and the teeth upon the bits, substantially as herein specified.

3. In deep well boring apparatus, a drill head adapted to pass into the bore casing and to be locked thereto, a suspension rod arranged axially in the drill head and capable of limited longitudinal movement therein, and boring bits carried in the drill head and adapted to be swung out beyond the compass thereof by the downward movement of the suspension rod and to be swung in within its compass by the upward movement of the suspension rod, substantially as herein specified.

4. In deep well boring apparatus, a drill head adapted to pass into the bore casing and to be locked thereto and carrying boring bits pivotally suspended therein, a longitudinally movable suspension rod arranged axially in the drill head, a head upon the upper end of such rod, means on the lower end of said rod adapted as the rod

is moved downward to engage and force outward said bits, a sleeve adapted to be passed down the bore casing and to encircle the top end of the suspension rod, said sleeve having a portion adapted to engage the head of said rod and force it downward, pawls pivoted within the sleeve and adapted to engage beneath the head on the rod, sliding rods mounted longitudinally with the sleeve and connections between the sliding rods and the pawls, said sliding rods being adapted to engage said drill head to remove said pawls out of engagement with said head when said sleeve has forced said suspension rod downward substantially as herein specified.

In testimony whereof, we have signed this specification in the presence of two subscribing witnesses.

JOHN HENRY HERMAN.
BERNARD JACOB WEGER.

Witnesses:

W. ALEXANDER,
M. E. BROWN.