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PROVISIONAL SPECIFICATION.

Improvements in and relating to Slide Rules.

I, THOMAS ROBERTSON (Senior), of 205, Newhaven Road, Leith, Scotland, Inland Revenue Official (retired), do hereby declare the nature of this invention to be as follows:—

5 This invention is a device of the slide-rule type for making certain calculations required in estimating the speed of steamships, motor-ships, motor-boats and the like by the laws of mechanical similitude; the displacement and length of ship being given. The device consists of a rule and two slides which latter are adapted to move in parallel grooves in the rule, and divide the rule into three parts or sections.

10 On the middle part are arranged sectional scales, which are divided logarithmically and on which thrusts may be plotted as ordinates to a base of what is known technically as "speed length ratio", *i.e.* speed in knots divided by square root of length of ship in feet. The ordinates are arranged at an angle to the grooves. The amounts representing thrusts at a particular speed length ratio,
15 for the purposes of this scale, are calculated by the formula;

Indicated horse power \times 1,000 displacement in tons \times speed in knots per hour, as being proportional to the thrust per ton displacement, and as involving a minimum of calculation; and the rule is made of a scope to embrace sufficient data of a particular class or classes of ships such as would be built say by one
20 firm.

The top slide is used for multiplying the thrust (as found above) by speed and displacement, this giving the indicated horse power. The bottom scale is used for dividing the speed of the ship in knots, by the square root of the length of the vessel, this giving the speed length ratio.

25 The device is so arranged that by setting the bottom slide, with a certain index mark thereon opposite the length of ship. (on bottom scale of rule) the speeds and speed length ratios for that particular ship, are found opposite each other.

The device may be used in the following way *viz.*, should it be required to estimate the indicated horse power for a given ship, the displacement length and required speed being given. Set the said index mark on bottom slide, as
30 above, opposite length of vessel, then the speed on bottom slide is opposite the speed length ratio of ship. Follow up the speed length ratio line (in the sectional scale) till a suitable "thrust speed length ratio curve" from a known similar vessel intersects it. From this point proceed to the left at right angles to the speed length ratio line to the edge of this scale. Opposite this set the speed on
35 the top slide, (*i.e.* the speed in knots of vessel comes twice into the operation) then opposite the displacement is found the required indicated horse power. The usual correction for skin friction for differences in lengths of the vessel is then made.

[Price 6d.]

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Several modifications of this device may be provided without departing from the invention.

Dated this 2nd day of November, 1914.

JOHNSONS,
Chartered Patent Agents,
41, St. Vincent Place, Glasgow, and
13, York Place, Edinburgh.

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COMPLETE SPECIFICATION.

Improvements in and relating to Slide Rules.

I, THOMAS ROBERTSON (Senior), of 205, Newhaven Road, Leith, Scotland, Inland Revenue Official (retired), do hereby declare the nature of this invention (which has been communicated to me from abroad by Thomas Robertson (Junior), of "Elwick", Mildura, Victoria, Australia, Engineer), and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

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This invention relates to an improved device of the slide-rule type for making certain calculations required in estimating the I.H.P. of steamships, motor-ships, motor-boats and the like by the laws of mechanical similitude; the displacement, length of ship and required speed being given. The device consists of a rule and two slides which latter are adapted to move in parallel grooves in the rule, and divide the rule into three parts or sections.

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In order that the invention may be clearly understood, I have hereunto appended an explanatory drawing which shows by way of illustration or example one form of the slide rule.

Fig. 1 is a front view of the rule.

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Fig. 2 is a cross section of the same.

The rule is made with two slides or strips *a*, *b*, adapted to work in two parallel grooves *c*, *d* which divide the face of the rule into three parts or sections *e*, *f* and *g*. On the middle part *f* of the rule sectional scales are arranged which scales are divided logarithmically and may have thrusts *h* ("thrust speed length ratio curves") plotted thereon as ordinates to a base of what is known technically as "speed length ratio", *i.e.* speed in knots divided by square root of length of ship in feet. The thrust speed length ratios—the amounts representing thrusts at a particular speed length ratio, for the purpose of this scale, are calculated by the formula:—

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Indicated horse power \times 1,000 displacement in tons \times speed in knots per hour, as being proportional to the thrust per ton displacement, and as involving a minimum of calculation; and the rule is made of a scope to embrace sufficient data of a particular class or classes of ships such as would be built say by one firm.

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The top slide is used for multiplying the thrust (as found above) by speed and displacement, this giving the indicated horse power. The bottom slide *b* is used for dividing the speed of the ship in knots, by the square root of the length of the vessel, this giving the speed length ratio.

The device is so arranged that by setting the bottom slide *b* with a certain fixed point *viz.*, the index mark "W" thereon opposite the length of ship on section *g* of rule, the speeds and speed length ratios for that particular ship, are found opposite each other. The speed scale on the upper edge of the slide *b* may be continued on the lower edge so that the range of speeds may correspond with the speeds on the slide *a*, the slide *b* being reversed to bring the higher

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speeds into use and having an additional index mark "W" for use when reversed.

