N° 17,499 A.D. 1904

(Under International Convention.)

Date claimed for Patent under Patents Act, 1901, being date of first Foreign Application (in United States), 12th Sept., 1903

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Accepted, 22nd Sept., 1904

COMPLETE SPECIFICATION.

"Improvements in Slide Rules"

I, RUDOLPH CHARLES SMITH, of No. 214 Woodworth Avenue, in the City of Yonkers, in the County of Westchester, and State of New York, United States of America, Engineer, 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:

The object of my invention is to construct an instrument which will in every case register mechanically the correct decimal value of the first figures of numbers used in the operation of a logarithmic scale for calculations. Such an instrument, as is well known, is of the greatest utility, as it does away with the many chances of error caused by the necessity of constant mental attention while using the ordinary slide.

My present invention consists in the construction of a cursor which, in conjunction with the uniformly-spaced divisions on the slide and stationary part of a slide-rule with decimal figures and with directive means on the ordinary logarithmic scale, will obtain the result of mechanically registering the decimal value of the numbers used for computation on the logarithmic scale.

Figure 1 is a top plan view of a calculating-scale embodying my invention.

Fig. 2 is a plan showing the under side of same.

Fig. 3 is a longitudinal side elevation of same; and Figs. 4 and 5 are respectively end elevations of the same, looking at the right-hand ends of Figs. 1 and 2, respectively.

The arrangement of the ordinary logarithmically-spaced slide-rule is well known and needs no detailed description. It consists of a stationary part and of a slidable part which can be moved to the desired place on the stationary part in proper guides.

The main slide 1 is held in place and slides on the stationary stock or part 4 below a flexible transparent covering-plate 2, which is kept at its proper place and at proper clearance for the slide 1 by the rivets 3, the latter being small strips of metal passing through the plate 2 and stock 4 and having their ends bent at right angles to form heads, as shown in Fig. 5. The slide 1 as well as the stationary part 4 are provided with any of the well-known logarithmic Gunter scales; but in my improved instrument the scales on the slide 1 as well as those on the stock 4 are prominently marked with a visible sign in such a way that the same sign, in conjunction with the cursor and the decimal spaces of the slide, is used to register the correct decimal value of the results obtained, as will be explained hereinafter.

The cursor 6 may be the ordinary cursor used with this class of instruments; but the cursor 5 is provided with three indexes 17, 20, and 19, respectively,

coinciding with the spacing of the decimal figures on the slide 8 by which the decimals are registered. The index-line 20 of the cursor 5 extends in a continuous line all around the stationary part 4, so as to serve to register the spacing on the back of the instrument with the middle line 20 of the said three indexes at the front of the cursor.

The figures on the auxilliary slide 8 and on the stationary part 7 of the decimal-scale are in three rows, which contain, respectively, the decimals of the rows of figures on the main scale, which are marked "3", "4", "1", and "2", (not as numerals of reference, but as incorporated with the instrument,) as shown at the left-hand end of Fig. 1.

It will be noticed that the upper row of the stationary scales are the square roots of the lower row of figures, while the slides have the same row of figures as the lower row of figures on the stationary parts.

For the purpose of distinguishing the figures of the left half of the instrument from those of the right half and for the purpose of fixing the figures to be registered with the proper index of the cursor 5 I provide the stationary sleeve 10 in the middle of the stationary part 4 of the main scale, through which sleeve 10 the main slide 1 slides. Heavy red lines 11 12, respectively, inclose the figures of the left of the main slide 1 and of the stationary part 4. The upper and lower red lines 12 of the stationary part 4 form, so to speak, a frame with the fixed cursor 10, and the red lines 11 join on a cross-line 13, which forms the end of the left half of the slide 1.

I provide the cursor 5 between the index 17 and index-opening 16 with the same transparent color, red, as used for the lines 11 and 12 on the left half of the instrument, while the surface of the slide 8 to the right of the index 19 (not being under the said transparent color) appears as white, which is the color of the right half of the main scale. I have discovered that this construction of the instrument is capable of registering the decimal mechanically, following a very simple rule of operation, *viz*: Repeat every move of the cursor 6 and slide 1 of the main scale with the cursor 5 and slide 8 of the decimal-scale, using the numbers on the main scale and the decimal of their first figures on the decimal-slide. Read all decimals in line with the middle index 20 of the cursor 5, except those of fractions where numerator and divisor have different colors. In this case the numerator is taken with the red index 17 of the cursor if it is on the red left half of the main rule and with the index 19 to the right of the middle opening 16 when the numerator is on the white half of the main slide.

