No. 651,142. Patented June 5, 1900.

W. L. E. KEUFFEL.

SLIDE RULE.

(Application filed Sept. 13, 1899.)

(No Model.)

Fig. 1.

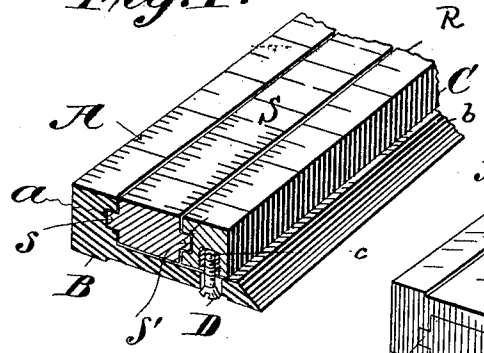


Fig. 2.

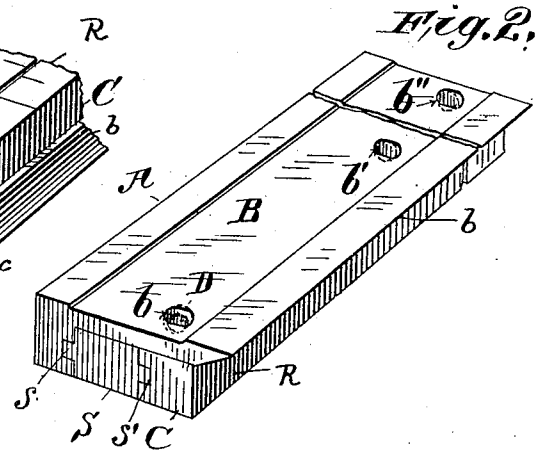


Fig. 3.

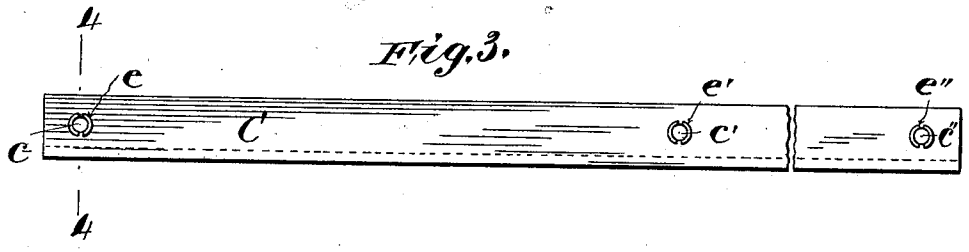


Fig. 4.

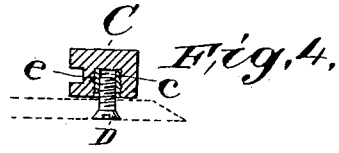
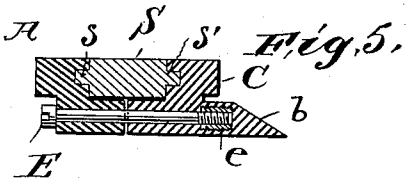


Fig. 5.



Witnesses;
C. V. Benjamin
S. J. Cop

Inventor;
Willie L. E. Keuffel
by William R Baird
atty

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

WILLIE L. E. KEUFFEL, OF HOBOKEN, NEW JERSEY, ASSIGNOR TO THE KEUFFEL & ESSER COMPANY, OF SAME PLACE.

SLIDE-RULE.

SPECIFICATION forming part of Letters Patent No. 651,142, dated June 5, 1900.

Application filed September 13, 1899. Serial No. 730,310. (No model.)

To all whom it may concern:

Be it known that I, WILLIE L. E. KEUFFEL, a citizen of the United States, residing in the city of Hoboken, county of Hudson, State of New Jersey, have invented a new and useful Improvement in Slide-Rules, of which the following is a specification.

My invention relates to slide-rules; and its novelty consists in the construction, arrangement, and adaptation of the parts, as will be more fully hereinafter pointed out.

In the simpler form of the Mannheim slide-rule it consists of a rule suitably graduated on one or both of its longest edges and adapted to be used in connection with a slide similarly graduated according to the principles governing the use of the instrument. Usually the rule has been longitudinally recessed to guide the reciprocation of the slide, which has been provided with a corresponding flange fitting into the recess on the rule. Sometimes this construction has been reversed, the slide being recessed and the rule being flanged, and commonly the rule has been divided into two parts or sections permanently mounted upon and made integral with a base-plate, each part being suitably graduated, the slide, also suitably graduated, being placed between the sections of the rule, accuracy of adjustment being provided for by the flange and recesses on the corresponding parts, as above described. It is of the utmost importance that this slide can be moved easily and smoothly in order to secure the proper coincidence of the graduations of the slide and rule. If the slide fits too tightly within the rule, too much force is required to get it into its relative or proper position, and if it works too freely within the rule the proper position to which it has been set is apt to be shifted. To overcome these disadvantages, attempts have been made heretofore to cut the rule and insert therein compensating springs; but such construction impairs the accuracy of the instrument, as springs cannot be made to respond freely and at the same time hold the parts in proper alinement.

