

N<sup>o</sup> 14,623



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### PROVISIONAL SPECIFICATION.

#### A New and Improved Slide Rule for Reducing Spirits.

I, MATTHEW JOSEPH SHERIDAN, Gentleman, 20 Heathland Road Stoke Newington London, N. do hereby declare the nature of this invention to be as follows:—

5 A slide rule for use in the operations of reducing the strengths of spirits by the addition of water—the marked indications of quantities on which rule are based on the unchangeability of the combined weights of alcohol and water, and allow for the contraction in bulk which takes places when water is added to spirits.

10 This slide rule will be constructed to show the water required to reduce spirits of any degree of strength from 70 overproof to 40 underproof, the quantities so shown on the rule allowing for the contraction in bulk which takes place in the combined bulk. This allowance for contraction is the special or novel feature of the invention. The rule will be made up of three parts, viz. the slide rule and two rules which will form a frame-work in which the slide rule will move so as to indicate the strengths and quantities necessary to show the results required.

15 Dated this 22nd day of July 1896.

M. J. SHERIDAN.

### COMPLETE SPECIFICATION.

#### A New and Improved Slide Rule for Reducing Spirits.

20 I, MATTHEW JOSEPH SHERIDAN 71 Eastcheap, London E.C. Publisher 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:—

25 The invention consists of a slide rule specially constructed, lined and marked to enable to be ascertained the correct quantity of water required to reduce spirits from higher to lower strengths, having regard to the contraction in volume which results from the addition of water to spirits.

The figures and marking on the rule are based on the weights of admixtures of alcohol and water, this basis affording the only correct means of estimating the quantity of water required to reduce.

30 The slide rules at present in use are not based on weight but on bulk, and failing to take any account of contraction give results which are incorrect and misleading. Thus if it be required to reduce 90 gallons of spirit from a strength of 40 degrees overproof to a strength of 25 degrees underproof these rules would show the aggregate volume of spirit and water to be 168 gallons, equivalent to an addition of 78 gallons of water to the 90 gallons of spirit, as the quantity necessary to reduce to a strength of 25 underproof.

35 In this admixture, however, the resultant strength would not be 25 underproof, but about 23 underproof, and to arrive at the required strength of 25 underproof

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further additions of water would have to be made until, by the aid of the hydrometer, testing the strength after each such addition, the nearest approach to 25 underproof is obtained.

My invention remedies this defect in existing rules and enables the correct strength to be obtained in one operation of adding water. 5

Thus in the foregoing example the aggregate volume of spirit and water would be shown to be  $171\frac{1}{2}$  gallons, as nearly as possible, equivalent to an addition of  $81\frac{1}{2}$  gallons of water to the 90 gallons of spirit.

This addition of water is  $3\frac{1}{2}$  gallons in excess of the quantity ascertained by the present rules, and such excess is necessary to ensure the desired strength of 25 degrees underproof. Similarly in larger or smaller operations the quantities indicated by my invention will be greater than those shown by the existing rules in proportion to the rate of contraction in volume which takes place in the various mixtures of spirit and water in reducing operations. 10

As illustrative of this difference I beg a reference to the example of a reducing operation shown in the accompanying drawings. 15

The rule section marked A is my invention.

The rule section marked B is the present rule.

The example shown in the setting of 40 overproof (A.) on the slide (right of "proof" is overproof; and left of "proof" is underproof) to 90 gallons, gives  $171\frac{1}{2}$  gallons over 25 underproof. 20

Similar setting of 40 overproof on "B" gives 168 gallons over 25 underproof.

Thus in this example a difference of  $3\frac{1}{2}$  gallons is shown in the aggregate volume of spirit and water, and as the 90 gallons of spirit is common to both this difference of  $3\frac{1}{2}$  gallons must be made up in the greater quantity of water required to be added—such being the quantity corresponding to the contraction in volume in the mixture of these particular proportions of spirit and water. Similarly the indications of the rules would differ at every other proportionate mixture. 25

The theory on which the present rules are based is simply that the difference in bulk between the spirit before reducing and that after reducing and contraction represents the quantity of water required, and the theoretical rule to ascertain this is:—Multiply the bulk of spirit to be reduced by its degrees of proof strength and divide product by degrees of proof in strength required. Thus, in the example 30

shown:—(40 overproof =  $140^\circ$ ; 25 underproof =  $75^\circ$ )  $\frac{90 \times 140}{75} = 168$  gallons.

(See rule B.) (This is simply bulk after reducing & contraction.) 35

The theory on which my invention is based combines the bulk with the weight or specific gravity of the spirits, and by so doing provides for the contraction in volume. The rule is:—Multiply the bulk of spirits before reducing by its then specific gravity and multiply the bulk after reducing and contraction by its specific gravity and the difference in the products will be the quantity of water required to be added to the original bulk of the spirit to ensure the required strength. This addition is shown on rule A. Thus for example:— 40

Spirit of 40 overproof is taken to be of a specific gravity of .8631 at  $62^\circ$  F. or of .8641 at  $60^\circ$  F.

