1296392

PATENT SPECIFICATION (11) 1296392

DRAWINGS ATTACHED

(21) Application No. 4758/69 (22) Filed 28 Jan. 1969

(23) Complete Specification filed 26 Jan. 1970

(45) Complete Specification published 15 Nov. 1972

(51) International Classification G09B 19/02//G06G 1/00

(52) Index at acceptance

G5G 5B

G4B 5D

(54) IMPROVEMENTS IN OR RELATING TO CALCULATING MEANS

(71) I, RODNEY MAX ELMS a British subject of 95 Waldegrove Road, Teddington, Middlesex (formerly of 38, Cresswell Road, East Twickenham, Middlesex), do hereby declare the invention for which we pray that a Patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention is concerned with improvements in or relating to calculating means and is especially concerned with calculating means comprising a set of interrelated members, the calculating means being useful in the education of children for teaching mathematical principles.

It is known to use a series of blocks and rods, generically termed members, representing various number in calculation of mathematical problems involving addition and subtraction, each member representing a number and having at least one dimension corresponding to, i.e., in direct proportion to, that number. The dimension usually selected is length. Consequently, a "number two" member is twice as long as a "number one" member and a "number three" member is three times as long as a "number one" member. In the same way, each member representing a number is that number times as long as a "number one" member. The members are marked to indicate the numbers they represent. In adding two or more numbers the respective members representing these numbers are aligned and abutted end to end so that the total length represents the sum of the numbers. This is measured by using a scale, divided into units each corresponding to the length of the "number one" member, or by comparing this combined length with the lengths of other members and finding one of the same total length as the combined lengths. The sum is indicated by the marking of this large member. Simple multiplication by addition can also be effected with these members. For example, to multiply three by four, four "number three" members, or three "number four" members, are longitudinally aligned and abutted as hereinbefore described. However, multiplication by addition in this manner is restricted, for practical purposes, to small numbers. Calculating means comprising such members are used in primary schools.

It is an object of this invention to provide improved calculating means.

The present invention provides calculating means comprising a logarithmic scale and set of members of different lengths for use with said scale, each member representing a number and being of a length which is in direct proportion to a logarithmic value of the number represented by its respective member and with which the member is marked, the logarithmic values of the members of the set having a base, and values indicated on the scale having the same base as the base of the logarithmic values of the members of said set so that the members can be used for simple multiplication and division in conjunction with the scale.

Preferably each member of said set is of a length which is in direct proportion to the logarithmic value of an integral number within the range from 2 to 10.

Thus the ratio of the relevant dimension of any one of the members representing one number, to the relevant dimension of any other of the members representing a different number, is equal to the ratio of their corresponding logarithmic values.

By longitudinally aligning and abutting members representing different numbers in similar fashion to the manner of using the known blocks for addition and subtraction, the numbers can be multiplied.

Numbers are divided, using these members, by abutting the members, representing the numbers, in parallel instead of longitudinally as for multiplication. For example, to divide a large number by a smaller number the members representing the numbers are placed side by side such that the end of one member is at the same level as the adjacent

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end of the other member. The result of the division is represented by the difference in levels of the respective other ends of the members. The members may be in the form of rods, blocks or any other suitable form.

The scale may be in the form of a rod mounted on a base, the numbers being represented by rings or tubes placed over the rod at distances proportional to the logarithmic values of the numbers.

Alternatively, each scale may be in the form of a wall chart incorporating a steel sheet, and the numbers may be represented by magnetic members which can be temporarily located on the chart.

The members may be in the form of cubes, of any suitable materials. Alternatively, the members may be in the form of rods or blocks each having a hooked portion at each of its opposite ends, the distance between the hooks on each rod or block corresponding to the logarithmic value of the number. To multiply with these rods or blocks, a hook of one rod or block is linked with the hook of another rod or block.

Means may be provided on any of the members for connecting two of the members together to assist dividing one number from another. For example, each rod of the embodiment described may be provided with a pin near one end and an aperture near the respective other end, such that, when one rod is connected to another rod, by inserting the pin of one rod into the aperture of the other rod one end of the one of the rods is at the same level as the adjacent end of the other rod, and the rods lie side by side.

