N° 12,966 A.D. 1915

Date of Application, 10th Sept., 1915

Complete Specification Left, 10th Mar., 1916—Accepted, 17th Aug., 1916

PROVISIONAL SPECIFICATION.

An Improved Slide Rule.

I, WILLIAM FEARON BROWN, of 2, Kingsdale Avenue, Higher Tranmere, Birkenhead, Cheshire, Engineer, do hereby declare the nature of this invention to be as follows:—

This invention relates to an improved slide rule by means of which the weight and cost of metal plates, angle bars, tubes, discs, round or square bars, or the like, may be rapidly and simply calculated.

According to this invention the rule comprises a series of scales, some fixed and others movable, by means of which the component factors, such as length, breadth, and thickness, may be first multiplied together to give the weight, and the weight so obtained then multiplied by the rate per unit of weight and the result read off on a cost scale.

In a suitable construction, the rule comprises a fixed scale of lengths, which may be termed the A scale, a fixed scale of weights which may be termed the D scale, and a fixed scale of costs to be termed the F scale. Mounted between the fixed A and D scales are two movable elements, primary and secondary, adjustable relatively to each other and when so adjusted capable of being moved as a whole relatively to the A and D scales. The primary movable element contains a B scale corresponding to breadth of plate, mean diameter of tube, sum of depth of flanges of angle bar, or the like, and a B^1 scale corresponding to diameter of round solid bar, or side of square bar, or the like, and a series of index pointers, such as, $\frac{\pi}{4}$ index for discs, an index for plates, bars, *etc.*, and a π index for tubes. The secondary element contains a C scale of thicknesses in legal standard wire gauge, and in say, twentieths and tenths of an inch, or otherwise, and a series of coefficient graduations corresponding to the various specific gravities of different metals. The secondary element also contains the index pointers for round or square bars. A third movable element is mounted to slide between the fixed D and F scales, and contains scales of rates per unit of weight, such as an E scale of rate per pound avoirdupois and an E^1 scale of rate per cwt. This third element also has an index pointer or pointers by which the costs are read off on the cost scale.

The operation of the rule will be best understood by illustrating how some examples may be worked.

To find the weight of a rectangular steel plate 12 feet long, 3 feet wide, and $^7/_{20}$ths of an inch thick. Slide the primary and secondary elements relatively until the plate index on the primary element is opposite the graduation corresponding to steel. The rule is now set for working in steel plates and the primary and secondary elements move together as one slide. Then slide both elements together until 3 feet on the B scale is opposite 12 feet on the A scale. Then opposite $^7/_{20}$ths on the C scale read off the weight of the plate on the D scale. A similar operation is effected when it is required to find the weight of an angle bar, the sum of the depth of the flanges of the angle

[*Price* 6*d.*]

bar on the B scale being set opposite the length of the bar. When estimating the weight of circular or elliptical discs, the $\frac{\pi}{4}$ index for discs is used in lieu of the plate index of the previous example, this $\frac{\pi}{4}$ index for discs being set opposite the graduation corresponding to the specific gravity coefficient of the particular metal required. Similarly in the case of finding the weight of tubes, the π index for tubes is first set opposite the required specific gravity coefficient when adjusting the primary and secondary elements.

To find the weight of cast iron round or square bars, say, of two bars 8 feet long by 2 ins. diameter, and 2 in. by 2 in. square.

Move the primary and secondary elements relatively until the plate index is opposite the coefficient for cast iron. Then move the elements together until the graduation of 2 in. on scale B^1 is opposite the graduation 8 feet on scale A. Then read off the weights of the two bars on the fixed weight scale D opposite the index pointers for round and square bars on the scale C.

To find the cost from the weight, the third element is moved until the particular rate per unit of weight on the rate scales of this element is opposite the weight just ascertained, when the cost may be read off on the cost scale opposite the index pointer of that particular rate scale.

The apparatus may be provided with a cursor if desired.

Dated this 9th. day of September, 1915.

For the Applicant,
A. J. DAVIES,
Patent Agent by Examination,
37, Moorfields, Liverpool.

COMPLETE SPECIFICATION.

An Improved Slide Rule.

I, WILLIAM FEARON BROWN, of 2, Kingsdale Avenue, Higher Tranmere, Birkenhead, Cheshire, 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:—

This invention relates to an improved slide rule by means of which the weight and cost of metal plates, angle bars, tubes, discs, round or square bars, or the like, may be rapidly and simply calculated.

Slide rules have been previously proposed for calculating the weight of plates and round or flat bars and tubes of circular section, such rules having relatively slidable scales of breadth, thickness, length, and width, and having coefficient graduations of different specific gravities marked on a cursor slidable over the scale. With such an arrangement the calculation being first effected, and the correction then made by the cursor for the correct coefficient, error is liable to occur by reason of not correctly placing the cursor after each primary calculation. Further, where a number of graduations are on the cursor it is difficult to read through the latter on to the scales of the rule, and only a limited number of graduations on the cursor can be used.

