N° 23,981 A.D. 1908

Date of Application, 9th Nov., 1908

Complete Specification Left, 5th May, 1909—Accepted, 2nd Sept., 1909

PROVISIONAL SPECIFICATION.

"Improved Means for Calculating or Estimating the Amount of Constituents of the Charges of Smelting Furnaces and the like."

I, ROBERT MARSHALL, of 22, Russell Priory, Russell Square, Bloomsbury, in the County of Middlesex, Engineer, do hereby declare the nature of this invention to be as follows:—

The object of this invention is to provide improved means for indicating the amounts of the constituents of the charges of smelting furnaces and the like.

I pivot a pointer which may conveniently be of sector shape at the centre of a disc on one face of which I draw a number of concentric graduated circles and I divide one edge of the pointer by arcs corresponding to these circles. In the various divisions of the pointer are written the names or symbols of the various elements or compounds that may occur in for instance copper smelting while the ratio of the circular measure of a division in any one circle to that of a division in the outermost circle is equal to the ratio of the molecular weights of the two bodies inscribed in the corresponding division of the pointer.

Upon the other or rear face of the disc is a second disc pivoted concentrically with the first and the two are graduated so as to form a circular slide rule.

The method of using the device is as follows:—Suppose the graduations of the rear face of the first disc represent pounds and we desire to know how many pounds of any constituent there will be in a charge of say 2570 lbs. of ore, the assay having shown that the percentage of that constituent in the ore is let us say 37·4. We turn the second disc on its pivot until the 37·4 graduation thereon is opposite to the zero mark on the first disc and we find that opposite the number 25·7 on the first disc is the number 9·6 on the second disc. Thus we find the number of pounds to be 960.

By this means we can readily write down the total weights of the constituents of the charge according to the percentages given by the assay.

By now turning to the front of the disc we can ascertain if we have the correct quantities of acid and base necessary for the smelting and if not how much acid or base should be added. For instance, if we want to ascertain how much silica should be present to combine with 125 pounds of magnesium oxide (MgO) we place the pointer opposite the 125 mark on the outermost circle, look out the arc on the pointer marked "SiO_2 for MgO mono" and find the pointer at 93·5 on the corresponding circle, thus showing that 93·5 pounds is required for a mono silicate.

Or again if we want to know how much CaO there would be in 155 parts of $CaCO_3$ we put the pointer to the 155 mark in the outermost circle and find that the corresponding graduation in the circle below the arc marked "CaO in $CaOCO_2$" is 87 and so on, the circles being of course prepared to meet the calculations most frequently occurring in any one kind of smelting operation.

Dated this 9th day of November, 1908.

ROBERT MARSHALL.

[*Price 8d.*]

COMPLETE SPECIFICATION.

"Improved Means for Calculating or Estimating the Amount of Constituents of the Charges of Smelting Furnaces and the like."

I, ROBERT MARSHALL, late of 22, Russell Priory, Russell Square, Bloomsbury, and now of 28, Elers Road, Ealing, in the County of Middlesex, Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

The object of this invention is to provide improved means for calculating or estimating the amounts of the constituents of the charges of smelting furnaces and the like.

I pivot a pointer, which may conveniently be of sector shape, at the centre of a disc, on one face of which I draw a number of concentric graduated circles, and I divide one edge of the pointer by arcs corresponding to these circles. In the various divisions of the pointer are written the names or symbols of the various elements or compounds that may occur in, for instance, copper smelting, while the ratio of the circular measure of a division in any one circle to that of a division in the outermost circle is equal to the ratio of the molecular weights of the two bodies inscribed in the corresponding division of the pointer.

Upon the other or rear face of the disc is a second disc pivotted concentrically with the first and the two are graduated so as to form a circular slide rule.

The accompanying drawings show a device for use in copper smelting made in accordance with my invention.

Figure 1 shows the front face of the disc *a* on the pivot *b* on which is mounted the pointer *c* shown separately in Figures 2 and 3.

Figure 4 shows the rear face of the disc *a* and the second disc *d*. A transparent pointer *e* may also be provided on the rear face.

