N° 19,288 A.D. 1899

Date of Application, 26th Sept., 1899
Complete Specification Left, 12th June, 1900—Accepted, 21st July, 1900

PROVISIONAL SPECIFICATION.

An Improved Slide-rule for Computing and Calculating Purposes.

I, FRANCIS CHARLES FARMAR, of 38, Thorndale Road, Waterloo, near Liverpool, in the County of Lancashire, Officer of Customs, do hereby declare the nature of this invention to be as follows:—

My invention relates to an improved slide-rule for computing and calculating purposes.

This invention is essentially characterised, (1) by the employment of a single radius of logarithmical divisions in operation with a line of segments broken into two equal parts; (2) by the employment of another single radius of logarithmical divisions in operation with its own counterpart; and (3) by the introduction of two sub-divided section enlargements of the same, as an auxiliary help.

The rule in question, which may be made in wood, ivory, or other suitable material, consists preferably of two narrow flat pieces of boxwood, kept at an even distance apart by brasses at each end, to allow of another piece, a trifle longer, sliding freely between them on the tongue and groove principle.

The length of the rule depends upon the length of the radius chosen. I prefer, however, a 20-inch radius, allowing a rule of 22 inches in length, with wide and clear sub-divisions.

The computing rules hitherto in use are constructed on the double-radius principle, which, in my opinion, produces an unnecessary repetition of figures, and an expenditure of space which might be more profitably employed in widening the subdivisions, and rendering them legible, and at the same time complete.

These objections I here seek to remedy by the following means:—Utilising both sides of the rule, one side is occupied thus: I place on the slide Fig. 1 (*a*), Fig. 3 (*i*) a single radius of logarithmical divisions in upper and lower position. On the upper stock Fig. 1 (*b*), Fig. 3 (*h*) I place the commencing half of a line of segments for lying casks; and on the lower stock Fig. 1 (*c*), Fig. 3 (*j*) the terminating half of the same line; the point of severance occurring at segment "37." The four extremities of this broken segment line Fig. 1 (*b*), Fig. 3 (*h*), Fig. 1 (*c*), Fig. 3 (*j*) are distinguished on the rule by the letters A, B, C, D, to indicate the four definite bung-setting positions.

The other side of the rule is occupied thus: I divide the slide into two parts by a line extending the whole distance of its length. On the upper part Fig. 2 (*d*), Fig. 4 (*l*) I place a single radius of logarithmical divisions. On the upper stock Fig. 2 (*e*) Fig. 4 (*k*) I place another single radius of logarithmical divisions. These operating together perform mechanically all proportional, percentage, and multiplying calculations—it being understood that both extremities of the upper line become setting-points. On the lower part of the slide Fig. 2 (*f*), Fig. 4 (*m*) I place a 10-fold enlargement of a section of the before-mentioned logarithmical radius, extending from 130 to 170 inclusive, and decimally subdivided. On the lower stock Fig. 2 (*g*), Fig. 4 (*n*) I place a similar 10-fold enlargement, extending from 100 to 127, also decimally subdivided. These operating together facilitate the rapid multiplication of numbers lying between their respective limits.

Dated this Twenty-third day of September 1899.

FRANCIS C. FARMAR,
Applicant.

[Price 8d.]

COMPLETE SPECIFICATION.

An Improved Slide-rule for Computing and Calculating Purposes.

I, FRANCIS CHARLES FARMAR, of 38, Thorndale Road, Waterloo, near Liverpool, in the County of Lancashire, Officer of Customs, 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:—

1.—My invention relates to an improved slide-rule for computing and calculating purposes.

2.—This invention is essentially characterised: (1) by the employment of a single radius of logarithmical divisions, in operation with a line of segments broken into two equal parts; (2) by the employment of another single radius of logarithmical divisions in operation with its own counterpart; and (3) by the introduction of two subdivided section-enlargements of the same, as an auxiliary help.

3.—The rule in question, which may be made in wood, ivory, or other suitable material, consists preferably of two narrow flat pieces of boxwood, kept at an even distance apart by brasses at each end, to allow of another piece, a trifle longer, sliding freely between them on the tongue and groove principle.

4.—The length of the rule depends upon the length of the radius chosen, and will vary according to the degree of clearness and perfection required.

