

No. 819,339.

PATENTED MAY 1, 1906.

J. W. CLELAND.
INCLINOMETER.

APPLICATION FILED NOV. 11, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

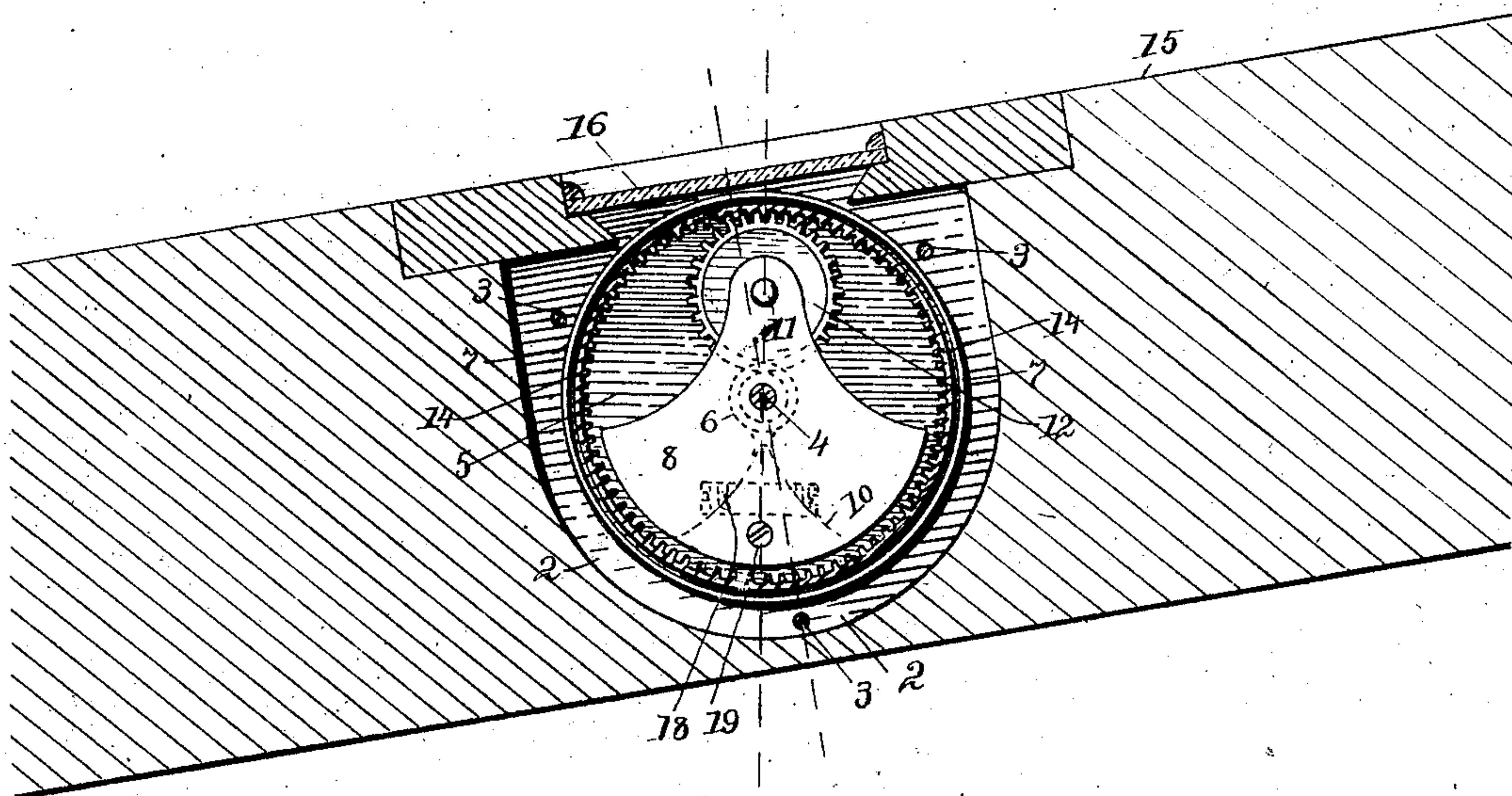


Fig. 2.

