

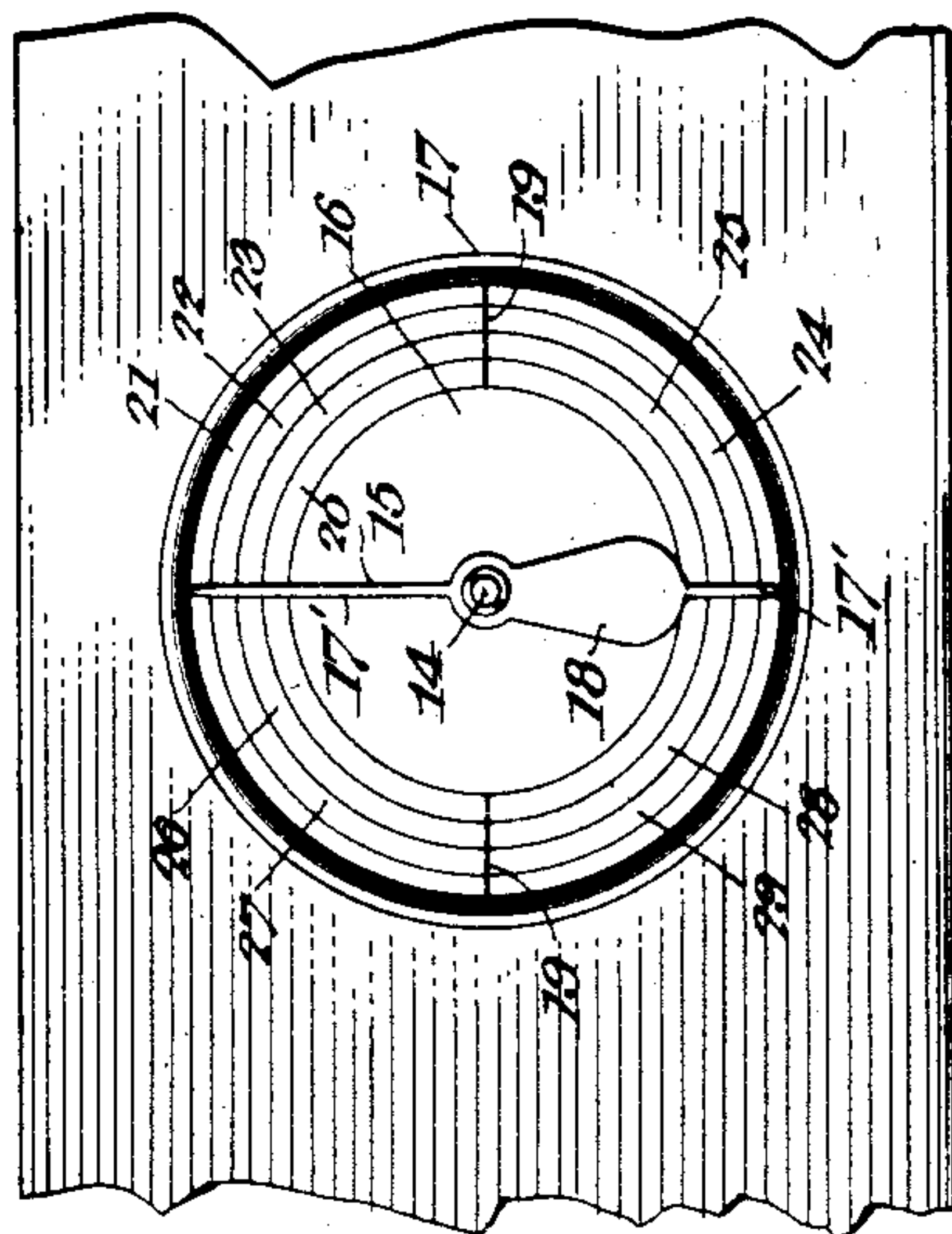
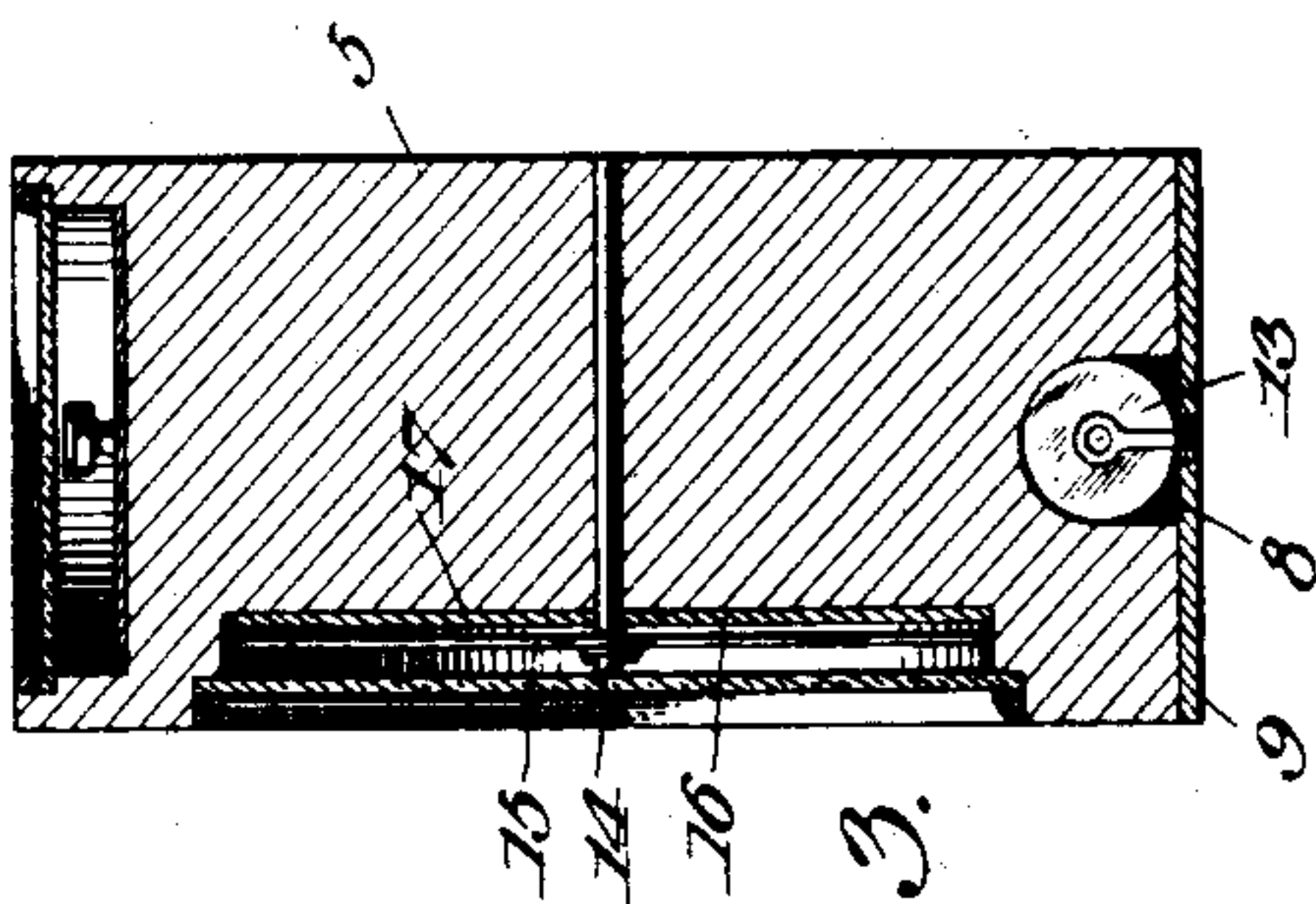