The method of using the device is as follows:—Suppose the graduations of the rear face of the first disc represent kilos and we desire to know how many kilos of any constituent there will be in a charge of say 2570 kilos of ore, the assay having shown that the percentage of that constituent in the ore is, let us say, 37·4. We turn the disc *d* on its pivot until the 37·4 graduation thereon is opposite to the zero mark of the graduations *f* of the disc *a* and we find that opposite the number 25·7 on disc *a* is the number 9·6 on the disc *d*. Thus we find the number of kilos to be 960. The pointer *e* may be clamped by the nut *g* with its line *h* over the number 25·7 to facilitate the reading of the disc *d*. By turning the disc *d* so that the various numbers corresponding to the various percentages of the assay come opposite the zero mark on disc *a* the various numbers of the kilos of the different constituents may be read off beneath the line *h*.

By now turning to the front of the disc we can ascertain if we have the correct quantities of acid and base necessary for the smelting and if not how much acid or base should be added. For instance, if we want to ascertain how much silica should be present to combine with 125 kilos of magnesium oxide (MgO) we place the pointer opposite the 125 mark on the outermost circle, look out the arc on the pointer marked "SiO_2 for MgO mono" and find the pointer at 93·5 on the corresponding circle, thus showing that 93·5 kilos is required for a mono silicate.

Or again if we want to know how much CaO there would be in 155 parts of $CaCO_3$ we put the pointer to the 155 mark in the outermost circle and find that the corresponding graduation in the circle below the arc marked "CaO in $CaOCO_2$" is 87 and so on, the circles being of course prepared to meet the calculations most frequently occurring in any one kind of smelting operation.

As the two series of graduations on the back of disc *a* and on disc *d* represent the logarithms of the natural numbers the device may be made more useful by adding a series of evenly divided graduations *i* outside those *f* already referred to on disc *a*, representing the natural numbers. It will be seen that opposite any number on scale *f* will be found its logarithm on scale *i*.

The pointer *c* may have attached to it a part *k* to act as an additional pointer on the back.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed I declare that what I claim is:—

The improved means for calculating or estimating the amount of constituents of the charges of smelting furnaces and the like substantially as described with reference to the drawings.

Dated this 5th day of May 1909.

CARPMAEL & Co.,
Agents for Applicant,
24 Southampton Bdgs., London, W.C.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1909.

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

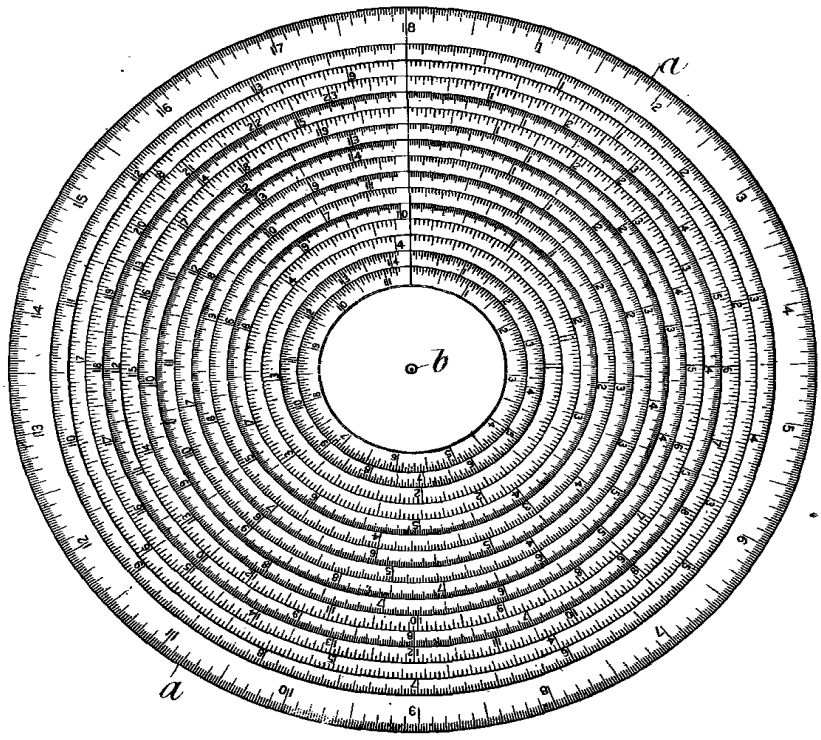

Fig. 2.