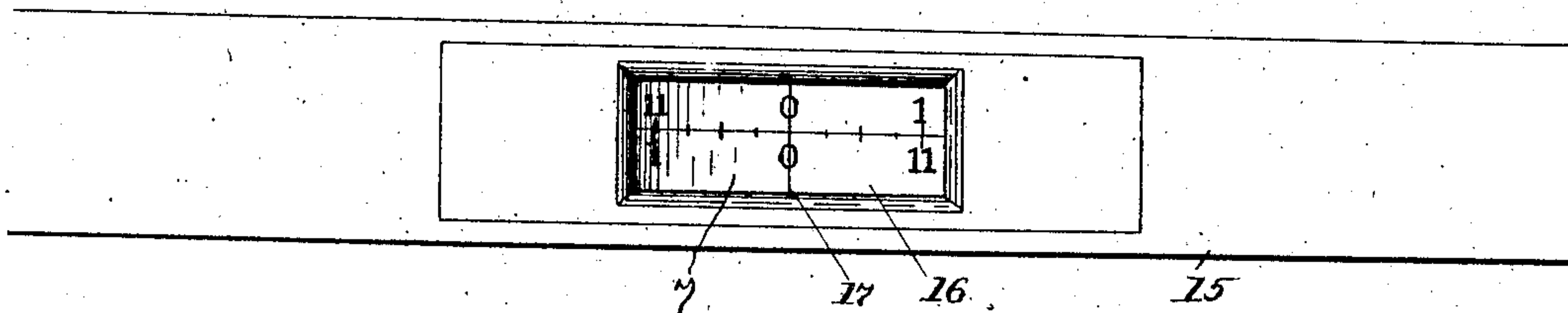
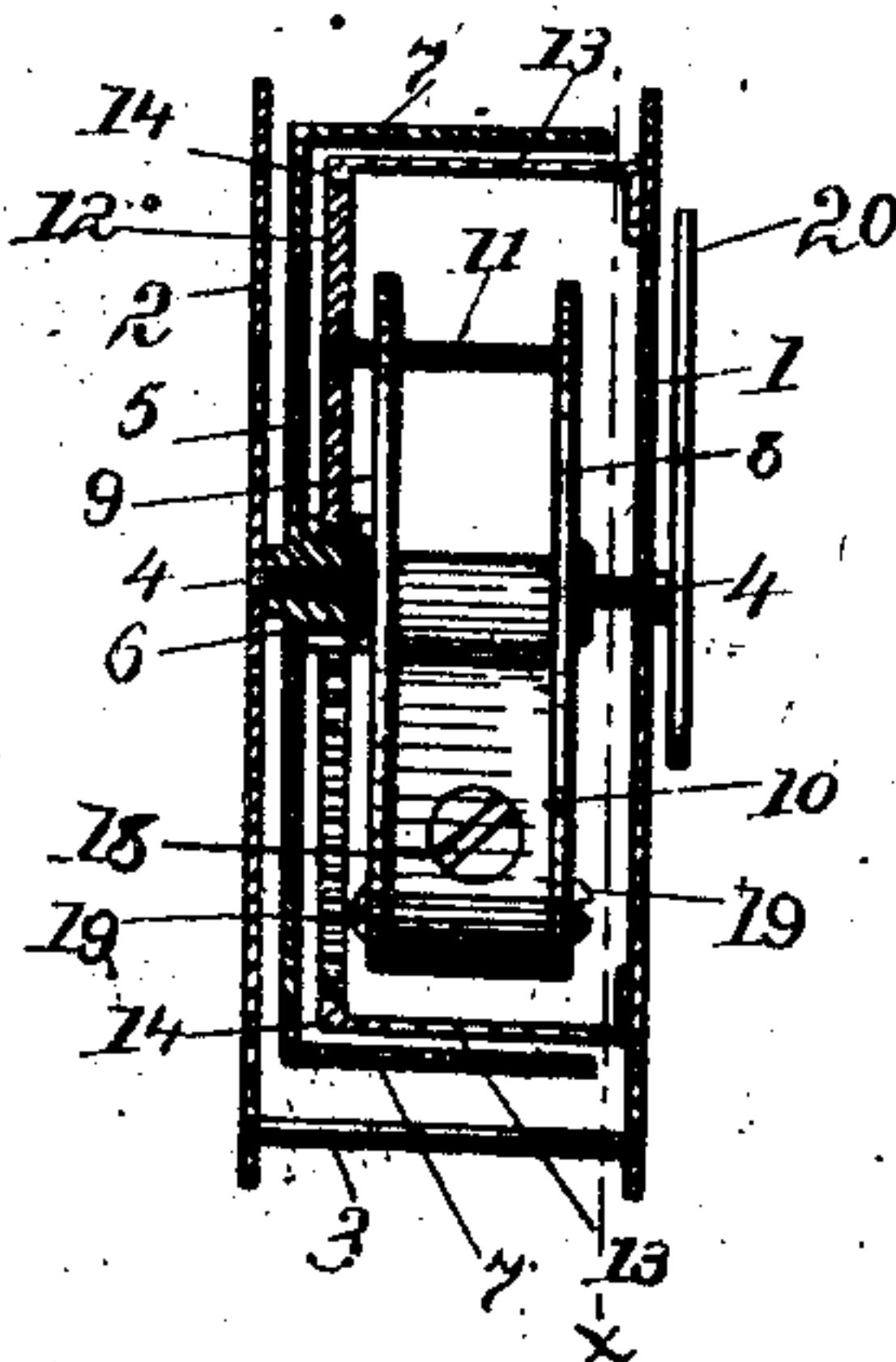