5.—The logarithmical slide-rules hitherto in use for similar computing purposes, are constructed on the double-radius principle, which, in my opinion, produces an unnecessary repetition of figures, and an expenditure of space which might be more profitably utilised in widening and completing the subdivisions.

6.—It is not essential that both sides of the rule should be marked. All the figuring may, if desired, be placed on the one side: but this would necessitate the further widening of the rule, and the introduction of a second slide, which would be likely to prove inconvenient in practical use.

7.—Therefore, preferably utilising both sides of the rule, one side is occupied thus:—

8.—I place on the slide (Fig. 1 *b*) a single radius of logarithmical divisions, in upper and lower position. On the upper stock, I place the commencing half of a line of segments, which may be either lying segments, as shown separately in Fig. 1 (*a*), or standing segments, as shown conjointly in Fig. 3 (*a*)—the breakage of the segment line constituting the fundamental principle of the invention. And on the lower stock—Fig. 1 (*c*), or Fig. 3 (*c*), as the case may be—I place the terminating half or complement of the same line or lines. The point of breakage or severance will occur, in the case of lying segments, at 37 (Fig. 1^d), and in the case of standing segments, at 84 (Fig. 3^d). The four extremities of such broken segment line or lines are distinguished on the rule by the letters A, B, C, D, to indicate the four definite bung or length-setting positions.

9.—The other side of the rule I occupy thus;—

10.—I divide the slide into two parts by a line extending the whole distance of its length. On the upper part (Fig. 2^b) I place a single radius of logarithmical divisions: and on the upper stock (Fig. 2^a) I place another single radius of logarithmical divisions—the one being a counterpart of the other. These operating together perform mechanically all proportional, percentage, and multiplying calculations—it being understood that both extremities of the upper line now become, and are hereby constituted, setting-points. On the lower part of the slide, I place a ten-fold or other suitable enlargement of a section of the before-mentioned logarithmical radius. Fig. 2 (*c*) illustrates such an enlarged section, extending from 130 to 170 inclusive, and subdivided. On the lower stock, I place

a ten-fold or other suitable enlargement of another section of the same logarithmical radius. Fig. 2 (*d*) illustrates such an enlarged section, extending from 100 to 127 inclusive, and subdivided. These operating together facilitate the rapid multiplication of numbers lying between their respective limits. Similarly, any other sections may be taken and enlarged within the limits of the rule.

11.—The main object intended to be served by my invention, is to provide a portable slide-rule, capable (1) of computing with more clearness and exactitude the ullage-quantities in lying or standing casks, whose full contents have been already ascertained; and (2) of calculating with greater rapidity and certainty any ordinary proof-quantity from any given ullage and strength.

12.—The method of working this rule is as follows, from which it will be seen that there is introduced a new principle in slide-setting, and in the general mode of rule manipulation.

13.—The four extremities of the broken segment line or lines are, as already stated, distinguished on the rule by the letters A, B, C, D, to indicate the four definite bung or length-setting positions. [*Vide* Figs. 1 and 3]. Thus:—

14.—Setting the bung-dimension, or length-dimension (according as the cask is lying or standing), to A, we get the segments for vacuities or ullages under an inch.

15.—Setting the bung or length to B, we get the segments for vacuities or ullages over an inch—up to $\frac{1}{10}$th of the bung or length.

16.—Setting the bung or length to C, we get the segments for vacuities or ullages over $\frac{1}{10}$th of the bung or length—up to 10 inches.

17.—Setting the bung or length to D, we get the segments for vacuities or ullages over 10 inches—up to the extreme limit.

18.—The segment thus found is to be set, on the reverse side of the rule (Fig. 2), to either extremity of the upper line [(*a*) or (*e*)]—that is, the left 100, or the right 100—whichever will bring the required figures within mutual compass: the reading being that familiarised by all logarithmical slide-rules.

19.—The proof-quantity is obtained by setting the strength to either 100 in like manner, whereupon the rule indicates the required result by showing how much is to be added to, or deducted from, the ullage, according as the spirit is over-proof or underproof. But when both ullage and strength are very high, it is preferable to use the enlarged divisions [Fig. 2 (*c*) (*d*)], and thus get the proof-quantities direct.

20.—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:—

A slide-rule having marked on it:—

1.—A single radius of logarithmical divisions operating with a line of segments broken into two equal parts—the said segments being either for lying casks, or standing casks, or both:—

2.—A single radius of logarithmical divisions operating with its own counterpart:—

3.—Two subdivided section-enlargements of logarithmical divisions, as an auxiliary help.