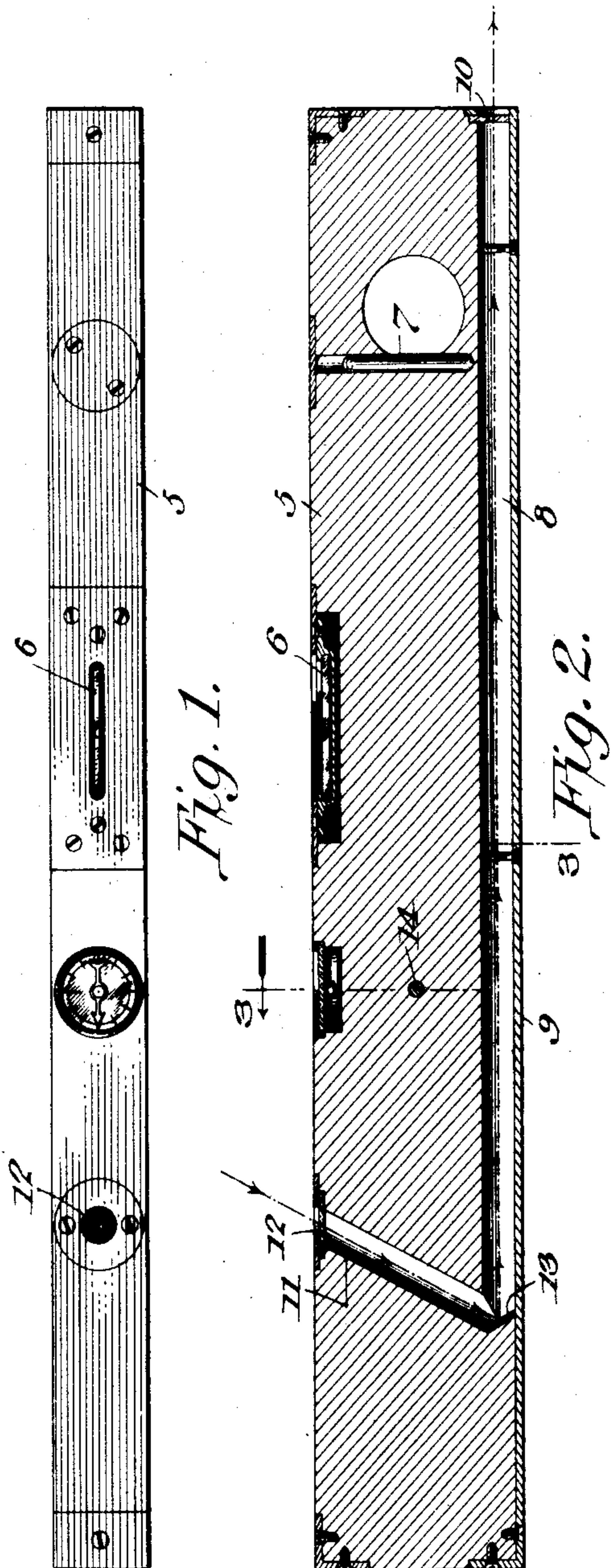
No. 868,089.