Fig. 3.



Witnesses.

Mrs. Graham.

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Inventor.

John W. Cleland.

by L. P. Graham
his attorney.

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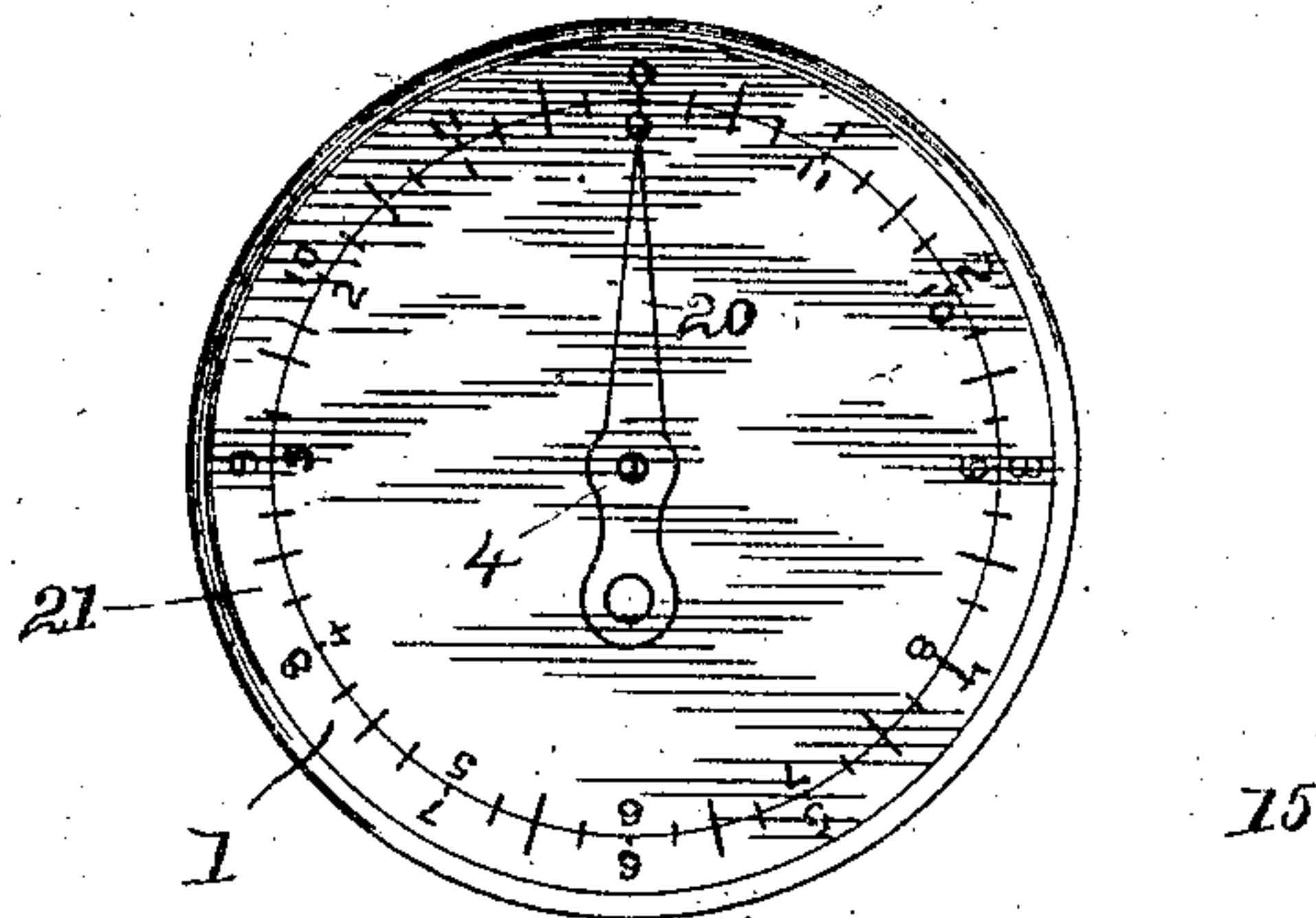
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2 SHEETS—SHEET 2.

