N° 20,708 A.D. 1907

Date of Application, 18th Mar., 1908—Accepted, 8th Oct., 1908

COMPLETE SPECIFICATION.

Improvements in Circular Logarithmic Slide-rules.

I WILLIAM JOHN READ, Station Road, Wootton Bassett, Wilts (late of 155 Victoria Road, Swindon), Railway Clerk, 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:—

My invention relates to improvements in circular slide-rules of known types in which the scales are divided into logarithmic ratios for the purpose of making various calculations.

The slide-rule to which my invention is applicable is that of the circular or disc type in which one scale is fixed and one rotatable.

The object of my invention is to adapt the circular or disc type of slide-rule, having one or both scales rotatable, for logarithmic calculations in which it is necessary to show the result in different terms from those in which the calculations are set out such as the result in pence derived by conversion from a calculation in pounds (sterling) and a result in pounds (avoirdupois) derived from a calculation in hundredweights.

The machine or calculator to which my invention is applied consists of two circular pieces of suitable material such as cardboard, xylonite, papier-mache fastened to or resting upon a baseboard or frame as shown in Figures 1 and 2 of the accompanying drawings. The scales are marked and figured in proper logarithmic ratio for the purpose required as hereinafter described and are rotated either by hand or by suitable gear wheels. A is the fixed scale, B the rotatable scale. It is obvious however that the scale A may be rotatable and B fixed without departing from the scope of my invention.

In Fig. 3 of the accompanying drawings is shown a portion of the representation, in plan, of a slide-rule adapted for working the average lbs. of coal consumed by locomotive engines per mile run.

In the scale A the circles a^2, b^2, c^2, d^2, and in scale B the circles e^2, f^2, g^2, h^2 are divided in the ordinary manner into logarithmic proportions from 1 to 1000. a^2, b^2, c^2, d^2 are used for the miles run (the divisors) and e^2, f^2, g^2, h^2 for ordinary slide-rule results. In order to adapt the scale for the purpose of obtaining the average lbs. of coal per mile in conjunction with the ordinary average, an extra set of scales or an extension of the ordinary slide-rule is provided, divided logarithmically from 11.2 to 112 as shown by scales circles i^2, j^2, k^2.

For instance, if it should be required to find at the same time the average lbs. of coal consumed per mile and the average pints of oil used per 100 miles by an engine, the following is the method adopted:—

Example:—Miles run by an engine—916, coal consumed 111 cwts. oil used 89 pints.

Set index 1 of movable scale A to 916 on fixed scale B as indicated by the numerals a^1, b^1, c^1. Then opposite 111 (indicated by numerals marked d^1, e^1, f^1) read 13.6 lbs. on scale circles i^2, j^2, k^2 a point (indicated by the asterisk) which will have been carried by the movement of scale A opposite that number. At the same time and without any further movements of the scale the pints of oil per 100 miles, namely, 9.72 can be read on the scale circles e^2, f^2, g^2, that

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number having been carried by the same movement to a point opposite numeral 89 on the fixed scale as indicated by g^1.

The manipulator places the decimal point from his knowledge of the relative values of the dividend and divisor.

When any of the numerals exceed 1000 the intermediate tenths of each of the smallest divisions of the scales are estimated, the quotient being unaffected by a slight error in the estimate. When the numerals reach to more than four integers the remaining figures beyond that number may be discarded, the result being unaffected. In such cases the remaining figures are regarded as a fractional part of the unit and the unit taken is the nearest whole number to that so expressed.

