

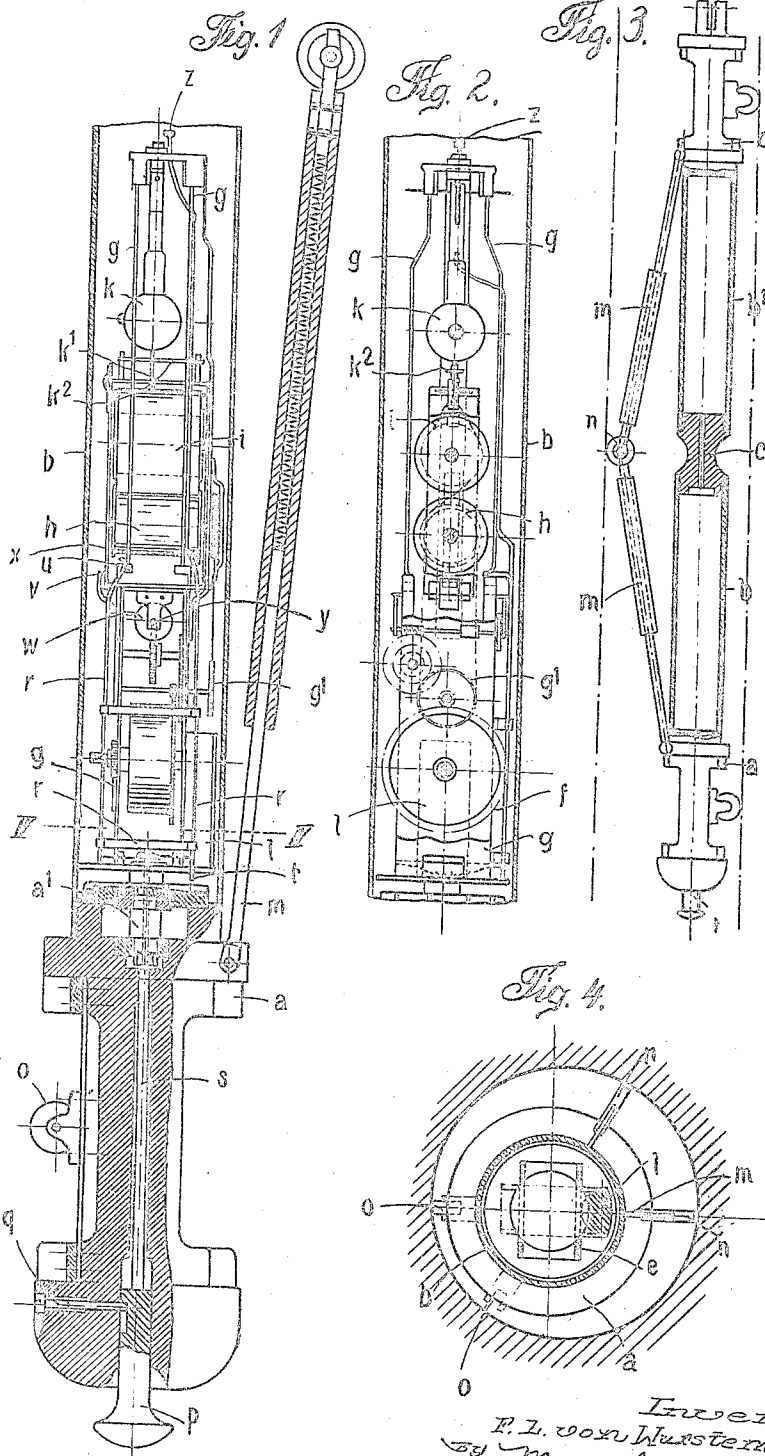
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APPARATUS FOR DETERMINING DEFLECTIONS FROM THE PERPENDICULAR OF BOREHOLES

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APPARATUS FOR DETERMINING DEFLECTIONS FROM THE PERPENDICULAR OF BORE-HOLES.

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The object of the present invention is an apparatus for determining deflections in boreholes, comprising a freely suspended pendulum, the movements of which are directly recorded on a recording strip.

This pendulum will preferably be suspended in a case which is adapted to turn about a vertical axis in a guide-piece unto which means are attached for keeping the apparatus in contact with the walls of the borehole.

The annexed drawing shows as an example one working form of the object of the invention.

Fig. 1 is a vertical section of the lower part of the apparatus.