According to this invention the rule comprises a series of scales, some fixed and others movable, by means of which the component factors, such as length, breadth, and thickness, may be first multiplied together to give the weight,

and the weight so obtained then multiplied by the rate per unit of weight, and the result read off on a cost scale. The distinguishing feature of the invention lies in the fact that certain of the movable scales are first relatively adjusted, according to the character of the material. The rule is thus made into a steel, copper, zinc, or other rule at the start, and the calculation then proceeds. The invention consists in a slide rule comprising the combination of features set out in the first claim and not in such features taken separately or in other combinations.

A slide rule in accordance with this invention is illustrated in the accompanying drawings, in which, Fig. 1. is a front view of the rule, and Fig. 2. a cross section, Fig. 1. being extended for the sake of clearness over three sheets of drawings, the part of the rule shown on Sheet 1 joining to that shown on Sheet 2 at the line A—A and the part of the rule shown on Sheet 2 joining up to that shown on Sheet 3 at the line B—B.

In a suitable construction, the rule comprises a fixed scale of lengths, marked A, a fixed scale of weights marked D, and a fixed scale of costs marked F. Mounted between the fixed A and D scales are two movable elements 1, 2, primary and secondary, adjustable relatively to each other and when so adjusted capable of being moved as a whole relatively to the A and D scales. The primary movable element 1 contains a B scale corresponding to breadth of plate, mean diameter of tube, sum of depth of flanges of angle bar, or the like, and a B^1 scale corresponding to diameter of round solid bar, or side of square bar, or the like, and a series of index pointers, such as, $\frac{\pi}{4}$ index for discs, an index for plates, bars, *etc.*, and a π index for tubes. The secondary element contains a C scale of thicknesses in legal standard wire gauge, and in say, twentieths and tenths of an inch, or otherwise, and a series of coefficient graduations corresponding to the various specific gravities of different metals. The secondary element also contains the index pointers for round or square bars. A third movable element 3 is mounted to slide between the fixed D and F scales and contains scales of rates per unit of weight, such as an E scale of rate per pound avoirdupois and an E^1 scale of rate per cwt.

This third element also has an index pointer or pointers by which the costs are read off on the cost scale.

The operation of the rule will be best understood by illustrating how some examples may be worked.

To find the weight of a rectangular steel plate 12 feet long, 3 feet wide, and $^7/_{20}$ths of an inch thick.

Slide the primary and secondary elements 1, 2, relatively until the plate index on the primary element is opposite the coefficient graduation corresponding to steel. The rule is now set for working in steel plates and the primary and secondary elements are moved together as one slide. Then slide both elements together until 3 feet on the B scale is opposite 12 feet on the A scale. Then opposite $^7/_{20}$ths on the C scale read off the weight of the plate on the D scale. A similar operation is effected when it is required to find the weight of an angle bar, the sum of the depth of the flanges of the angle bar on the B scale being set opposite the length of the bar on the A scale. When estimating the weight of circular or elliptical discs, the $\frac{\pi}{4}$ index for discs is used in lieu of the plate index of the previous example, this $\frac{\pi}{4}$ index for discs being set opposite the graduation corresponding to the specific gravity coefficient of the particular metal required. Similarly in the case of finding the weight of tubes, the π index for tubes is first set opposite the required specific gravity coefficient when adjusting the primary and secondary elements 1, 2.

To find the weight of cast iron round or square bars, say of two bars 8 feet long by 2 ins. diameter, and 2 in. by 2 in. square.

Move the primary and secondary elements 1, 2, relatively until the plate and bar index is opposite the coefficient for cast iron. Then move the elements together until the graduation of 2 in. on scale B^1 is opposite the graduation 8 feet on scale A. Then read off the weights of the two bars on the fixed weight scale D opposite the index pointers for round or square bars on the scale C.

To find the cost from the weight, the third element 3 is moved until the particular rate per unit of weight on the rate scales of this element is opposite the weight just ascertained, when the cost may be read off on the cost scale opposite the index pointer of that particular rate scale.

The various scales on the rule are graduated on a logarithmic basis and the positions of the coefficient graduations are obtained in the first instance by a trial calculation, the answer to which being known, their positions are determined. There is no necessary fixed radius or position for the scales A, B, and D, they can be placed in any arbitrary position, but the C scale of thickness must be laid out in such a position that when, for example, the graduation 1 foot on the B scale is set against 1 foot on the A scale then the graduation 1 inch on the C scale of thickness must be opposite the reading on the weight scale D indicating the correct weight of a square foot of, say, steel 1 inch thick. This determines the position of the thickness scale for steel and a coefficient graduation for steel is made on the C scale opposite the index pointer on that scale which may be placed in any desired position on the movable element carrying the scales B, B^1, the coefficient graduations on C for other metals being determined by trial calculations, or from the difference of their specific gravities relative to that of steel. Also there is no fixed position of the cost scale F or the rate scales E, E^1, relatively to the weight scale D, but the index pointer on the rate per lb. scale E must be marked in such a position that when, for example, the graduation corresponding to 1/- on the E scale is set against 1 lb. on the weight scale D, the index pointer must then be opposite the graduation of 1/- on the cost scale F. The same remarks apply to the position of the rate per cwt. scale E^1.

