

No. 756,628.

PATENTED APR. 5, 1904.

J. HAPPLE.  
LEVEL, PLUMB, AND INCLINOMETER.

APPLICATION FILED OCT. 23, 1903.

NO MODEL.

FIG. 6.

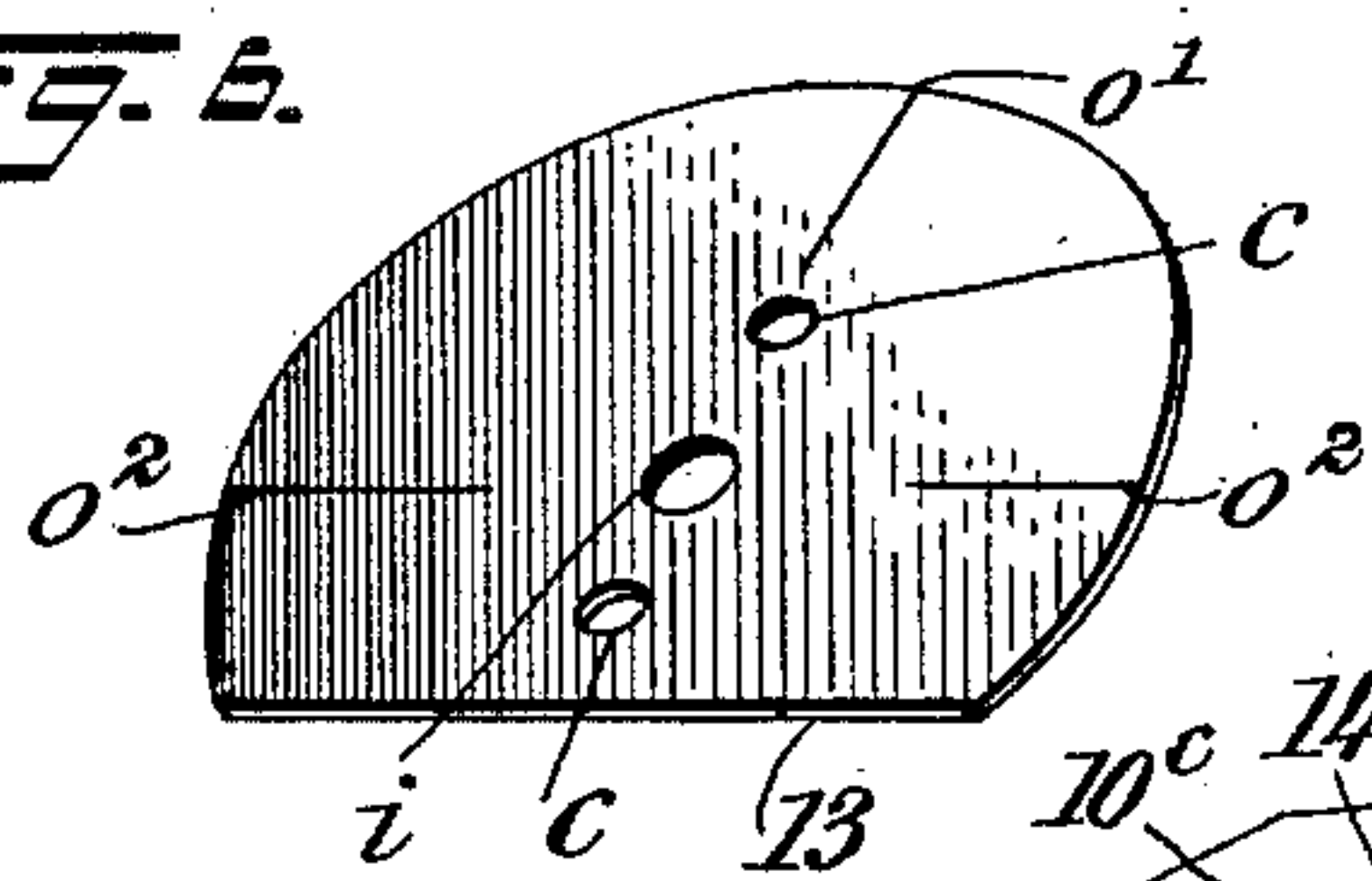


FIG. 1.

