R. F. KOSTER.

CALCULATING DEVICE.

APPLICATION FILED JAN. 4, 1909.

1,005,560. Patented Oct. 10, 1911.

Fig. 1.

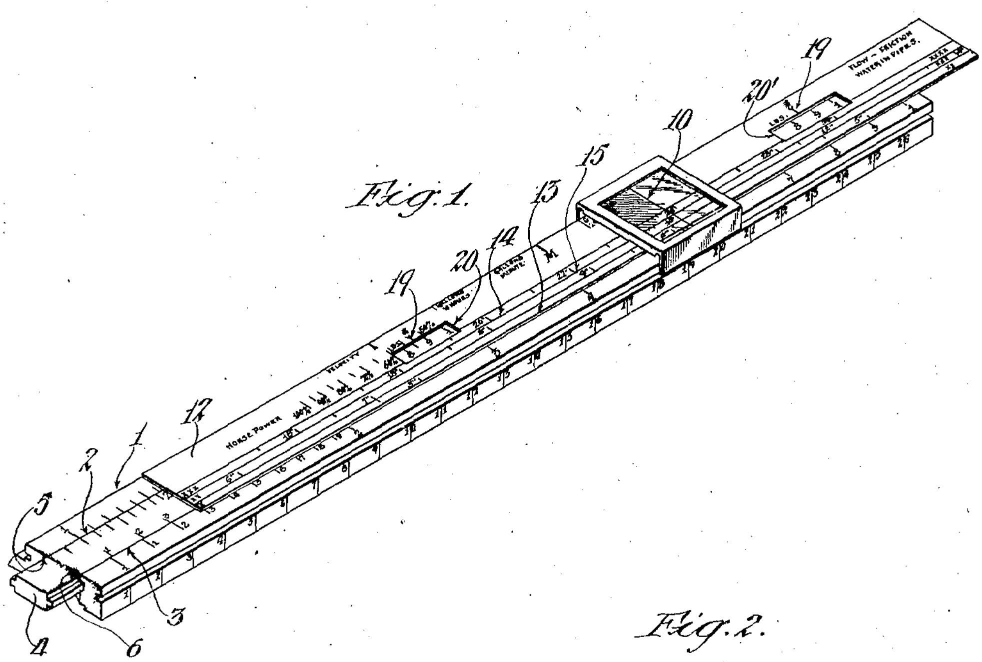


Fig. 2.

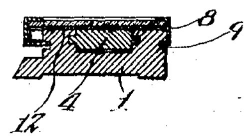


Fig. 3.

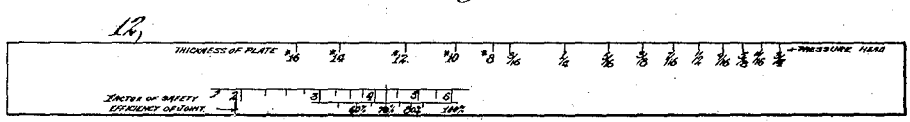
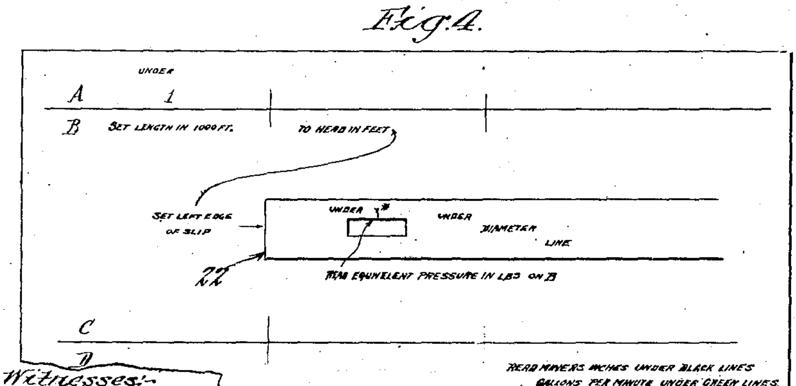


Fig. 4.



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UNITED STATES PATENT OFFICE.

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CALCULATING DEVICE.

1,005,560. Specification of Letters Patent. Patented Oct. 10, 1911.

Application filed January 4, 1909. Serial No. 470,718.

To all whom it may concern:

Be it known that I, ROY F. KOSTER, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Calculating Device, of which the following is a specification.

This invention relates to a class of calculating devices known as slide rules and the object of the invention is to provide a device of this character whereby a given formula may be worked out more rapidly and with less mental calculation than can be done with the usual slide rule.

Another object of the invention is to provide means whereby a large number of different formulæ can be worked out on the same slide rule by the use of separable supplementary devices, each corresponding to a given formula or set of formulæ.

Other objects of the invention will appear hereinafter.

The accompanying drawings illustrate the invention and referring thereto: Figure 1 is a perspective of the slide rule with the supplementary device or attachment slip in place thereon. Fig. 2 is a transverse section. Fig. 3 is an inverted plan of the supplementary strip. Fig. 4 is a diagram or chart of instructions for the use of the device.

1 designates the body of a slide rule which is provided on its upper face with the usual upper and lower scales 2, 3, the said body being grooved between said scales to receive and guide the slide member 4 which is provided with upper and lower scales 5, 6 reading respectively on the scales 2, 3, all of said scales being logarithmic so as to provide for the operations of multiplication and division by setting of the slide in the well known manner.

