Feb. 6, 1940. J. W. CULBERTSON 2,189,560

ANGLE MARKER FOR INCLINATION RECORDING APPARATUS

Filed Nov. 1, 1937

Fig. 1

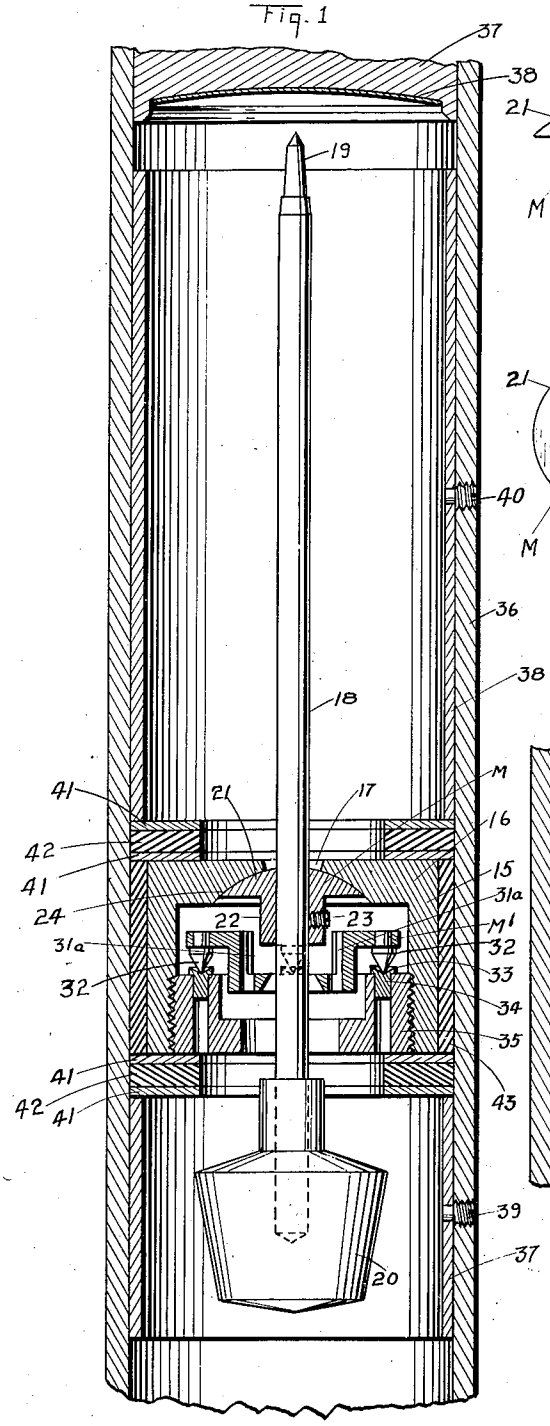


Fig. 3

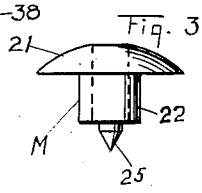


Fig. 4

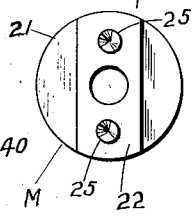


Fig. 5

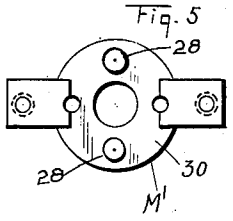


Fig. 6

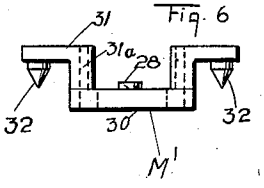
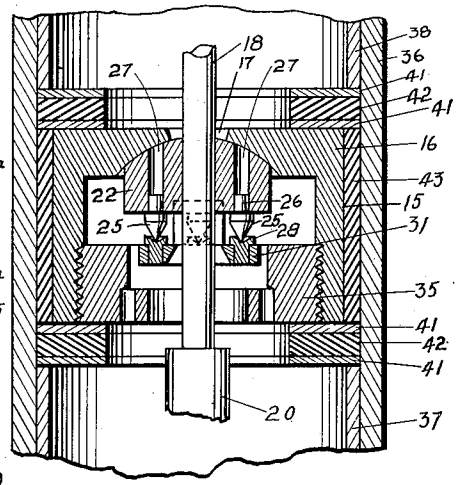


Fig. 2



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Patented Feb. 6, 1940 2,189,560

UNITED STATES PATENT OFFICE

2,189,560

ANGLE MARKER FOR INCLINATION RECORDING APPARATUS

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Application November 1, 1937, Serial No. 172,142

6 Claims. (Cl. 33—215)

My invention relates to angle markers of the pendulum type as used in apparatus for recording drift or inclination of a bore hole from the vertical, such as disclosed in my pending application for Letters Patent, Serial Number 114,479, filed April 3, 1935.