PATENTED OCT. 15, 1907.

E. HELB.
LEVEL.

APPLICATION FILED JUNE 17, 1905.

2 SHEETS—SHEET 1.



Witnesses

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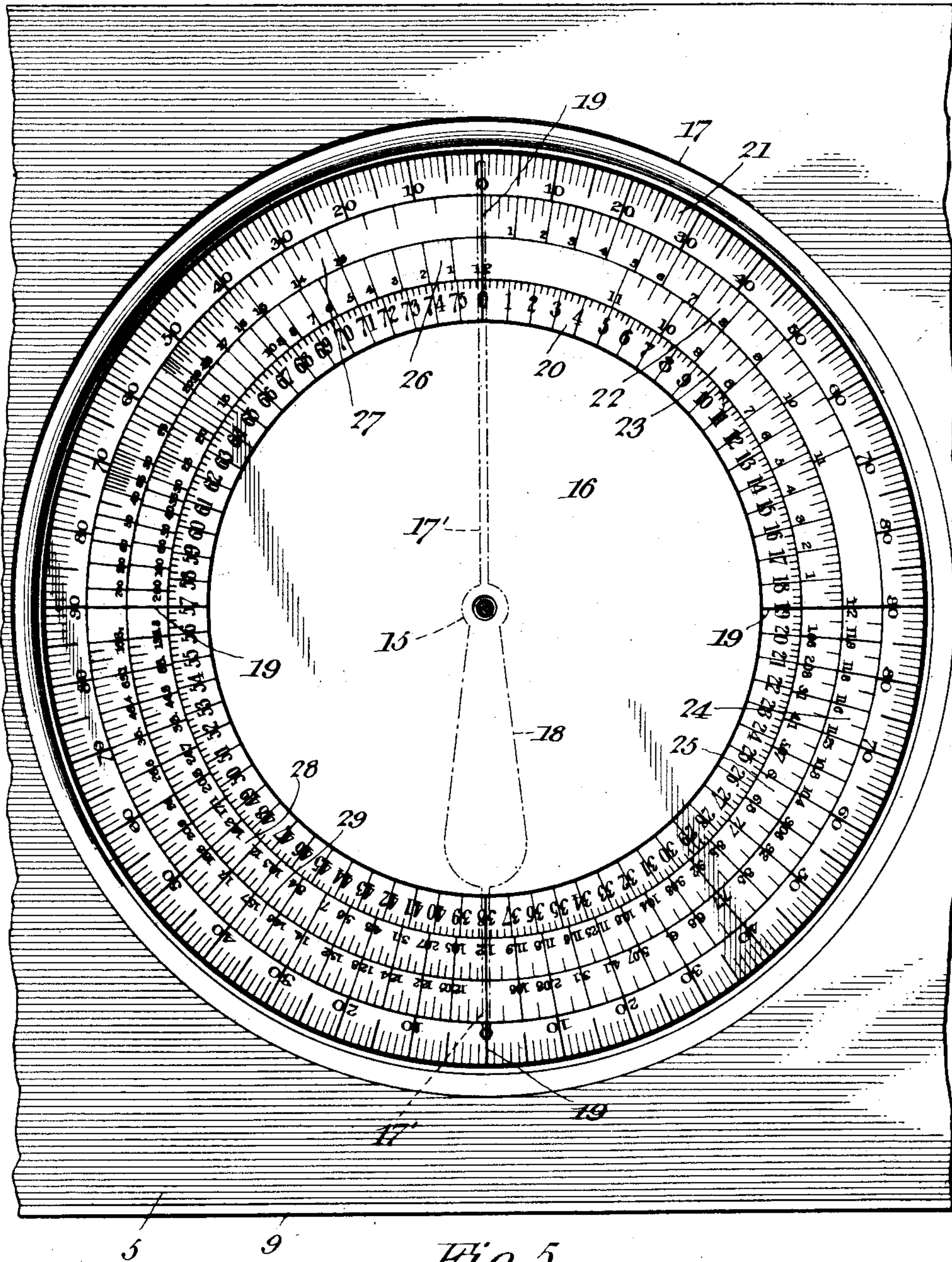


