March 28, 1939. W. L. ACKER 2,151,673

CORE DRILL

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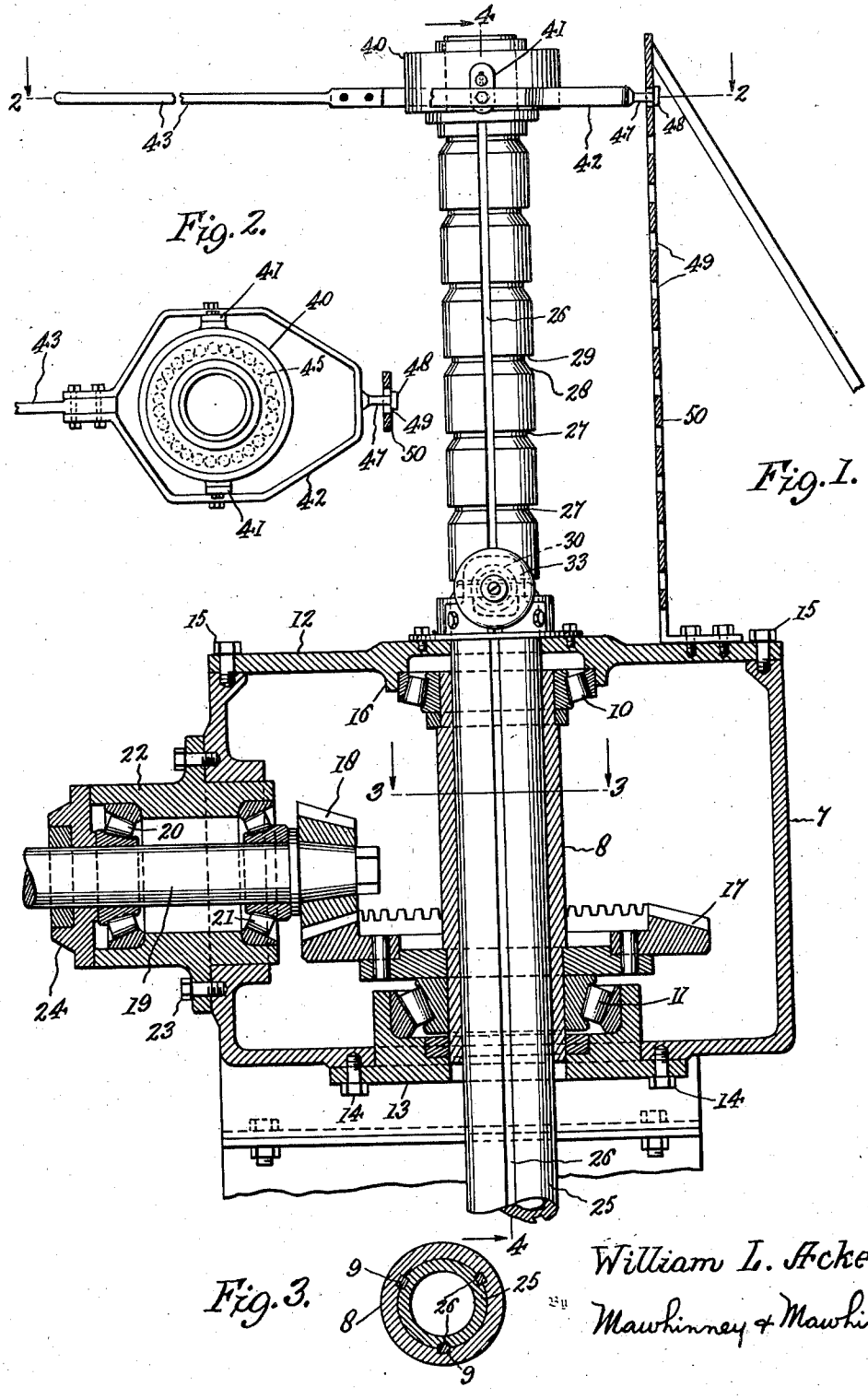


Fig. 2.

Fig. 1.

Fig. 3.

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Fig. 4.