The instrument registers factors of proper and improper fractions, like

$$\frac{60}{3} \times \frac{2}{5} \times \frac{600}{12} \quad \begin{matrix} \text{answer} \\ 8 \end{matrix} \quad \begin{matrix} \text{answer} \\ 15 \end{matrix}$$

by the following sequence of moves for all the fractions: Fix the divisor (in our example "3") on the main slide 1 with the ordinary cursor 6. Repeat the same operation, using the decimal "1" of the divisor "3" in our example and the special cursor 5 of the decimal auxiliary slide 8, moving the cursor 5 until the decimal "1" on the slide 8 is within the opening 16 and coinciding with index 20. Now move the main slide 1 to bring the numerator "60" to the position previously fixed for the denominator by the cursor 6 in the first operation above explained. Repeat the same move with the slide 8 of the decimal-scale, using the decimal of the first figure of the numerator, which is "10" in this case, and moving said slide 8 until the "10" on the slide appears in the aforesaid opening 16 of cursor 5, which is the position of the parts shown in Fig. 1.

Read all values of decimals in line with index-line 20, except when the numerator and divisor are of different colors, then use a red numerator with the index 17 to the left of the opening 16, while with a white numerator on a red denominator the index 19 to the right of the opening 16 should be used.

Fig. 1 shows the position of the scale after the numerator "60" has been moved to the edge of the cursor 6, (the latter being in the position in which it previously fixed the "3") and also the position of the cursor 5 on the decimal-scale, (both terms in this illustration being of the same red colour,) with "10" in the opening 16 of the cursor 5, in line with "1" on the stationary part 7 of the decimal-scale. The next move will be the main cursor 6 to "5" on the slide 1 and the opening 16 of the cursor 5 to the "1" on the slide 8. Then move the main slide 1 until the "2" thereon reaches the edge of the main cursor 6, and leave the opening 16 of cursor 5 on the "1" of the decimal-slide, since the decimal of the "2" and "3" composing the fraction is "1" and and since they both are of the same color. Now move edge of main cursor 6 to "12" on slide 1 and move opening 16 of decimal-cursor 5 to the "10" on the decimal-slide 8, then move slide 1 until the "600" thereon reaches the position fixed for the denominator "12" by the cursor 6 in the previous move, and then move the slide 8 until the "100" thereon is directly below the red index 17 of cursor 5, since the denominator "12" was white and the numerator "600" was red. Above the "8" found on the stock 4 read answer "32" on slide 1. Both being red, read in opening 16 of decimal-cursor "1000" as the decimal of the first figure of said "32", giving the answer, consequently, as "3200". If multiplying with fifteen instead of by eight, move the cursor 5 until index-line 20 thereof coincides with the "10" on part 7, then above "15" on stock 4 we find "6" on slide 1 as the first figure of the answer, and then we find "1000" as the decimal of the answer in line with red index 17 of cursor 5, thus disclosing the final answer as "6000."

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 sliding rule having lines of uniform spacing, marked respectively with a continuous series of powers of ten, with a cursor having three indexes of the same spacing; as and for the purposes described.

2—In combination with the logarithmic slide-rule, an auxiliary slide-rule with scales of uniform spacing, marked with a continuous series of powers of ten, and with the cursor having three indexes of the same spacing as the scales of the auxiliary slide-rule; substantially as set forth.

3—In combination with the logarithmic slide-rule, an auxiliary slide-rule of uniform spacing, and marked with a continuous series of powers of ten, and with a cursor having three indexes of the same spacing and respectively the same distinguishing-sign which appears on the halves of the logarithmic slide; substantially as described.

4—In combination with the logarithmic slide-rule, an auxiliary slide-rule of uniform spacing, and marked with the series of powers of ten, with the cursor having three indexes of the same spacing and respectively with same distinguishing-sign which appears on the halves of the logarithmic slide, and with the stationary sleeve of the logarithmic scale; substantially as described.

