W. L. MILLER.

SLIDE RULE.

APPLICATION FILED MAY 5, 1920.

1,431,409. Patented Oct. 10, 1922.

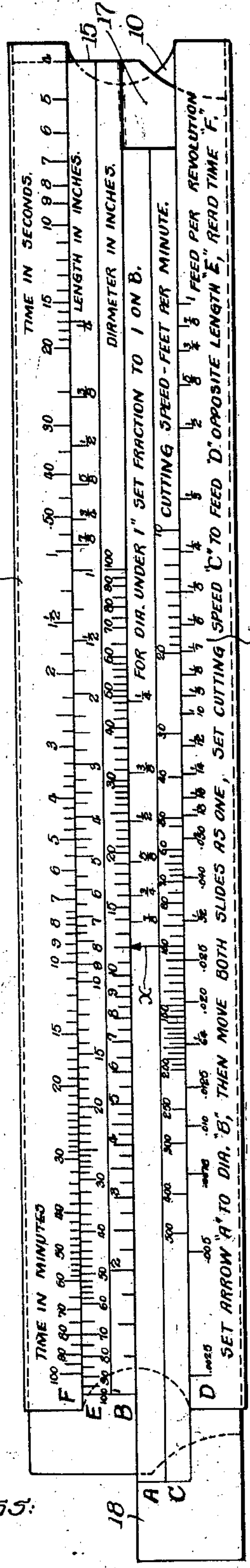

Fig. 1.

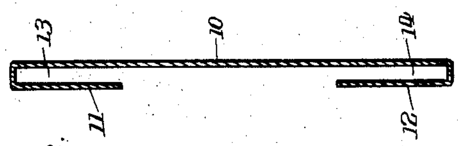

Fig. 2.

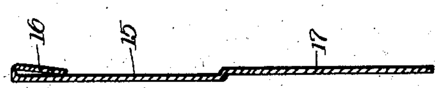

Fig. 3.

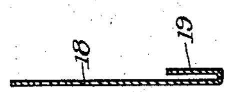

Fig. 4.

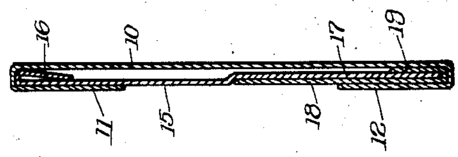

Fig. 5.

Witness:
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UNITED STATES PATENT OFFICE.

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SLIDE RULE.

Application filed May 5, 1920. Serial No. 379,151.

To all whom it may concern:

Be it known that I, William L. Miller, a citizen of the United States, residing at Madison, in the county of Dane and State of Wisconsin, have invented certain new and useful Improvements in Slide Rules, of which the following is a specification.

This invention relates to improvements in slide rules of that general character which are employed for computing purposes; the several elements of the rule bearing scales indicating various data, and the information being obtained by setting the several elements of the rule to certain relative positions corresponding with known factors of the result to be ascertained.

One object of the present invention is to provide a simple, inexpensive, easily manipulated and reliable rule for computing the time required to effect the turning of a piece of work in a lathe, when the diameter and length of the piece are known, the cutting speed per minute, and the feed per spindle revolution.

Another object of the invention, which is independent of the particular data borne by the rule and of the particular matter to be computed, is to provide a slide rule having a body or holder and a plurality of relatively movable slides, wherein the slides having been set to a predetermined position relative to each other, will possess sufficient friction to be moved together in the body or holder without danger of relative displacement or disturbance during such movement.

Other objects and advantages of the invention will be apparent to those skilled in the art from the following detailed description, taken in connection with the accompanying drawing showing one practical embodiment of the invention, and in which—

Fig. 1 is a top plan view of my improved slide rule;

Fig. 2 is a cross-section through the body or holder, as viewed from the right of Fig. 1;

Fig. 3 is a similar cross-section of one of the slides which has a width substantially equal to the full internal width of the body or holder;

Fig. 4 is a similar cross-section of the narrow slide which is frictionally engaged with the wide slide shown in Fig. 3; and,

Fig. 5 is a similar cross-section of the complete assembled structure.

Referring to the drawing, 10 designates the body or holder preferably made of thin sheet metal such as tin or aluminum, the latter being preferred on account of its lightness. The bottom wall of the body is flat, as shown in Figs. 2 and 5, and its upper and lower marginal portions are folded over inwardly, forming upper and lower strips 11 and 12 lying parallel with the back wall 10 and forming, with the latter, grooves or channels 13 and 14, respectively, in which is mounted a slide 15, shown in cross-section in Fig. 3. The upper marginal portion of the slide 15 is folded over as shown at 16, in order that the said slide may have a light friction fit in the upper channel 13 of the body; and the said slide 15 is formed with a laterally offset base or flange 17 which extends down into the lower groove 14 of the body.