8 designates the cursor which slides over the body member 1 and is guided thereon by engaging in the usual grooves 9 in said body member, said cursor having the usual hair-line 10 for reading on the scales.

The supplementary device or attachment which constitutes the particular feature of my invention consists of a strip of suitable material, for example, celluloid, which is of such width and thickness that it can be slipped under the cursor and retained thereby in position on the slide rule. Said strip is preferably of such width that when one edge thereof is brought to register with an edge of the slide rule body the other edge of the strip will not cover the scale near the other edge of the slide rule body, so that either the lower or the upper scale on the slide rule body may be read with reference to the marks on the supplementary strip. The said marks on the supplementary strip are arranged in accordance with a predetermined formula, the strip being appropriated to that formula or set of formulæ, so that it is not necessary for the person using the device to rely on a table, or formula, or on his memory in using the device for working out any given formula.

For the purpose of illustration I will explain the use of the device in connection with the formula for flow of water in pipes, the supplementary strip shown in drawings being marked for that formula. Near the lower edge of said strip three scales 13, 14, 15 are marked, each of these scales being logarithmic and corresponding to definite diameters of pipes in inches, for example 3 inches, 4 inches, etc., up to 30 inches. The successive scales 13, 14, 15 reading to successively larger diameters and forming in effect a single scale of three times the length, it being understood that in reading on the second scale the reading is multiplied by ten compared with the reading on the first scale, and reading on the third scale 15 the reading is multiplied by 100, this difference in reading being indicated by the marks x, xx, xxx on the respective scales. Assume now that it is desired to ascertain the number of miners' inches which will flow in the given length, say 1200 feet, of pipe of a given diameter, say 10 inches, under a given head, say 2 feet. The slide 4 is set with its upper scale 5 to the reading 1200 with reference to "1" (the left index) on the upper fixed scale 2. The slip or supplementary strip 12 is then set to a head, namely 2, on the upper slide scale 5, the reading being taken to the lefthand end of the strip. The cursor is then set to the diameter of the pipe in inches, namely 10, whereupon the reading may be had directly by the hair-line of the cursor on the lower fixed scale 3, namely 54 75/100 miners' inches. To perform this same operation by means of a slidable scale would involve several operations of the slide with the necessity of making intermediate readings and retaining in the mind the results of the last reading, whereas the work of the present

case is that of only a separate operation. Moreover, having set the slide 4 to a given length of pipe and the slip to a given head the miners' inches for any size of pipe can be read off by simply setting the cursor. Other data may also be indicated at the same time, for example I have shown the supplementary strip 12 provided with windows or openings 20 adapted to read on one of the scales of the slide 4, say the upper scale 5. When the lefthand end of the strip 4 is set to a head, as indicated on the said upper scale 5, the index mark 19 at said openings 19, 19′ will read the pounds per square inch on the said upper scale. Thus, if an engineer is working in terms of pounds per square inch rather than terms of head, he will use these marks 19 instead of the end of the strip, or, if desired, he can translate from terms of head to terms of pounds per square inch by this expedient. Other marks may also be provided on the scale, for example, along the upper edge may be provided an index denoting "velocity"; and another index *n* denoting miners' inches and a series of other marks representing gallons in different intervals of time, so that when any one of these marks is set to a given figure on the upper fixed scale 2 the corresponding quantity may be read from the other marks on the said upper scale. The back of the slip may also be provided with marks as shown in Fig. 3 corresponding to another formula or set of formulæ.

In practice it is preferred to provide a set or plurality of slips 12, each provided with marks representing a definite formula or set of formulæ, thus each slip may provide for a formula in general use by an engineer in any one branch, there being, for example a slip for hydraulic engineering, a slip for steam engineering, one for electric wiring, etc., all of the slips being interchangeable and reading insertible beneath the cursor or removable therefrom, so that with a set of slips on hand it is but the work of a moment to insert the proper slip and the slip when inserted not only takes the place of the cumbersome table of formulæ, but enables the operation to be performed without mental effort. If desired, a chart or diagram of instructions can be issued with each slip or set of slips, as shown in Fig. 3, the chart indicated at 22 in said figure corresponding to the slip shown in Fig. 3.

What I claim is:

1. A calculating device comprising a body member provided with a logarithmic scale, a slide member mounted to slide on said body member and provided with a logarithmic scale reading with reference to the aforesaid scale, a cursor mounted to slide on said body member, and a strip mounted to slide over said body member and slide member and between said cursor and said body member and having portions thereof adapted to read on said slide member or on the body member, the said strip being of a width less than the cursor so as to expose the aforesaid scale on the body member.

2. A calculating device comprising a body member provided with two logarithmic scales, a slide member mounted to slide on said body member and also provided with two logarithmic scales reading with reference to the aforesaid scales, a cursor mounted to slide on said body member, and a strip mounted to slide between the cursor and the said body member and having portions thereof adapted to read on said slide member or on the body member, the said strip being of such width as to expose one of the scales on the body member.

3. A calculating device comprising a body member provided with two logarithmic scales, a slide member mounted to slide on said body member and also provided with two logarithmic scales reading with reference to the aforesaid scales, a cursor mounted to slide on said body member, and a removable strip mounted to slide between the cursor and the said body member and having portions thereof adapted to read on said slide member or on the body member, the said removable strip being of such width as to expose one of the scales on the body member.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 26th day of December, 1908.

ROY F. KOSTER.

In presence of—
ARTHUR P. KNIGHT,
FRANK L. A. GRAHAM.