5—In combination with the logarithmic slide-rule, an auxiliary slide-rule of uniform spacing, marked with the continuous series of powers of ten, with the cursor having three indexes of the same spacing and the same distinguishing-sign which appears on the logarithmic slide, and with its middle index extending around the front and back of the instrument; substantially as described.

Dated this 29th day of July 1904.

RUDOLPH CHARLES SMITH.
Haseltine, Lake & Co.,
7 & 8 Southampton Buildings, London, W.C.
Agents for the Applicant.

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SMITH'S Complete Specification.

1 SHEET.

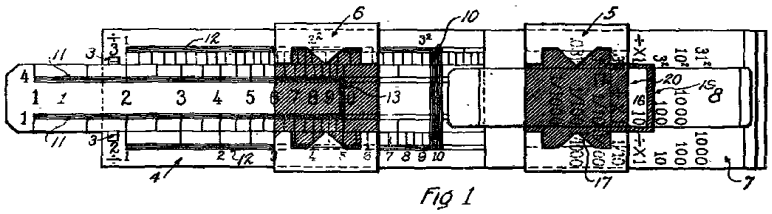


Fig. 1

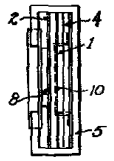


Fig. 4

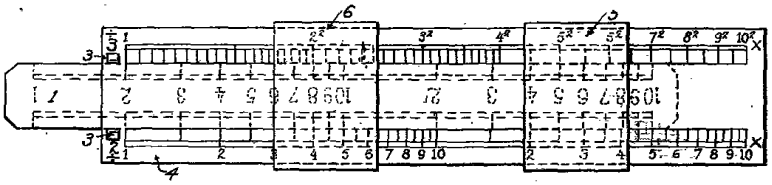


Fig. 2

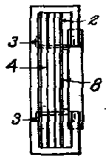


Fig. 5.

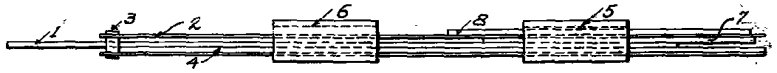
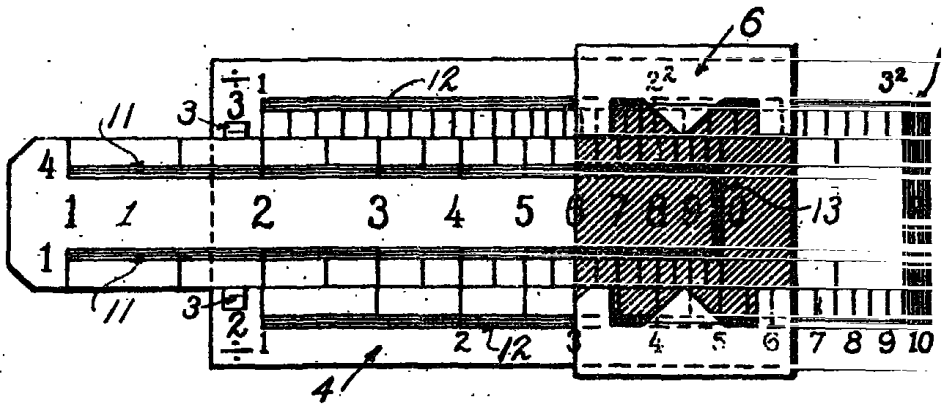


Fig. 3.

[This Drawing is a full-size reproduction of the Original.]

A.D. 1904. Aug. 11. Nº 17,499.

SMITH'S Complete Specification.



