PATENT SPECIFICATION

Application Date: April 5, 1928. No. 10,422/28. **314,609**

Complete Accepted: July 4, 1929.

COMPLETE SPECIFICATION.

Cylindrical Slide Rule.

I, MICHAEL EWGENJEWITCHEM PODTJAGIN, a citizen of the Union of Soviet Socialist Republics, of 21, M. Bronnaia, Moscow, Russia, 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 form of cylindrical slide rule.

The object of the invention is the production of a slide rule that is portable and noiseless in operation, while combining durability with low cost.

As in the case of ordinary slide rules it is intended for multiplication and division and is based upon the addition and subtraction of logarithms of numbers, but differs therefrom, in that addition and subtraction are carried out by adding and subtracting areas on a cylindrical surface.

To add to the usefulness of the rule, other cylindrical members may be provided upon which information such as the squares, cubes of numbers, and sines and tangents are marked.

The invention consists in a cylindrical slide rule comprising a fixed cylinder and a slidable co-acting transparent cylinder the markings upon which represent a logarithmically divided scale that is cut into many parts in order to obtain the equivalent of a long slide rule.

The invention also consists in the feature that the markings are on the inside of the outer transparent tube, the two sets of markings being in different colours.

The invention further consists in the combination with the said slide rule of additional inner and outer cylinders having squares, cubes of numbers, sines and tangents and other useful information marked thereon, the latter cylinder serving as a case.

The invention also comprises the method of manufacture in which the scales are marked by means of a lithographic process (stereotype plates) obtained by photographic means by reducing originals produced by the usual graphic means.

In order that the invention may be clearly and readily understood reference will now be made by way of example to the accompanying drawings, in which:—

Figure 1 is a sectional view of a slide rule according to the invention showing only the logarithmic cylinders,

Figure 2 is a cross-section of same,

Figure 3 represents the scale on the transparent tube developed on a plane surface, and

Figure 4 represents a similarly developed view of the markings on the main cylinder.

In Figure 1, A represents a cylindrical tube of any suitable material preferably aluminium upon which is secured, as by gluing, the celluloid rectangular sheet F. Upon this tube is adapted to slide a transparent celluloid cylindrical tube B, fitted with celluloid bands C at the ends thereof and approximately half the length of tube A. The ends of the cylinder A are fitted with plug members, one of which D is screwed into the tube, the other plug E being a sliding fit with slight friction.

The celluloid sheet F the length of which agrees with the distance between the shoulders of the plugs D and E has a width equal to the outer circumference of the tube A.

The area of the sheet forming the cylinder B is divided by, for example, 20 lines on which beginning from the top left-hand corner and ending at the bottom righ-hand corner, are marked all numbers from 100 to 1,000 logarithmically in accordance with their mantissae. At the beginning of each line the numbers are shown in full, that is, three fingures, but further along the line the figures are shown only at the places where the last figures change. The places where the first figures change are marked by double-figure numbers, e.g. 20, 30 etc., The first figures are shown in heavier type than the last. The divisions between the marked figures permit the reading of mantissae of all four-figured numbers and partly of five-figured numbers. All numbers are marked above their respective lines.

The markings on the left-hand side of the sheet F of cylinder A, are an exact

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copy of those on cylinder B the only difference being that the figures are marked below their respective lines. Each line of the righ-hand half of the sheet represents the normal continuance of the corresponding left-hand half line with divisions and numbers in normal sequence. In this manner the first line of the right half is a duplicate of the second line on the left half.

In addition to the logarithmic markings, there may be included special arithmetic values such as π and the like.

In order to better distinguish the markings when the cylindrical tube B is in working position, one set is given a different colour to that of the other, those on the sliding cylinder being marked on the underside of the tube, by which means the reading is facilitated, both sets thereby being practically on one and the same surface.

The operation of the instrument is given by means of an example. Suppose it is required to multiply 11,218 by 13,273. On the third line of the cylinder we find 13,273 (the last figure being gauged by eye between indices corresponding to 1,327 and 1,328) and the initial division of the tube is placed in alignment with this value. Against 11,218 on the tube we read on the cylinder the result, 14,890 given exact to 5 figures.