Fig. 4 represents a general average scale used for finding the cost per mile (in pence and decimal parts of a penny) per 1000 cubic feet of gas, per man (for wages) and similar calculations coming within the scope of the scale. Scale-circles a^3, b^3, c^3, d^3, e^3, f^3, g^3, h^3 are divisors and their quotients, the value of the indices being given by the manipulator, and scale-circles i^3, j^3, k^3 are for the results in pence up to £1, with one, two and three places of decimals, the decimals depending upon the number of integers in the amount. These scale numbers are obtained by multiplying the ordinary quotient by 240 so as to express the results in pence and decimal parts of a penny. The results are found by setting the index of the movable scale to divisor (up to the first four figures) on the fixed scale, and opposite the amount of the nearest pound (£) also up to four figures, as shown on the fixed scale may then be found on the movable scale the required average. When any figures are discarded the unit figure of both divisor and dividend should be the whole number nearest to that indicated by the remaining figures.

It is obvious that other conversions of calculations can be made by suitably dividing the scale for the purpose of such conversions.

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:—

1. In a circular slide-rule for logarithmic calculations, in which one or both scales are rotatable, providing means on one of the scales for expressing the result in different terms from those in which the calculations are set out.

2. In a circular slide-rule for logarithmic calculations, in which one or both scales are rotatable, providing means on one of the scales for expressing the result in pence derived by conversion from a calculation in pounds (sterling).

3. In a circular slide-rule for logarithmic calculations, in which one or both scales are rotatable, providing means on one of the scales for expressing the result in pounds (avoirdupois) derived by conversion from a calculation in hundredweights.

Dated this 18th day of March, 1908.

W. J. READ.

J. F. Tonkin,
For the Applicant.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1908.

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READ'S COMPLETE SPECIFICATION.

(2 SHEETS)
SHEET 1

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

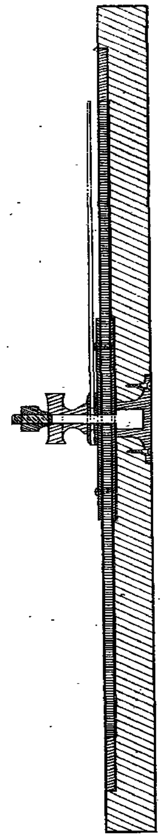

FIG. 1.