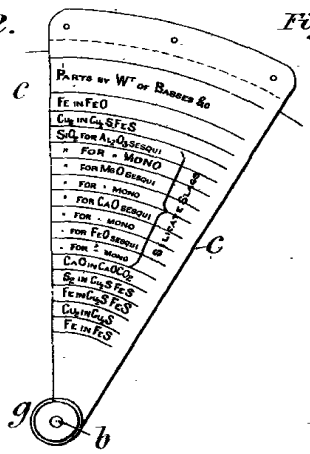

Fig. 3.

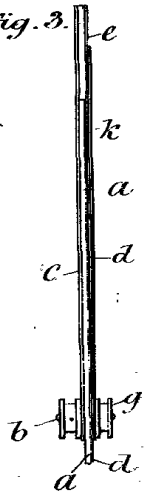

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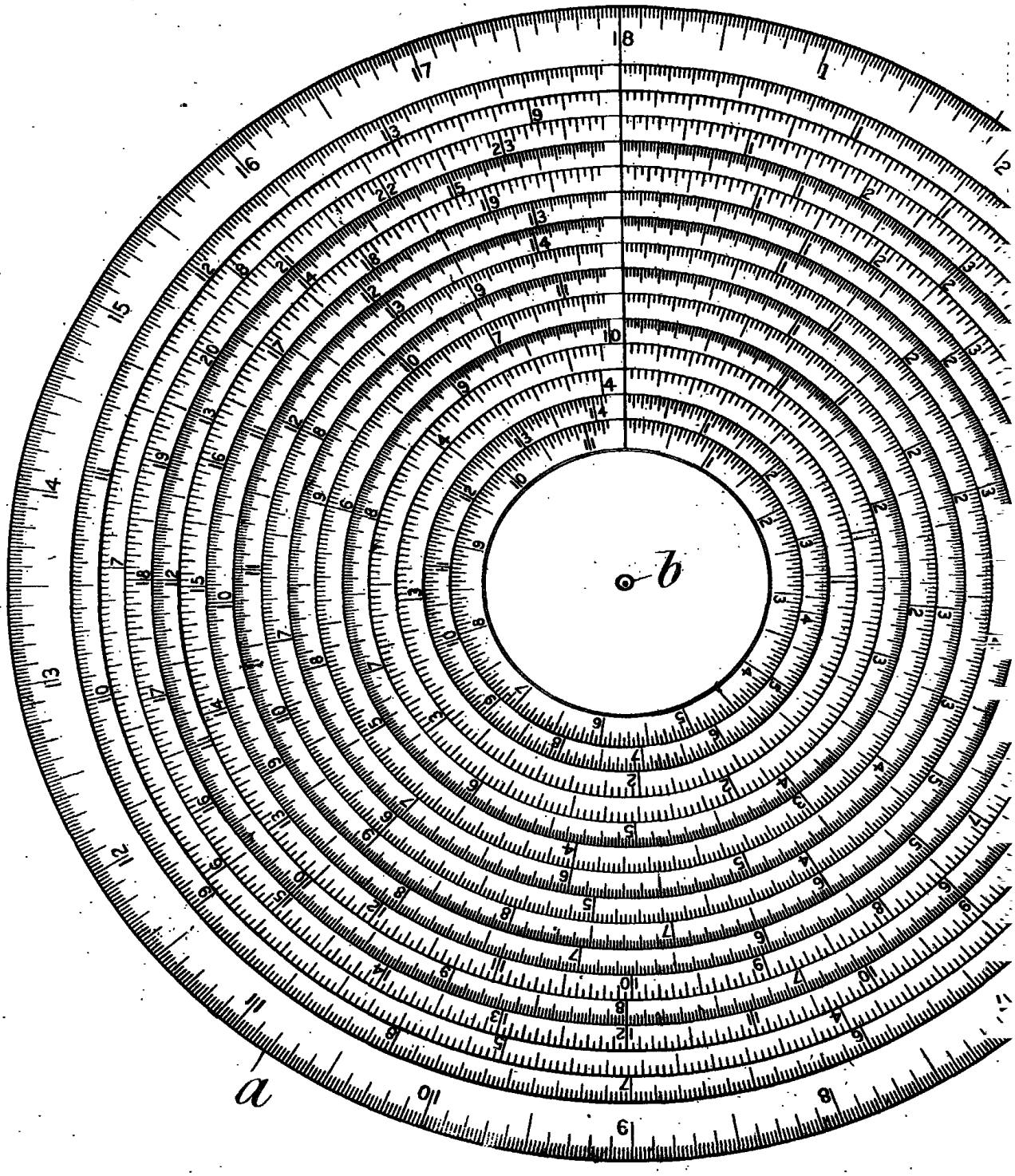
Fig. 1.



