

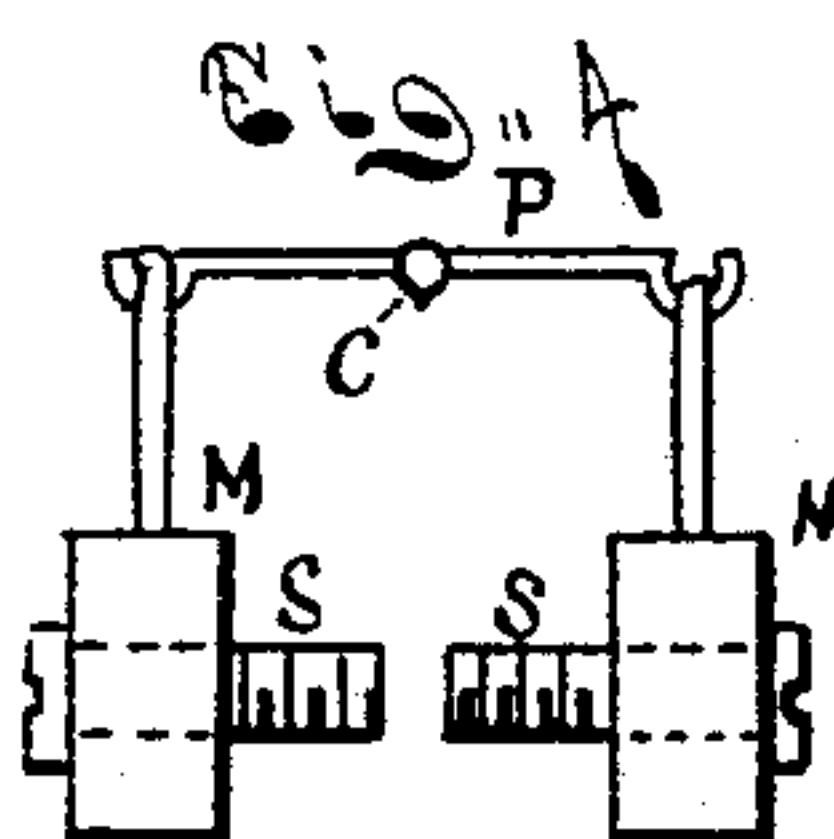