Dated this Eleventh day of June 1900.

FRANCIS C. FARMAR,
Applicant.

Redhill: Printed for Her Majesty's Stationery Office, by Malcomson & Co., Ltd.—1900.

A.D. 1899. Sep. 26. N° 19,238.

FARMAR'S Provisional Specification.

SHEET 1

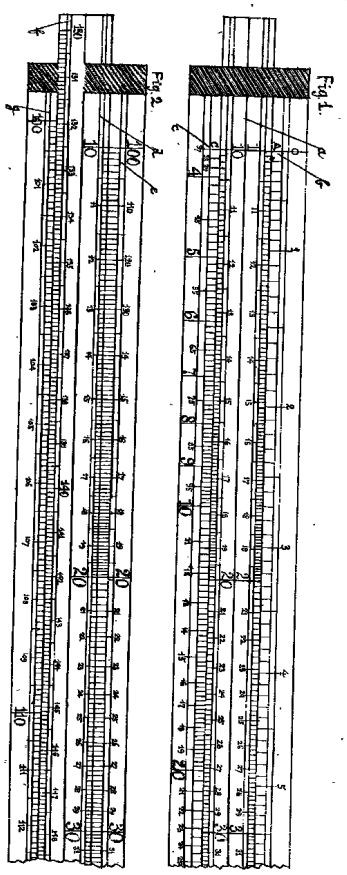

Fig. 1.

Fig. 2.

[2 SHEETS:
SHEET 2

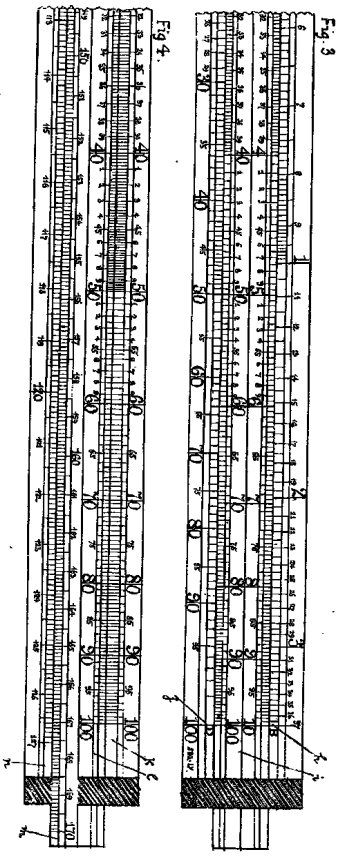

Fig. 4.

Fig. 3.

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

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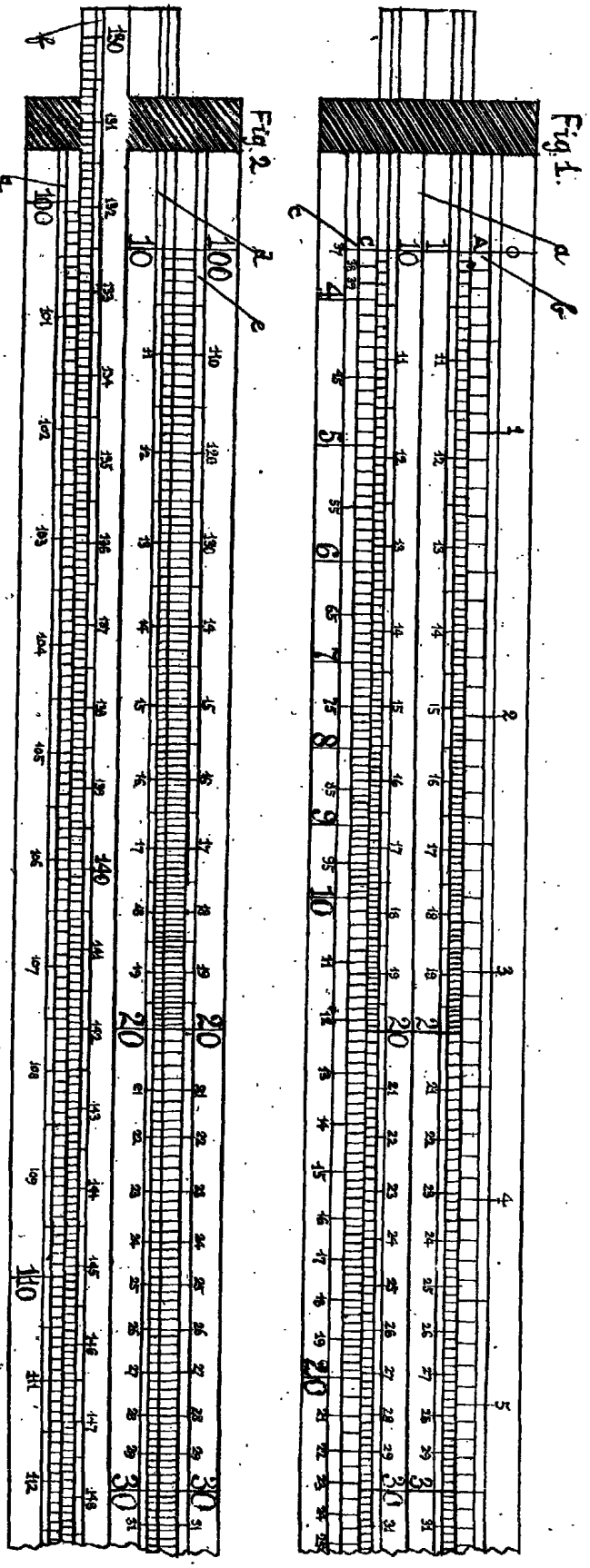
FARMAR'S Provisional Specification.

