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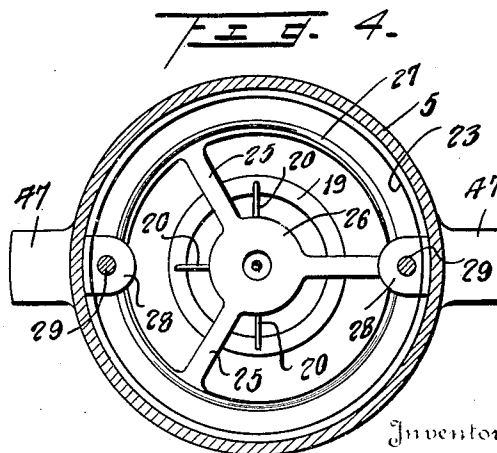
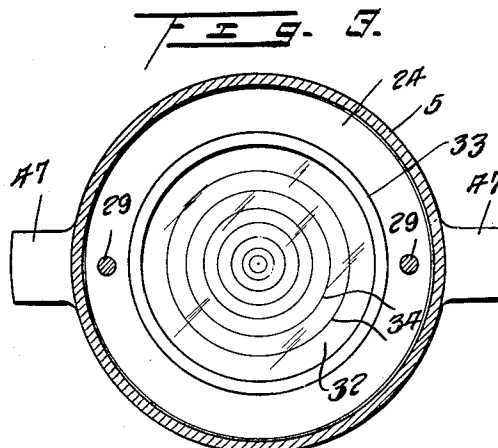
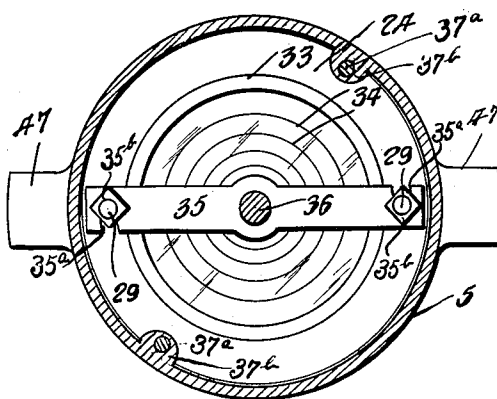
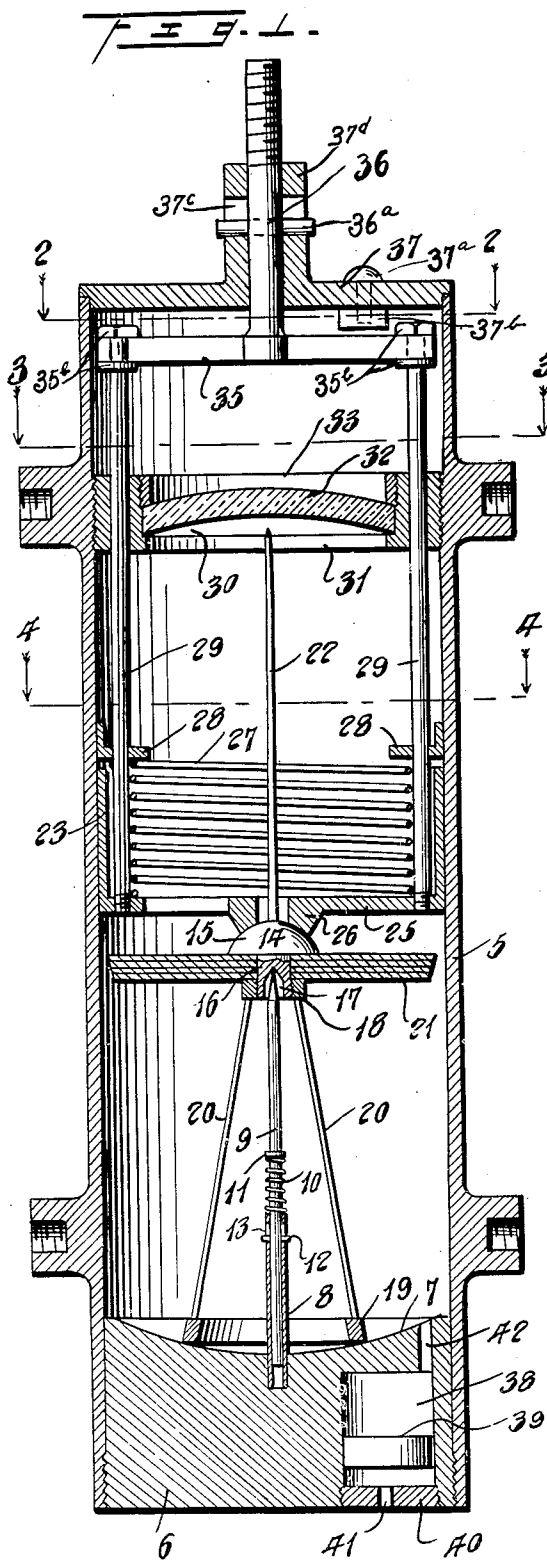
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CORE POSITION INDICATOR FOR WELL DRILLING APPARATUS