The lower of the two slides, designated by 18 and shown in detail in Fig. 4 is a flat strip of metal, with its lower marginal portion folded back as shown at 19 so as to frictionally embrace the lower portion of the offset base or flange portion 17 of the wider slide 15. As will be seen from Fig. 5, the lower folded portion of the slide 18 engages in the lower channel 14 under light friction, while the friction of the slide 18 and the grip of its folded margin 19 on the offset base or flange 17 of the slide 15 are sufficient to insure the movement of both slides together in the body or holder under a push or pull imparted to either slide.

In the adaptation of this rule to compute the time required for turning out work on such a tool as a lathe, the upper folded margin strip 11 of the body member 10 is provided with a scale designated by F indicating the time in minutes or seconds required to finish a piece of work. On the face of the slide 15 are a pair of upper and lower parallel scales marked E and B, the former of which indicates the length in inches, and the latter the diameter in inches of the piece of work to be turned. The calibrations of the upper scale E, designating the length, lie directly opposite the calibrations of the scale F carried by the body, and indicating the time period.

On the face of the narrow slide 18 is a

scale designated by A consisting of an arrow marked x and, to the right thereof, a series of calibrations designating diameters that are fractions of an inch; and beneath and parallel with the scale A is another scale designated by C, the calibrations of which indicate cutting speed in feet per minute. The scale A lies opposite and cooperates with the scale B carried by the slide 15.

On the lower upwardly folded margin 12 of the body is another scale D, the calibrations of which indicate the amount of feed per revolution of the lathe spindle, these being expressed in fractions of an inch.

To illustrate the manner of using the rule, let it be assumed that we have a piece of work twelve inches in diameter and seven and three-fourths inches long that we wish to turn at a cutting speed of forty-five feet per minute, using a feed of one-sixteenth of an inch per revolution. To ascertain the time required, we first set the arrow x on the scale A opposite the twelve inch diameter mark on scale B, as shown in Fig. 1. We then move both scales together, setting the cutting speed of forty-five feet per minute on scale C opposite the feed of one-sixteenth inch per revolution on scale D. Then referring to the seven and three-fourths inch mark on scale E (length in inches), we read opposite this point on scale F the time required which, in this case, is eight and one-half minutes.

In the great majority of cases, the diameter of the work exceeds one inch; but where the diameter of the work is less than one inch, the fraction shown on scale A (instead of the arrow x) is first set opposite the one inch mark on scale B, and the further settings are then proceeded with as above described.

From the foregoing, it will readily be seen that, by the use of this scale, with the diameter and length of a piece of work being known, and also the feed per revolution and cutting speed per minute, by the setting of the parts of the rule by simple sliding movements in the manner above described for the purposes of illustration, the time required to perform the operation can be ascertained at a glance on the uppermost scale F. The structural features, by which the friction between the two slides safely exceeds the friction between the slides and the body, are of importance, since, after the two slides have been set to a predetermined relative position, it is essential that they be moved in unison and without relative disturbance, since the correct registrations of the movable scale E with the stationary scale F are dependent upon the registrations of the movable scale C with the stationary scale D.

Obviously, so far as the structural features of the rule are concerned, the particular data carried by the body and slides are immaterial, and may be changed and adapted for the computing of other desired information.

I claim:—

1. In a computing slide rule, the combination of a body, and a plurality of slides mounted on said body, said body and slides carrying cooperating scales, and said slides engaging each other under greater friction than that existing between the slides and the body, whereby said slides may first be set to a predetermined position with reference to each other, and then the slides as a unit may be moved to predetermined positions with reference to the scales carried by said body through a push or pull on one slide.

2. In a computing slide rule, the combination of a body formed with upper and lower channel guides carrying scales, and a pair of slides carrying scales and respectively engaged with the upper and lower channel guides of said body, said slides engaging each other under greater friction than that existing between the slides and the body, whereby said slides may first be set to a predetermined position with reference to each other, and then the slides as a unit may be moved to predetermined positions with reference to the scales carried by said body through a push or pull on either slide.

3. In a computing slide rule, the combination of a body formed with upper and lower channel guides carrying scales, a slide mounted on said body and carrying a scale, said slide being frictionally engaged with the upper guide and having a base extension lying within the lower guide, and a second slide carrying a scale, said second slide resting throughout its full width upon and covering the base extension of said first slide.

4. In a computing slide rule, the combination of a body formed with upper and lower channel guides carrying scales, a slide mounted on said body and carrying a scale, said slide having a folded upper margin frictionally engaged within the upper guide and having a laterally offset base extension lying within the lower guide, and a second slide carrying a scale, said second slide resting upon and covering the base extension of said first slide and having a folded lower margin embracing the lower edge of said base extension within said lower guide.

WILLIAM L. MILLER.