SHEET 1.



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SHEET 2.

Fig. 3.

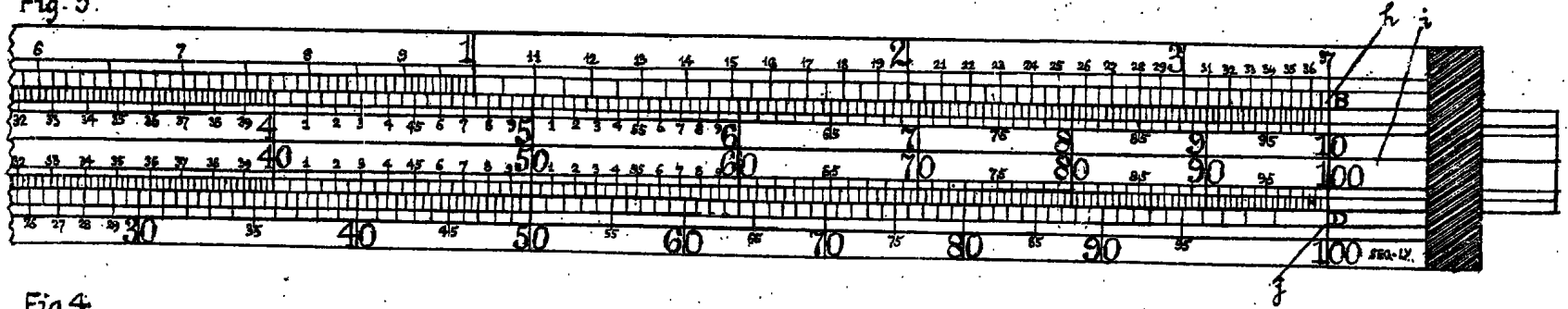
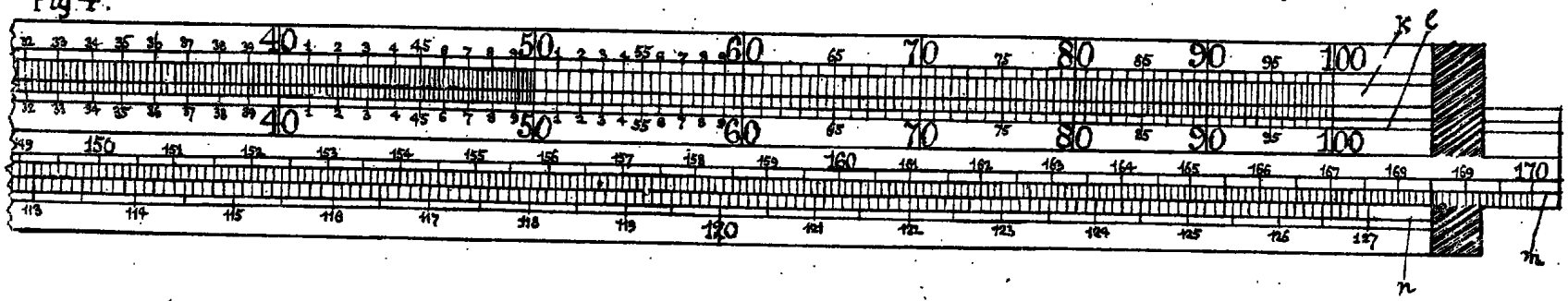


Fig 4.