Practice has shown that the use of angle markers of the single pivot type disclosed in the aforesaid application, ultimately results in the recording apparatus producing erroneous records of inclination. One reason for this is that the single pivot is too delicate to withstand the shocks to which it is subjected as the apparatus descends in and strikes the bottom of a drill pipe, and, in consequence, the pivot is broken or otherwise distorted thus destroying the sensitivity of the marker to inclination. A second reason is that the single pivot allows spinning of the angle marker about its own axis in response to the spinning of the apparatus as a whole set up by its remittant striking of the drill pipe as it descends therein. This spinning of the marker adversely affects its sensitivity to inclination, and it also retards its coming to rest sufficiently long to erroneously mark on the chart the true angle inclination of the hole.

It is a purpose of my invention to provide an angle marker which is characterized by the pendulum element thereof being supported by a plurality of pivots constructed and arranged to allow free swinging movement of the pendulum in any vertical plane to assume any angle and yet is secured against axial turning or spinning; and further to provide such added support to the pendulum as to effectively resist breakage or distortion of the pivot points.

It is also a purpose of my invention to provide an angle marker having cushioning means constructed and arranged to cushion the parts of the marker against axial and radial shocks, thus, further reducing the possibility of breakage or distortion of the pivots and other parts of the marker.

A further purpose of my invention is the provision of an angle marker having an outer support which is not only simplified in its construction but provides the additional advantage of automatically centering the marker in that part of the apparatus in which the marker and the chart which the latter punches is contained.

I will describe only one form of angle marker embodying my invention and will then point out the novel features thereof in claims.

In the accompanying drawing,

Fig. 1 is a view showing in vertical longitudinal section one form of angle marker embodying my invention mounted within the container of the inclination apparatus.

Fig. 2 is a fragmentary view similar to Fig. 1, but taken at right angles thereto.

Fig. 3 is a detailed view showing in side elevation the upper pivot member of the marker shown in Figs. 1 and 2.

Fig. 4 is a view showing the member of Fig. 3 in bottom plan.

Fig. 5 is a view showing in top plan the lower pivot member of the marker shown in Figs. 1 and 2.

Fig. 6 is a view showing the member of Fig. 5 in side elevation.

Referring specifically to the drawing, my invention in its present embodiment comprises an inverted cup shaped box 15 having an upper wall 16 formed with a central opening 17 through which extends the rod 18 of the pendulum element of the marker. A punch 19 is mounted on the upper end of the rod, while on its lower end is a weight 20 which causes the rod to gravitate to vertical position.

Within the box 15 is an upper pivot member, designated generally at M, comprising a rounded head 21 and a rib 22 extending diametrically of and formed integral with the head 21. Both the head and rib are formed with openings through which the rod 18 extends, and the rod is secured to the rib by means of a screw 23 (Fig. 1). The head 21 is movable in a socket 24 formed in the underside of the wall 16, it being understood that the head and socket are so constructed that they permit movement of the pendulum rod in any vertical plane.

The upper pivot member M is supported for pivotal movement on a lower pivot member M^1 through the medium of a pair of pivot pins 25. These pivot pins have conical points formed on the ends of studs 26, and the studs have driving fits in openings 27 drilled in the pivot member M, as best illustrated in Fig. 2.

The points of these pivots 25 are seated in bearings 28 on studs 29 secured at diametrically opposed points in a disk 30. This disk forms the central part of the lower pivot member, and it is provided with a central opening through which the pendulum rod 18 extends and is freely movable laterally to allow the pendulum to assume its various angular positions. As also forming parts of the lower pivot member are L-shaped extensions or brackets 31, and the horizontal portions of these brackets carry pivot pins 32 of the same construction as the pins 25.

The points of these pins are seated in bearings 33 in the upper ends of studs 34 secured in a plug or base member 35. The vertical portion of the brackets 31 are grooved on their confronting faces as indicated at 31a, and either groove accommodates the screw 23 to allow free movement of the pendulum in relation to the lower pivot member M1.

The plug 35 is screw threaded into the bottom of the box 15 and when screwed home operates in conjunction with the top wall 16 of the box 15 to confine the upper and lower pivot members in proper operative relation one to the other so that they function to support the pendulum for swinging movement in any vertical plane to permit it to assume vertical position when it comes to rest.

