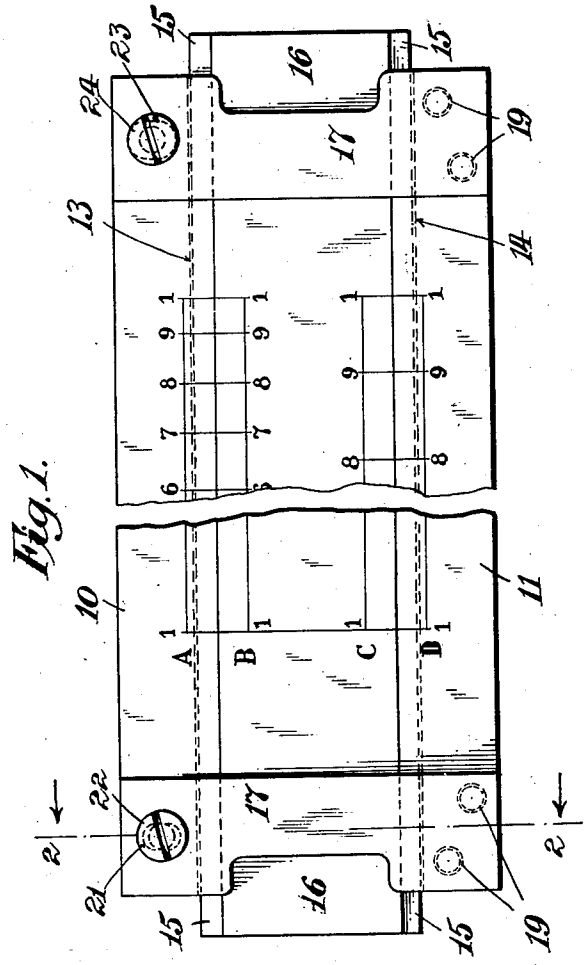
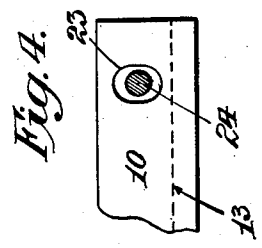
W. L. E. KEUFFEL.

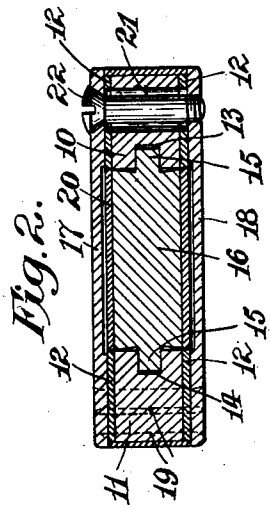
SLIDE RULE.

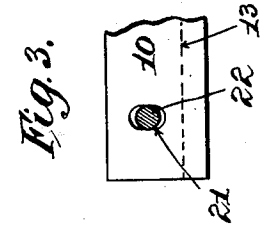
APPLICATION FILED DEC. 30, 1907.

907,373. Patented Dec. 22, 1908.









Attest:
Sara S. O'Rourke
Alan C. McDonnell.

Willie L. E. Keuffel, Inventor:
by William R. Baird
his Atty

UNITED STATES PATENT OFFICE.

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

SLIDE-RULE.

No. 907,373. Specification of Letters Patent. Patented Dec. 22, 1908.

Application filed December 30, 1907. Serial No. 408,657

To all whom it may concern:

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

My invention relates to slide rules and its novelty consists in the means employed to secure a proper adjustment or arrangement of the parts after changes due to variations in temperature and in the amount of moisture in the air and similar causes.

My invention relates particularly to that class of slide rules in which the slide is adapted to reciprocate between two rules. These rules are sometimes as much as twenty inches in length. They are usually made of wood with a surface of paper or celluloid on which the graduations are displayed and are therefore particularly liable to grow or swell, if the weather is damp and hot, and to correspondingly shrink if the weather is dry and cold.

It is the purpose of my invention to provide means whereby a proper adjustment of the parts can be made after such distortion.

In the drawings, Figure 1 is a plan of a slide rule embodying my invention, the middle portion being shown broken away so as to illustrate it within the limits of the sheet. Fig. 2 is a transverse section of the plane of the line 2—2 in Fig. 1. Figs. 3 and 4 are details of the extremities of one of the rules.