Suppose it is described to divide 14,890 by 13,273: for this purpose we have to find 13,273 again on the cylinder and bring into alignment with this value the initial division of the tube, in order to read on the tube the results 11,218 against 14,890 on the cylinder, Thus the rule for setting the instrument is the same for division and multiplication of all numbers.

There is no need to move the tube from left to right (when the product is more than unity) as is necessary with the ordinary slide rule, and the tube never moves over the ends of the cylinder.

A white celluloid cylindrical case is preferably fitted over the cylindrical slide rule. The internal diameter of this case is larger than that of the sliding tube, and the outside diameter is smaller than that of the plugs. The left half of this case is provided with 20 lines printed in two different colours, giving squares and square roots of all numbers. The right-hand half of the case is also provided with 20 lines giving cubes and cube roots accurate to 4 or 5 figures.

Inside of the cylinder is placed another cylinder on which are marked values of sines and tangents. This cylinder may be fixed to the plug E in order to move together with it. In this way all scales are placed on four cylinders sliding one within the other, which gives a maximum of portability.

The scales on the celluloid are preferably produced by the lithographic process, by adding acetone to the colour medium. The aluminium stereotype plates are produced by the photographic process by means of reduction of the originals. The latter are made by means of the usual graphic method with an accuracy up to 0.01 mm. This is the most accurate and economical way of producing the scales.

A convenient length for this type of slide rule is about 380 mm. say about 14 inches, which is equivalent to an ordinary slide rule of about 24 feet long.

Other materials than those mentioned may be employed and modifications may be introduced without departing from the scope of the invention.

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 cylindrical slide rule comprising a fixed cylinder and a slidable co-acting transparent cylinder, the markings upon which represent a longitudinally divided scale that is cut into many parts in order to obtain the equivalent of a long slide rule.

2. A cylindrical slide rule as claimed in Claim 1, in which the markings are on the inside of the outer tube, the two sets of markings being in different colours.

3. A slide rule as claimed in Claim 1 or 2, in combination with additional inner and outer cylinders having the squares and cubes of numbers, sines and tangents of angles and/or other useful information marked thereon, the outer cylinder serving as a case.

4. A slide rule as claimed in the foregoing claims, in which the scales are marked by means of a lithographic process (stereotype plates) obtained by photographic means by reducing originals produced by graphic means.

5. The slide rule substantially as described and as illustrated in and by the accompanying drawings.

Dated this 4th day of April, 1928.

MARKS & CLERK.

Reference has been directed, in pursuance of Section 7, Sub-section 4, of the Patents and Designs Acts, 1907 to 1928, to Specification No. 23968 of 1914.

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

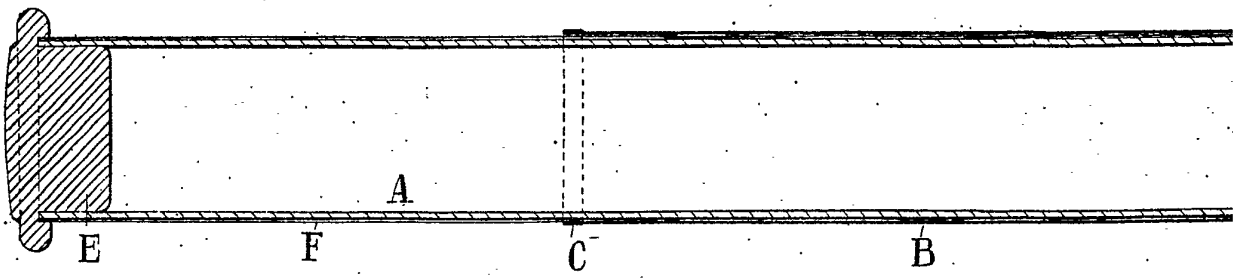


Fig.1.