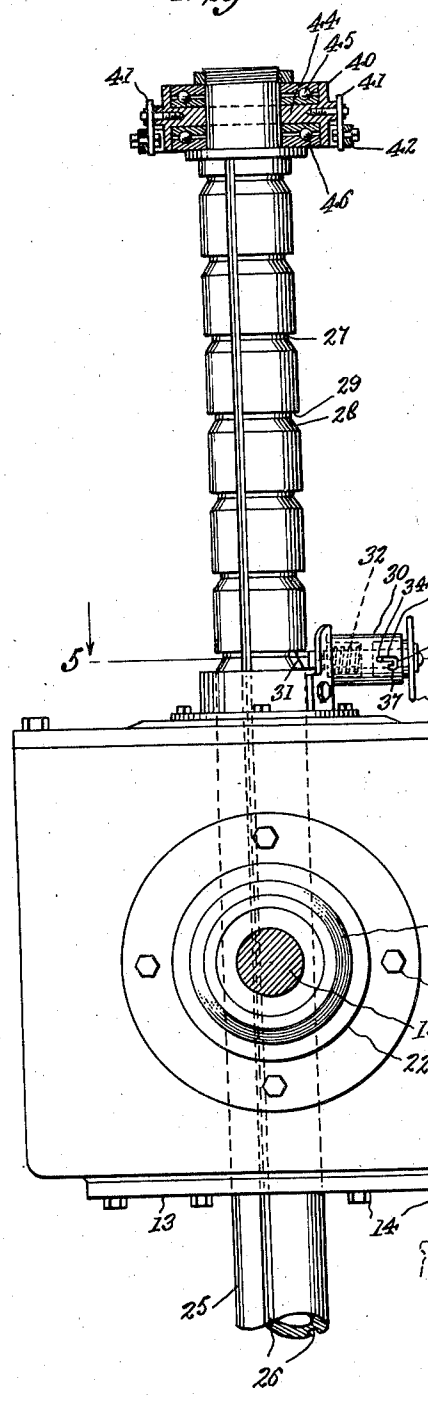


Fig. 5.

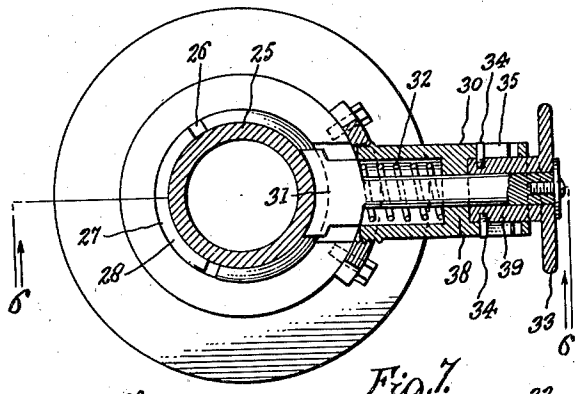


Fig. 7.

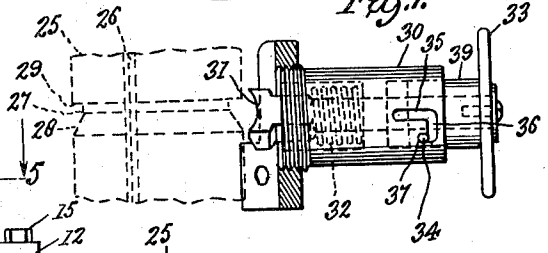
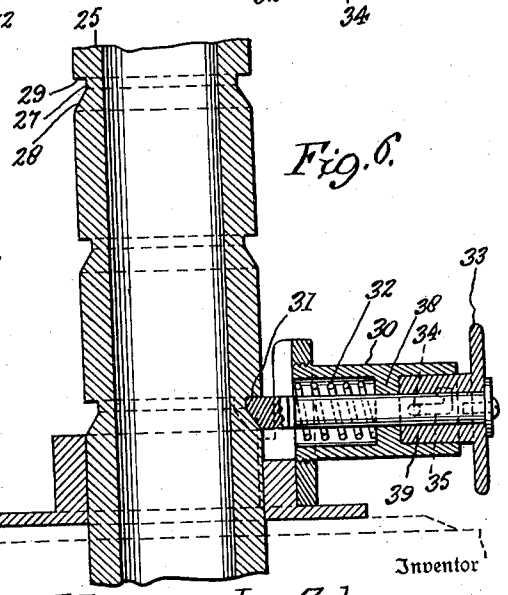


Fig. 6.



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CORE DRILL

William L. Acker, Scranton, Pa.

Application March 26, 1938, Serial No. 198,304

8 Claims. (Cl. 255—22)

The present invention relates to improvements in core drills and has for an object to provide an improved core drill useful for sub-surface exploratory purposes, for instance in the taking of core samples from concrete roads to show the interior character of the construction and mixture.

