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DRILL.

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Patented Oct. 6, 1914.

1,112,946.

Fig. 1.

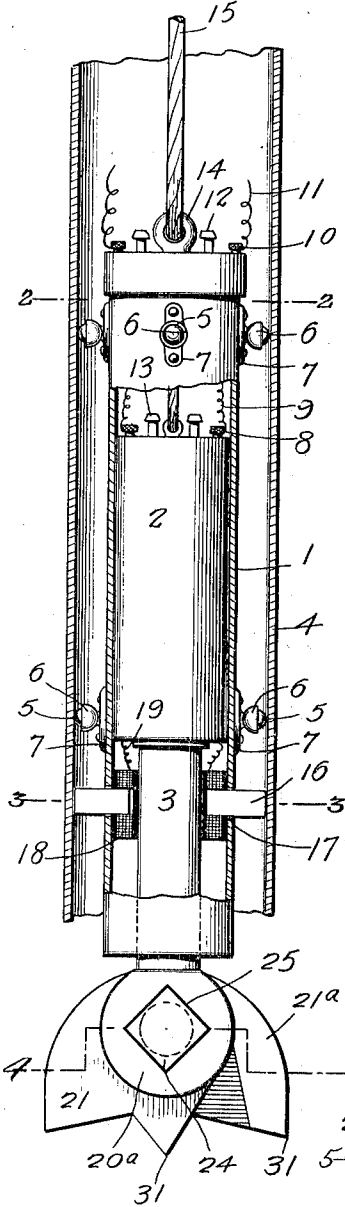


Fig. 2.

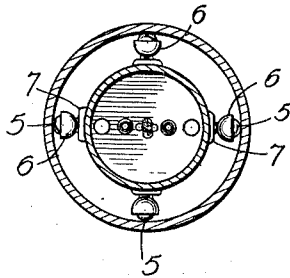


Fig. 5.

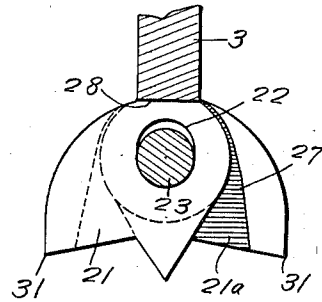


Fig. 3.

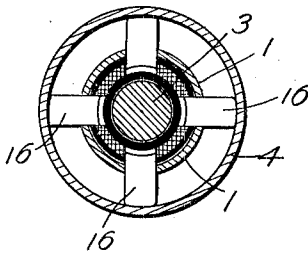


Fig. 6.

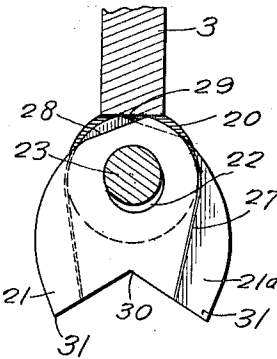
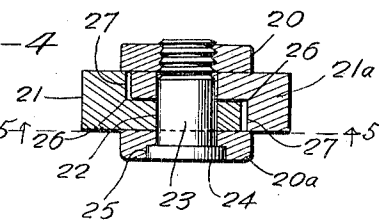


Fig. 4.



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DRILL.

1,112,946.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WALTER J. TURNBULL, a citizen of the United States, and a resident of New Orleans, in the parish of Orleans and State of Louisiana, have invented a new and useful Improvement in Drills, of which the following is a specification.

My invention is an improvement in drills, and has for its object to provide a device of the character specified, wherein the motor is provided with means for anchoring the same from rotation in the well casing, the said means being electrically operated and releasable at will, and wherein a peculiar form of cutting blade or knife is provided, so arranged that when in operation and actually cutting, the said knives or blades will be extended beyond the peripheral surface of the well casing to undercut or underream the same, and which when not cutting and not in contact with the material to be cut, may be moved into contracted position by the mere lifting of the drill.

In the drawings:—Figure 1 is a longitudinal section of the improved drill, Figs. 2, 3 and 4 are sections on the lines 2—2, 3—3, and 4—4, respectively, of Fig. 1, and Figs. 5 and 6 are sections on the line 5—5 of Fig. 4 showing the cutters or fingers in different positions.