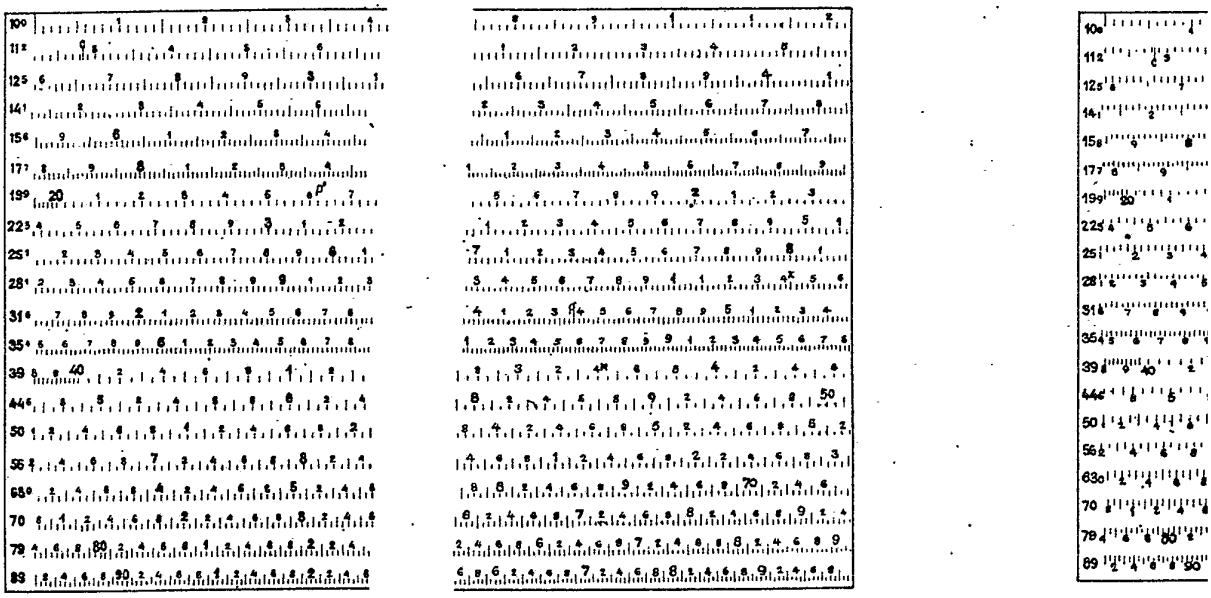
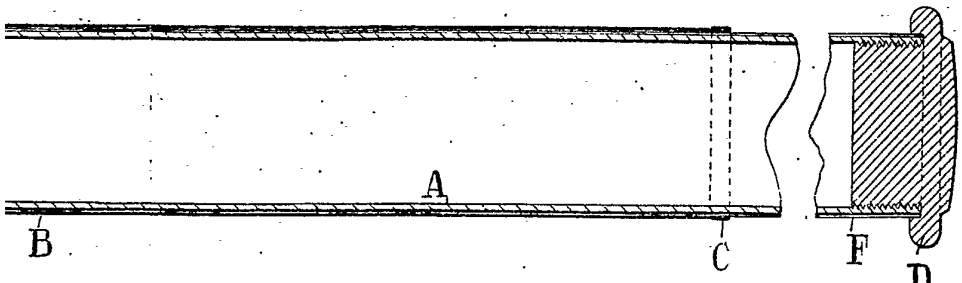


Fig.3.



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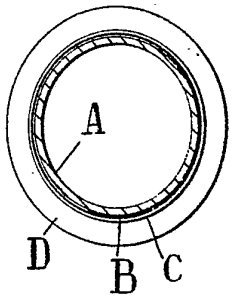


Fig. 2.