It is one purpose of the invention to provide a totally-enclosed gear box for the driving gears to enable such gears to run in a bath of oil.

Another object of the invention is to provide the vertical spindle with grooves at intervals around its circumference whereby to prevent the spindle from slipping downwards when the grooves are engaged by a latch provided for this purpose.

A further object of the invention is to provide a hand lever for applying the necessary pressure for drilling, and to connect this hand lever to the vertical spindle by means of a ball thrust bearing and also preferably through a swinging link joint connection.

A still further object of the invention is to provide, in connection with the hand lever, a variable fulcrum for such lever; for instance in the example shown by means of a rack or a series of holes in a standard of structural steel.

A still further object of the invention is to provide a ball thrust bearing for the vertical spindle in conjunction with a hand lever and fulcrum rack, these parts being susceptible of placement above or below the gear box.

With the foregoing and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claims appended hereto.

In the drawings, wherein like symbols refer to like or corresponding parts throughout the several views,

Figure 1 is a vertical elevation, with parts broken away and parts shown in section illustrating an improved core drill constructed in accordance with the present invention.

Figure 2 is a horizontal section taken on the line 2—2 of Figure 1.

Figure 3 is a similar view taken on the line 3—3 in Figure 1.

Figure 4 is a vertical section taken on the line 4—4 in Figure 1.

Figure 5 is a horizontal section taken on the line 5—5 in Figure 4.

Figure 6 is a vertical section taken on the line 6—6 in Figure 5, and

Figure 7 is a fragmentary side view with the latch in the pulled-out position.

Referring more particularly to the drawings, 7 designates a gear box which is totally enclosed, and 8 represents a thick tube quill made of steel or other appropriate material.

As shown more particularly in Figure 3, the quill contains fast thereto and projecting upon its inner circumference one or more keys 9, three such keys being shown in the one embodiment of the invention illustrated in the drawings.

The quill 8 is rotatably carried in the gear box by means of roller or other bearings 10 and 11. The quill does not extend above the closed top 12 of the gear box and terminates at its bottom within the gear box 7 or within a bottom plate 13, which bottom plate may carry the lower roller bearing assembly 11. In fact the plate 13 may constitute the base upon which the unit consisting of the lower roller bearing assembly 11 and quill 8 is mounted. This plate 13 may be secured to the bottom of the gear box by appropriate fastenings 14.

Suitable fastenings 15 may be used to secure the removable top 12 in place, this top having an annular guide or boss 16 for the upper roller bearing assembly 10.

The quill 8 is rotatably driven by a bevel gear 17 made fast thereon and meshing with a beveled pinion 18 which receives its rotation from a power shaft 19 extending horizontally through one side wall of the gear box 7. The roller bearings 20 and 21 of the power shaft 19 are carried within a housing 22 removably affixed, as by the fastenings 23 to the side wall of the gear box 7, and closed at its outer end by a head or plate 24 carrying an appropriate packing. Within the quill 8 is a vertical spindle 25 which is free to slide up and down with respect to the quill and through the gear box 7. The top plate 12 and the bottom plate 13 are perforated to permit of the passage of the vertical spindle 25 therethrough. At the bottom end of the spindle 25, which is not shown, is connected the core barrel or drill rods in a well known manner.

The external diameter of the vertical spindle 25 is such as to fit slidably yet snugly within the driving quill 8. The external surface of the vertical spindle 25 has one or more keyways 26 to receive the keys 9 whereby rotation of the quill 8 will be imparted to the vertical spindle 25 without interfering with the vertical adjustment of the spindle 25 up and down through the quill 8.

The upper portion of the spindle 25 has machined therearound a number of ratchet-like slots 27. The lower walls 28 of these slots are beveled while the upper walls 29 form abrupt

shoulders extending substantially horizontally. The slots 27 are annular or extend around the entire circumference of the vertical spindle.

Carried by the cover 12 is a latch case 30, shown more particularly in Figures 5 and 6 and containing a latch 31 urged toward the spindle by a coil spring 32. In Figures 5 and 6 the latch is shown as occupying one of the notches or slots 27. The horizontally flat top wall of the latch 31 forms an abutment for the upper wall or shoulder 29 of the spindle slot. The latch head or nose 31 is shown in Figure 6 as being beveled on its underside to agree substantially with the taper given the lower walls 28 of the spindle slots. The purpose of the latch is to hold the vertical spindle at any one of the ratchet slots 27 whereby to prevent the falling of such spindle. The spindle may be raised without withdrawing the latch which automatically is backed off by reason of the inclined lower wall riding up upon the beveled underside of the latch nose. However, the spindle will not fall until the latch is manually withdrawn.