[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 2.

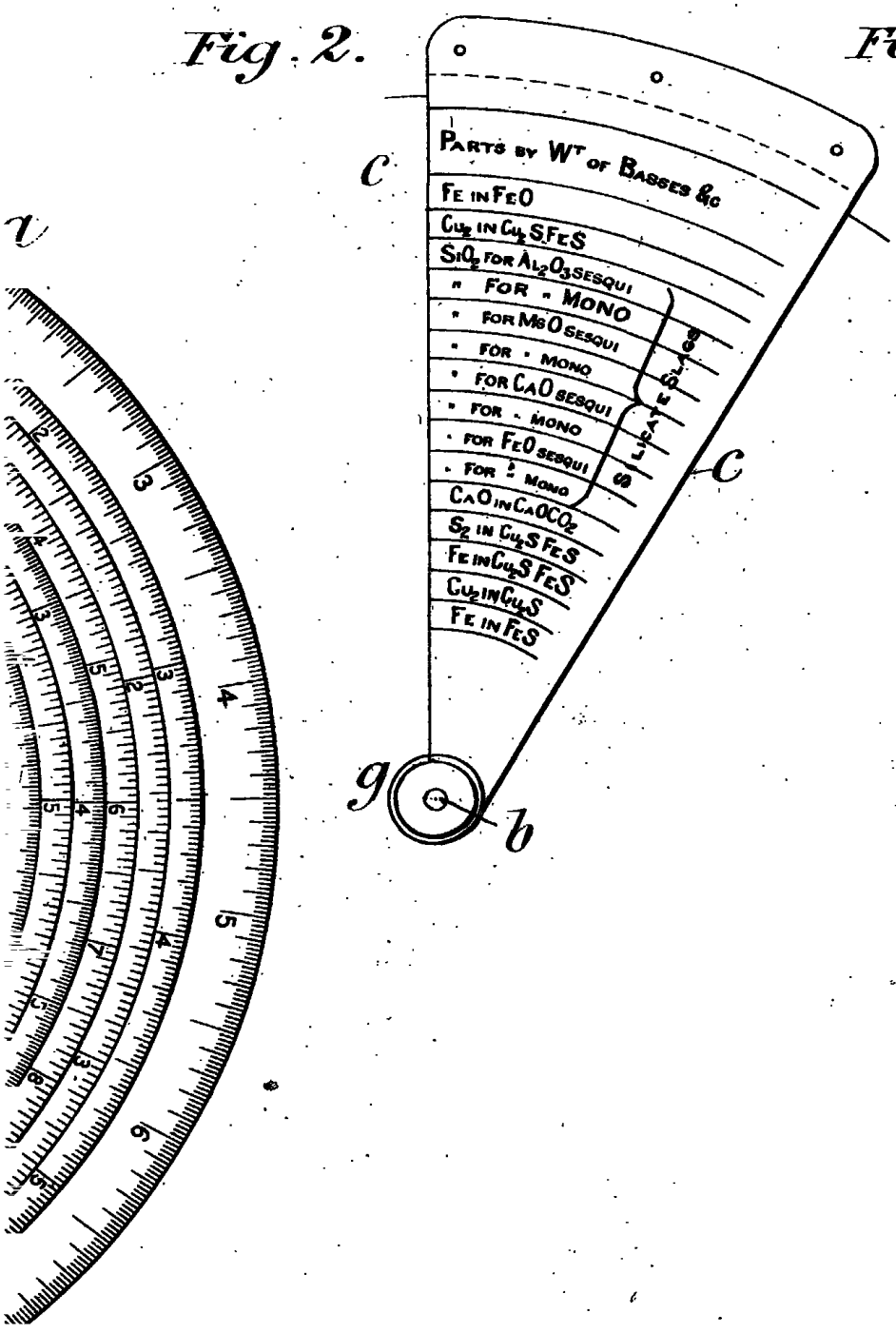
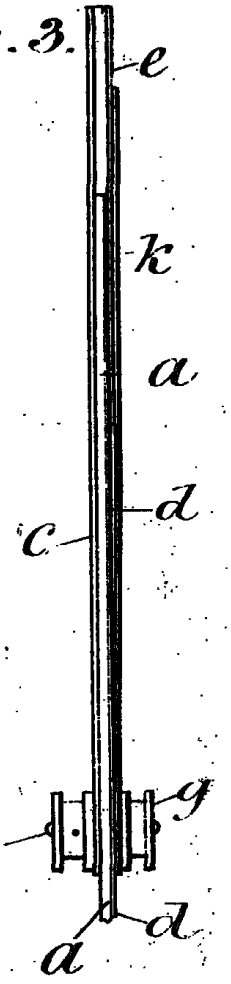