In the drawings, 10 and 11 are rules made of wood, or similar material, each provided with a surface 12 logarithmically graduated according to the principles governing their method of use and which are well known to those skilled in the art. They are longitudinally recessed on their inner edges at 13 and 14 respectively, so as to engage with the flanges 15 of the slide 16, and they are held apart by two transverse members 17 and 18, preferably made of brass, or similar material, and firmly secured to one of the rules by rivets 19, shown in dotted outline in both figures. They are adjustably secured to the other slide in the manner which I am about to describe.

The slide 16 has a surface 20 of paper or celluloid, which is also suitably and logarithmically graduated to be used in harmony with the rules. Its longitudinal flanges 15 are adapted to engage with the recesses 13 and 14 in the rules.

It will be understood that in using the device the slide is moved so that some one of its graduations coincides with some one graduation on one of the rules. It is then moved again so that some other graduations similarly coincide and the value of the rule depends upon the accuracy of coincidence of these second graduations. Now, in a device of this kind, the parts may shrink causing them to work too loosely, or swell, causing them to work too tightly. It is the purpose of my invention to provide for a readjustment of the parts after either condition has become established. To that end I provide means for rearranging the parts. The transverse members 17 and 18 being rigidly secured to the rule 11, no adjustment between them is likely to be needed. The adjustment which is necessary is between the slide 16 and the rule 10. This rule 10 is provided at one end and at a place where it is in contact with the transverse members 17 and 18, with a slot 21 having a width equal to that of a screw or bolt 22 adapted to pass through it and to engage with both transverse members and a length greater than its width, its length being in a direction at right angles to the longitudinal axis of the device. This rule is provided at its other end, and at a place where it is in contact with the other pair of transverse members 17 and 18, with a slot 23 which is slightly larger in all directions than the diameter of the screw or bolt 24 adapted to pass through it and which engages such transverse members.

The mode of using the invention is as follows: Suppose that the parts have shrunk or swelled, the screws 22 and 24 are slightly loosened sufficiently to permit the slide 16 to move freely between the rules 10 and 11 without binding. The slide 16 is then stopped at a position where its major graduations coincide with those of the rule 11, as they ought to do. The screws 22 and 24 are then loosened more freely than before and the rule 10 is moved until its major graduations and those of the slide coincide. The screws are then tightened, first, the one in the slot 21, and second, the one in the slot 23.

It might be thought that both slots 21 and 23 should be transverse slots of the same diameter as the screws passing through them. This could be so in short rules, but in long rules where there will be a tendency of rule 10 to warp more than rule 11, inasmuch as

the latter is rigidly braced by members 17 and 18, it is advisable to provide a clearance space around one of the bolts longitudinally of the rule as well as transversely thereof. Thus, in practice, should the rule 10 warp, its end provided with slot 21, and movable only in a transverse direction upon screw 22, will be first tightly secured in proper relation to slide 16 and rule 11, after which the opposite end, provided with slot 23 may be forced to corresponding relation, and tightly secured by screw 24. From this it will be seen that the movement of the first named end of rule 10, is a strictly transverse one as the rule is loose but when this end is secured, the movement of the opposite end is not only transverse, but is in a slight arc.

What I claim as new is:—

1. A device of the kind described, comprising a pair of rules, a slide mounted to reciprocate between the same, holding elements transversely of the device, and means for securing the rules and holding elements together, adapted to permit relative adjustment between the rules and slide in a direction approximately transverse to and either toward or from the longitudinal axis of the device.

2. A device of the kind described, comprising a frame, a pair of rules, a slide mounted to reciprocate between the rules, means for securing one of the rules immovably to the frame, and means for permitting the other rule to be adjusted in the frame toward and from the slide to compensate for swelling and shrinkage and for securing it in adjusted position.

3. A slide rule, comprising a pair of rules, a slide mounted to reciprocate between the same, holding means engaging the rules and slide and provided opposite one of the rules with apertures in its top and bottom walls and said rule having an aperture registering with those in the holding means, and securing means extending through said apertures and of less diameter than the aperture in the rule in a direction transverse to the longitudinal axis of the latter.

4. A slide rule, comprising a pair of rules, a slide mounted to reciprocate between the same, holding means engaging the rules and slide and fixedly secured to one of the rules and provided opposite the other rule with apertures in its top and bottom walls, said other rule having a through-opening which registers with said apertures, and securing means comprising a stem which is received by the apertures in the holding means and rule and is of less diameter than the latter in the direction of the longitudinal axis of said rule.