When the spindle 25 is being rotated and forced downward, the latch is disengaged and held out by pulling the handle 33 backward and giving the same a partial turn which causes the pins 34 which slide in slots 35 to enter the cross channels 36 and be ultimately received into the notches 37 in which the coil spring 32 will hold the same until by manual exertion such pins 34 are lifted out of the notches 37 and returned back by a reverse rotary movement of the handle 33 into the slots 35, whereupon the coil spring 32 will automatically restore the latch 31 to its engaged position in a notch or slot 27. It is possible, as above explained, to lift the spindle 25 upwards, the latch sliding into and out of successive grooves 27, but the spindle is prevented from falling downward until the latch is manually disengaged by pulling out the handle 33. A septum or diaphragm 38 in the latch case 30 provides an abutment at one side for the coil spring 32 and a stop at the other side for the shank 39 of the handle 33.

At the top of the spindle is a thrust bearing 40. Links 41 connect this thrust bearing at opposite sides with the yoke 42 of a hand lever 43. The links 41 permit the lever to swing horizontally.

As shown in Figure 4 the links are connected to a central member 44 of the thrust bearing. This central member pushes upwardly against ball or other bearings 45 and downwardly against similar bearings 46. The raising movement of the lever 43 will exert pressure upon the upper ball bearing assembly 45 and thus cause lifting of the vertical spindle 25. A downward movement of the hand lever 43 will exert pressure upon the lower ball bearing assembly 46 and transmit such pressure to the vertical spindle 25 and to the core barrel or drill.

The lever 43, or rather its yoke 42, carries a fulcrum pin 47 having a head 48 thereon adapted to pass through ony one of a vertical series of spaced holes or openings 49 in a standard 50 which may be made of a piece of structural steel. This perforated standard 50 forms a rack to hold the short end 47 of the lever 43. The rack 50 may be supported on the gear box and appropriately braced from other parts of the truck or structure upon which the device is mounted.

There are three common methods of operation for core drills in use at the present time. One is a screw feed, in which the spindle is threaded to fit in a stationary nut and travels downward or upward as the nut rotates. In the second method, the spindle passes through a hydraulic cylinder, being attached to a piston in the middle of the cylinder. Water or oil is admitted above or below the piston to accomplish the feed up or down. The third method is to accomplish the vertical feed through the use of a rack or racks and pinion.

The present invention purposes to accomplish the feed by hand through the lever 43. Pressure, upward or downward, is regulated by either the length of the lever 43 or the weight exerted against such lever. In actual drilling, and when the spindle 25 is connected to a line of drilling rods at the bottom of which is a core barrel, the latch 31 is disconnected. The spindle is then free to slide up and down. A source of power being connected to the drive shaft 19, the quill and the spindle are put into rotation. When the spindle is disconnected from the line of drilling rods or core barrel and it is desirable to lift it up out of the way, the latch 31 is snapped in place.

The hand lever has the advantage of permitting quicker lifting and replacing of core bit at the bottom of the hole. In drilling many materials, particularly where there is a tendency to plug, it is necessary to lift the bit from bottom of hole slightly to keep the bit free and then immediately force it back to bottom. Also, in feeding the bit by hand, the operator is able to tell immediately, through the sense of touch, whenever the bit is not running smoothly or properly or has encountered broken or blocky material.

The fulcrum rack, with thrust bearing and lever 43, may be placed underneath the gear box 7 as well as above the same. The ball thrust bearing and hand lever 43 are shown above the drill for low mounting, as on a small hand truck, but the same may also be placed beneath the gear box if it is desirable to place the drill on a high mounting. By this choice of arrangement it is possible always to bring the hand lever within convenient reach of the drill operator.

The driving gears continuously run in a bath of oil which supplies lubrication at the same time to the roller bearings 10 and 11 of the quill 8, yet the construction is such that the vertical spindle 25 may slide freely through the quill and through the gear box.

With the foregoing and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claims appended hereto.

In the drawings, wherein like symbols refer to like or corresponding parts throughout the several views.

What is claimed is:

1. In a core drill, an axially slidable spindle having a series of annular grooves spaced apart along its axial length, the upper walls being abrupt and the lower walls beveled, a latch for selectively engaging said grooves to hold the spindle elevated, and means for raising and lowering said spindle, said latch having a beveled undersurface engaged by the beveled lower walls of the grooves to automatically disengage the latch on lifting movement of the spindle.