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FARMAR'S Complete Specification.

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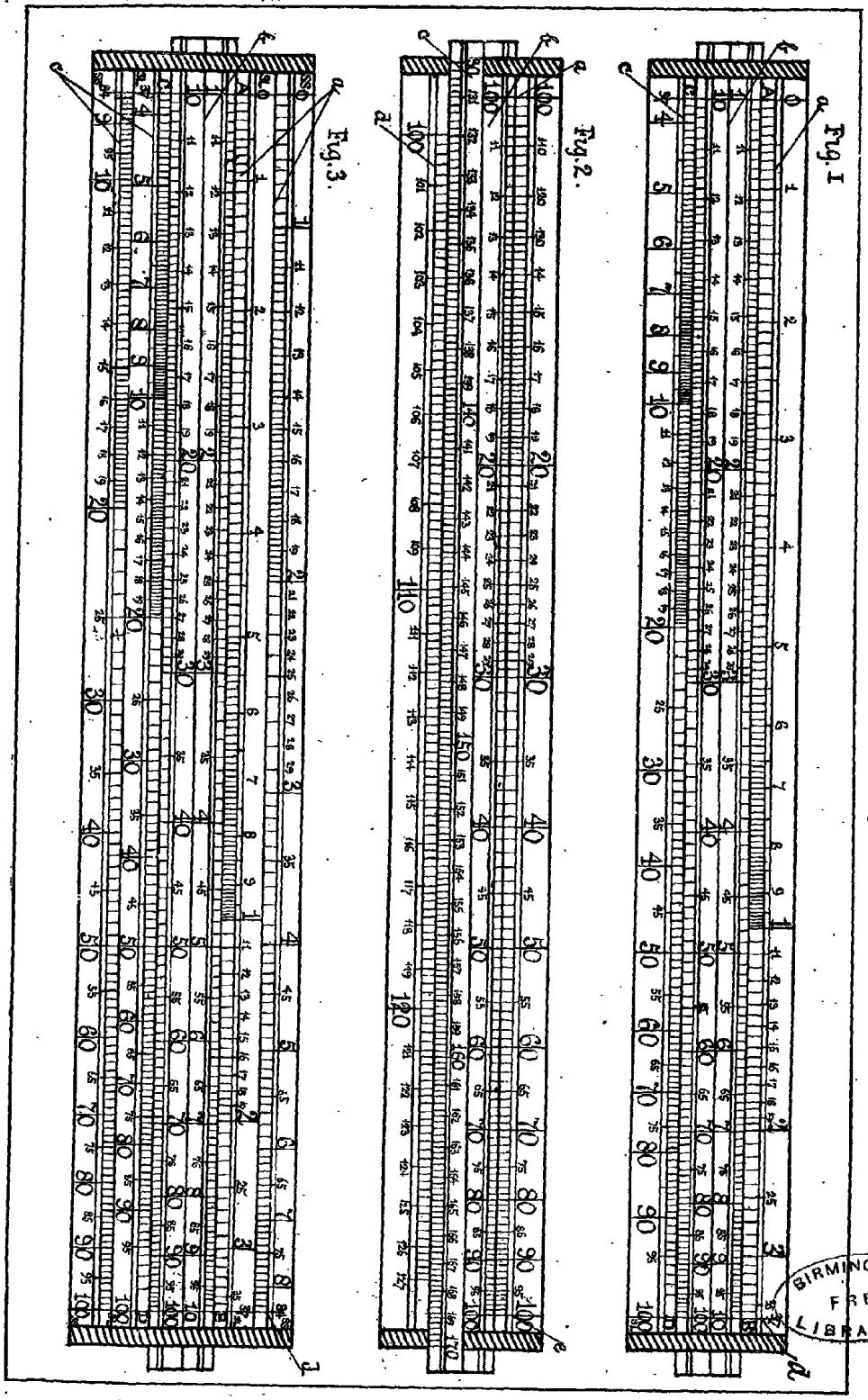