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. A slide rule, for calculating the weights of metal plates, angle bars, tubes, discs, or the like, comprising fixed length and weight scales, a primary movable element containing a scale of breadth of plates, mean diameter of tubes or sum of flanges of angle bars, another scale of diameters of round solid bars or sides of square bars, index pointers corresponding to the different classes of articles the weight of which is to be calculated, a secondary movable element containing a scale of thicknesses, and a series of graduations corresponding to the specific gravities of different materials and index pointers for round and square bars.

2. In a slide rule, as claimed in Claim 1, a fixed scale of costs and a movable element containing a rate per unit of weight scale and pointers adapted to indicate on the cost scale the required cost of the article.

3. The improved slide rule substantially as described and shown in the accompanying drawings.

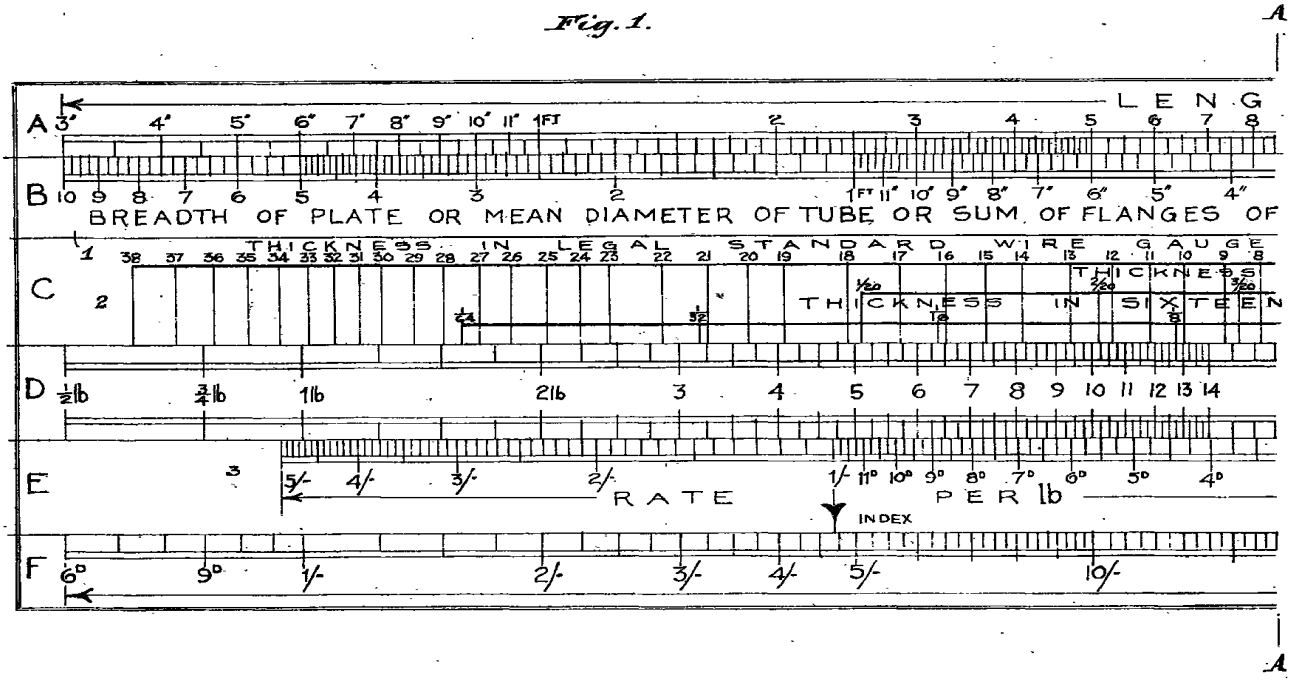
Dated this 8th day of March, 1916.

For the Applicant,

A. J. DAVIES,
Patent Agent by Examination,
37, Moorfields, Liverpool.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1916.

Fig. 1.



