## COMPLETE SPECIFICATION

## Slide Rule

I, GUY WILLIAM FARRIER SANGWIN, 6, Montrose Avenue, Sidcup, Kent, British, do hereby declare the invention, for which I pray that a patent may be granted to me, and
5 the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a slide rule for the conversion of petroleum volumes, mea-
10 sured in cubic feet, long water tons, cubic metres, or America barrels, said petroleum being classified by either International or America Petroleum Institute systems of measuring specific gravity, into long, metric or
15 short tons.

The principle embodied in this rule is the marking of the scales in terms of one quantity, but its numbering in another, as described hereunder, which enables (1) International
20 specific gravity readings to be placed directly against measurements in cubic feet, and the tonnage, in long, metric and America short tons to be read off in one movement of the rule, and (2) A similar system of marking
25 as described in Para. 5 where International specific gravity values are numbered according to their equivalent A.P.I. numbers, which is the only possible way of putting such numbers on a slide rule, inasmuch as they are a means
30 of identification only and have no mathematical significance at all.

(1) In one embodiment of the invention the body of the rule comprises one scale at the top, " A ", and one at the bottom " E "
35 (Fig. 1) and the centre slide carrying three scales " B ", " C ", and " D "( Fig. 2) calibrated as described below.

The cursor, which is fitted with a through clamping device to hold it to the centre slide
40 at any particular specific gravity reading, carries three lines numbered 1, 2, and 3 respectively counting from the left to give readings in long metric, and short tons in that order. Lines 2 and 3 are displaced from

line 1 by (Log scale ×1.016) and (Log scale 45 ×1.12) to act as multipliers for this purpose.

(2) Scales " A " and " E " are formed by taking double logarithmic scale 1—10/10— 100 and rejecting the lower end 1—4.5 and the upper end 50—100. The remaining centre 50 section is halved arithmetically, and the left hand section moved to a new position underneath the right hand section to form scale " A " top, and " E " bottom, (Fig. 1).

Scale " A " reads in cubic feet in thousands, 55 or in barrels as one tenth scale reading, or tons as one hundreth scale reading. Scale " E " reads in tons, or, multiplied by ten in barrels.

(3) Scale " B ", the top scale of the centre slide, is part of a logarithmic scale reading 60 from 33.292—59.972, the lower and upper ends having been rejected. But while the markings are as stated (being the number of cubic feet per ton of oils of specific gravity readings ranging from 600—1.08) the numbers 65 appearing against the markings are those of the appropriate specific gravities themselves, thus giving an automatic conversion between specific gravity and volume, without which it would be impossible to perform 70 the required calculation in one operation. The base line for this scale, 1, which has been rejected together with the lower end of the scale, reappears on the rule superimposed on scale " D ", it having been moved to the 75 right by the same amount as scale " E " has been in its new position, and then projected downwards on to scale " D " (Marker No. 1 Fig. 2). Also superimposed on scale " D " are two more markers (Markers No. 80 2 and 4 Fig. 2) displaced from marker No. 1 by the same amount as the lines 2 and 3 on the cursor and serving the same purpose.

(4) Scale " C " is part of a double logarithmic scale 1—10, 10—100 extending from 85 6 through 10 to 10.08 with its lower and upper ends rejected, to show specific gravity readings directly. Its base line is at the value 10 which has been projected downwards

through A.P.I. reading 10 on scale " D " with which it coincides, so that it can be read against scale " E " (Marker No. 5 Fig. 2). The three lines of the cursor give appropriate
5  answers in long, metric, and short tons.

(5) Scale " D " is a scale of American Petroleum Institute specific gravity values. The actual markings are International specific gravity values, equivalent to the numbers of
10  the A.P.I. scale which run from 1—104 and these are the numbers the scale actually shows. The base line on this scale is a marker at the point 6.404, which is the " Constant " value (number of barrels of fresh water per
15  long ton at 60 Fahrenheit) (Marker No. 3 Fig. 2). The three lines of the cursor give the three tonnages as explained above.

WHAT I CLAIM IS: —

1. A slide rule for carrying out computa-
tions in connection with the loading of oil    20
into ships, comprising a basic portion having upper and lower logarithmic scales, graduated in cubic feet and tons respectively, and a slide carrying upper, middle, and lower logarithmic scales, the upper scale of the slide    25
being graduated in terms of cubic feet per ton, but numbered in terms of the appropriate specific gravities, the middle scale being a standard logarithmic graduation for converting long or metric water tons into oil tons accord-    30
ing to the specfic gravity, and the lower scale being graduated in terms of international specific gravity but actually numbered in terms of the appropriate A.P.I. values.

2. A slide rule substantially as described    35
with reference to the accompanying drawings.

G. SANGWIN.

**Fig. 1**

STANDARD LOGARITHMIC CALIBRATION 4·5 — 15

STANDARD LOGARITHMIC CALIBRATION 16—50    A

STANDARD LOGARITHMIC CALIBRATION 4·5 — 15    E

**Fig. 2**

BASE LINE 1

CALIBRATED 33292 — 59972 BUT NUMBERED 10·08 — 600    B

CALIBRATED & NUMBERED 600 — 10·08    C

CALIBRATED 600·8 — 10·016 BUT NUMBERED 104—1    D

MARKERS 1    2    3    4

B    C    D