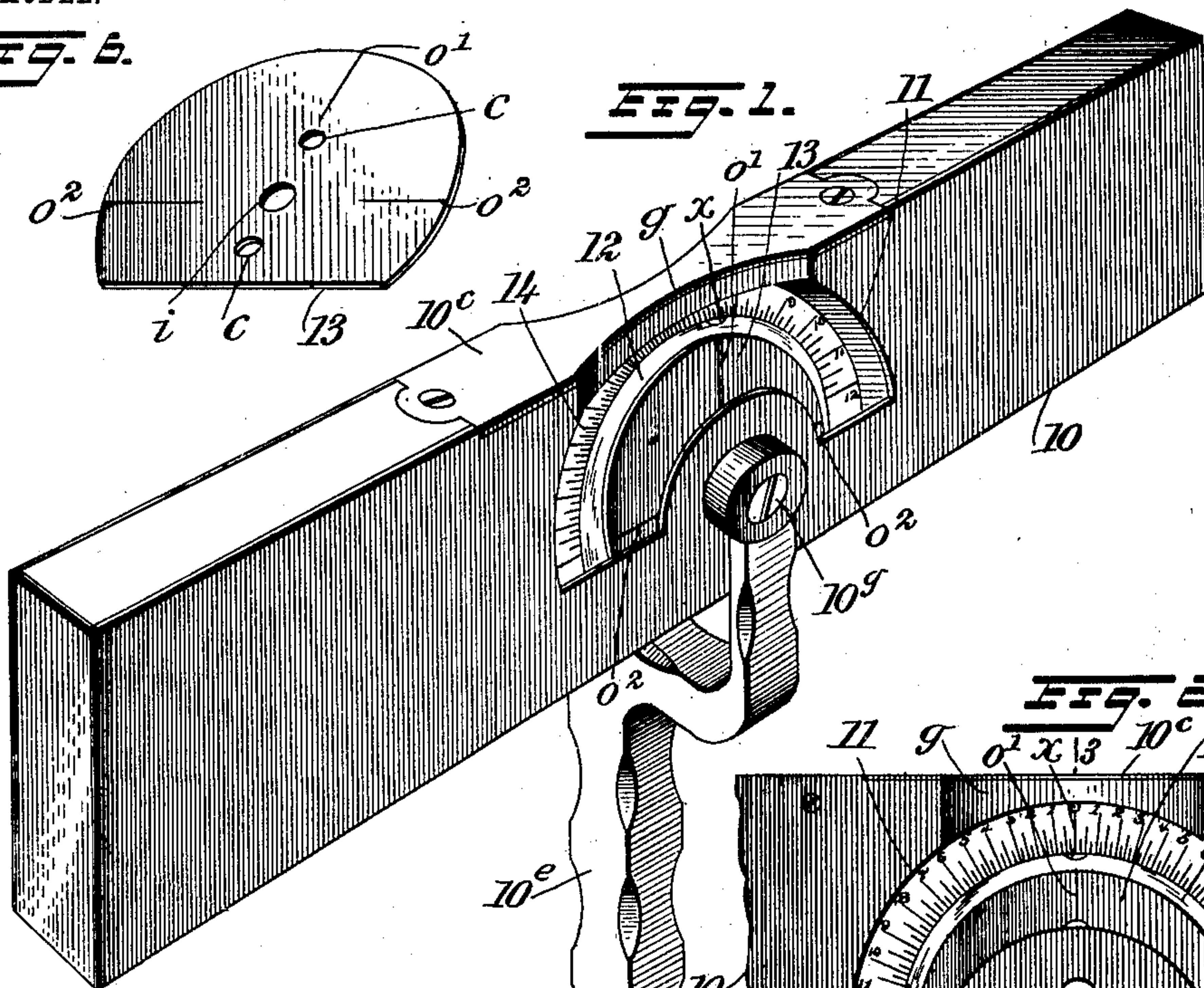


FIG. 2.