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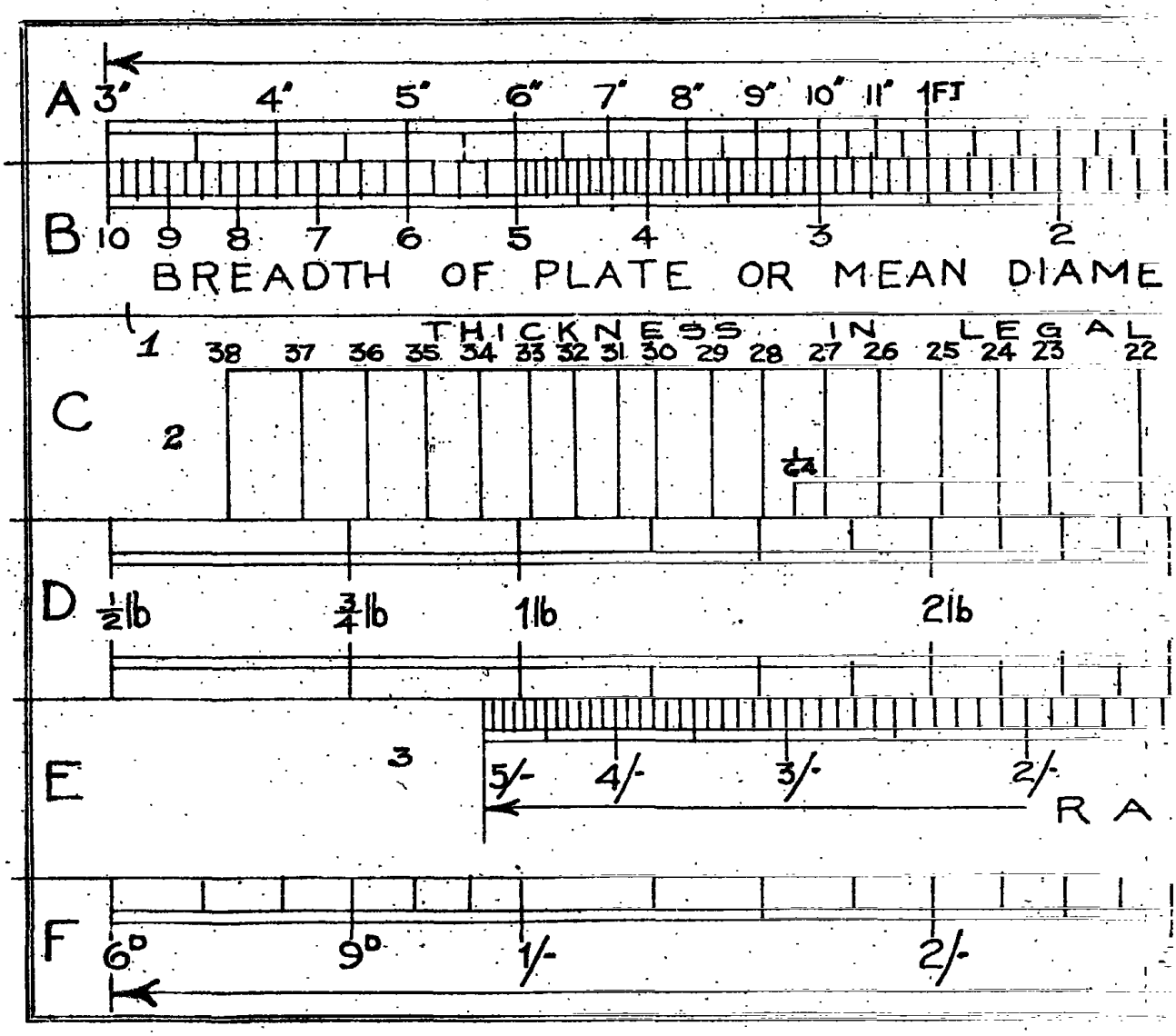
[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.