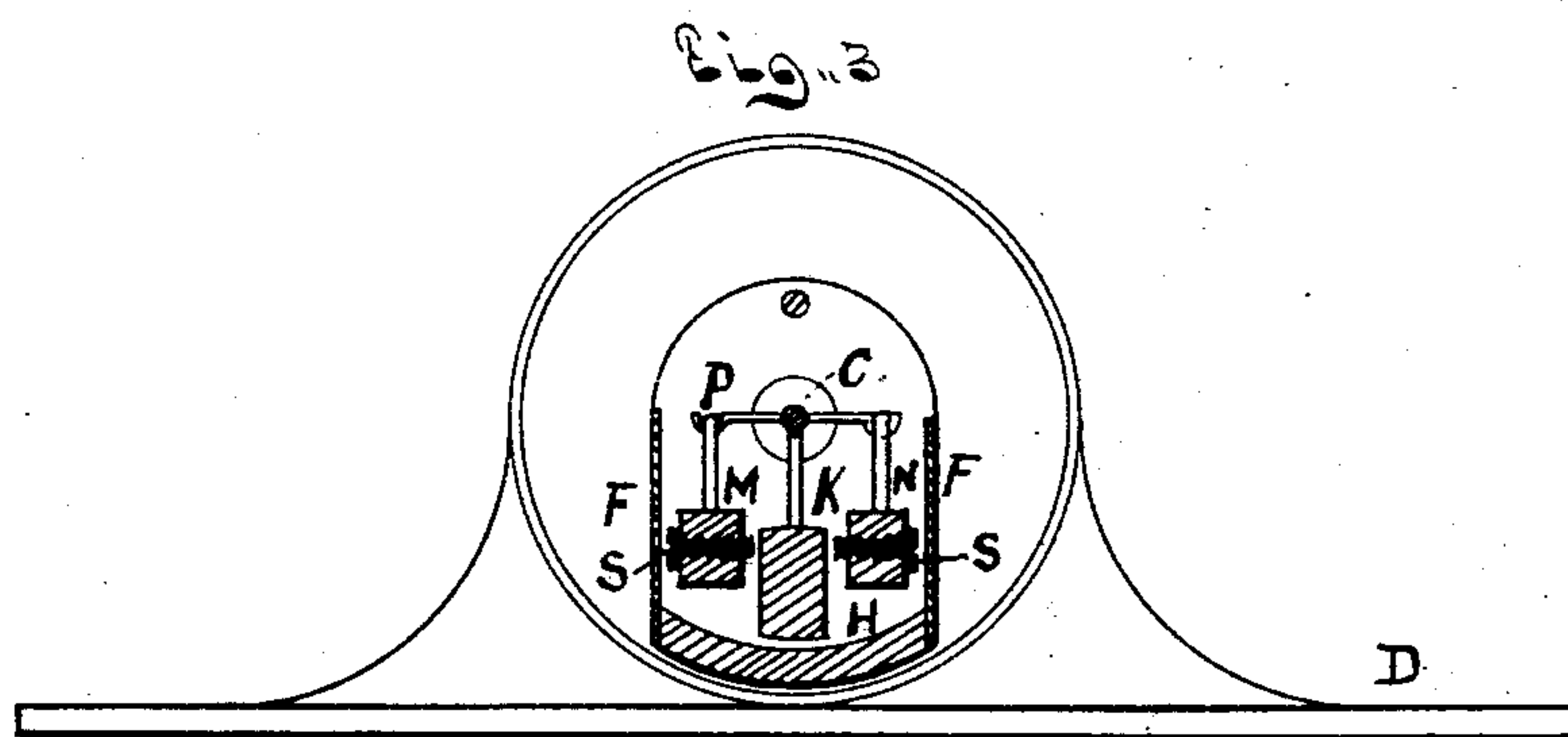
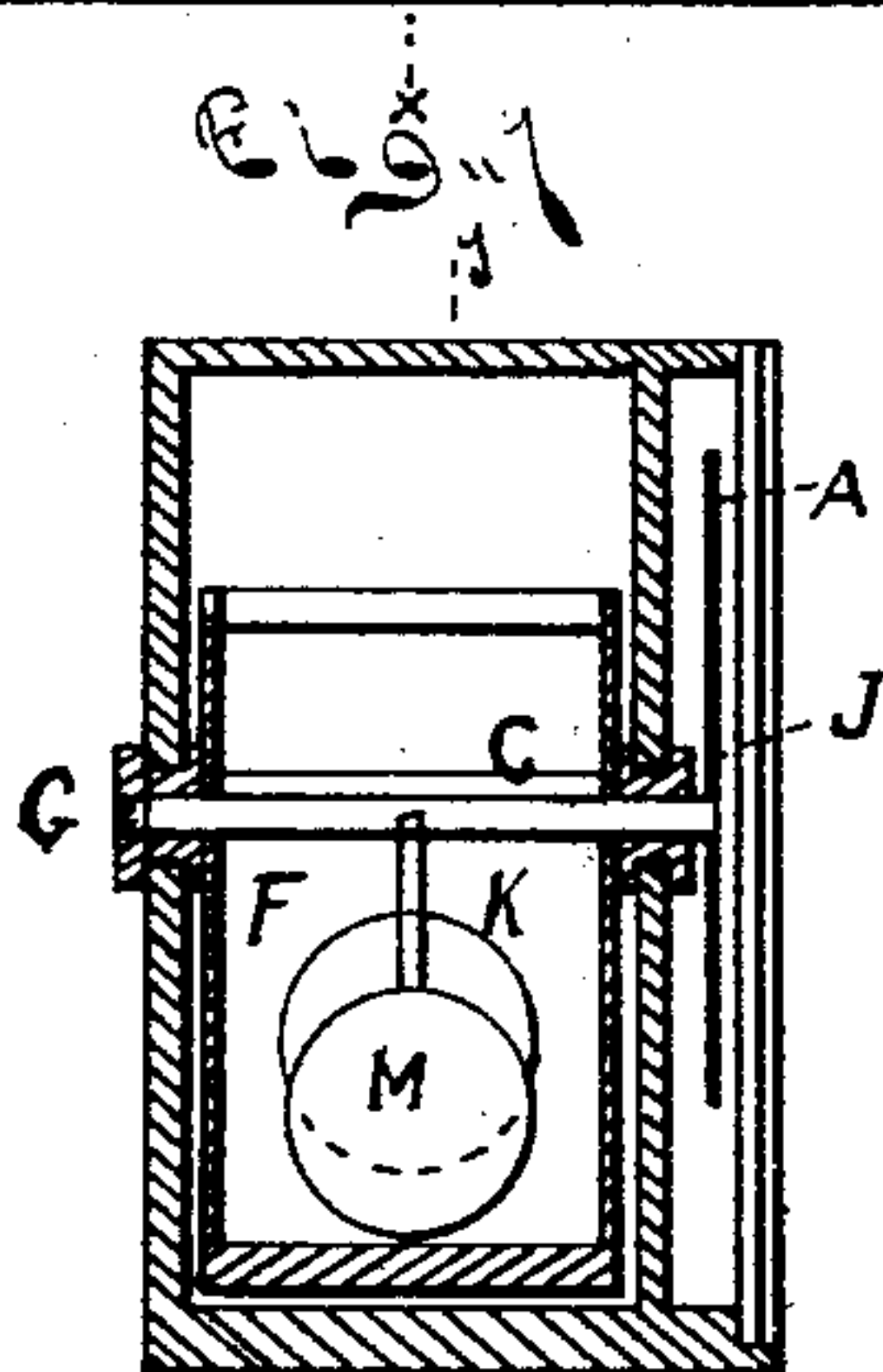