Fig. 5.

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UNITED STATES PATENT OFFICE.

EDWARD HELB, OF RAILROAD, PENNSYLVANIA.

LEVEL.

No. 868,089.

Specification of Letters Patent.

Patented Oct. 15, 1907.

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To all whom it may concern:

Be it known that I, EDWARD HELB, a citizen of the United States, residing at Railroad, in the county of York and State of Pennsylvania, have invented a new and useful Level, of which the following is a specification.

This invention relates to a combined level and grade finder and has for its object to provide a simple, durable and efficient device of this character particularly designed for use by carpenters, bricklayers, mechanics and other persons in ascertaining different grades, determining the heights of objects, laying out roads and for various other purposes.

A further object of the invention is to provide a tool or instrument having a double-ended gravity actuated pointer or index finger movable over the face of a graduated dial seated in a recess in one side of the instrument, said dial consisting of a plurality of concentric circles graduated in such a manner that when one end of the pointer or finger is actuated to indicate the grade in inches per horizontal foot in any elevation or the number of inches in the grade to every foot in the base, the opposite end of the pointer will simultaneously indicate the grade per slant foot and the number of inches in the base for every foot in the grade.

With these and other objects in view, the invention consists in the construction and novel combination and arrangement of parts illustrated in the accompanying drawings and pointed out in the claims hereto appended, it being understood that various changes in form, proportions and minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

In the accompanying drawings forming a part of this specification, Figure 1 is a top plan view of a combined level and grade finder constructed in accordance with my invention. Fig. 2 is a longitudinal sectional view of the same. Fig. 3 is a transverse sectional view taken on the line 3—3 of Fig. 2. Fig. 4 is a side elevation of a portion of the instrument showing the graduated dial. Fig. 5 is an enlarged front elevation of the dial.

Similar numerals of reference indicate corresponding parts in all the figures of the drawing.

The improved tool or instrument comprises a stock or body portion 5 having a spirit tube 6 seated in the upper edge thereof and a similar tube 7 extending transversely of the stock near one end of the latter, as shown. A longitudinal recess 8 is formed in the lower edge of the stock, said recess being covered by a metal plate 9 which also serves as a binder to the lower or wearing surface of the stock. One end of the longitudinal recess is closed by a plate of glass or other transparent material 10 while the opposite end thereof communicates with an inclined recess 11 which extends to the upper edge of the stock and is covered by a transparent plate 12, there being an inclined mirror 13 disposed at the

junction of said recesses for reflecting the rays of light passing through the longitudinal recess upwardly through the inclined recess 11. The above mentioned elements are shown and described in my former patent No. 764,809, dated July 12, 1904 and form no part of the present invention, being merely illustrated in order to enable the improvements hereinafter described to be more readily understood.

Extending transversely of the stock or body portion 5 is a shaft 14 upon which is mounted for rotation a pointer or index finger 15, the latter being movable over the face of a graduated dial 16 seated in a suitable recess 17 formed in one side of said stock or body portion. The pointer 15 is provided with oppositely disposed indicating fingers 17', the lower one of which is weighted, as indicated at 18, so as to always maintain said pointer in a vertical position regardless of the angle or inclination of the stock. The dial 16 consists of a plate of metal, cardboard or other suitable material upon which are printed, stamped or otherwise represented a plurality of circles arranged concentric with the shaft 14 and divided by division lines 19 into quarter circles or quadrants, as shown. The inner circle 20 is divided by radial lines into seventy-six equal spaces representing inches on the circumference of a circle while the outer circle 21 is divided by similar radial lines into degrees, each quarter circle or quadrant representing ninety degrees. The upper right-hand quadrant 22 is graduated from left to right and indicates the height of the perpendicular in inches per slant foot in any elevation and the adjacent quadrant 23 graduated from right to left and indicates the number of inches in the base for each slant foot in the hypotenuse. The lower quadrants 24 and 25 are graduated to indicate the same measurements as the upper quadrants 22 and 23 only the lower quadrants are numbered in whole numbers and decimals per foot for every five degrees thereby enabling the operator to more readily see the fractions of an inch per foot.