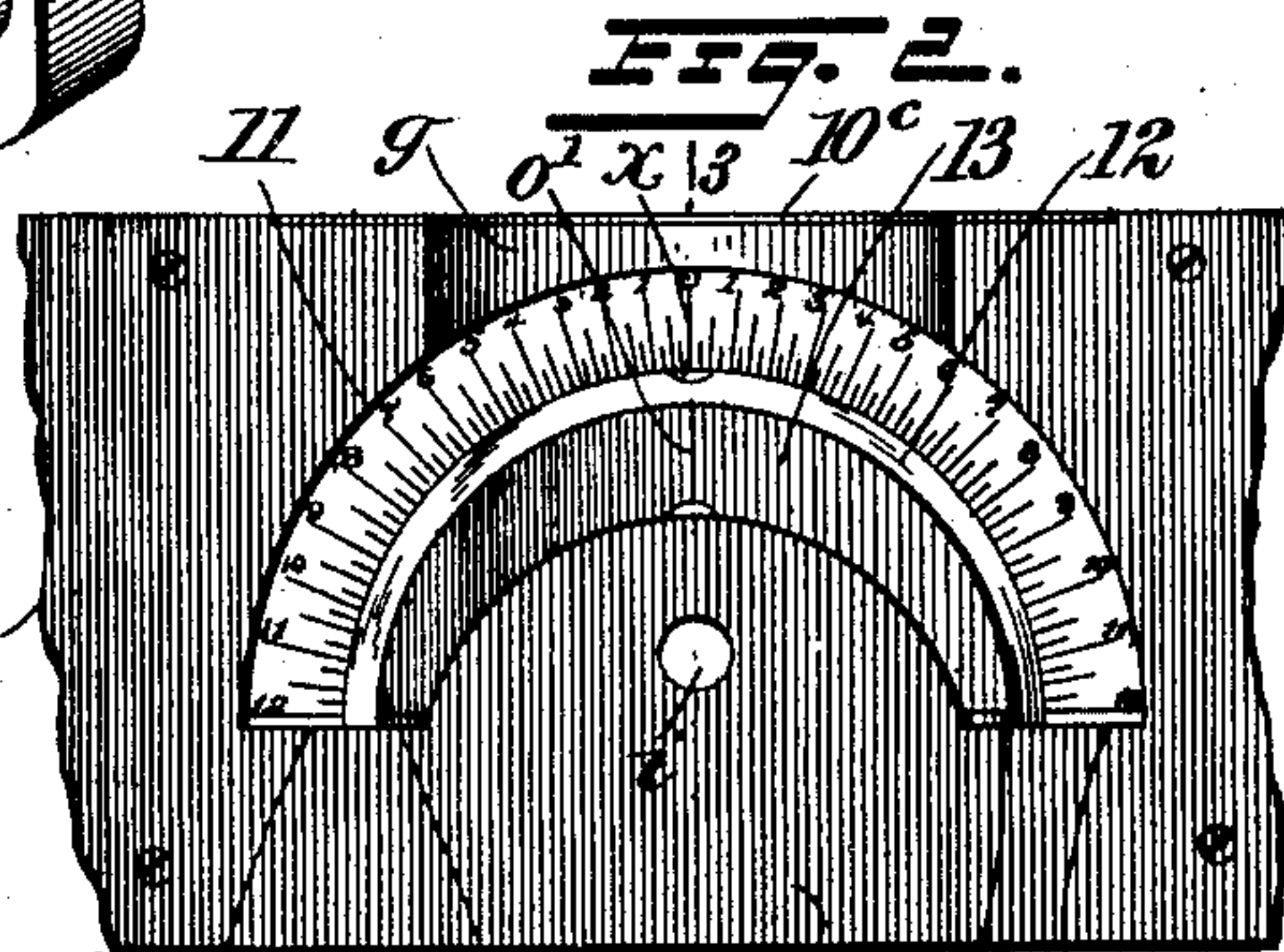


FIG. 3.