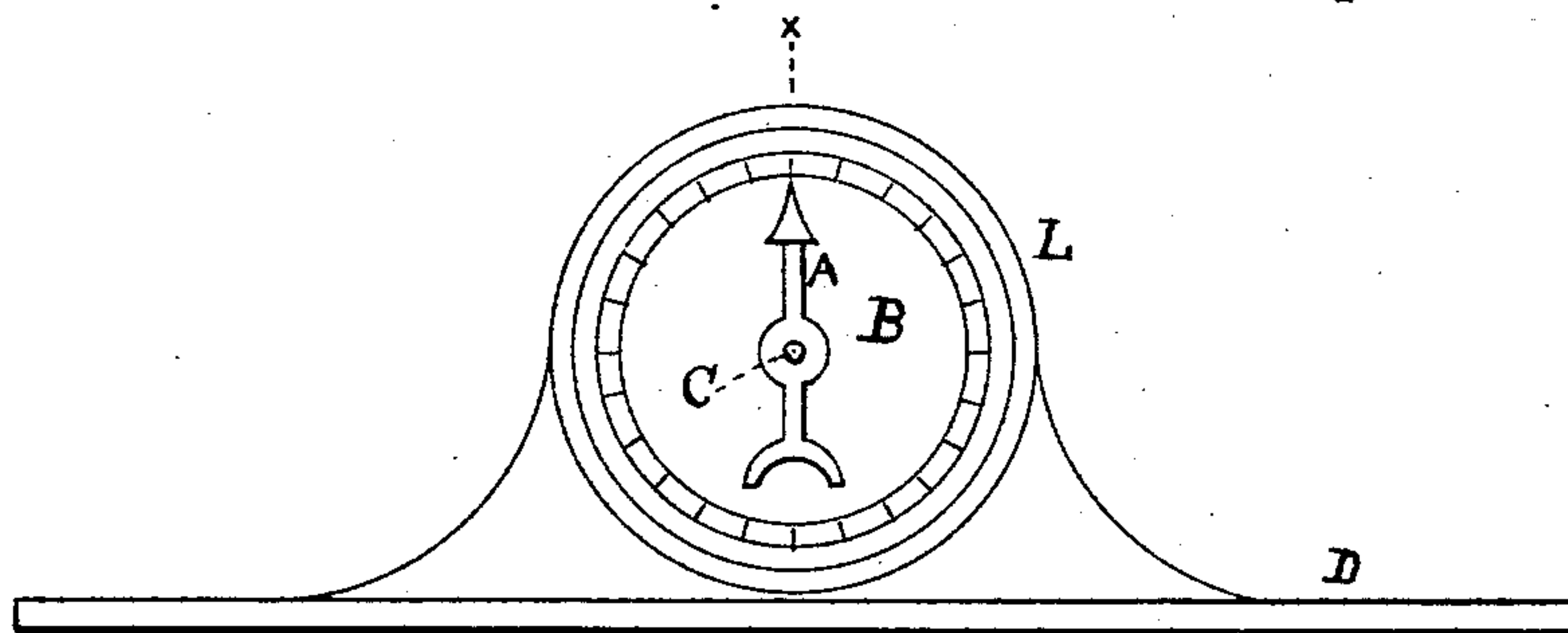
(No Model.)