2. In a core drill, a vertical spindle mounted for axial adjustment and having a series of spaced apart grooves therein, the upper walls of the grooves being substantially horizontal and the lower walls inclined, a latch for engaging

in said grooves, a latch casing for the latch made fast adjacent said spindle, spring means for urging said latch toward the spindle, means for withdrawing the latch from engagement with the spindle, and means for holding said latch in the withdrawn position, said latch having an upper horizontal surface and an under inclined surface.

3. In a core drill, a vertically adjustable spindle having latch grooves therein, a fixed support, a latch movably mounted on said fixed support for engaging said grooves to hold the spindle in a selected vertical position, a hand lever for lifting and lowering said spindle, and a fulcrum rack for detachably engaging said hand lever in various positions of adjustment thereover.

4. In a core drill, a vertically disposed and vertically adjustable spindle having annular latch grooves spaced apart along its axis, a fixed support adjacent the spindle, a latch movably mounted on said fixed support and positioned for engaging said grooves to hold the spindle in a selected vertical position, a fulcrum rack disposed alongide said spindle, a lever having a fulcrum pin for detachably and selectively engaging various portions of said rack, a thrust bearing on said spindle, and means for connecting said lever to said thrust bearing while permitting the lever to float horizontally in accordance with its angular movement.

5. In a core drill, an enclosed oil-containing gear box, a quill rotatably mounted in said gear box, gear means in the gear box for rotating said quill, the ends of said quill being exposed through opposite parts of the gear box, a spindle extending through the gear box and through said quill, means for carrying said spindle around in rotation with said quill and at the same time permitting of the axial adjustment of the spindle through the quill, said spindle having an axial spaced series of grooves, a latch carried by the gear box for detachably engaging in a selected groove, a perforated rack bar on the gear box adjacent the spindle, a thrust bearing on the spindle, a hand lever having a yoke extending about said thrust bearing, links securing the yoke to the thrust bearing and a headed fulcrum pin on the lever for selectively engaging in the perforations of said rack bar.

6. In a core drill, a gear box, a hollow quill rotatably mounted entirely within said gear box and having its opposite ends exposed through the upper and lower parts of the gear box, gearing in said gear box for communicating rotary motion to said quill, a spindle extending through said gear box and said quill and being vertically slidable through said quill, means between said spindle and quill for imparting the rotary motion of the quill to the spindle, the upper portion of said spindle which is adapted to rise above said gear box having a series of annular grooves spaced apart axially, a latch casing carried fixedly by the upper portion of said gear box, a latch in said casing restricted by the casing from vertical movement with the spindle but having a relative radial movement to the spindle to move into and out of said annular grooves, a hand lever having its intermediate portion coupled to the top portion of said spindle and having a free fulcrum end, and a rack bar adjacent the spindle and having a series of openings progressing in a line parallel with the axis of the spindle for selectively and quick-detachably receiving the free fulcrum end of said hand lever.

7. In a core drill, a rotating hollow quill, means for rotating said quill, a support for the quill, a spindle vertically adjustable through said quill, means between the quill and spindle for driving the two together, the upper portion of said spindle which is adapted to extend above the quill having numerous closely spaced annular grooves, a latch casing held fixedly upon said support, a latch held fixedly in said casing against vertical movement with said spindle but having a limited horizontal movement in said casing to move into and out of said annular grooves to hold the spindle suspended, a hand lever coupled loosely at its intermediate part to the upper end portion of said spindle and having a free fulcrum end, and a rack bar mounted adjacent said spindle above said support and having a series of openings progressing in a line substantially parallel with the axis of the spindle, said openings adapted to successively and quick-detachably receive the free fulcrum end of said lever according to the vertical position occupied by said spindle.

8. In a core drill, an axially shiftable spindle, means for rotating said spindle, a thrust bearing connected to said spindle, a hand lever with an end forming a fulcrum pin with an enlarged head thereon and a yoke to fit on opposite sides of said thrust bearing, a swinging connection between said yoke and thrust bearing, and a rack having a series of perforations substantially parallel to said spindle and adapted to receive the fulcrum pin of the lever successively in the perforations, whereby said lever may be swung in the rack to shift the spindle axially, then the fulcrum pin removed by swinging the lever and yoke away from the rack and the pin placed in the next perforation of the rack.

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