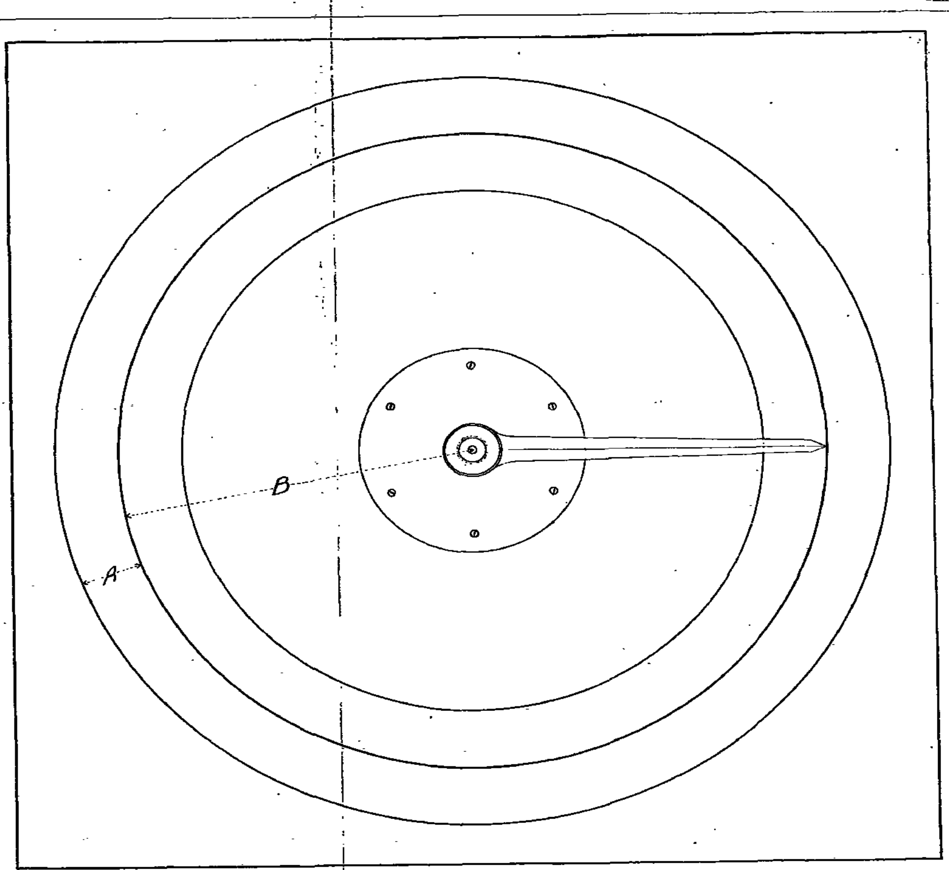

FIG. 2.

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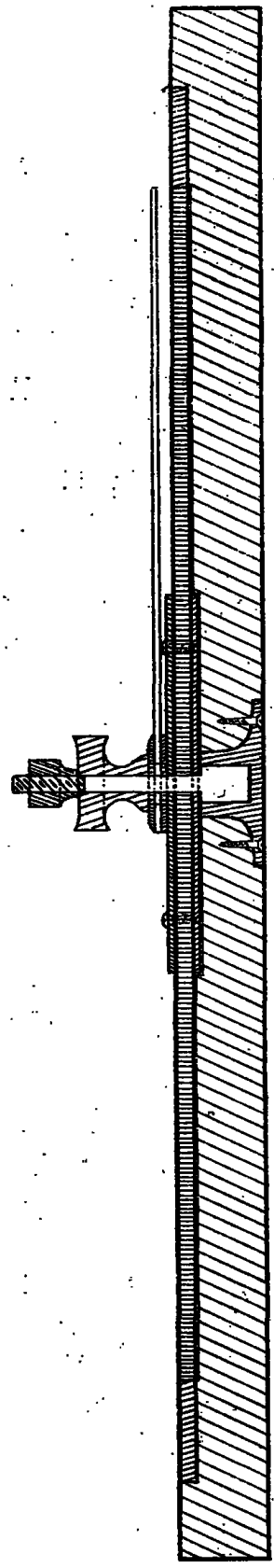
[This Drawing is a reproduction of the Original on a reduced scale.]