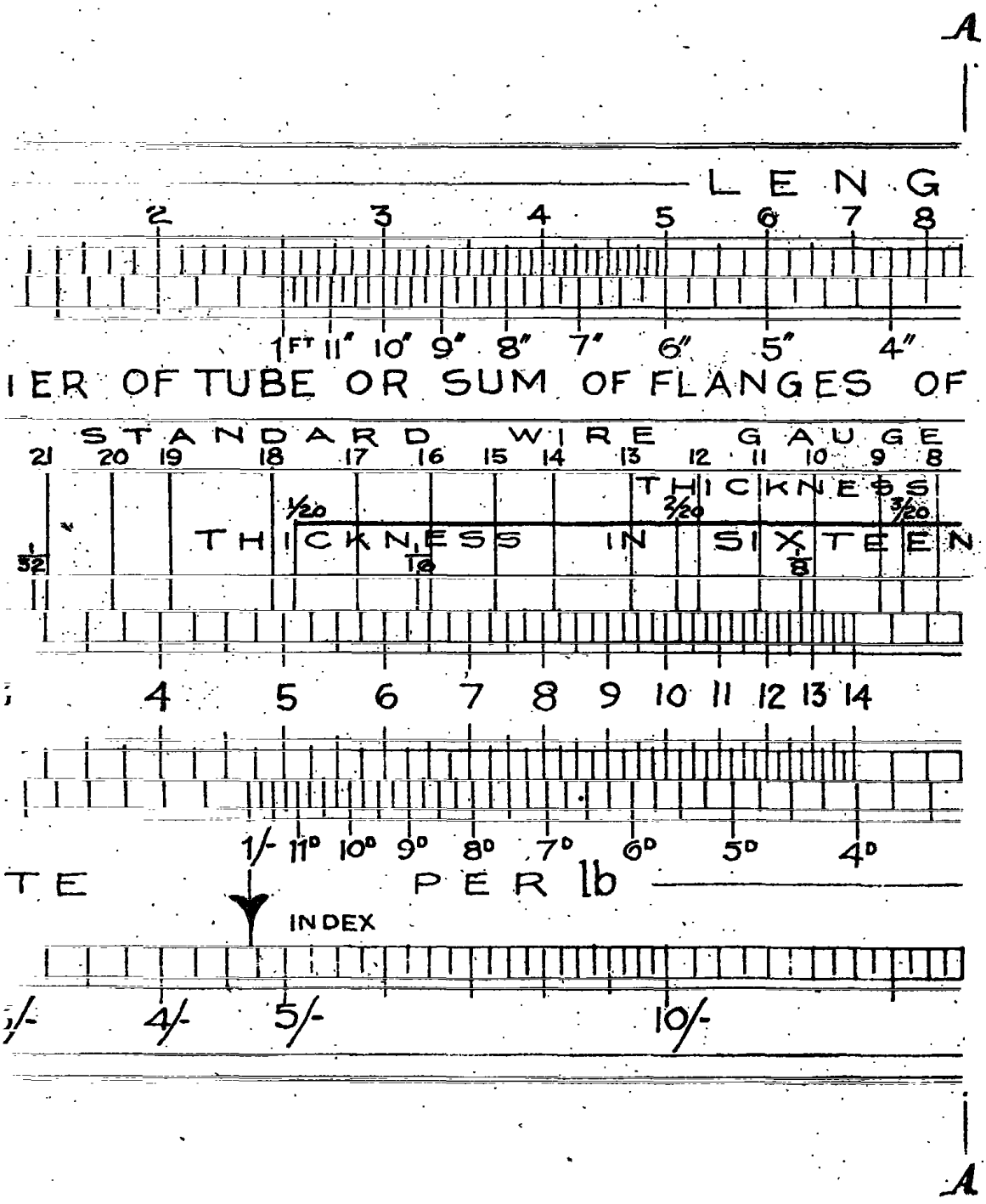


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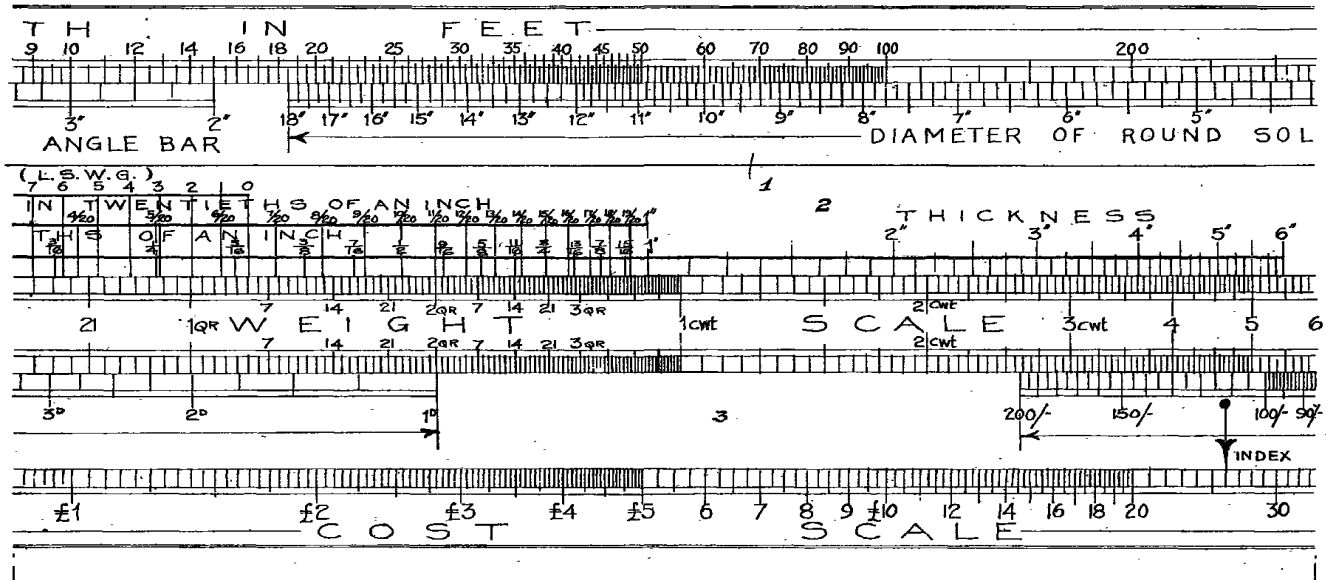
Fig. 1.



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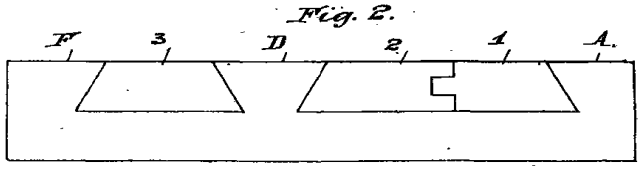