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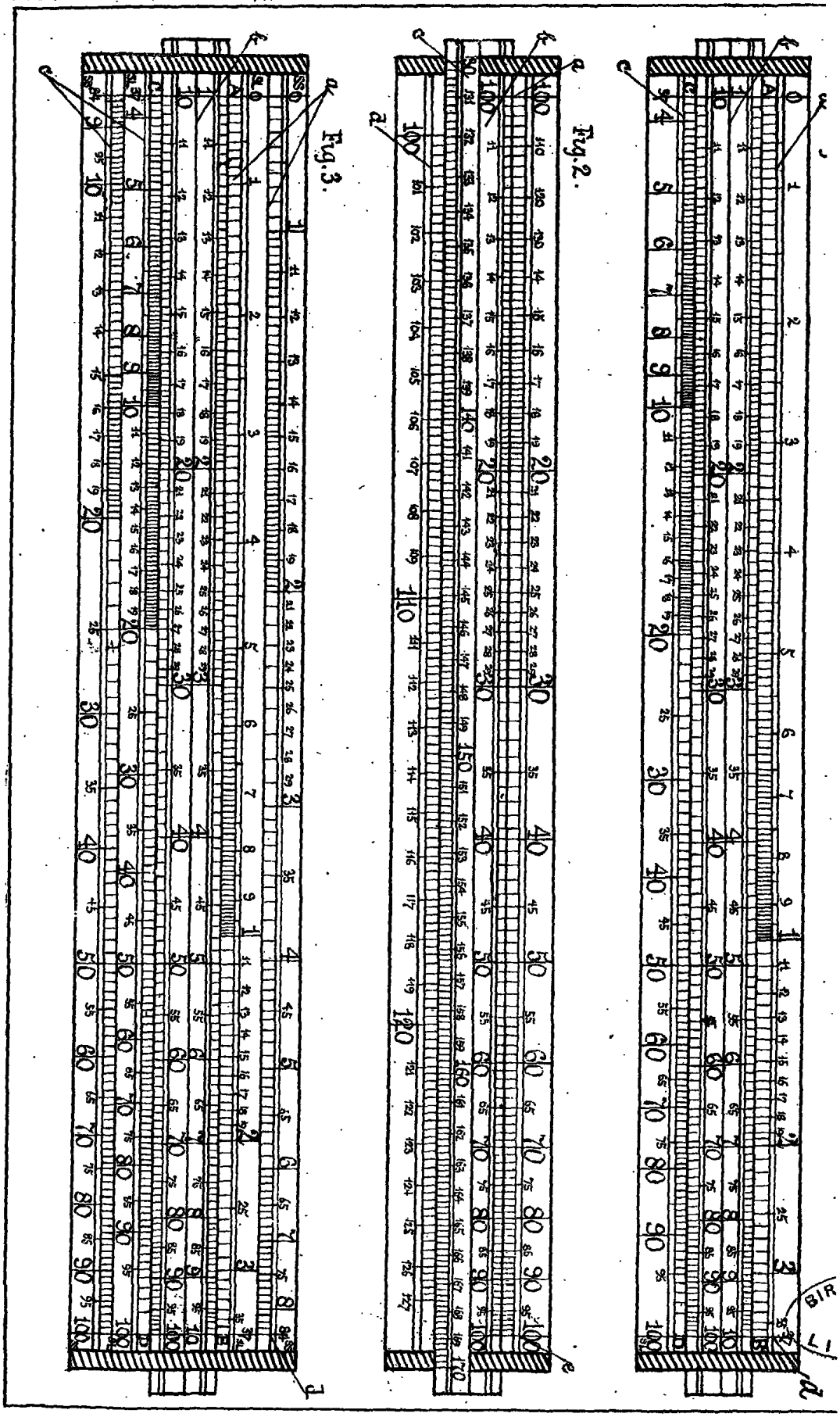

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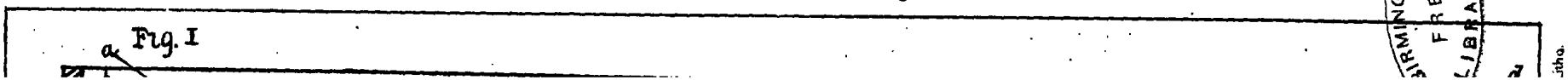

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