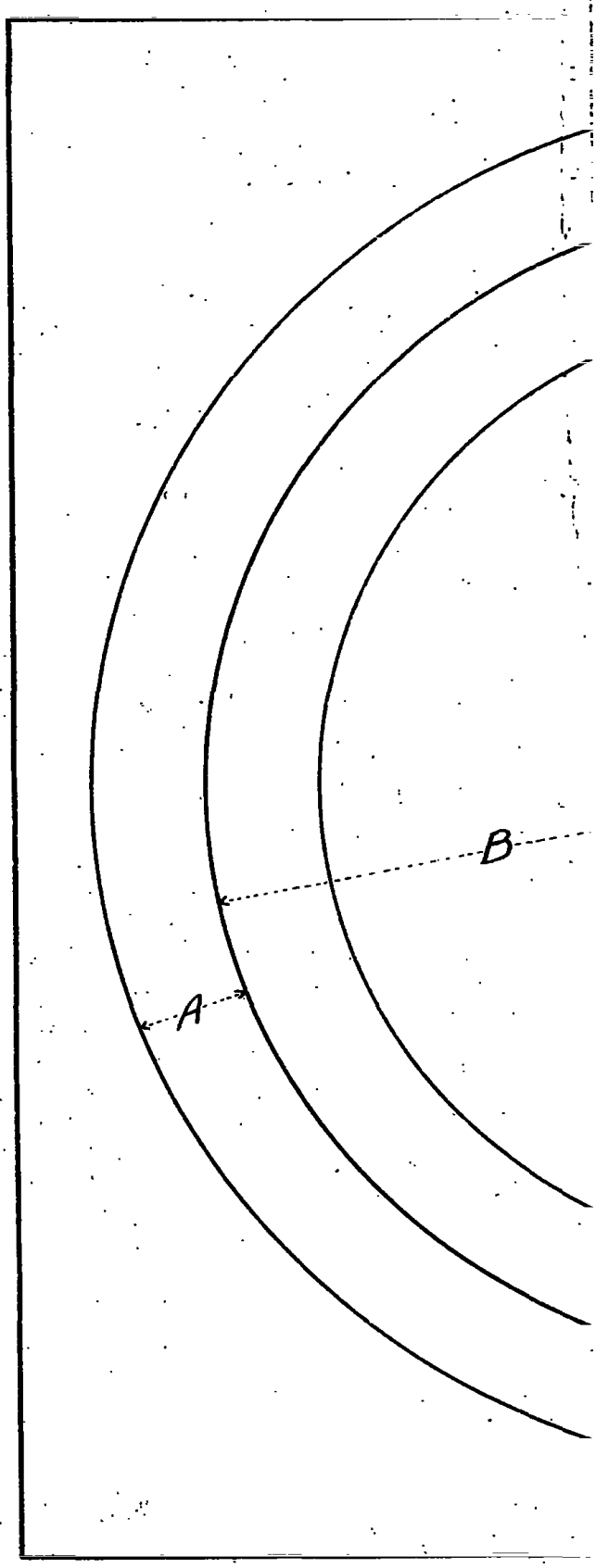


FIG. 1.