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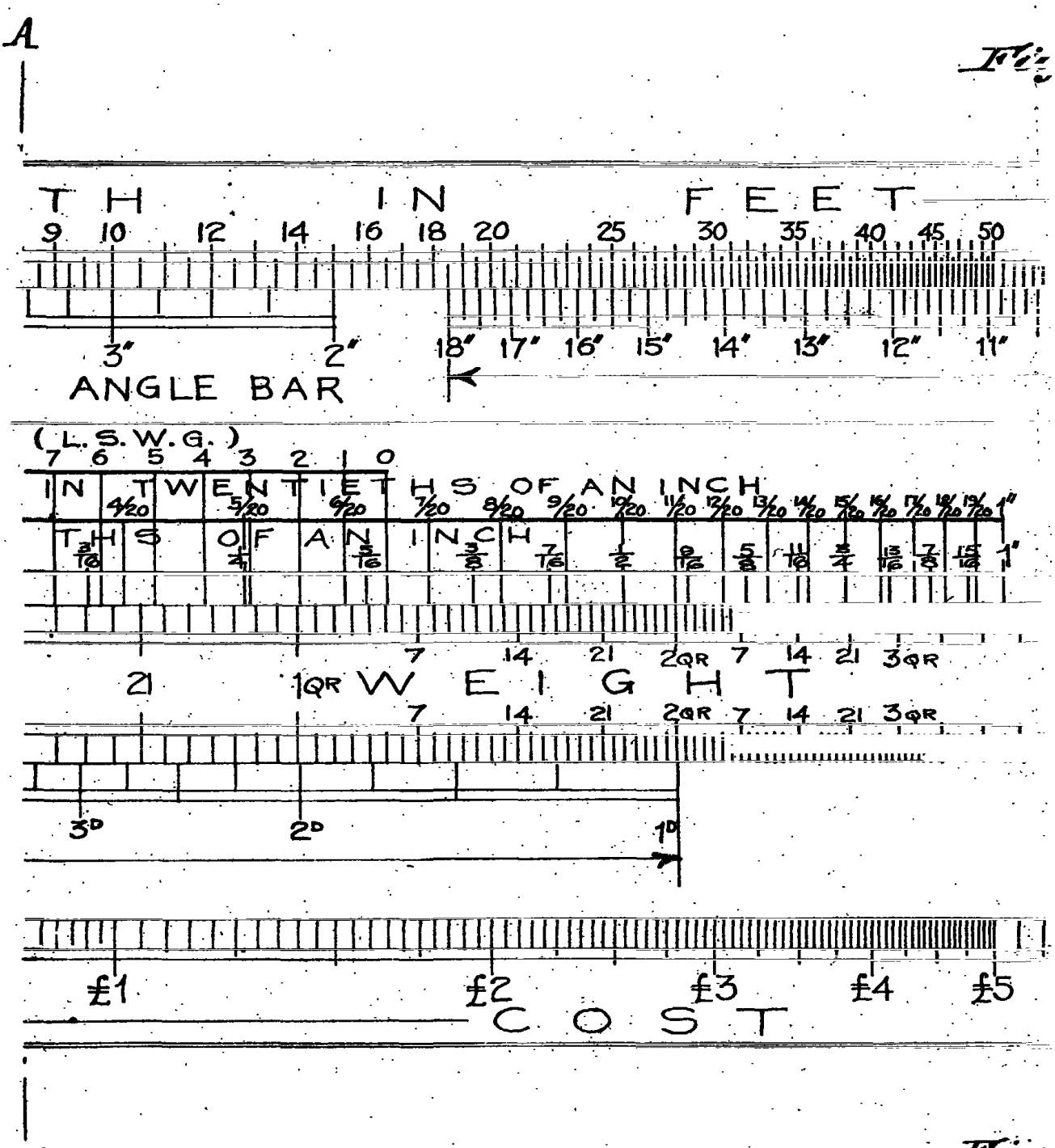
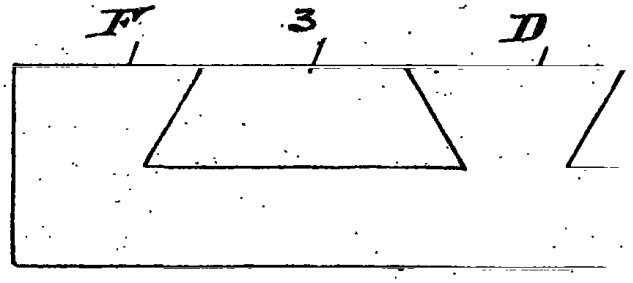


Fig.



1.

B

60 70 80 90 100 200

10" 9" 8" 7" 6" 5"

DIAMETER OF ROUND SOL

1

2

THICKNESS

2" 3" 4" 5" 6"

2 cwt

1cwt SCALE 3cwt 4 5 6

2 cwt

3

200/- 150/- 100/- 90/-

INDEX

6 7 8 9 10 12 14 16 18 20 30

SCALE

B

2.