Filed July 9, 1928

2 Sheets-Sheet 1



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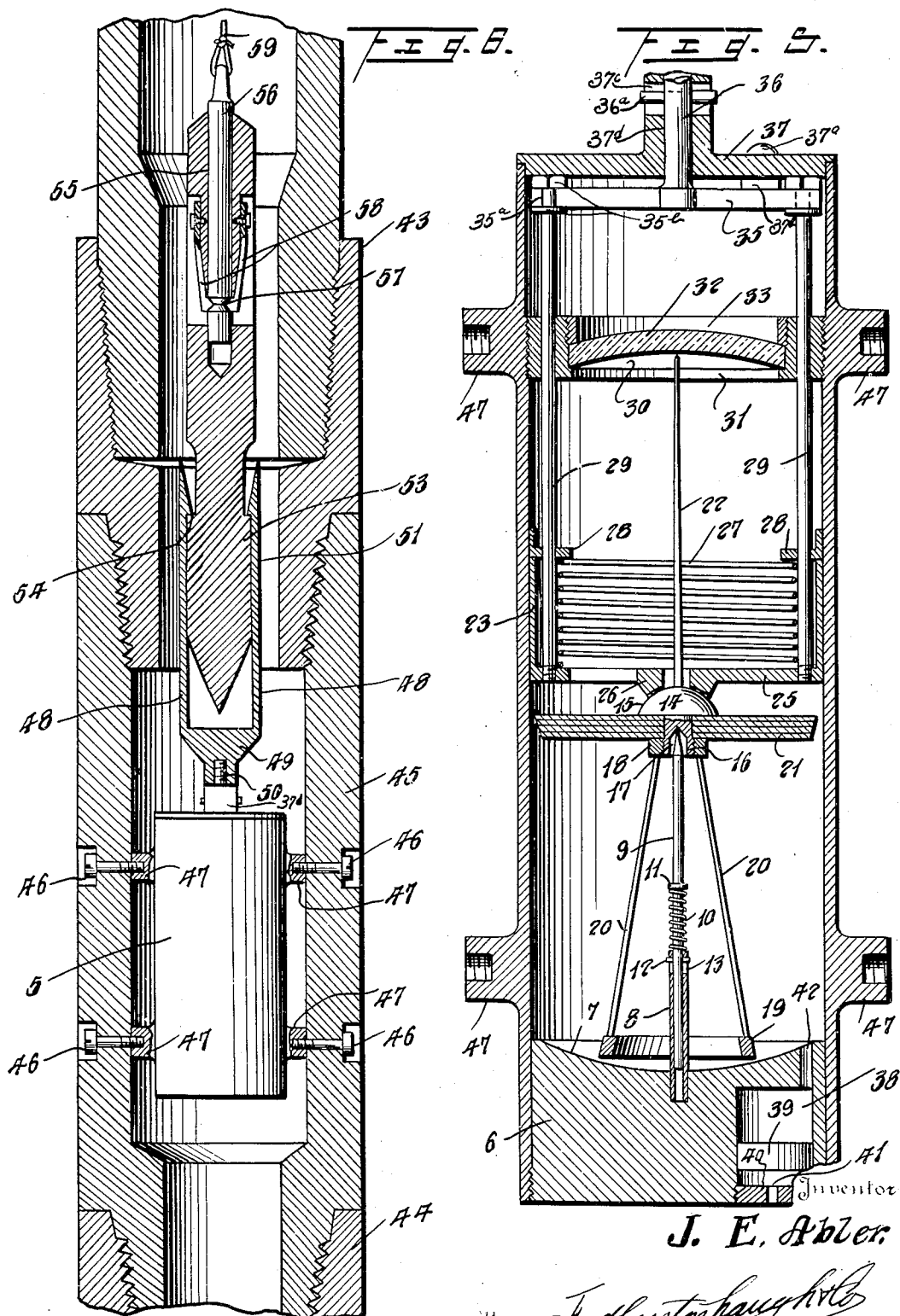
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CORE POSITION INDICATOR FOR WELL DRILLING APPARATUS