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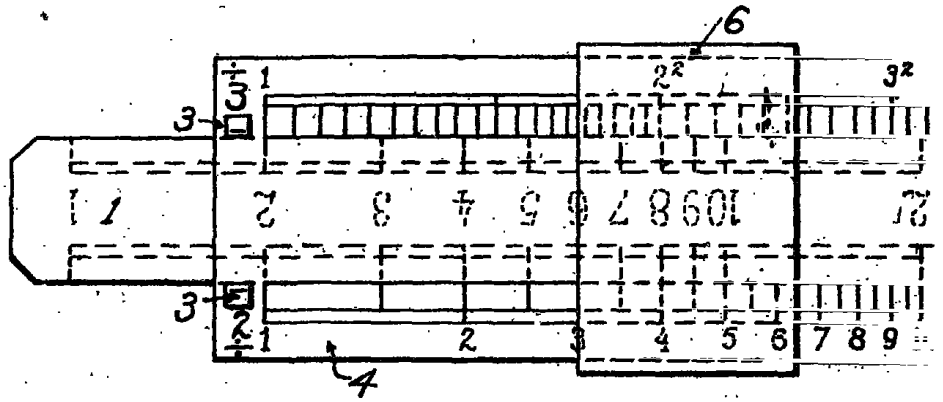
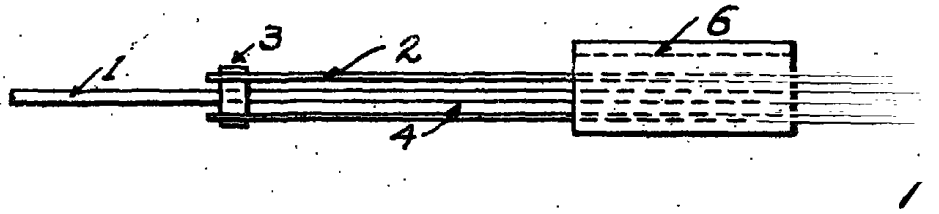


Fig



Fig

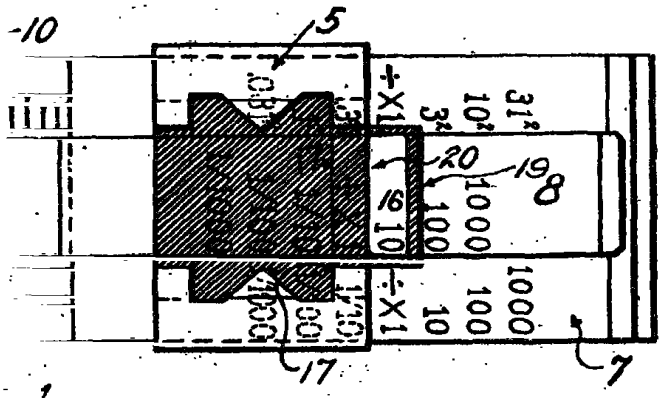


Fig. 1

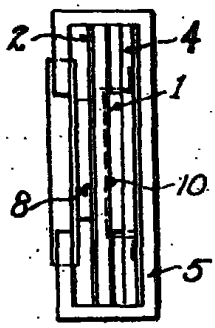


Fig. 4

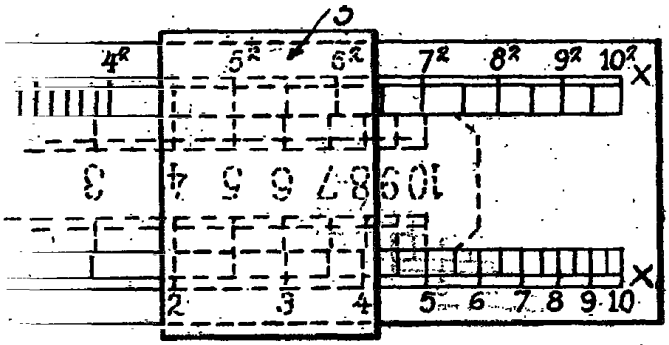


Fig. 2

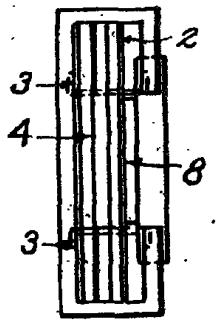


Fig. 5.

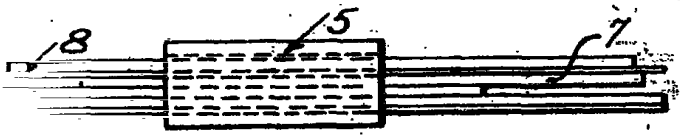


Fig. 3.

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