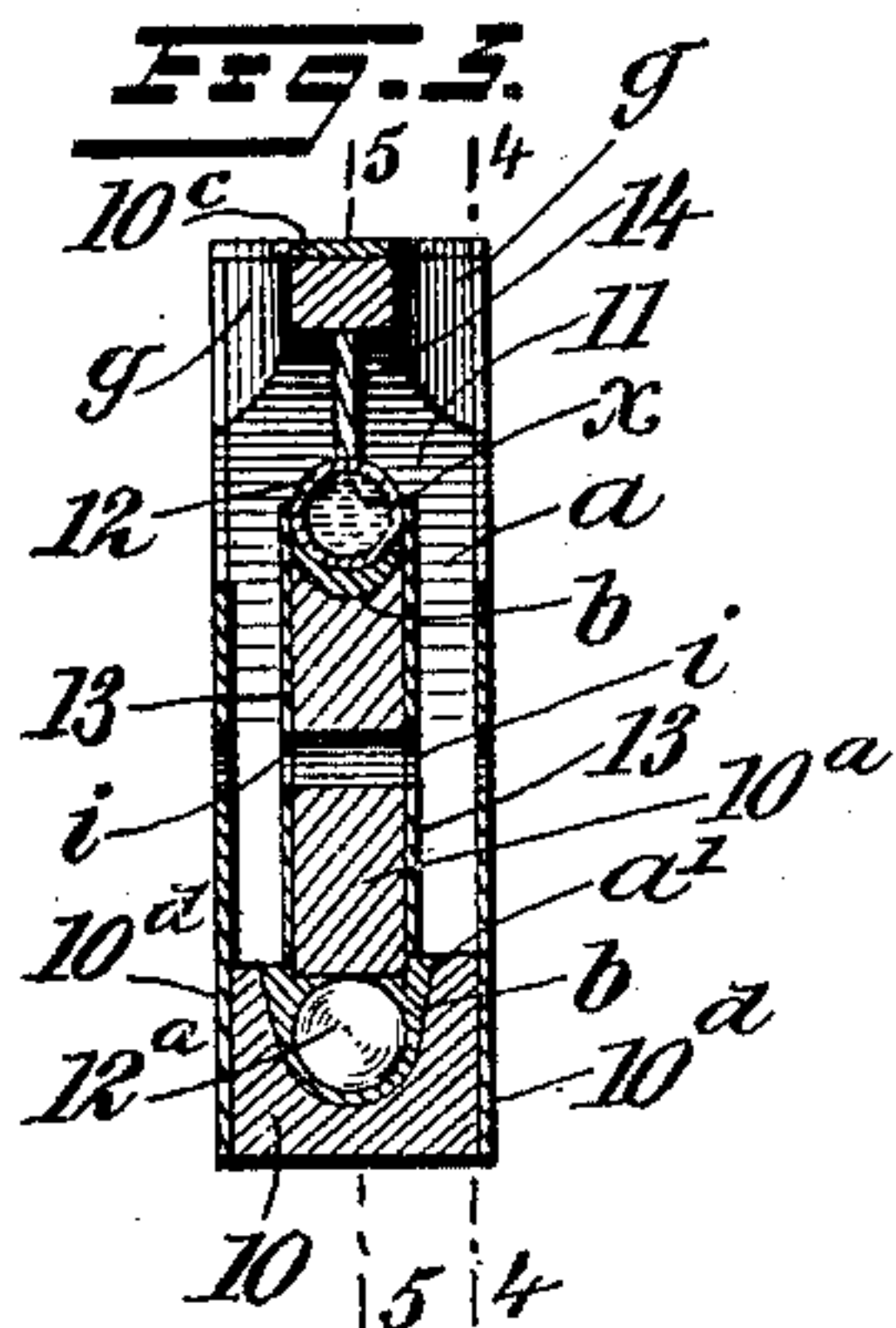


FIG. 4.