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2 Sheets-Sheet 2



# UNITED STATES PATENT OFFICE

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## CORE POSITION INDICATOR FOR WELL DRILLING APPARATUS

Application filed July 9, 1928. Serial No. 291,293.

This invention relates to bore hole testing apparatus and has for its object the provision of means for indicating the original position of a core that is removed from a well during the process of rotary drilling so that the direction of inclination of the strata from which the core is removed may be readily determined.

Other objects, characteristic features and advantages of the invention will be more readily understood from the following detailed description taken in connection with the accompanying drawings in which,

Figure 1 is a vertical sectional view of an instrument constructed in accordance with the present invention, certain elements of the instrument being shown in elevation;

Figure 2 is a sectional view on the line 2—2, Figure 1;

Figure 3 is a sectional view on the line 3—3, Figure 1;

Figure 4 is a sectional view on the line 4—4, Figure 1;

Figure 5 is a view similar to Figure 4 but showing certain parts in a different position, and,

Figure 6 is a vertical sectional view of a drill pipe showing the manner of applying the instrument thereto.

Proceeding now to a more detailed discussion of the drawings 5 designates a tubular body closed at the lower end by a plug 6 having a concave upper surface 7 in the center of which is mounted a vertical tube 8. A needle 9 has its lower end slidably mounted in said tube and is subjected to upward pressure by an encircling spring 10 confined between the upper extremity of the tube and a suitable abutment 11 carried by the needle. Upward movement of the needle is limited by a cross pin 12 operating in a slot 13 formed in said tube.

The point of the needle affords a pivot bearing for suspending a pendulum including a rivet shaped element 14 having a semi-spherical head 15 and a shank 16, the latter being provided with a bearing recess 17 in which the point of the needle is received. The other components of the pendulum comprise a relatively small upper ring 18 threaded on

to the aforesaid shank 16 and a relatively large lower ring 19 suspended from the ring 18 by inclined rods 20 or equivalent connecting means. A magnetic compass needle 21 is secured to the pendulum by clamping said needle between the ring 18 and the head 15 of the rivet shaped element 14. Fixed to and extending perpendicularly from the central portion of the said head 15 is a pointer 22 which is utilized as hereinafter set forth.

Slidably mounted above the rivet shaped element of the pendulum is a cup shaped member 23 having an apertured bottom wall 25 formed to provide a central hub like member 26 through which the pointer 22 extends as shown. The lower extremity of the hub member 26 is machined to conform to the head 15 of the pendulum and is held in engagement with said head by means of a coil spring 27 confined between the bottom wall 25 of the cup shaped member and suitable L-shaped guides 28 secured to the inner surface of the tubular body 5. The guides 28 are arranged as shown to provide stops engageable with the upper edge of the cup shaped member 23 to limit upward movement thereof against the resisting pressure of the spring 27.

Guide rods 29 are fastened to the bottom wall 25 of the cup shaped member 23 to extend upwardly through the guides 28 and through a lens-retaining ring 30 which is secured in the upper portion of the tubular body 5. The lens retaining ring 30 is provided with an integral seat 31 on which is supported a concavo-convex lens 32 held to said seat by means of the fastening ring 33. As shown to advantage in Figures 2 and 3 the lens 32 is preferably provided with a series of concentric lines 34 which cooperate with the trip of the pointer 22 to indicate the position of the pendulum with respect to the vertical.