Fig. 3.



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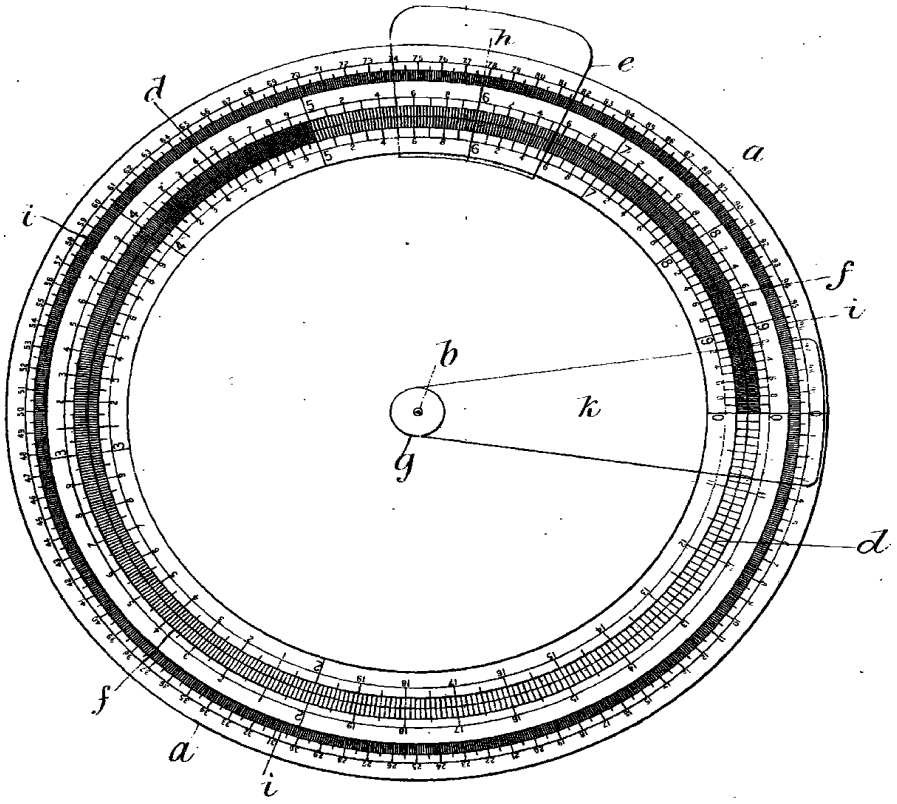
[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 4.