2 1 A

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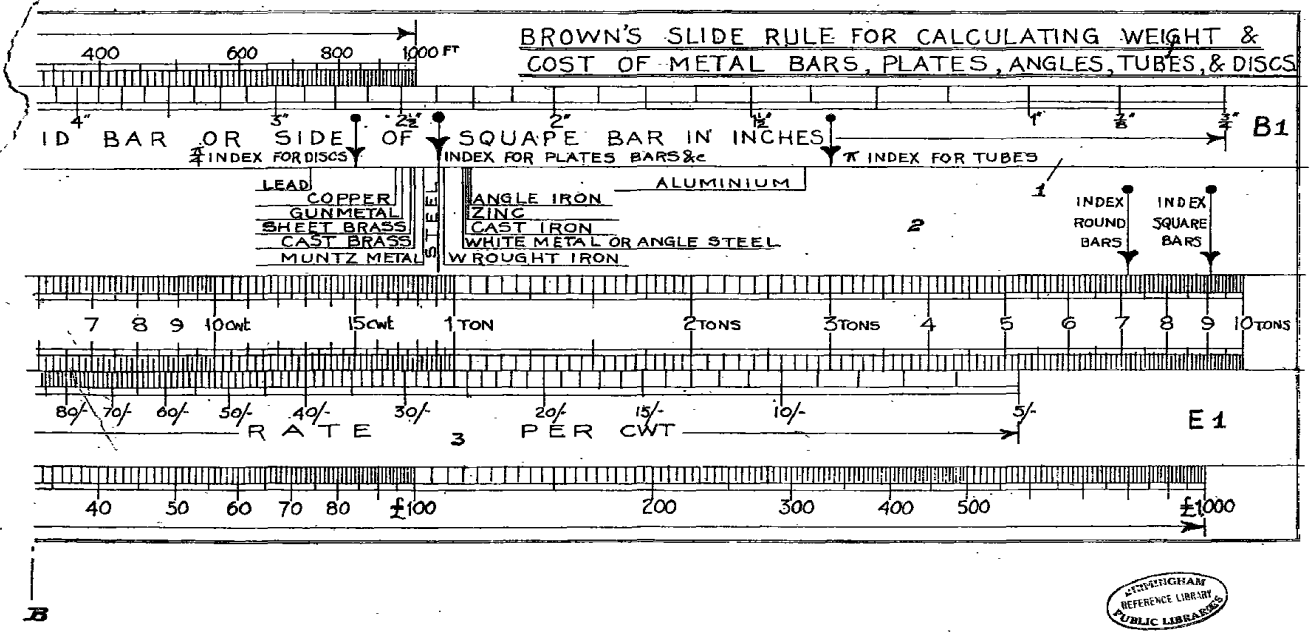
Fig. 1.



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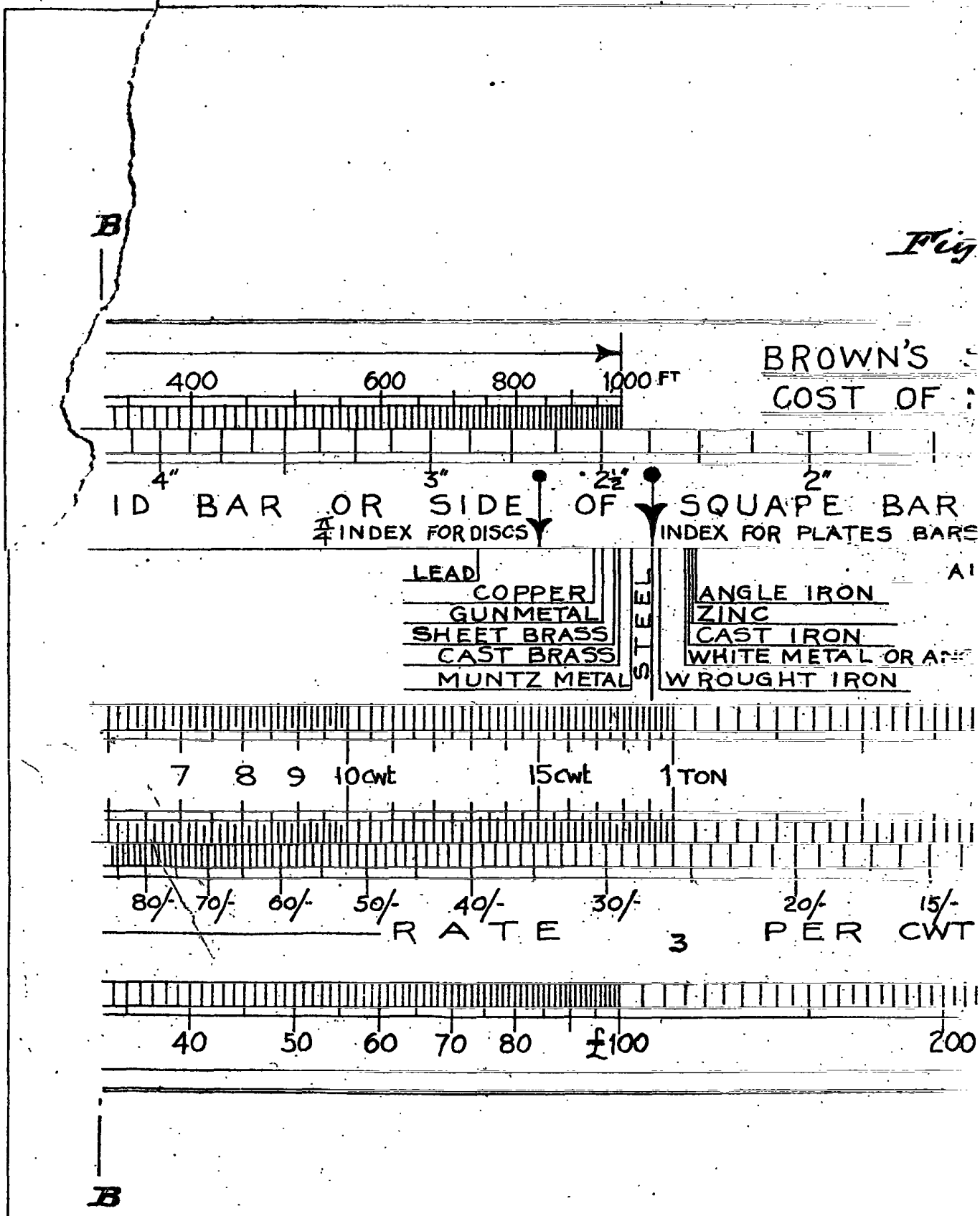