The upper ends of rods 29 are secured to a cross head 35 having a stem 36 passing upwardly through a cover 37 which is held in place by means of screws 37a passing through the cover and threaded into suitable inwardly projecting bosses 37b formed integral with the upper portion of the body 5. The upper terminals of rods 29 fit into oppositely facing slots 35a formed in the cross head 35 and

are held against vertical displacement by means of abutments 35b engaging the upper and lower surfaces of the cross head. Rotary movement of the cross head independently of the cover 37 is prevented by means of a pin 36a passing transversely through the stem 36 and having its terminals engaged in a vertical slot 37c formed in a neck 37d projecting upwardly from the cover 37, the depth of the slot being such as to permit limited vertical movement of the cross head 35 and the stem 36 relative to the cover 37. In assembling the parts here described the cover 37, carrying the stem 36 and the cross head 35, is applied to the upper end of the body 5 and then rotated to engage the upper portions of the rods 29 in the cross head slots 35a. In this position of the cover the openings provided for reception of the screws 37a are aligned with the bosses 37b so that when the screws are passed through these openings and threadedly engaged with the bosses the cross head 35 and rods 29 are effectively secured together. Cover 37 serves to protect the lens 32 but is not a pressure tight fit on the upper end of the body 5.

The plug 6 closing the lower end of body 5 is cored out to provide a cylinder 38 containing a free piston 39 and having its lower end closed by a plug 40 provided with a central aperture 41. The upper end of the cylinder communicates via passage 42 with the interior space of the tubular body 5 above passage 42. In practice the space between the lens 32 and the plug 6 is filled with a suitable liquid such as light oil which is introduced through the cylinder 38 and passage 42 subsequent to which the piston 39 and plug 40 are applied as shown. The purpose of this liquid is to equalize the pressure inside the indicating portion of the instrument with the hydro-static and pump pressure of the circulating fluid to which the instrument is subjected when inserted in a drill pipe as hereinafter explained it being understood that the hydro-static and pump pressure of the circulating fluid equalizes against the piston 39 through the medium of the openings 41 and 42. This prevents distortion or collapse of the instrument, as well as leakage from outside pressure and allows for the change of displacement caused by movement of the rods 29.

Normally the pointer 22 and the pendulum of the instrument are held in a vertical position by the pressure of the hub 26 on the head 15 of the pendulum, this pressure being sufficient to force the lower ring 19 of the pendulum downwardly into engagement with the concave upper face of the plug 26 whereby the pendulum is effectively held against swinging movement.

Figure 6 illustrates the manner in which the instrument, with the parts arranged as shown in Figure 1, is inserted in a drill

pipe. In this figure 43 and 44 designate pipe sections of a rotary drill pipe string while 45 designates an auxiliary pipe section adapted at times to be inserted as a coupling between the sections 43 and 44. The section 45 contains the tubular body 5 of the instrument, said body being held in place by screws 46 threaded through the section 45 into lugs 47 carried by the body 5, said lugs serving as spacers to permit free passage of the circulating fluid past the body 5 of the instrument. The stem 36 of the instrument is coupled to a lifting device by an interlocking connection comprising a female member having a plurality of spring catches 48 formed integral with a base 49 having a socket 50 into which the upper end of the stem is threaded so that the base 49 rests upon the upper end of the cover neck 37d. The male member 53 of the lifting device is provided with a shoulder 54 adapted to be engaged as shown by the spring catches 48. At its upper end the member 53 is provided with a bore 55 in which is inserted a removable pin 56. The lower end of this pin is provided with a groove 57 in which are received the free ends of a pair of spring catches 58 by means of which the pin is held to the member 53. At its upper end the pin 53 is secured to a cable 59.