From the preceding description it will be clear that the pivots 25 serve to support the upper pivot member for rocking movement in a plane at right angles to the plane of the lower pivot member, and that the pivots 32 serve to support the lower pivot member, on the plug 35 for pivotal movement in a plane at right angles to that of the upper pivot member. The combination of these two movements of the pivot members allows the pendulum to swing in any vertical plane, and yet the pendulum cannot turn on its own axis because of the fact that the pivots 25 and 32 are secured in their bearings through the combined holding action of the plug 35 and the box 15.

In practice, the angle marker is adapted to be enclosed in a tubular container 36 with a head 37 carrying chart 38, in accordance with the operation of the recording apparatus embodied in my application hereinbefore referred to, and this head is adapted to be forced downwardly in the container to cause the chart to be marked by the point 19 of the pendulum for recording the maximum angle of deviation of a bore hole from the vertical.

The angle-marking function of the pendulum necessitates that its point of support be exactly centered in the container. To this end I provide a lower sleeve 37, and an upper sleeve 38, both of which have a sliding fit within the container. These sleeves are disposed at opposite sides of the box 15 and secured in position by pins 39 and 40, respectively. Interposed between the box and the sleeves are transverse members each comprising a pair of flat metal wings 41 between which are disposed a flat cushioning ring 42 preferably made of rubber. These two cushioning rings are provided for the purpose of absorbing the axial shocks to which the angle marker is subjected when the apparatus of which the angle marker forms a part, is dropped or lowered into a drill pipe.

For the purpose of absorbing radial or transverse shocks to which the angle marker is subjected as previously explained herein, the box 15 is constructed so that its external diameter is considerably less than the internal diameter of the container 36 in order to accommodate between the two a cushioning band 43 preferably formed of rubber.

Manifestly, through the combined cushioning action of the members 42 and 43 the pendulum support and particularly the pivots 25 and 32 are insulated against shocks in all directions, resulting in the preservation and proper functioning of the pivots to support the pendulum for free swinging movement so that a true recordation of the precise maximum angle of inclination of the bore hole is made when the chart is marked by the punch 19.

It will be clear from the preceding description that the box 15 and the cushioning band 43 as a unit is slidable into the container to automatically center the pendulum in relation to the chart so that the maximum degree of inclination of a bore hole will be recorded on the chart when the chart head is actuated. Also, the sleeves 37 and 38 function to definitely position the pendulum support axially in the container, so that the punch 19 will be engaged by the chart to properly mark the latter when the chart head is actuated.

Although I have shown and described only one form of angle marker embodying my invention, it is to be understood that various changes and modifications may be made herein without departing from the spirit of my invention and the spirit and scope of the appended claims.

I claim:

1. An angle marker comprising; a box having a top wall and an open bottom; a plug threaded in the bottom of the box; a lower member pivotally supported on the plug within the box; an upper member pivotally supported on the lower member and at right angles to the pivot of the latter; a pendulum element including a rod extending upwardly through the plug, lower member and top box wall; and means for securing the upper member to said rod.

2. In combination; a container; a gravity actuated angle marker within the container; a support for the angle marker slidably fitted in the container and centering the angle marker in the container; sleeves in the container at opposite sides of said support; and means for securing said sleeves in fixed position within the container and in embracing relation to said support.

3. A combination as embodied in claim 2 wherein cushioning means is interposed between the support and said sleeves for insulating the support against axial shock.

4. A combination as embodied in claim 2 wherein cushioning means are interposed between the support and said sleeves for insulating the support against axial shock, said cushioning means comprising a pair of rubber rings arranged at opposite sides of the support; and two pairs of metal rings one pair for each of the rubber rings arranged at opposite sides thereof.

5. In combination; a container; a pair of sleeves in the container; an angle marker including a box disposed within the container between said sleeves; cushioning means interposed between the box and said sleeves; and a second cushioning means interposed between the box and said container.

6. In combination; a tubular container; a pair of sleeves secured in the container with their confronting ends spaced one from the other; a box between the sleeves; a plug secured within the box; upper and lower members arranged at right angles to each other within the box; pivots for supporting the upper member on the lower member, and other pivots for supporting the lower member on the plug and arranged at right angles to the pivots for the upper member; and a pendulum element including a rod extending upwardly through the plug, box and members, and secured to the upper member.

JOE W. CULBERTSON.