The present embodiment of the invention comprises a core, box or casing 1, of approximately cylindrical form in which is a motor 2, the said motor being of any desired construction, in the present instance, an electric motor, and the bit 3 is connected with the motor in the usual manner, to cause the bit to rotate when the motor is in operation. The casing 1 is held coaxial with the well casing 4, by means of bearing balls 5, each of the said bearing balls being mounted in a race or holder 6, and the said bearing balls engage the inner surface of the casing 4. The races 6 are arranged in series, a series near the top of the casing 1, and a series intermediate the ends of the casing, but nearer the lower end than the upper. Each series comprises four races or holders for the balls, and the said races are arranged at angle of 90 degrees with respect to each other. Each race or holder is provided with a base 7, and the said bases are secured to the casing 1 in any suitable manner. The motor 2 is provided with the

usual binding posts 8, which are connected by lead wires 9, with other binding posts 10 on the upper end of the casing 1, and lead wires 11 connect the binding posts 10 with a suitable source of supply. When the motor 2 is a fluid operated motor driven by air under pressure or the like, the connection with the motor is made by means of nipples 12 on the casing 1, and other nipples 13 on the motor.

The upper end of the casing 1 is provided with an eye 14, and a cable 15 has one end connected with the eye for raising and lowering the drill. It will be understood that the cable 15 is in sections, and that the said cable passes over a sheave or pulley on a derrick to a suitable lifting mechanism for raising and lowering the drill. In actual practice the cable will be wound on the drum or the like, the length corresponding to the depth of the well, and will be let out as required to follow the drill.

A series of four magnets 16 is arranged around the bit below the motor, the said magnets being spaced at angles of 90 degrees from each other, and each magnet extends through an opening 17 in the casing 1. The magnets are arranged radially with respect to the bit, and the said magnets are held at their inner ends by means of a ring 18, the ring encircling the bit loosely. The magnets are not permanent magnets, but are intended to be magnetized by the current that supplies the motor, and lead wires 19 are provided for connecting the ring 18 with the said circuit that supplies the motor. The outer ends of the magnets contact loosely with the inner surface of the well casing 4, in such manner that while the drill may move vertically freely in the casing, the said drill will be held from rotation with respect to the well casing, by means of the magnets when they are energized. The motor and the casing 1 are thus held from rotation with the drill.

The lower end of the bit 3 is provided with oppositely arranged lugs or ears 20 and 20^a, the said lugs being spaced laterally from each other, and the blades or knives of the bit are held between the said lugs or ears. There are two knives or blades, one of the said knives or blades being designated by the reference character 21, and the other by the reference character 21^a, and each knife

or blade is provided with an opening 22 for receiving a screw bolt 23, which connects the knives or blades with the bit. The openings 22 are of elliptical shape, and arranged with their long axes vertical, so that a limited motion obtains between the bit and the blades. The screw bolt 23 has a polygonal head 24, and the lug or ear 20^a is counterbored as shown at 25, to receive the said head. The lug or ear 20 has a threaded opening for engagement by the threaded portion of the bore. The knives or blades 21—21^a are rabbeted on their adjacent faces as indicated at 26, and the rabbeted portions fit together in such manner that the said blades may move toward and from each other to a limited extent, as indicated in Figs. 5 and 6.

A shoulder 27 is formed between the rabbeted portion of each blade and the body portion thereof, and the said shoulders are adapted for engagement by the inner edges of the blades or knives, to limit the inward movement of the knives or blades with respect to each other.

It will be noted from an inspection of Figs. 5 and 6 that each of the knives or blades is provided with a plane surface 28 at its upper end for engagement by the plane lower end of the bit, that is, by that portion of the said lower end between the ears or lugs 20—20^a. When the bit is moved downwardly as shown in Fig. 5, the said plane lower end 29 of the bit engages the plane surfaces 28 of the knives or blades and moves them away from each other as shown in Fig. 5.

The lower end of each blade or knife is provided with an approximately V-shaped recess 30, so arranged that two points 31 are provided on each knife or blade, and the arrangement is such that when the knives or blades are in the position of Fig. 6, the pointers 31 register, so that taking the blades or knives as a whole, but two points are seen. When the blades are separated as shown in Figs. 1 and 5, three points 31 are visible, the inner points of the two blades overlapping and registering.

When the bolt 23 is in the position shown in Figs. 1 and 5, the blades or knives are extended to underream or cut below the casing 4, while when the bolt 23 is moved upwardly with respect to the knives or blades the blades are moved inwardly to a position such that they may be withdrawn through the well casing 4.

When there is no pressure on the points 31 of the knives or blades, that is, when the said knives or blades depend from their connection with the bit, the said knives or blades take the position of Fig. 6, and the bit may be lowered through the well casing. As soon however, as the knives or blades strike the surface that they are intended to cut, they take the position of Fig. 5, and are held

in this position against movement toward the position of Fig. 6, by the engagement of the plane surfaces 28 and 29 of the knives or blades and the bit.