A. SPRANGER.

PLUMB LEVEL.

No. 369,750.

Patented Sept. 13, 1887.



Witnesses
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UNITED STATES PATENT OFFICE.

ANTHONY SPRANGER, OF DETROIT, MICHIGAN.

PLUMB-LEVEL.

SPECIFICATION forming part of Letters Patent No. 369,750, dated September 13, 1887.

Application filed April 19, 1887. Serial No. 235,305. (No model.)

To all whom it may concern:

Be it known that I, ANTHONY SPRANGER, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented a new and useful Improvement in Inclinometers, of which the following is a specification.

My invention relates to that class of inclinometers or angle-measurers in which the angularity between a horizontal line and a straight or plane surface which forms one side of the inclinometer is measured by the movement of an index or pointer rotating about a pivot at the center of a graduated face-plate.

Figure 1 is a front elevation showing the relative position of the straight-edge, the face-plate, and the index of the inclinometer. Fig. 2 is a sectional view from front to rear through the line $x x$ of Fig. 1. Fig. 3 is another sectional view showing the interior mechanism on a plane at right angles to that employed in the section shown in Fig. 2. Fig. 4 shows a modification of my invention in which the movement of the index is controlled by two weights instead of by three, as shown in Fig. 3.

A straight-edge, D, has attached to it a frame-work or casing, L. This case consists of a circular box closed at the rear and arranged at the front to hold a graduated circular disk, B, through the center of which passes a hollow journal, J. In the center of the rear part of the case L is a box to receive a corresponding hollow journal, G.

The hollow journals G and J are attached, respectively, to the back and front sides of a frame-work or case, F H F, of which one side, H, is weighted, and the entire case F H F is capable of movement through an entire circle around the center of the hollow journal or trunnions J G, and in consequence of such movement the frame F H F comes to rest after the position of the inclinometer has been changed, with the weighted side H at the lowermost point, and with the openings through the hollow journals J G in a position fixed with reference to a horizontal line. The frame-work F H F thus constitutes a hollow pendulum swinging from the journals J G, and within it I hang a second compound pendulum from the arbor C, which passes across the hol-

low pendulum F H F from front to rear, and passes into or through the hollow journal G and through the hollow journal J, and supports at its outer end the index or pointer A. This arbor fits loosely in the journals through which it passes, and has one side cut to a knife-edge. Across the arbor C, at about its middle point and at right angles to it, I fasten firmly a cross-piece, P, of which the ends are hooked to support weighted hangers M and N. I also fasten firmly to the pin C, at right angles to it and at right angles to the cross-piece P, a weight, K.

The weights M and N hang freely from the ends of the cross-piece P and can move for a short distance in any direction, their range of movement being limited by the sides of the inclosing frame-work F H F and by the weight K, which hangs between them, and I regulate the range of movement by means of the adjusting-screws S S, that pass through them.

The operation of the mechanism is as follows: Upon changing the inclination of the straight-edge D the hollow pendulum F H F, carrying with it the inclosed compound pendulum, seeks a position of rest with the weighted side H at the lowermost point; but, owing to frictional resistance of the bearings upon which it swings, it does not reach such a position with sufficient accuracy or with sufficient quickness to enable an indicator attached directly to it to be used practically in determining inclination. The desired accuracy and quickness are, however, attained by means of the compound pendulum, which swings from the knife-edged arbor, resting in the hollow journals J and G, and also the compound pendulum, by means of the freely-swinging weights M and N, which act as dampers, is brought quickly to rest.

The use of the weight K, rigidly attached to the arbor C, is not essential, as that weight may be dispensed with and the same result may be attained by the use of the swinging weights M and N alone, the set-screws in this case being arranged to strike against each other instead of against the weight K between them. This form of construction is indicated in Fig. 4.

Having thus described my invention and its

mode of operation, what I claim as novel, and desire to have secured to me by Letters Patent, is—

- 5 1. In an inclinometer, a pointer whose movements are controlled by an arbor supporting weights freely swinging from a cross-piece attached thereto and resting in bearings, which bearings are themselves the journals supporting a hollow pendulum.
- 10 2. In an inclinometer, the combination of a pointer mounted upon an arbor, balanced weights swinging freely from a cross-piece secured to said arbor, and adjusting screws lim-

iting the approximation of said weights to each other.

- 15 3. In an inclinometer, the combination of a pointer mounted upon a vibrating arbor, balanced weights swinging freely from a cross-piece secured to said arbor, and a hanging weight secured directly to said arbor between 20 said balance-weights.

ANTHONY SPRANGER.

Witnesses:

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