The device may be used in the following way, *viz.*, should it be required to estimate the indicated horse power for a given ship, the displacement length and required speed being given. Move the slide *b* until the index mark "W" thereon is opposite length of vessel, then the required speed on slide *b* is opposite the line *i* representing the speed length ratio of ship on section *f* of rule. Follow up this speed length ratio line *i* (in the sectional scale of section *f*) till it is intersected by a suitable "thrust speed length ratio curve" *h* (which has previously been plotted on the section *f*) for a known similar vessel. From this intersecting point proceed to the left at right angles to the speed length ratio line *i* to the edge of this scale. Opposite this point set the required speed on the top slide *a*, (*i.e.* the speed in knots of vessel comes twice into the operation) then opposite the displacement is found, on section *e*, the required indicated horse power. The usual correction for skin friction for differences in lengths of the vessel is then made.

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 making certain calculations required in estimating the I.H.P. of steamships, and the like by the laws of mechanical similitude—displacement length and required speed being known—constructed and operating as hereinbefore described and shown.

2. A slide rule for making certain calculations in the estimating of a ship's I.H.P.—when the displacement, length and required speed are given—consisting of a slide adapted to be adjusted in accordance with the length of the ship and having speed indications capable of being read in connection with a "speed length ratio" scale on the rule, which scale is adapted to be used in connection with speed indications of a second slide which latter is also provided with displacement indications from which the I.H.P. indications of the rule face may be read, as described.

3. A slide rule such as claimed in Claims 1 and 2 having a pair of slides between which sectional scales are provided, such scales being divided logarithmically and having thrusts plotted thereon as ordinates to a base of what is known as "speed length ratio", the amounts representing thrusts at a particular speed length ratio being calculated by the formula: I.H.P. \times 1,000 displacement in tons \times speed in knots substantially as described.

Dated this 9th day of April, 1915.

JOHNSONS,
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41, St. Vincent Place, Glasgow, and
13, York Place, Edinburgh.

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

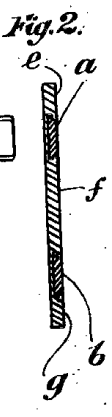
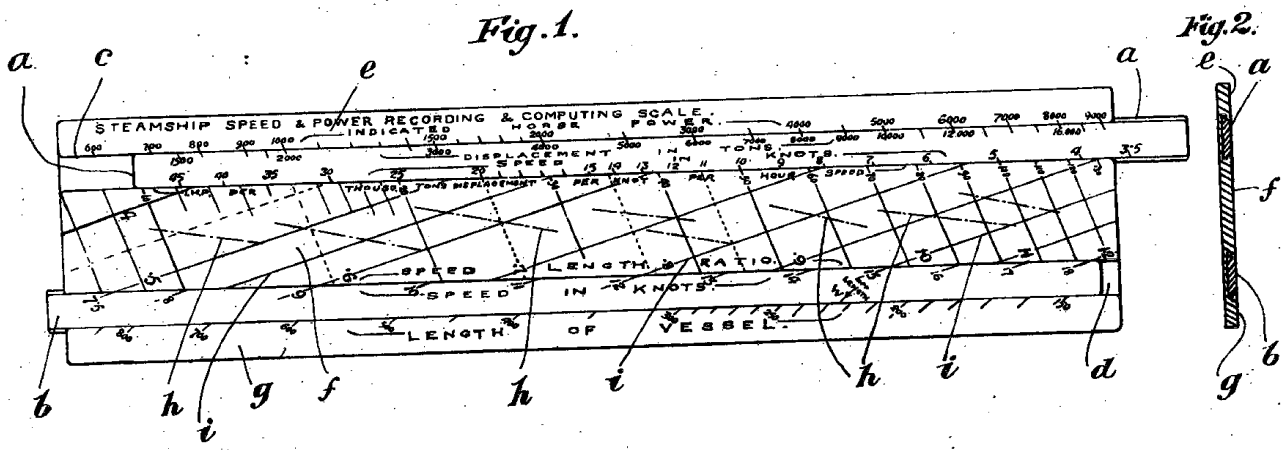
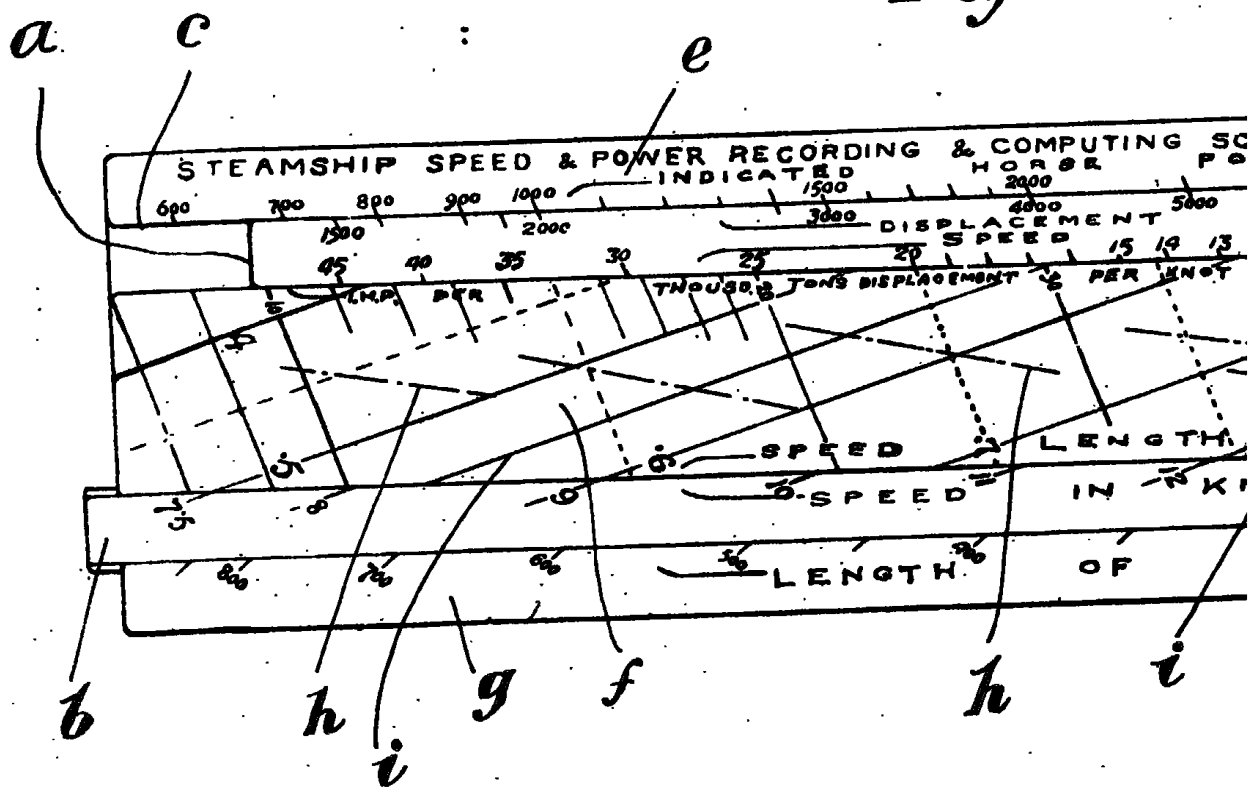