When the motor 2 is driven by fluid under pressure, the winding or coil 18 of the magnets 16 is interposed in an electrical circuit, so that the said magnets may be energized.

The operation of the device is as follows:—The drill is lowered into the well casing, or into contact with the material to be cut, with the bits in the position of Fig. 6. As soon as the bits strike the surface to be cut, they are moved into the position of Figs. 1 and 5. When now the bit 3 is rotated by the motor, the bits cut their way through the material, and the drill, as a whole, follows the knives or blades. The magnets 16 prevent rotation of the motor and the casing 1 through their magnetic attraction for the metallic well casing 4.

Whenever it is desired to remove the drill, it is only necessary to make traction on the cable 15. As soon as the bolt 23 is at the upper ends of the elliptical openings 22, the blades will take the position of Fig. 6, and may be moved through the well casing 4. The more firmly the points of the blades are pressed into contact with the material to be cut, the more firmly they are held in extended position. As long as the blades are cutting, they cannot take the contracted position of Fig. 6. As soon as the current is cut off from the ring 18, the magnets 16 lose their magnetism and offer no resistance to the withdrawal of the drill.

I claim:—

1. In a drill, a stem having laterally spaced lugs at its lower end, a pair of blades arranged between the lugs, each of the said blades having an opening at its upper end, and a bolt passing through the openings of the blades and engaging the lugs of the stem to pivot the blades to the stem to permit the blades to swing toward and from each other into contracted or expanded position, said blades being similar and each being rabbeted on its inner face to receive the rabbeted portion of the other blade, a shoulder being formed between the rabbeted portion and the body portion of each blade for engagement by the inner edge of the other blade to limit the movement of the blades toward each other into contracted position, the openings of the blades being elliptical and having their long axes parallel with the axis of the stem to permit a limited longitudinal movement of the blade with respect to the stem, each blade having a plane portion at its upper end for engagement by the end of the stem to hold the blades in expanded position, each blade being notched at its lower end to form cutting points, the inner points of the blades registering with each other when the blades are

expanded and registering with the other blade when in contracted position.

2. In a drill, a stem having laterally spaced lugs at its lower end, a pair of blades arranged between the lugs, each of the said blades having an opening at its upper end, and a bolt passing through the openings of the blades and engaging the lugs of the stem to pivot the blades to the stem to permit the blades to swing toward and from each other into contracted or expanded position, said blades being similar and each being rabbeted on its inner face to receive the rabbeted portion of the other blade, a shoulder being formed between the rabbeted portion and the body portion of each blade for engagement by the inner edge of the other blade to limit the movement of the blades toward each other into contracted position, the openings of the blades being elliptical and having their long axes parallel with the axis of the stem to permit a limited longitudinal movement of the blade with respect to the stem, each blade having a plane portion at its upper end for engagement by the end of the stem to hold the blades in expanded position.

3. In a drill, the combination with the stem adapted to rotate on its long axis, of cutting blades pivoted to the stem for swinging movement toward and from the axis of the stem into contracted and expanded position, means for limiting the movement of the blades toward each other, each blade having its lower cutting end notched to form inner and outer points, the inner points being of less length than the outer points to cause the outer points to move away from each other when the blades are engaged with the work, said blades having a limited movement longitudinally of the stem, and means in connection with the blades and the stem for holding the blades in expanded position

when the said blades are moved toward the stem.

4. In a drill, the combination with the stem adapted to rotate on its long axis, of cutting blades pivoted to the stem for swinging movement toward and from the axis of the stem into contracted and expanded position, means for limiting the movement of the blades toward each other, each blade having its lower cutting end notched to form inner and outer points, the inner points being of less length than the outer points to cause the outer points to move away from each other when the blades are engaged with the work.

5. In a drill, the combination with the stem adapted to rotate on its long axis, of cutting blades pivoted to the stem for swinging movement toward and from the axis of the stem into contracted and expanded position, the lower working ends of the blades being notched to form inner and outer points, the inner points being of less length than the outer to cause the blades to move away from each other when they engage the work, and means in connection with the stem and the blades for holding the blades expanded when they are in engagement with the work.

6. In a drill, the combination with the stem adapted to rotate on its long axis, of cutting blades pivoted to the stem for swinging movement toward and from the axis of the stem into contracted and expanded position, the lower working ends of the blades being notched to form inner and outer points, the inner points being of less length than the outer to cause the blades to move away from each other when they engage the work.

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Witnesses:

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