Fig. 4.



Witnesses.

Mrs. C. Graham

Nora Graham

Inventor,

John W. Cleland.

by L. P. Graham

his attorney

UNITED STATES PATENT OFFICE.

JOHN W. CLELAND, OF DECATUR, ILLINOIS.

INCLINOMETER.

No. 819,339.

Specification of Letters Patent.

Patented May 1, 1906.

Application filed November 11, 1905. Serial No. 286,957.

To all whom it may concern:

Be it known that I, JOHN W. CLELAND, a resident of the city of Decatur, county of Macon, and State of Illinois, have invented a certain new and useful Inclinator, of which the following is a specification.

This invention provides means for accurately determining the inclination or slope of surfaces, and it is exemplified in the structure hereinafter described.

In the drawings forming part of this specification, Figure 1 is a longitudinal vertical section through an inclinometer embodying my invention, the movement-casing being cut on line X in Fig. 3. Fig. 2 is a plan of the upper edge of the inclinometer, showing the sight-aperture in said edge. Fig. 3 is a central vertical section crosswise of the casing and gearing of the inclinometer-movement. Fig. 4 is a side elevation of a face or side of the inclinometer-stock, showing a graduated dial and a pointer therein.

The movement or operative mechanism of the inclinometer is sustained in a casing composed of plates 1 and 2 and strut-rods 3. The plates are held parallel some distance apart by means of the strut-rods, and the pivot-shaft 4 is journaled at its ends in the plates. A disk 5 and a pinion 6 are fastened onto the pivot-shaft adjacent to plate 2, the disk being nearer the plate, and a pointer 20 is also fastened onto the pivot-shaft outside plate 1. A cylindrical rim 7 is formed on or attached to the circumference of disk 5, and the external surface of the rim is suitably graduated, as will be hereinafter explained. The outer face of plate 1 is graduated to correspond with the graduations of rim 7, as shown in Fig. 4.

A plumb-bob, comprising plates 8 and 9 and the interposed weight 10, is provided with an adjusting set-screw 18 and is swung on the pivot-shaft 4, with extensions of the plates projecting above the pivot-shaft. The plates and the weight are secured together by suitable means—as, for instance, the set-screws 19. A shaft 11 is carried in the upper extensions of the plumb-bob plates, and a gear-wheel 12 is fastened onto an end of shaft 11, protruding beyond the inner plate 9 of the plumb-bob. A cylindrical flange 13 is secured to casing-plate 1. It extends toward casing-plate 2 inside the graduated rim 7, and it is internally toothed at its inner edge, as shown at 14. The gear-wheel 12 meshes with pinion 6 and with the teeth 14 in the flange 13.

The stock 15, which may be of any desired size and proportion, is recessed to receive the inclinometer-movement. The sight-aperture in the edge of the stock is provided with a glass 16, and the sight-aperture in the side of the stock is also provided with a glass, as shown at 21 in Fig. 4. The sight-aperture in the edge of the stock has a cross-line 17 in Fig. 2, from which readings on the graduated cylinder 7 are made. The cross-line may be drawn on the glass or may be otherwise produced.

As shown in the drawings, the scale is divided into twelve principal divisions, which may be subdivided to any desired extent, and the inclinometer is adapted to measure inches or parts thereof to the foot of inclination. When twelve inches of inclination exists, the indicator points to zero and the stock is either horizontal or vertical.

To provide a smaller device which will give the same fineness in gradation and facility in reading, the gearing may be so proportioned that the indicator will make a complete rotation when the stock is moved forty-five degrees from either the vertical or the horizontal and the scale is divided into six principal divisions or the gearing may be proportioned to give a complete rotation to the indicator through the movement of the stock through any other equal division of a circle and the main divisions of the scale be made to aggregate twelve in a swing of the stock from the vertical to the horizontal. If, for instance, the indicator should be geared to rotate three times while the stock is swinging from the vertical to the horizontal, the scale will have four main divisions.

The foregoing description of the gradation of the scale in relation to the swing of the stock and the proportion of the gearing is merely explanatory of advantages that may be derived from the device; but it is obvious that the scale may be marked according to the degrees of a circle or according to any other system of measuring.