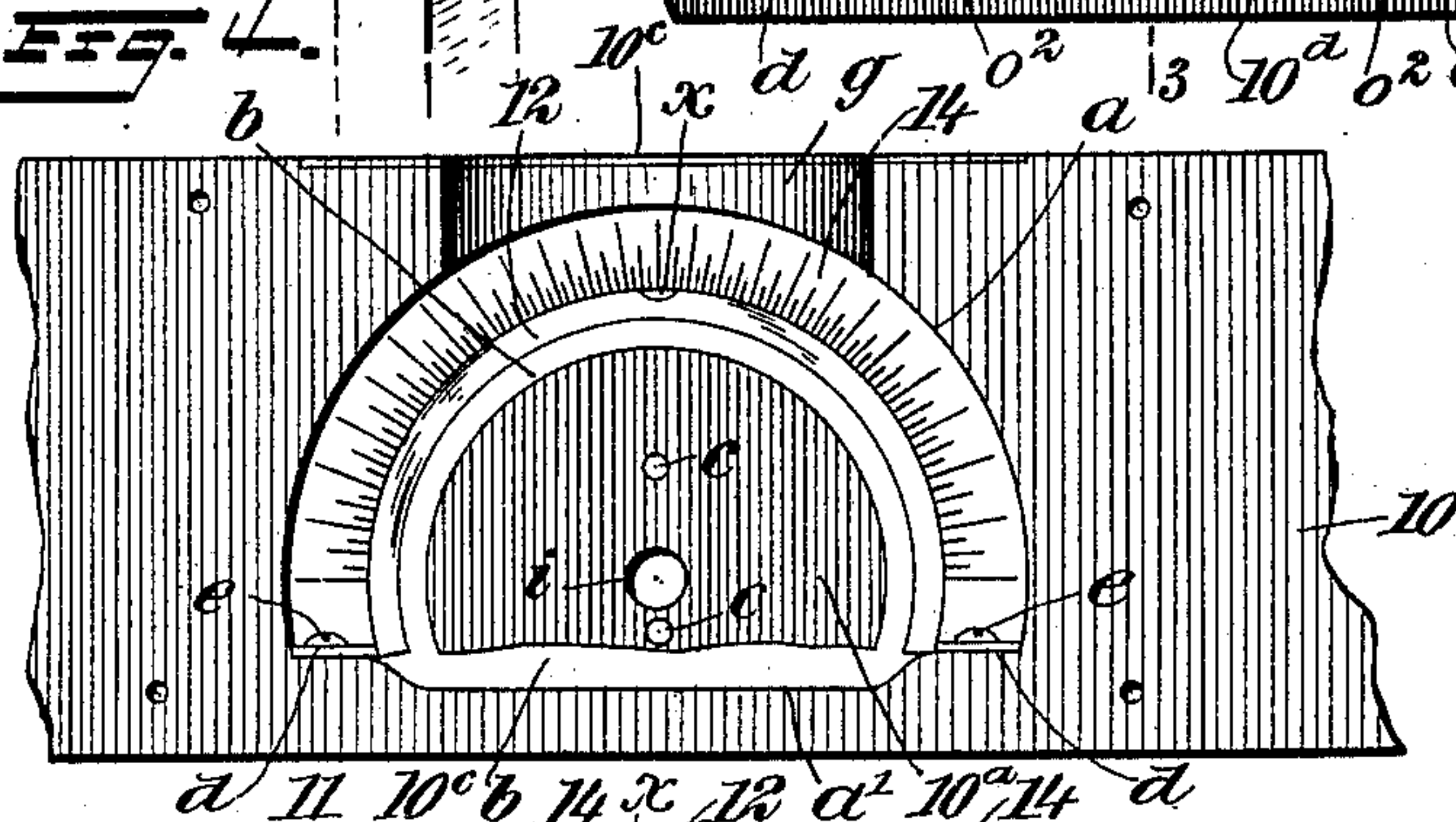
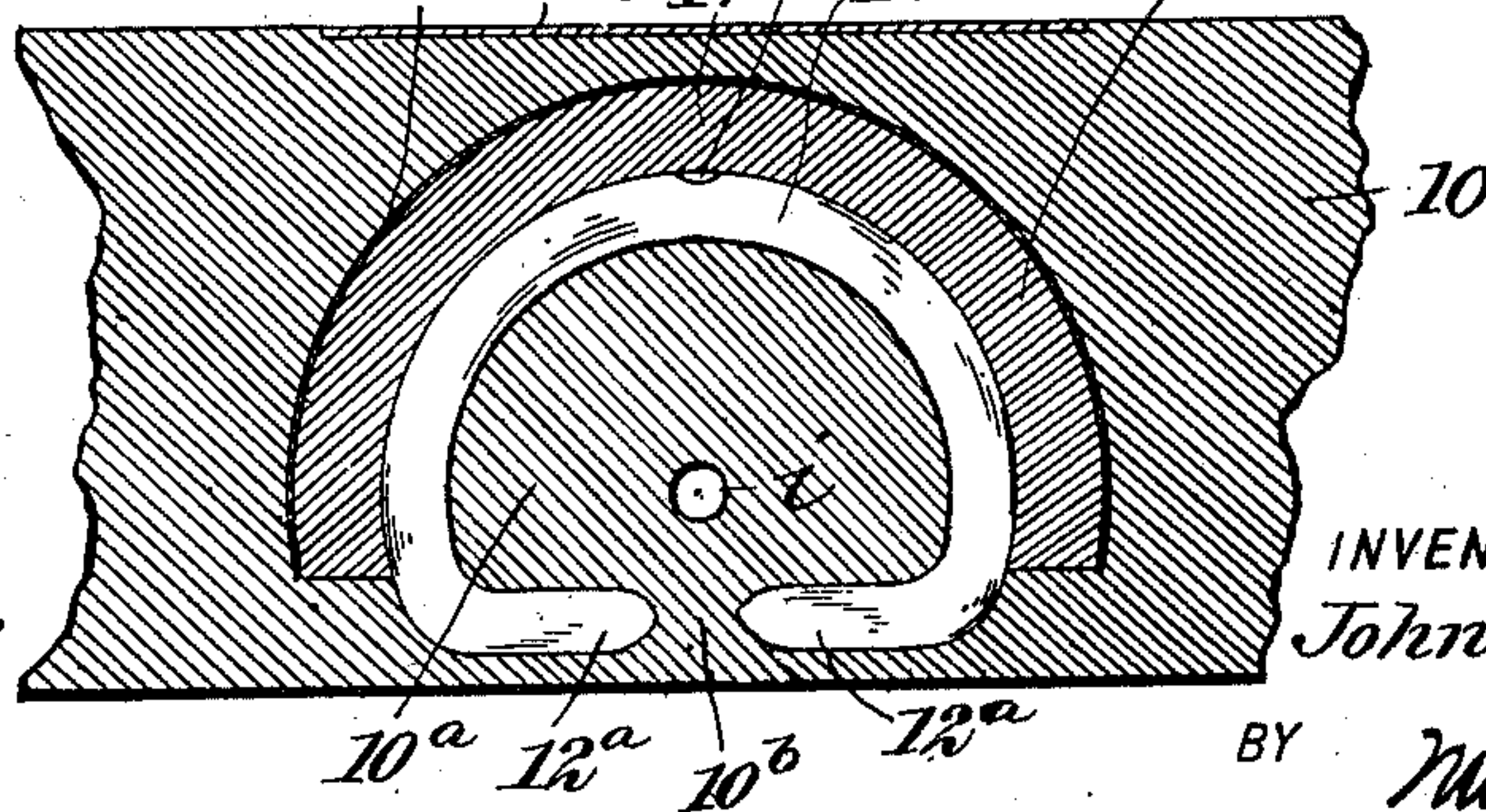