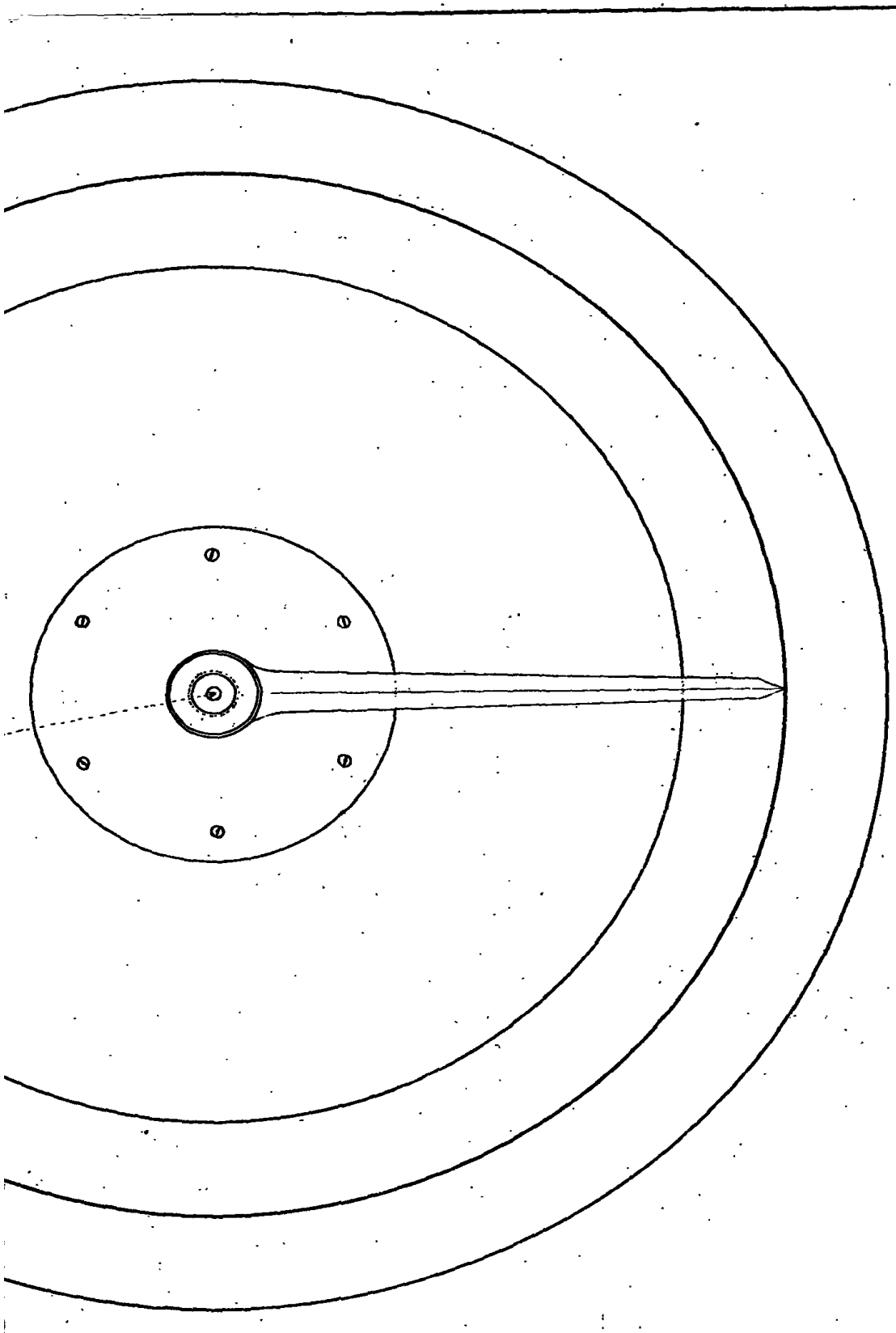


FIG. 2.

Malby & Sons, Photo-Litho.

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READ'S COMPLETE SPECIFICATION.

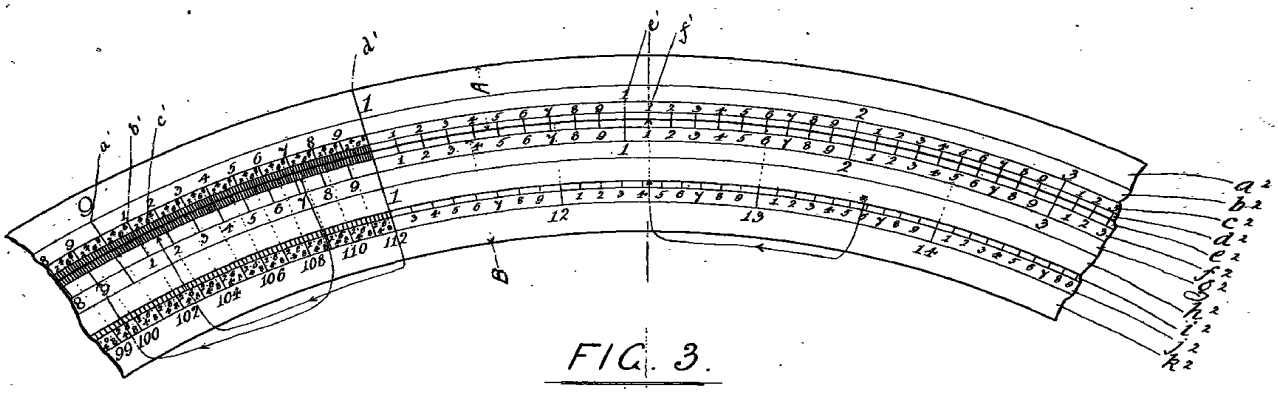


FIG. 3.