Spirit of 25 underproof is taken to be of a specific gravity of .9464 at  $62^\circ$  F. or of .9474 at  $60^\circ$  F. 45

90 gallons = bulk of spirit before reducing = 40 o.p.

168 gallons = bulk after reducing and contraction = 25 u.p.

Ex.:—(168  $\times$  sp. gr. of 25 u.p. spirit) — (90  $\times$  sp. gr. of 40 o.p.) = 81.3 gallons. 50

81.3 + 90 = 171.3 combined volume.  
It will therefore be seen that the difference of 3.3 gallons (171.3 — 168) shown in these calculations is shown on the rules A & B in drawings—such difference representing the amount of contraction in the mixture, and corresponding to the quantity of water in excess of that shown by present rules, necessary to ensure correct strength as required. 55

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As the rate of contraction in bulk varies with the range of spirit strengths before and after reducing, so the graduations on my rule are made to vary correspondingly throughout.

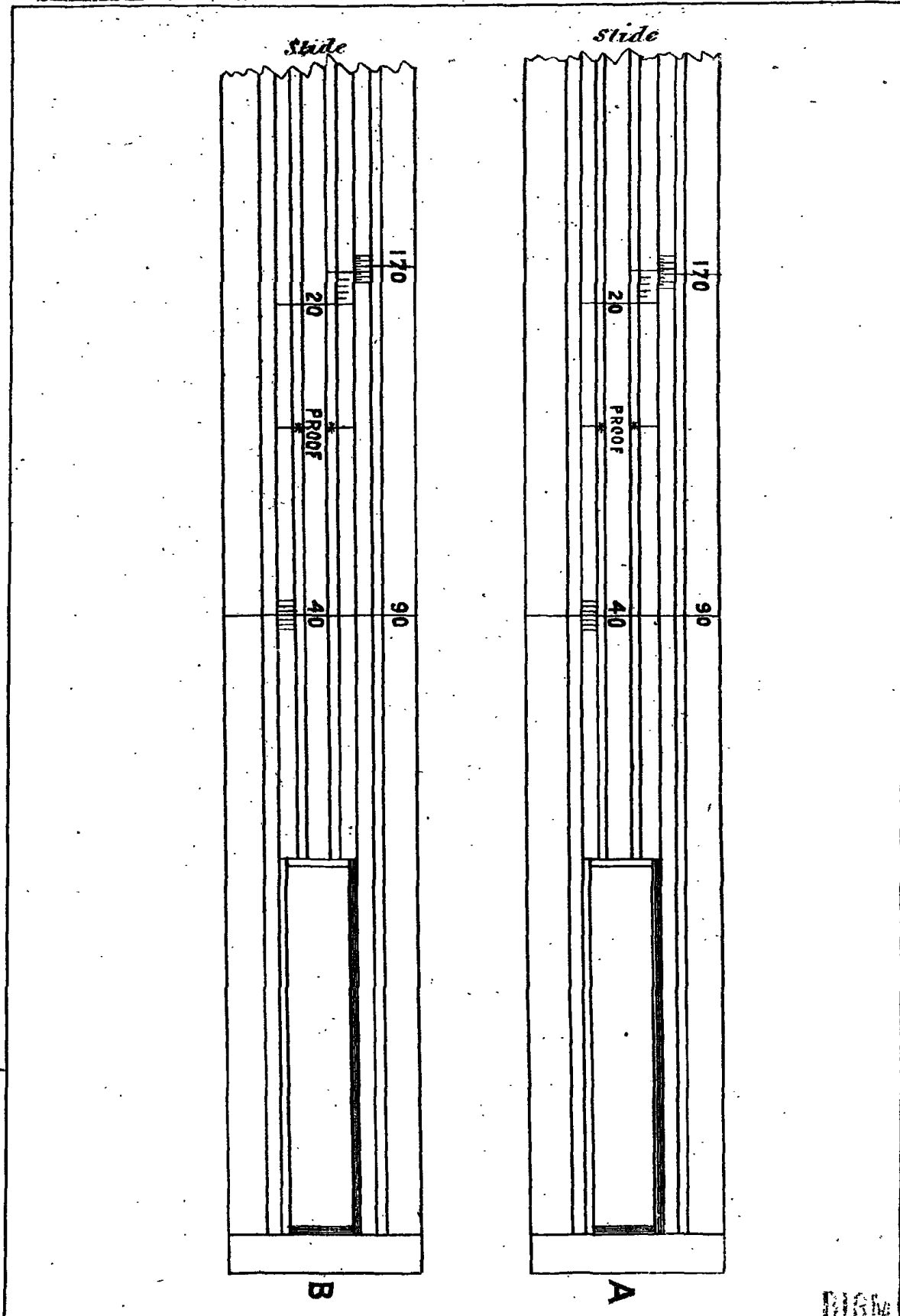
5 The invention will be of the ordinary slide rule pattern, with one or more slides, the lines and indications being logarithmically laid down, and the quantities and strengths being shown in gallons and degrees or fractions of gallons and degrees according to the lengths in which the rules are made.

10 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 for reducing spirit of construction as herein described and illustrated.

Dated this 31st day of March 1897.

M. J. SHERIDAN.



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