FIG. 5.



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# UNITED STATES PATENT OFFICE.

JOHN HAPPLE, OF CLEVELAND, NEW YORK.

## LEVEL, PLUMB, AND INCLINOMETER.

SPECIFICATION forming part of Letters Patent No. 756,628, dated April 5, 1904.

Application filed October 23, 1903. Serial No. 178,242. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN HAPPLE, a citizen of the United States, and a resident of Cleveland, in the county of Oswego and State of New York, have invented a new and Improved Level, Plumb, and Inclinator, of which the following is a full, clear, and exact description.

This invention relates to a class of instruments employed for exactly determining the position of an object with regard to a perpendicular or horizontal plane, and has for its purpose to provide novel details of construction for a device of the character indicated which adapts it for convenient and reliable service to determine if an object or surface that may be fixed or movable is plumb, level, or inclined and define the degree of inclination or deviation from a perpendicular or horizontal plane.

A further object is to ascertain the height of a building or other stationary thing by use of the improvement.

The invention consists in the novel construction and combination of parts, as is herein after described, and defined in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a perspective view of the improved instrument and of a support therefor. Fig. 2 is a side view of the middle portion of the instrument, showing the indicating device thereon. Fig. 3 is a transverse sectional view substantially on the line 3 3 in Fig. 2. Fig. 4 is a side view of the indicating device more fully exposed by the removal of a side face-plate from the level-stock, substantially on the line 4 4 in Fig. 3. Fig. 5 is a sectional side view of the level-stock between its ends, taken substantially on the line 5 5 in Fig. 3; and Fig. 6 is a perspective view of a clamping-plate employed.

The body portion or stock of the instrument is of usual form, consisting of an elongated block 10, of hard wood or metal, that is rectangular in cross-section and has its side walls and edges respectively parallel with each

other, the stock being of proper length for convenient and efficient service. At the longitudinal center of the stock 10 an opening *a* is formed laterally therethrough, the contour of which is mainly circular, but having a nearly flat portion or wall *a'*, that is substantially parallel with the edges of the stock, as is indicated in Figs. 3 and 4. A preferably sheet-metal reflector-plate 11 is secured as a lining in the opening *a* and conforms with the concave surface that is a main portion of the defining-wall thereof, and the exposed or inner surface of the arched plate 11 is preferably silvered and highly polished to adapt it to reflect light.