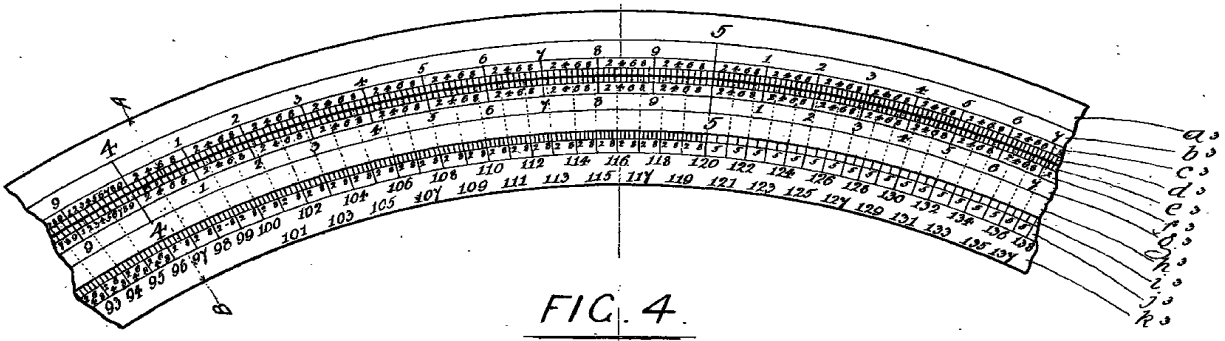


FIG. 4.

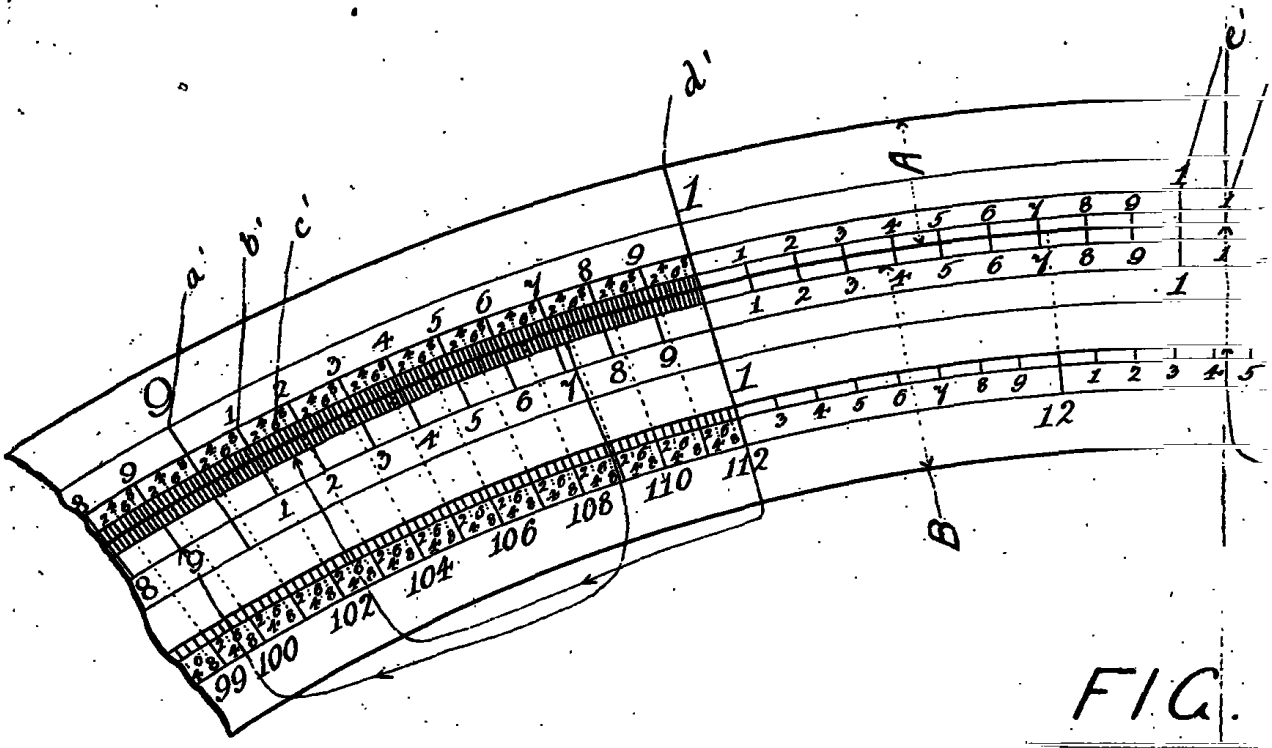


FIG.