In practice the section 45, containing the instrument to which is fitted the spring catches 48, is preferably placed between sections of drill pipe located near the core barrel and the drill pipe is then lowered into the drill hole and drilling resumed until the core is ready for removal. The member 53 is then lowered, by means of the cable 59 and pin 56 through a suitable opening provided at the upper end of the drill stem until said member 53 becomes interlocked with the spring catches 48. The impact incident to engagement of the member 53 with the spring catches 48 is prevented from being transmitted to the pendulum through the rods 29 by reason of the fact that the base 49 to which the catches 48 are secured rests squarely on the upper end of the cover neck 37. The wire 59 is then pulled sufficiently to raise the cup shaped member 23 of the instrument up to the guides or stops 28. This relieves the pressure on the head 15 of the pendulum and permits the comparatively light spring 10 to elevate the pendulum out of contact with the curved surface 7 of the plug 6. The pin 12 serves to limit this upward movement of the pendulum in order to reserve a slight clearance between the head 15 and the lower surface of the elevated hub 26 so that the pendulum, is now free to move on its pivot under the influence of gravity and the pull on the magnetic needle 21. When sufficient time has elapsed to permit the pendulum to definitely locate itself a stiff pull is exerted on the wire 59 to release the pin 56 from the

spring catches 58 of the member 53 and allows the wire and pin to be withdrawn from the drill pipe. When the pin 56 is removed, as here explained, the spring 27 presses the hub 5 26 downwardly against the head 15 of the pendulum thus forcing the pendulum downwardly against the resistance of the needle spring 10 until the ring 19 of the pendulum is clamped against the curved surface 7, thus 10 locking the pendulum, pointer and magnetic compass in the indicating position to which these elements have moved in interim between the elevation and release of the hub 26. Subsequent to this the drill pipe is removed 15 from the well and the cover 37 detached from the tubular body 5 of the instrument. The locked compass needle 21 indicates, by its position, the position of the core barrel and its contained core with relation to the points 20 of the compass while the pointer cooperates with the concentric lines of the lens 32 to indicate the angle of the core with respect to the vertical. With this information as a basis of calculation the original position of 25 the core and its direction and angle of stratification may be readily ascertained.

Having thus fully described what I now consider to be the preferred embodiment of the invention it will be understood that various modifications may be resorted to within 30 the scope and spirit of the appended claims. What I claim is:

1. An instrument of the character described comprising a casing having a bottom 35 wall provided with a concave upper surface, a vertically yieldable pendulum supporting needle rising centrally from said surface, a normally vertical pendulum having its upper end bearing on the tip of said needle, a pointer 40 projecting centrally from the upper end of the pendulum and adapted in the vertical position of the pendulum to align with the pendulum supporting needle, a magnetic compass needle carried by the pendulum and extending 45 at right angles to said pointer, said compass needle being rotatable about an axis coinciding with the longitudinal axis of the pointer, a lens mounted in the casing and provided with a plurality of concentric lines with 50 which the pointer cooperates and displaceable holding means yieldingly engaging the upper end of the pendulum to force the pendulum downwardly into engagement with the concave bottom wall surface of the casing 55 whereby the pendulum is effectively secured in a vertical position.

2. An instrument of the character described comprising a casing, a normally vertical pendulum yieldingly supported from the bottom 60 wall of the casing, means normally tending to position the pendulum in elevated relation to said bottom wall so as to permit free swinging movement of the pendulum, pressure applying means engaging the pendulum and 65 normally serving to press the pendulum

downwardly into engagement with the bottom wall of the casing to hold the pendulum immovable and in a vertical position, said pressure applying means being displaceable to permit the pendulum to be elevated by its 70 supporting means to a free swinging position, and a pointer carried by the pendulum and arranged to indicate angles of vertical inclination.

3. An instrument as recited in claim 2 including a magnetic compass needle carried 75 by the pendulum and arranged at right angles to the pointer, said compass needle being rotatable about an axis coinciding with the longitudinal axis of the pointer. 80

4. An instrument adapted to be inserted in a well pipe to indicate the original position of a core that is removed during the process of rotary drilling, said instrument comprising 85 a casing containing the indicating means and filled with a light liquid such as oil, there being a cylinder formed in the bottom wall of the casing and having its upper end communicating with the oil filled interior of the casing and its lower end provided with an 90 opening to the atmosphere and a piston slidably fitting said cylinder.

In testimony whereof I hereunto affix my signature.

JOHN EDWARD ABLER. 95

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