A glass spirit-tube 12 is provided, which is curved to represent a section of a circle that is somewhat greater than a semicircle and is bent near each end thereof to produce the similar legs 12<sup>a</sup> thereon, which project toward each other and are axially coincident, the legs having such length as will permit a space of proper width to intervene the ends of the tube. The radial diameter of the circular portion of the spirit-tube 12 is considerably less than that of the circle defining the arch of the reflector-plate 11, and as said tube is cylindrical in cross-section its inner surface defines an arched opening that is of the same radial diameter as that of the inner wall of the opening *a* in the stock 10, which is practically an arched slot, leaving a central block 10<sup>a</sup> intact with the body portion of the stock, to which latter the block is joined by the web 10<sup>b</sup>, as shown in Fig. 5. The spirit-tube 12 is fitted into the opening *a*, its legs being introduced within the lower straight portions of said opening, and is held centered therein by plastic cement *b*, that hardens, plaster-of-paris being preferably used for the purpose.

The block 10<sup>a</sup>, that fills the opening defined by the bent spirit-tube 12, is reduced in thickness, so that it is less than the diameter of the tube, and upon each side of said filling-block 10<sup>a</sup> a clamping-plate 13 is secured by means of screws that are passed through perforations in the clamping-plates and into the filling-block.

In the space in the opening *a* separating



the peripheral surface of the arched tube 12 from the reflector-plate 11 a scale-plate 14 is placed, said plate having an arched form, which adapts it to fill the unoccupied portion of the opening  $a$ . The scale-plate 14 is held at the diametrical center of the spirit-tube 12 by means of the laterally-bent flanges or feet  $d$ , formed on the ends of the scale-plate and secured on the flat lower defining-wall  $a'$  of the opening  $a$  by screws or nails  $e$ , as is indicated in Fig. 4.

The spirit-tube 12 is filled, or nearly filled, with alcohol or other suitable liquid that will not freeze at a low temperature and is then hermetically sealed at the end into which the spirituous liquid has been introduced, this filling of the tube having been effected before it is placed and secured in the opening  $a$ .

Upon each side of the scale-plate 14 indicating-graduations are formed or affixed, these graduations on each side of the plate being similar, and respectively comprise two series of indicating-marks that commence at "0," or zero, which is at the exact crown of the arch on each side of the scale-plate, and increase in degree of separation and progressively in value therefrom downwardly. As shown in Fig. 2, the scale on each side of the "0" point, or zero, at the crown of the arch is defined by the numerals "1" to "12," inclusive, the graduations between the numerals representing progressively-increasing degrees or fractions of a quarter-circle that represents one-half of the scale on each side of the arched plate 14.

In arranging the spirit-tube 12 within the opening  $a$  the small quantity of air that is left remaining in said tube and that forms a small bubble  $x$  must be centrally positioned with regard to the zero-mark on the two scales that are located on the opposite sides of the arched plates 14 when the stock 10 is seated upon a level surface or is by other means disposed in a horizontal plane.

Directly above the spirit-tube 12 the stock 10 is rendered concave at each side thereof, as indicated at  $g$ , and these concavities, which reduce the thickness of the stock above the zero-mark on the scales, expose the crown of the tube 12, so that the position of the bubble  $x$  may be seen from the upper edge of the stock and the deviation of said bubble from coincidence with the zero-mark on the scales may be readily noted.

If the body or stock 10 of the instrument is formed of wood, there may be a cap-plate 10<sup>c</sup> secured on the upper edge of the stock and have its side edges scalloped to correspond with the concavities  $g$  in the sides of the stock 10. The wooden stock of the instrument may also be protected on each side by facing-plates 10<sup>d</sup>, held thereon by means of screws or rivets, and in said facing-plates arched slots are formed that are disposed op-

posite the openings  $a$  in the stock and conform in size and shape therewith, so that the tube 12, the scales on the plate 14, and the reflector-plate 11 are exposed at each side of the instrument.

On the opposite clamping-plates 13 a vertical indicating-mark  $o'$  may be formed on each that is in the same vertical plane with the zero-mark on a corresponding scale that is above said mark, and opposite each numeral "12," in the same plane with the graduations said numerals denote the value of, corresponding indicating-marks  $o''$  are placed on the clamping-plates.