The logarithmic values employed may be those having a base of ten or may be logarithmic values having any desired base or more than one base, i.e., scale $\log_e$, one set of members $\log_e$ and one set $\log_{10}$.

An example of calculating means according to the invention will now be described by way of example with reference to the accompanying drawings, wherein:—

Figure 1 is a perspective view of a set of members and a scale for calculating mathematical problems, and

Figure 2 is a plan view of the scale.

Referring to the drawings twenty rods 10 provided, two rods representing each of the numbers two to ten, one representing the ratio 'pi', i.e., approximately 3.1413 or 3.142 and one a linear metric conversion factor. The rods 10 may be colour coded, i.e., respectively different colours used for the different numbers represented, for ease in identifying the rods 10. The rods 10 are used with a scale 11 having a planar surface 12, a longitudinal abutment, or lip 13, extending along and parallel to the scale 11, and a stop 14 near one end of the scale 11. Scale markings 15 are printed onto the surface 12. The relevant abutment face 18 of the stop 14 is aligned with the zero position 17 of the scale 11.

The common logarithmic system having a base 10 is used for determining the lengths of the rods 10 corresponding to the numbers and the scale markings 15. The scale markings 15 go up to one hundred over a distance of twenty inches, with intermediate scale markings 16 being correspondingly logarithmically spaced. For example, the rods 10 representing the number 10 are each ten inches long, and, similarly, the scale marking 19 representing the number ten is ten inches from the zero of the scale at the abutment face 18 of the stop 14. The rods 10 are of wood, but may also be of any other suitable material such as injection moulded plastic material or aluminium. The scale 11 is a sheet of aluminium, but could be made of wood, and the lip 13 is formed by a square section wooden rod on the sheet. The stop 14 is formed by a transverse square section wooden rod, but the lip 13 and stop 14 could be made by folding the edges of the sheet. The scale 11 could be of injection moulded plastics material, with the scale markings 15 formed during the injection moulding process. Alternatively, and especially in the case of scales which are not moulded, the scale markings 15 may be formed by etching, printing or machining.

Any two numbers from two to ten are multiplied together in the following manner. A rod 10 representing one of the numbers, is placed on the scale 11 so that one end lies at the zero of the scale 11 abutting against the abutment face 16 of the stop 14 and the rod extends along the scale 11. Then a rod 10 representing the other number, is placed on, and extends along, the scale 11 so that one end abuts against the free end of the first rod 10. The result of the multiplication is then read off from the scale marking which is in alignment with the free end of the second rod.

Three or more numbers may be multiplied in a similar manner, answers exceeding 100 being read from the scale by manipulating a rod having a value of '10'.

WHAT I CLAIM IS:—

1. Calculating means comprising a logarithmic scale and set of members of different lengths for use with said scale, each member representing a number and being of a length which is in direct proportion to a logarithmic value of the number represented by its respective member and with which the member is marked, the logarithmic values of the members of the set having a base, and values indicated on the scale having the same base as the base of the logarithmic values of the members of said set so that the members

can be used for simple multiplication and division in conjunction with the scale.

2. Calculating means according to claim 1, wherein each member of said set is of a length which is in direct proportion to the logarithmic value of an integral number within the range from 2 to 10.

3. Calculating means substantially as hereinbefore described with reference to the accompanying drawings.

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Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1972.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