Fig. 1.



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

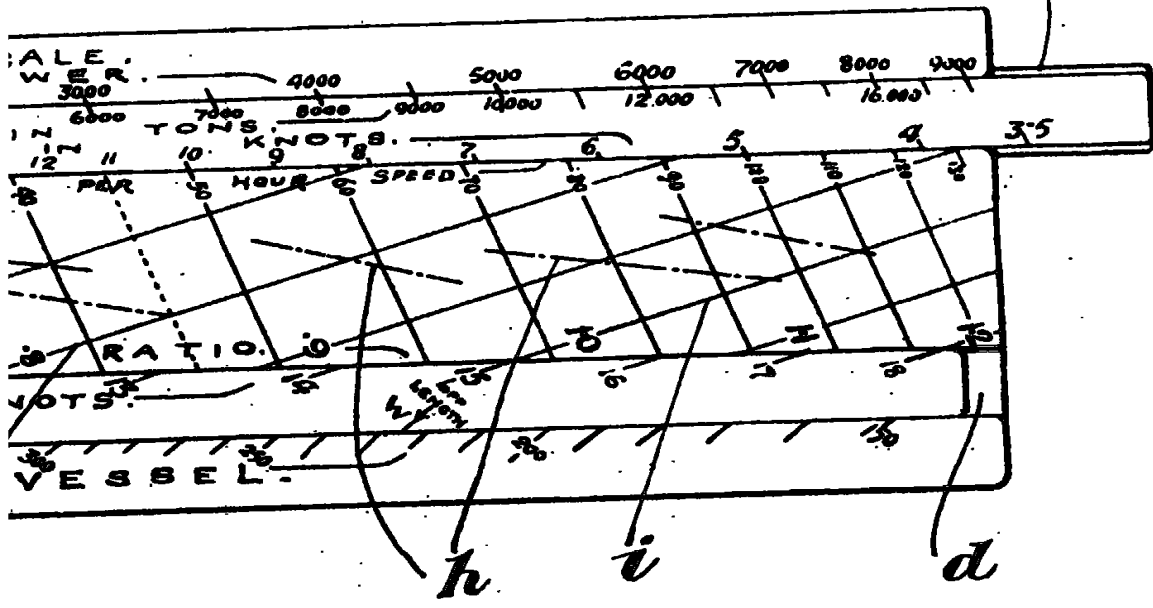


Fig. 2.