In using the instrument when it is to serve as a spirit-level the stock is placed upon an object to determine its deviation from a horizontal plane, the degree of which will be shown by the distance between the center of the bubble  $x$  and the zero-mark on the scale, this distance being denoted by the graduation on the scale that the bubble is centrally opposite, and it will be seen that the inclination from a level position in either direction will be shown on the corresponding graduations of the scale either at the right or left of the zero-mark "0" on either side of the scale-plate 14. It will also be seen that the marks  $o'$  on the clamping-plates 13 will coact with the zero-marks to show the degree of variation from a horizontal position had by the surface of the object upon which the instrument is seated or applied.

In the employment of the device for determining if a wall or other object is vertical the stock 10 may be applied thereto, and if the surface to be tested is perpendicular the bubble  $x$  will assume a position directly opposite the mark  $o''$  that is nearest thereto and the center of the bubble will be alined with the marks  $o''$  that are respectively disposed opposite the scale-graduations represented by the numerals "12."

To adapt the instrument for determining the height of a fixed object, the stock 10 is held to rock on a forked post 10<sup>e</sup> by a pivot-bolt 10<sup>f</sup>, that passes through the ends of the parallel members of the fork, which loosely embrace the stock, said bolt being also inserted through alined perforation in the clamping-plates 13 and filling-block 10<sup>a</sup> and are formed at the radial center of the arched tube 12 and the scale-plate 14.

When the instrument is employed to ascertain the height of a building or other object, the post 10<sup>e</sup> is erected at a known distance from the object and the stock 10 is inclined so as to aline its upper surface with the extreme top point on the object it is pointed at. The number of degrees on the scale-plate that intervene between the zero-mark and the center of the bubble  $x$  will define the angle embraced between a horizontal plane at the foot of the post and building and the inclined plane



indicated by the line of sight, from which data the height of the object may be readily computed, the scales having the graduations of increasing value from "0" to "12" being of service for such a computation.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a device of the character described, the combination with an elongated stock having parallel edges, and a lateral arched opening therein, of an arched reflector-plate secured in the opening, an arched spirit-tube held positioned in the opening concentric with the reflector-plate, said tube being nearly filled with spirits or the like, an arched scale-plate having graduations and reading from zero at the top of the arch to the lower ends of the scale-plate, and means for securing the scale-plate between the spirit-tube and the reflector-plate.

2. In a device of the character described, the combination with an elongated stock having parallel sides and parallel edges, and also having a central arched opening transversely therein, an arched reflector-plate conforming with the arch of the opening and secured therein, and an arched spirit-tube having alined straight members extended toward each other at the bottom of the arched portion, said tube and its members being nearly filled with spirits or the like, securing means for the tube wherein the straight members are embedded, and an arched scale-plate graduated on each side thereof, and reading on each side from zero at the top of the scale on each side of the plate to lower ends thereof, said graduations gradually increasing in distance apart from zero toward the lower ends of the scale-plate, and means for securing the scale-plate in the space between the spirit-tube and the reflector-plate.

3. In a device of the character described, the combination with an elongated stock having parallel sides and parallel edges, and a central arched opening therein, of an arched spirit-tube having straight alined members at its ends and nearly filled with spirits or the like, an arched reflector-plate in the opening contacting with its arched wall, a filling-block in the space bounded by the spirit-tube, means for securing the spirit-tube concentric within the opening and around the filling-block, two opposite clamping-plates held on the filling-block and bearing at their edges upon the arched tube, an arched scale-plate having foot-flanges on its ends and secured in the opening between the arched spirit-tube and the reflector-plate, said scale-plate having a series of graduations on each side thereof that are numerically defined and increase in value from zero at the crown of the arched plate to the feet thereon, and a bubble formed by confined air in the tube indicating on the scale at either side and in either direction of inclination.

4. In a device of the character described, the combination with an elongated stock, and an indicating device thereon comprising an arched spirit-tube held in a central opening in the stock, and a graduated scale-plate in the opening at the outer edge of the tube, of a forked post pivoted upon the stock at the radial center of the spirit-tube and scale-plate.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN HAPPLE.

Witnesses:

H. D. HOLMES,  
ISAAC T. NICKERSON.