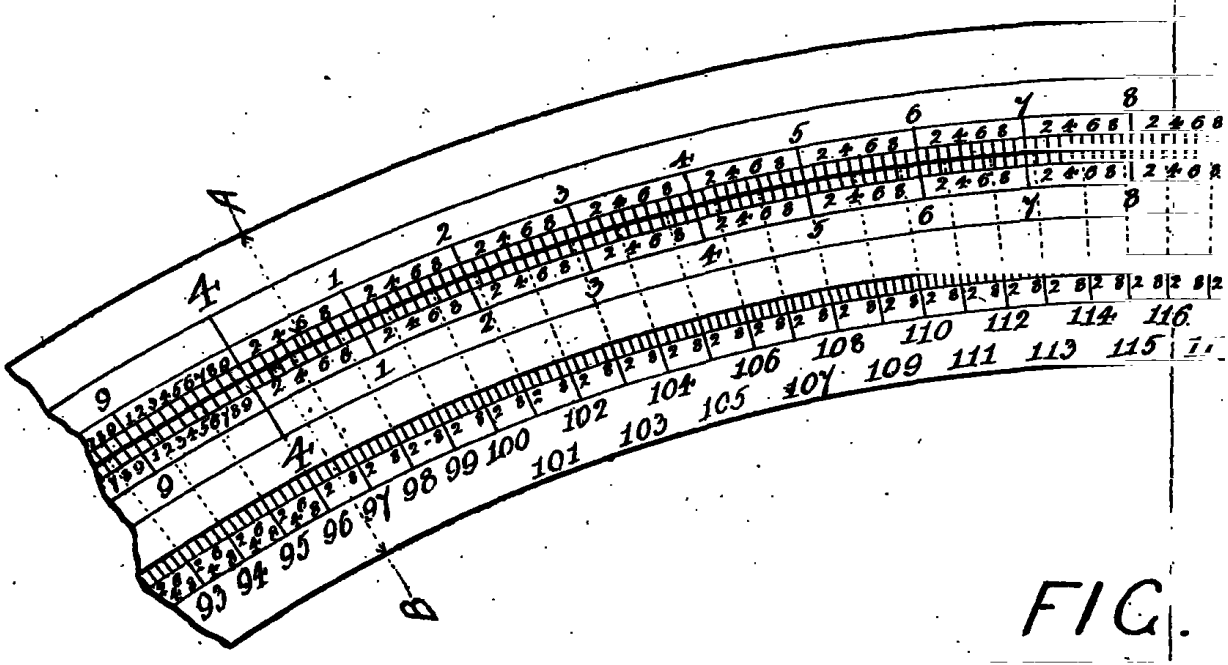
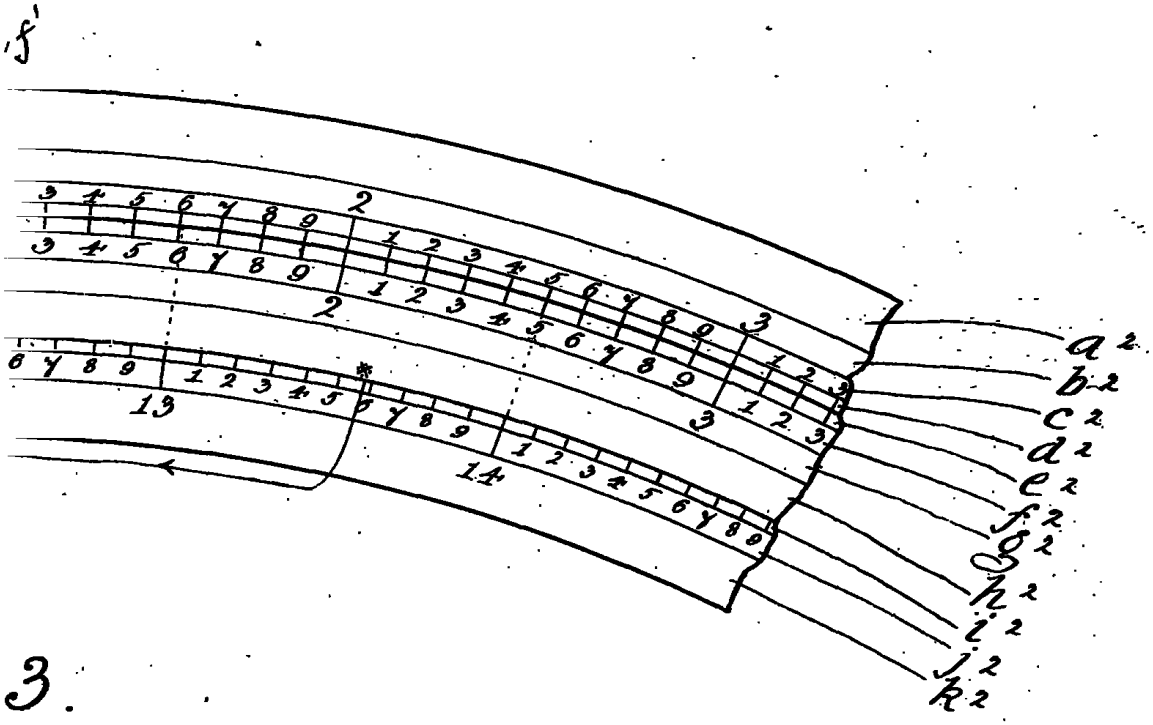