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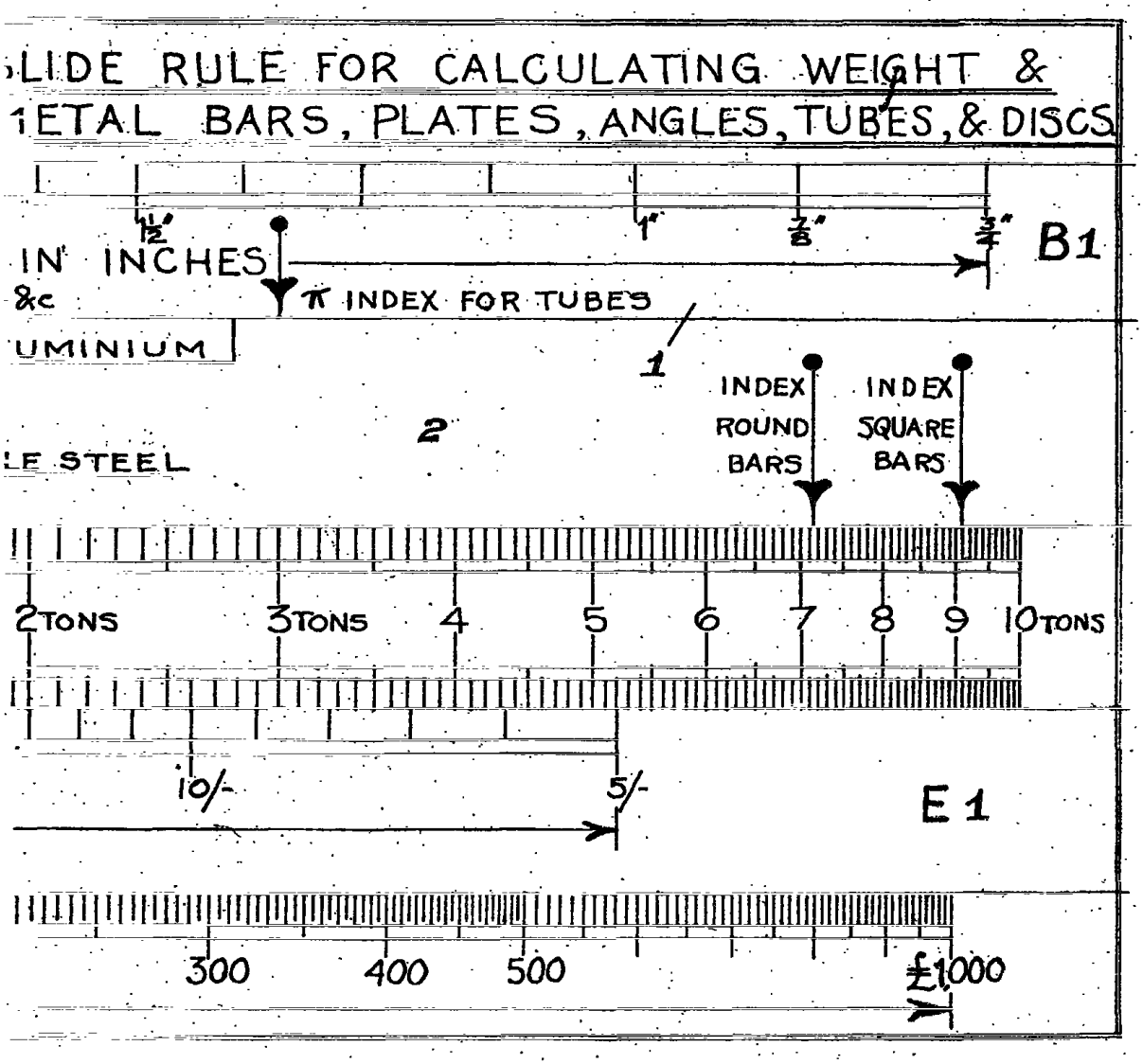

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