5. A slide rule, comprising a pair of rules, a slide mounted to reciprocate between the same, holding means arranged at opposite ends of the rules and fixedly secured to one of the rules and provided with apertures opposite the other rules, said other rule having apertures which register with those in the holding means, and securing devices extending through the registered apertures in said rule and holding means, one of said fastening devices being of less diameter than one of the apertures which receives it, in a direction transverse only of the rule and the other of said devices being of less diameter in all directions than an aperture which receives it.

6. A slide rule, comprising a slide adapted to reciprocate between two rules held in position by a frame, one of said rules being provided with means whereby it may be adjusted in the frame and secured in place after adjustment, consisting of a slot in the rule and a screw or bolt adapted to pass therethrough and engage the frame, the slot being wider than the screw or bolt in a direction at right angles to the longitudinal axis of the slide rule.

7. A slide rule, comprising a slide adapted to reciprocate between two rules held in position by a frame secured to both rules but not to the slide, one of said rules being provided with means whereby it may be adjusted in the frame and secured in place after adjustment, consisting of a slot in the rule and a screw or bolt adapted to pass therethrough and engage the frame, the slot being wider than the screw or bolt in a direction at right angles to the longitudinal axis of the slide rule.

8. A slide rule, comprising two rules held apart by transverse members to which they are both secured and adapted to permit a slide to reciprocate between them and such members, and means whereby one of the rules may be adjusted with respect to such transverse members, consisting of a slot in the rule, and a screw or bolt adapted to pass therethrough and engage the adjacent transverse members.

9. A slide rule, comprising two rules held apart by transverse members to which they are both secured and adapted to permit a slide to reciprocate between them and such members, and means whereby one of the rules may be adjusted with respect to such transverse members, consisting of a slot in the rule, and a screw or bolt adapted to pass therethrough and engage the adjacent transverse members, the slot being longitudinally as wide as the screw or bolt and transversely wider.

10. A slide rule comprising a slide adapted to reciprocate between two rules, one of said rules being provided with means at or near each end whereby it may be adjusted with respect to the slide to compensate for longitudinal and transverse variation in the area of the rule and held in position after such adjustment.

11. A slide rule, comprising a slide adapted to reciprocate between two rules held in po-

sition by a frame, one of said rules being provided with means whereby it may be adjusted transversely and longitudinally in the frame and secured at or near each of its ends in place after adjustment.

12. A slide rule, comprising a slide adapted to reciprocate between two rules held in position by a frame secured to both rules but not to the slide, one of said rules being provided with means whereby it may be adjusted transversely and longitudinally in the frame and secured at or near each of its ends in place after adjustment.

13. A slide rule, comprising two rules, a reciprocatory slide, and transverse members to which the rules are secured, the securing means for one of said rules adapted to permit the rule to be adjusted relatively to the transverse members longitudinally of the device and laterally outward and inward from its initial position and to secure it fixedly in its adjusted position.

14. A slide rule, comprising a slide adapted to reciprocate between two rules held in position by a frame, one of said rules being provided with means whereby it may be adjusted transversely and longitudinally in the frame and secured in place after adjustment, consisting of two slots in the rule adapted to coöperate with proper screws or bolts, one slot being longitudinally as wide as its screw or bolt and transversely wider, and the other slot being larger than its screw or bolt in all directions.

15. A slide rule, comprising a slide adapted to reciprocate between two rules held in position by a frame secured to both rules but not to the slide, one of said rules being provided with means whereby it may be adjusted transversely and longitudinally in the frame and secured in place after adjustment, consisting of two slots in the rule each adapted to coöperate with proper screws or bolts, one slot being longitudinally as wide as its screw or bolt and transversely wider and the other slot being larger than its screw or bolt in all directions.

16. A slide rule, comprising two rules held apart by transverse members to which they are both secured and adapted to permit a slide to reciprocate between them and such members, and means whereby one of the rules may be adjusted transversely and longitudinally with respect to such transverse members, consisting of two slots in the rule, each adapted to coöperate with proper screws or bolts, one slot being longitudinally as wide as its screw or bolt and transversely wider and the other slot being larger than its screw or bolt in all directions.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIE L. E. KEUFFEL.

Witnesses:
B. B. VAN SICKLE,
E. MOU.