Fig. 2 is a similar section in a plane standing at an angle of 90° to the plane of the preceding figure.

Fig. 3 is a general side elevation on a smaller scale.

Fig. 4 is a cross-section on line IV—IV of Fig. 1 showing also the lining of the bore-hole.

a is a solid piece of cast-iron serving as a lower guide and solidly attached to a tube b which is fixed to a central coupling piece c . To this is also fixed a tube b^1 to which is attached a solid piece of cast-iron d as an upper guide of the apparatus.

In the upper portion of the guide-piece a two ball-bearings are provided wherein the pivot a^1 of case g is adapted to turn about a vertical axis. The case extends almost the entire length of tube b and carries in its lower portion a clockwork f , which by means of a groove-wheel g^1 drives a paper-roller h , the movements of the latter being transferred to a registration-strip i .

At the top of case g is suspended a pendulum k , inside of which a registration-pin k^1 is arranged so as to be slightly pressed against the paper-strip i under the effect of a spring concealed within the body of the pendulum. The pin is guided between guide bars k^2 , thus restricting the movement of the pendulum determined to one plane. This plane stands vertically on the paper strip and contains also the center of gravity of a weight l attached to the foot of case g .

Therefore whenever the apparatus assumes an inclined position case g will be turned by said weight so as to turn this weight towards the inclined side and will bring the swinging-plane of the pendulum

into the vertical plane containing the inclined axis of the apparatus. If the writing-pin is in the centre of the paper-strip and the apparatus in a vertical position, each deflection from the perpendicular, can be perceived by the deflection resulting in the line of the paper-roll.

Two other rollers n arranged also in a pair like the rollers o but on diametrically opposite sides are supported each by a pair of extensible links attached to the two guide pieces a and d in such a way that while the rollers o on the guide pieces are travelling on one side of the bore-hole rollers n are travelling on the opposite side of the hole and are thus always securing the close contact between the guide-pieces and the respective wall of the hole, such as shown in Figs. 3 and 4.

As is customary in such clock-work driven mechanisms also in this mechanism means are provided for starting and stopping the clock-work and with it also the travelling recording-strip.

This device comprises a frame r , r slidably fitted to the case g . A rod s extends from the bottom platform through the hollow pivot a^1 and the lower guide-piece a to the outside of this guide piece a where it is provided with a knob p forming a ground-contact of the apparatus. A resilient arm w attached at y to the frame r is held in a horizontal position and adapted to interfere with the wheel y of the clockwork so as to stop it and this position of rest is shown in Fig. 1.

In this position the frame is held fast by a rod t which limits the downward movement of the frame. When knob p after having touched the ground has pushed the frame r upwards so as to disengage the arm w from wheel y the frame is held fast in this position by a resilient finger x bearing on a knob u of the cage g in spite of knob p having left the ground again.

In order to restore again the position of rest of the clockwork it is necessary to push the knob z whereby the finger x is disengaged again from the knob u . This operation is effected when the recording strips i are taken out from cage g through a suitable door provided for this purpose.

The space provided inside the tube b^1 contains an installation which is not represented and which serves to define the compass-bearing of the deflections of the bore-

hole. This installation consists chiefly of a magnetic needle, the position of which is registered at determined intervals.

The apparatus is used in the following way:—

After the clock-work has been wound up and the registration-strip been arranged beneath the pin of the pendulum the whole apparatus is inserted into the bore-hole. As soon as it reaches the bottom of the hole the ground-contact *p* sets the clock-work to go. Hereafter the apparatus is pulled up at a certain uniform speed. Arriving at the top the strip is examined, whereby every deflection from the central-line of the registration-strip indicates the deflection of the walls of the bore-hole from the perpendicular. This deflection in connection with the registration of the magnetic needle serves

to determine amplitude, locality and compass-bearing of such deflection.

I claim:—

In an apparatus for determining deflections from the perpendicular of bore-holes and in combination, a protecting tube; a case adapted to turn freely around a longitudinal axis of the tube, a pendulum suspended within said case; means for limiting the pendulum bearing to one determined plane within said case and a weight attached to one side of said case and within the swinging plane of the pendulum so as to bring always said determined swinging plane of the pendulum into the vertical plane containing the inclined axis of the apparatus.

In testimony whereof I affix my signature.
FRANZ L. v. WURSTEMBERGER.