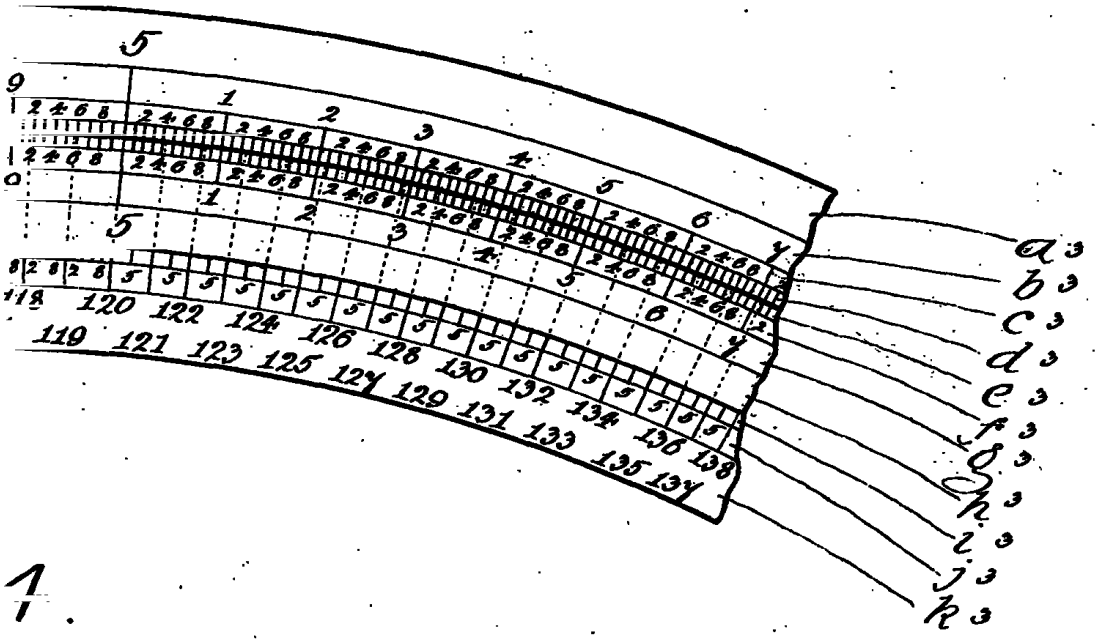


FIG.



3.



1.

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