The material of which the slide-rules are usually made is wood, the surfaces to be graduated being sometimes enameled or covered with celluloid to provide a suitable surface upon which to display the graduations. Under ordinary conditions of use such slide-rules are apt to contract and expand with changes in the weather or in the temperature and humidity of the places where they are employed, and in such cases the slide will move either too freely or not freely enough. As the graduations on these slide-rules are logarithmic, any inaccuracy in their relative adjustment affects in increasing ratio the result of the operations performed with them, and consequently it has become important to secure some means of overcoming the defects and disadvantages referred to, as it is commercially impracticable to change the material of which the rules are made. It has been found in practice that as the slide and rule are each much longer than they are wide the effect of the contraction and expansion of either within limits which do not completely destroy their usefulness may practically be overcome if they can be adjusted in a direction at right angles to their longitudinal axes.

The object of my invention is to take advantage of this fact and to secure such adjustment by making the rule on one or both sides of the slide separable or detachable from its base and providing it with means whereby after adjustment it may be rigidly secured in position. As a fine thread in the adjusting-screw is apt to strip in the wood, I insert a bushing tapped to receive the thread in the adjusting-screw, as shown. This, however, is not essential, and the adjusting-screw may be tapped directly into the wood, although I believe the use of the bushings to be preferable.

In the drawings, Figure 1 is a side elevation in section and a perspective of my improved device. Fig. 2 is a bottom plan view of the same. Fig. 3 is a bottom plan view of the separable rule. Fig. 4 is a vertical transverse section of the same on the plane of the line 4 4 in Fig. 3, and Fig. 5 is a vertical section of a modified form of the device, showing the bolt inserted from the side instead of the bottom.

Referring to the drawings, S is the slide, suitably graduated on its edges and provided with the flanges *s* and *s'*, by means of which its reciprocation with respect to the rule is guided as the flanges fit into their corresponding recesses.

R is the rule, provided with a base B, which for convenience is beveled at *b* and upon which are mounted the graduated rules A and C. In the form of instrument illustrated in the drawings the rule A is shown as being made integral with the base B. The rule C is separable from the base. Each of the rules A and C is suitably graduated to correspond with the graduation upon the slide S.

The means by which the adjustment of the separable rule C is secured are as follows: On the under side of this rule it is provided with recesses *c c' c''*, which nearly penetrate the body of the rule and which are internally threaded. The base B is provided with transverse oblong slots *b b' b''*, corresponding in number and position to the recesses *c*, *c'*, and *c''*, and bolts or screws D are adapted to pass through said slots and engage with and screw into the threaded recesses *c*, *c'*, and *c''*, the slots being made wide enough to permit of the passage of the screw, but not wide enough to allow their heads to pass through. The slots are longest in the direction at right angles to the longitudinal axes of the instrument, and consequently the rule C may be secured by means of the screws D at any position with respect to that axis permitted by the length and location of the slots.

In order to prevent undue wear upon the threads in the recesses *c*, *c'*, and *c''*, I have found it convenient to provide them with internally-threaded metallic bushings or eyelets *e*, *e'*, and *e.''* I also countersink the slots *b*, *b'*, and *b''*, so as to receive the heads of the screws D and not to interrupt the plane under surface of the base B.

In using my improved rule if I find that the parts have contracted or expanded, so that the slide works too tight or too free in the rule, I first loosen the screws D, so as to give sufficient freedom of movement to the separable rule C. Then I place the slide in position and adjust the rule C until the slide has the required tension. Then while the rule C is in its new adjusted position I tighten the screws or bolts D, holding the rule firmly in place.

Modifications in detail may be made in my invention without departing from its essential principles. Under Fig. 5 I show one of these modified forms, where the bolts are inserted from the side instead of the bottom, as hereinbefore described.

The instrument may be made with any number of rules, one or all of which may be separable and adjustable, as described, and different means may be provided to secure such adjustment or to insure the proper reciprocation of the parts.

What I claim as new is—

1. A slide-rule consisting of a slide adapted to reciprocate in juxtaposition with one or more rules separably mounted on a suitable base each separable rule being provided with means whereby it may be transversely adjusted and firmly secured to the base after adjustment.

2. In a slide-rule consisting of a base upon which are mounted one or more rules, and a slide adapted to reciprocate alongside of, or between, them, means for transversely adjusting the rules with respect to the slide and firmly securing them in place after adjustment.

3. A slide-rule consisting of an integral base portion and rule, another and separable rule, a slide adapted to reciprocate between said rules, and means for transversely and positively adjusting said separable rule with respect to the slide, substantially as described.

4. A slide-rule provided with a separable rule and means for adjusting the same with respect to the slide and securing it firmly in place after adjustment.

5. In a slide-rule the combination with a base provided with oblong slots, a rule provided with a plurality of threaded recesses corresponding in position to the slots in the base, a similar plurality of bolts or screws adapted to pass through said slots and into said recesses, and a slide adapted to reciprocate adjacent to said rule.

6. In a slide-rule the combination with a base provided with oblong slots, a rule provided with a plurality of threaded recesses corresponding in position to the slots in the base, a similar plurality of bolts or screws adapted to pass through said slots and into said recesses, and a slide adapted to reciprocate adjacent to said rule, and provided with means for guiding such reciprocation.

Witness my hand this 11th day of September, 1899, in the presence of two subscribing witnesses.

WILLIE L. E. KEUFFEL.

Witnesses:
HERMAN H. STUTZ,
OSCAR WIENER.