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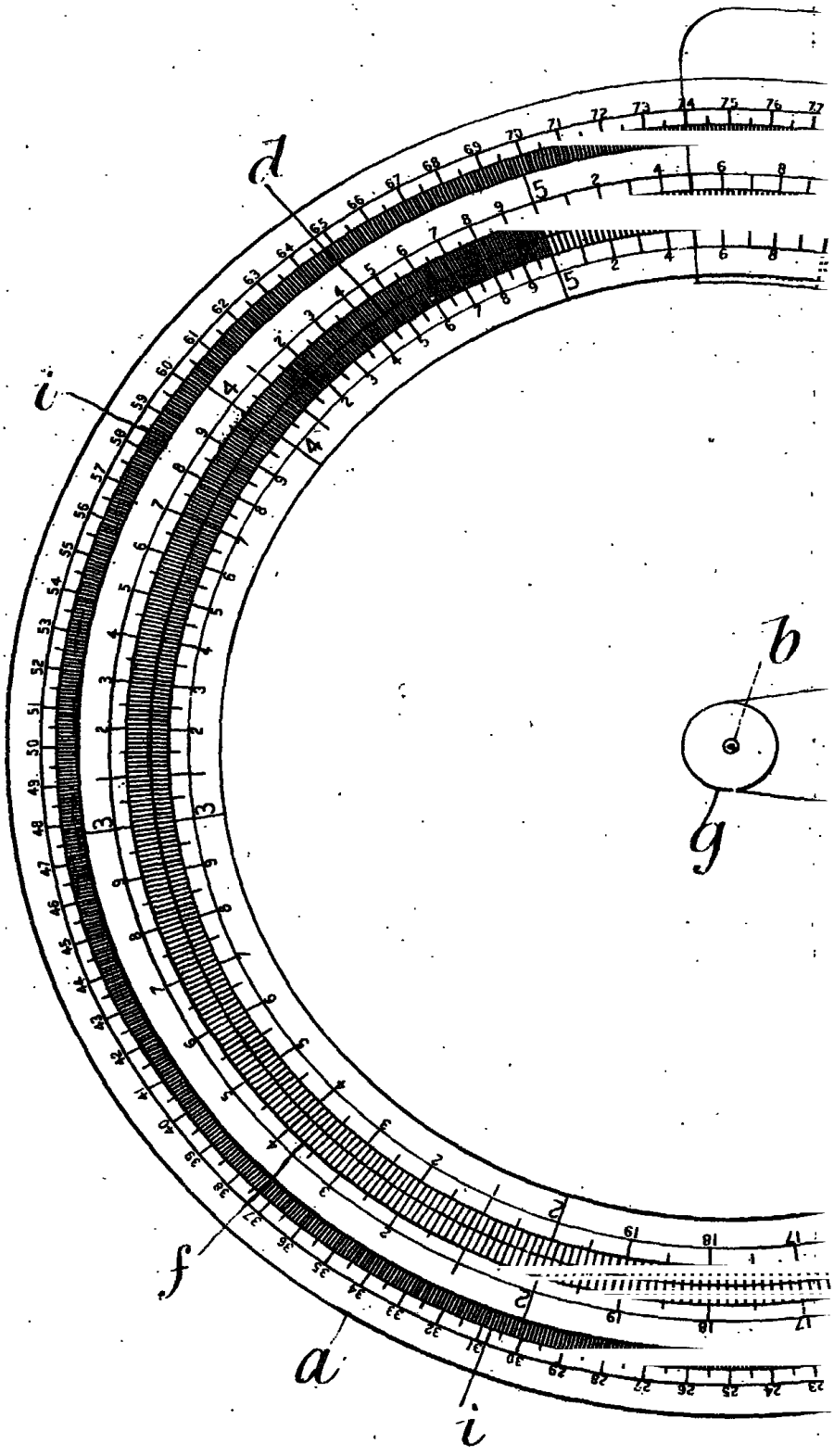
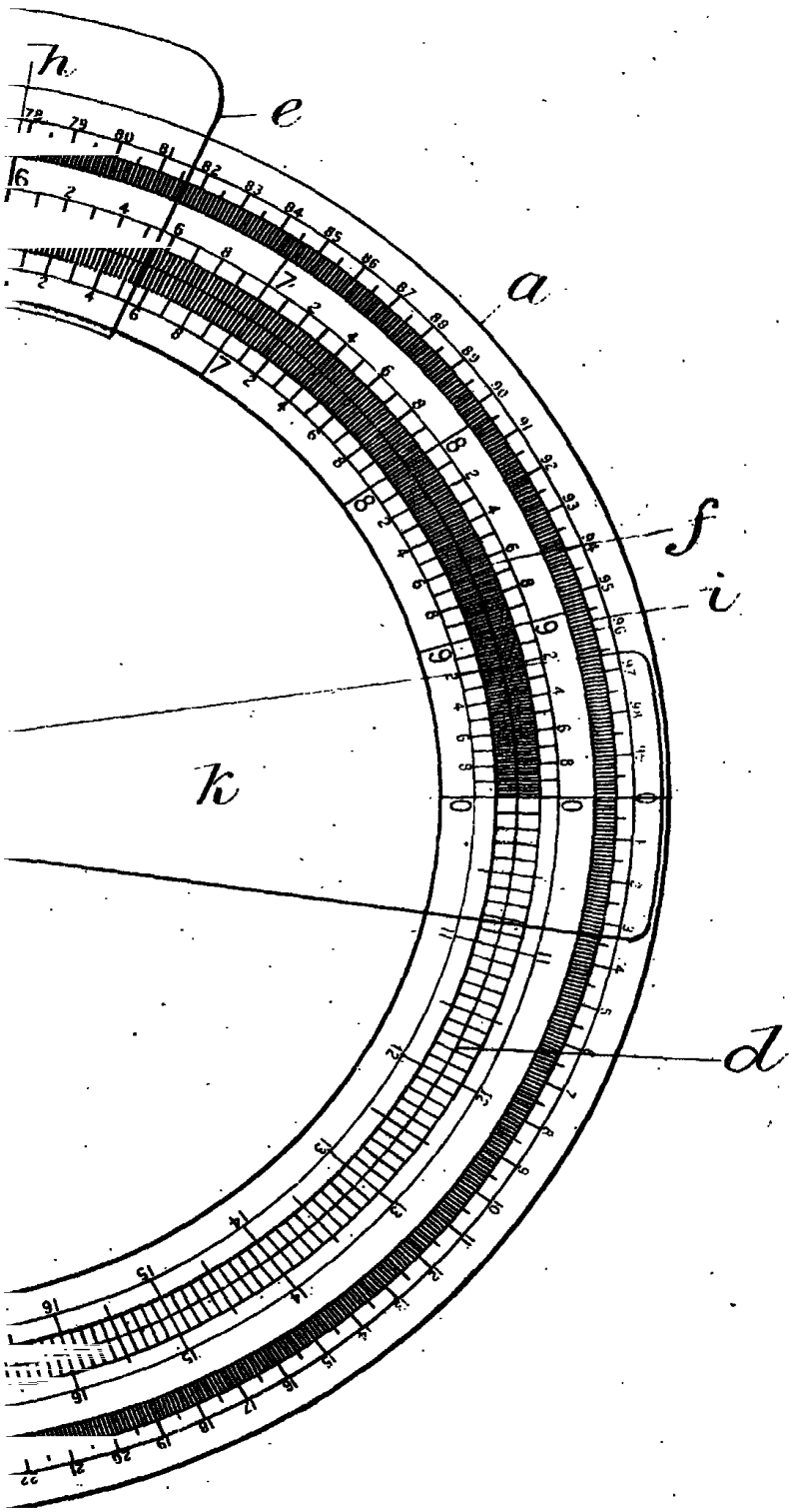
[This Drawing is a reproduction of the Original on a reduced scale.]

Fig



4.



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