As the stock is swung with relation to inclination, the toothed flange moves with the stock, while the plumb-bob is held in position by gravity. The motion of the toothed flange imparts rotary motion to the gear-wheel 12, the gear-wheel transmits the motion to the pinion 6, and the rotation of the pinion is shared by the disk 5, the rim 7, and the pointer 20. The pinion is so much smaller than the toothed flange that a small motion

of the flange will transmit an extensive movement to the rim and the pointer through the pinion, and so it is possible to make gradations of the scale large enough to be easily read and sufficiently numerous to give delicately precise indications or measurements.

In the larger instruments the movement of the indicators may be four times that of the toothed flange, and in the smaller instruments the movement of the indicators in proportion to the movement of the toothed flange is correspondingly increased.

The center of gravity of the plumb-bob weight is shifted by means of the adjusting-screw 18 in order to get precise correlation between the moving parts of the indicator and the indicating-lines, and in case of disadjustment correction may be made through the shiftable screw. The adjustment is effected by turning the screw one way or the other, shifting it bodily to one side or the other of the plumb-bob weight, and thus changing the center of gravity of the weight.

The graduated rim provides for edgewise reading of the inclinometer, while the graduated plate provides for sidewise reading. In the case of the rim the graduated scale moves with relation to the line 17, while in the case of the side plate the pointer moves with relation to the graduated scale; but the mechanical means whereby the motion is produced is the same in each case, and the result is the same. One scale is the reverse of the other in the arrangement of movable and stationary parts. Both may be used at once, either may be used without the other, or the pointer and graduated side plate may be reproduced on the opposite side of the stock.

I claim as new and desire to secure by Letters Patent—

1. In an inclinometer, the combination of a stock, a pivot-shaft journaled in the stock crosswise thereof, an internally-toothed flange fixed in the stock concentric with the pivot-shaft, a pinion fastened onto the pivot-shaft, a plumb-bob swung on the pivot-shaft, a gear-wheel carried on the plumb-bob in mesh with the pinion and with the internally-toothed flange, and a movable member of an indicator attached to the pivot-shaft, substantially as described.

2. In an inclinometer, the combination with a stock, of a pair of plates placed in the stock and held separate one from the other, a pivot-shaft journaled in the plates, an internally-toothed flange fastened to one of the

plates concentric with the pivot-shaft, a pinion fastened onto the pivot-shaft, a plumb-bob swung on the pivot-shaft, a gear-wheel carried by the plumb-bob in mesh with the pinion and with the internally-toothed flange, and a movable member for an indicator fastened onto the pivot-shaft, substantially as described.

3. In an inclinometer, the combination of a stock, a pivot-shaft journaled in the stock crosswise thereof, an internally-toothed flange fixed in the stock concentric with the pivot-shaft, a pinion fastened onto the pivot-shaft, a pair of plumb-bob plates swung on the pivot-shaft and extended above and below the same, a weight between the plumb-bob plates below the pivot-shaft, a cross-shaft carried by the plumb-bob plates above the pivot-shaft, a gear-wheel on the cross-shaft in mesh with the pinion and with the internally-toothed flange and a movable member of an indicator attached to the pivot-shaft, substantially as described.

4. In an inclinometer, the combination of a stock, a pivot-shaft journaled in the stock crosswise thereof, an internally-toothed flange fixed in the stock concentric with the pivot-shaft, a pinion fastened onto the pivot-shaft, a pair of plumb-bob plates swung on the pivot-shaft and extended above and below the same, a weight secured between the lower extensions of the plumb-bob plates, an adjusting-screw in the weight, a gear-wheel carried by the upper extension of the plumb-bob in mesh with the pinion and with the internally-toothed flange, and a movable member of an indicator attached to the pivot-shaft, substantially as described.

5. In an inclinometer, the combination of a stock, a pivot-shaft journaled in the stock crosswise thereof, an internally-toothed flange fixed in the stock concentric with the pivot-shaft, a pinion fastened onto the pivot-shaft, a plumb-bob swung on the pivot-shaft, a gear-wheel carried on the plumb-bob in mesh with the pinion and with the internally-toothed flange, and a cylindrical indicator-rim secured to the pivot-shaft concentric therewith and outside the internally-toothed flange, substantially as described.

In testimony whereof I sign my name in the presence of two subscribing witnesses.

JOHN W. CLELAND

Witnesses:

E. S. McDONALD,
ROSA VOELCKER.