1296392 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

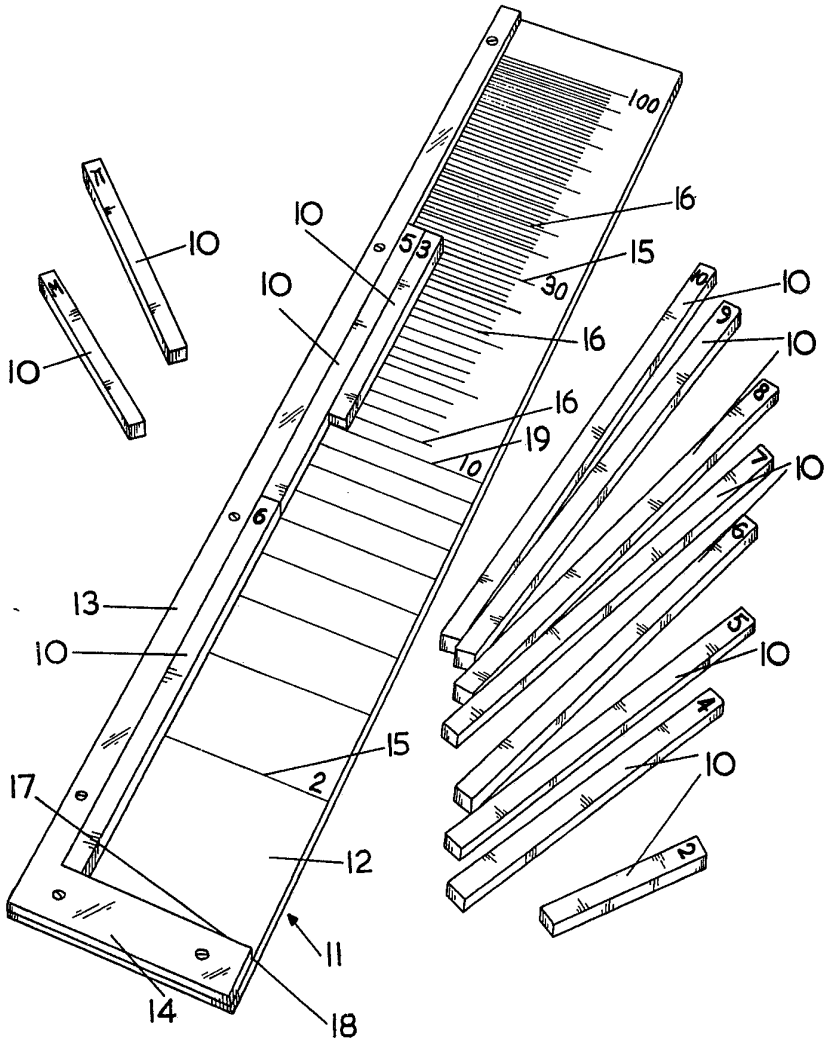

FIG.1.

1296392 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 2

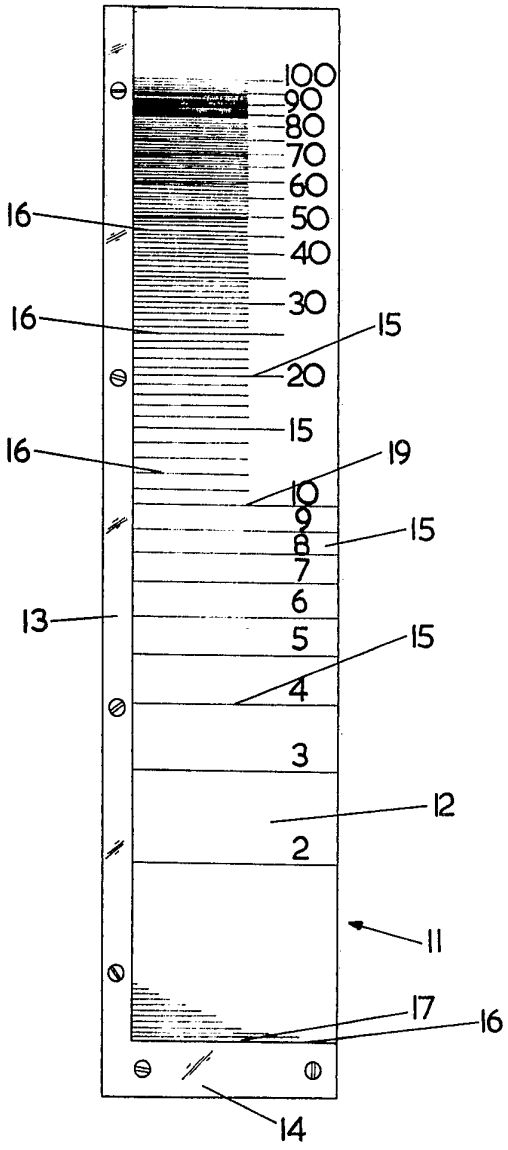

FIG. 2.