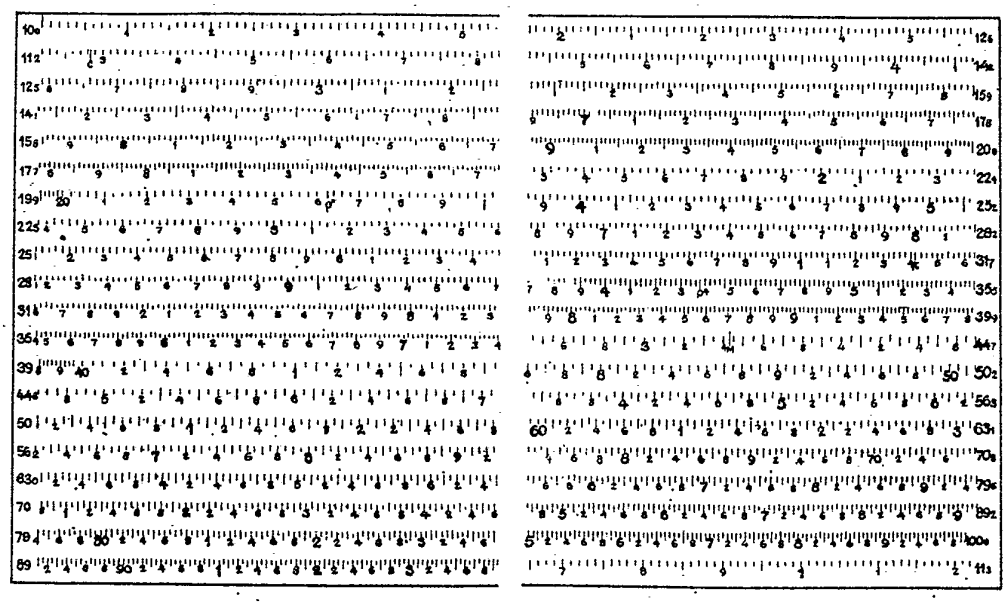
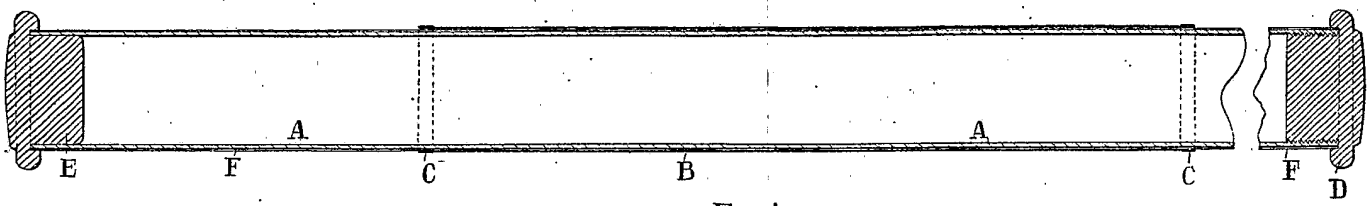


Fig. 4.

Charles & Read Ltd. Photo Litho.

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



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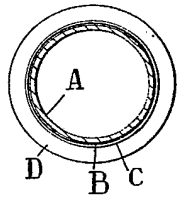

Fig.2.

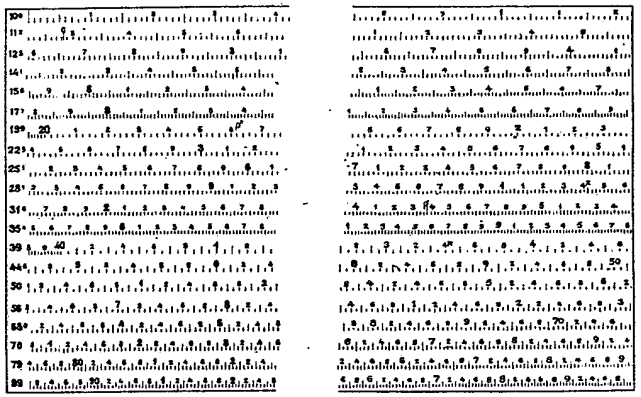

Fig.3.

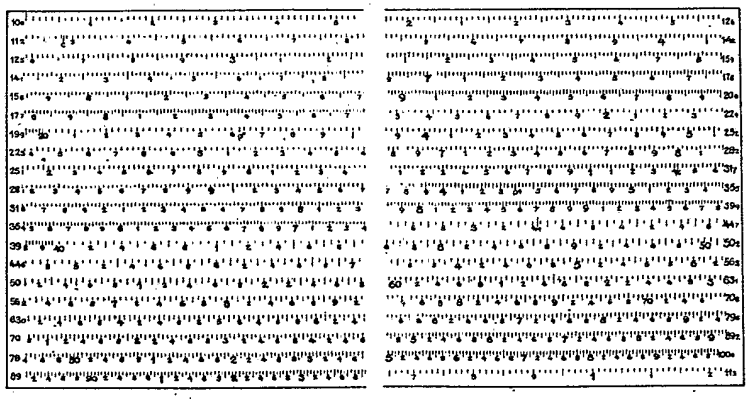

Fig.4.

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