The upper left-hand quadrant 26 is graduated from right to left and is used for ascertaining the height or altitude of a perpendicular from a known base, at a desired grade, and also the length of the slant line or hypotenuse if the length of the base or the height of the perpendicular are known. The adjacent upper left-hand quadrant 27, which is also graduated from right to left, indicates the number of inches in the slant line or hypotenuse to every foot in the base. Thus for example if the grade is nine inches per horizontal foot the index finger of the dial will point to the numeral 9 on the quadrant 26 and to the numeral 15 on the quadrant 27, thus indicating that to every foot in the base there are fifteen inches in the slant line hypotenuse. In further explanation of the use of the quadrants 26 and 27 let us say that it is desired to know the height of a perpendicular fifty feet from a

given point, if the grade is nine inches to the foot. In this case elevate the instrument until the index finger points to the numeral 9 on the quadrant 26 and then sight over the level or through the longitudinal recess therein and the height of the perpendicular will be 50x9 or 37 feet 6 inches. Again, let us say the height of the perpendicular is known, as well as the base and it is desired to ascertain the length of the slant line or hypotenuse. Place the instrument at an incline and sight to the top of the perpendicular and if, for instance, the index finger points to the numeral 9 on the quadrant 26, it will also point to the numeral 15 on the adjacent quadrant 27 thus indicating that to every horizontal foot (in this case fifty feet) there are fifteen inches in the slant line or hypotenuse thus making the slant line 50x15 or 62 feet 6 inches.

The lower left-hand quarter circles 28 and 29 represent the same measurements as the upper quadrants 26 and 27 only the inches per foot are numbered in whole numbers and decimals for every five degrees similar to the opposite lower quadrants 24 and 25.

By having the several quadrants graduated in the manner described it enables the operator to determine at one reading the grade in inches per horizontal foot in any elevation or the number of inches in the grade to every foot in the base, the grade per slant foot, and the number of inches in the base for every foot in the grade. To illustrate this more clearly let us say that the length of the base line of a given elevation is fifty feet and the grade is five inches to the horizontal foot, then the top of the index finger will point to the numeral 23 on the degree circle 21, to the numeral 5 on the quadrant 26 and to the numeral 13 on the quadrant 27, thus indicating that the perpendicular or height of the elevation would be 50x5 or 20 feet 10 inches, and the length of the slant line or hypotenuse 50x13 or 54 feet 2 inches. With the index finger in this position

the lower end thereof will also point to exactly the same degree on the lower half of the circle 23, to 4.63 on the quadrant 24 and to 11.9 on the quadrant 25, thus indicating that the grade per slant foot is 4.63 and that for every foot in the slant line or hypotenuse there are 11.9 inches in the base. When the grade per slant foot, as indicated in the quadrant 22, constitutes the starting point the reverse proportions will be indicated on the lower quadrants 28 and 29.

From the foregoing description it will be seen that there is provided a simple and durable instrument admirably adapted for the attainment of the ends in view and which may be manufactured and furnished at only a small increase in price over an ordinary spirit level.

Having thus described the invention, what is claimed is:—

In a measuring instrument, a dial comprising inner and outer concentric scales divided by radial lines into quadrants, some of the quadrants of the scales being graduated to indicate measurements in inches and diametrically opposite quadrants graduated to indicate the same measurements in inches and decimals thereof for a pre-determined number of degrees, a degree circle arranged concentric with the outer scale and surrounding the latter, the radial lines of the concentric scales intersecting the degree circle and dividing the latter into quadrants corresponding to the quadrants of said concentric scales, an inmost scale graduated to represent inches on the circumference of a circle, and a single double ended pointer having one end thereof weighted and movable over the face of the dial for indicating simultaneously a given measurement in inches on one of the quadrants and the same measurement in inches and decimals thereof on the opposite quadrant for any particular marking on the degree circle.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

EDWARD HELB.

Witnesses:

S. J. McDOWELL,
M. P. HOCKER.