

G. W. RICHARDSON.

SLIDE RULE.

APPLICATION FILED APR. 3, 1911.

1,021,484.

Patented Mar. 26, 1912.

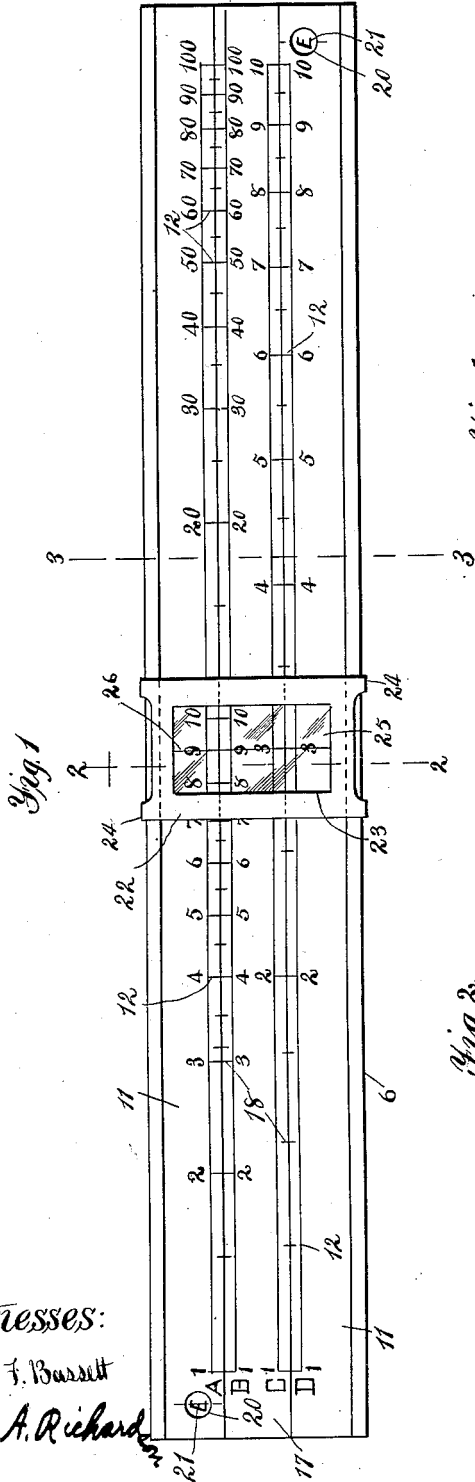


Fig. 4.

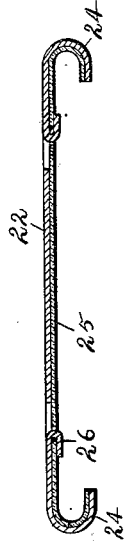


Fig. 5.

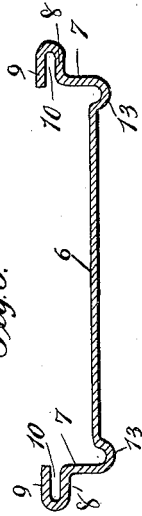


Fig. 2.

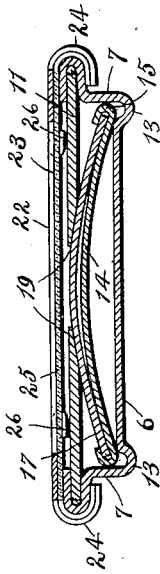
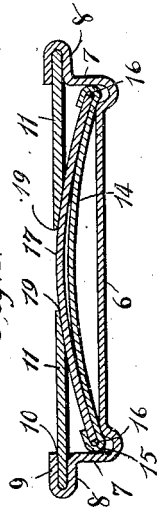


Fig. 3.



Witnesses:

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# UNITED STATES PATENT OFFICE.

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## SLIDE-RULE.

1,021,484.

Specification of Letters Patent. Patented Mar. 26, 1912.

Application filed April 3, 1911. Serial No. 618,634.

*To all whom it may concern:*

Be it known that I, GEORGE W. RICHARDSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Slide-Rules, of which the following is a specification.

My invention relates to slide rules, and refers particularly to instruments of that type in which a rectangular slide is adapted to be moved relatively to fixed scales mounted on a supporting member termed the stock.

The primary objects of the improvements which constitute the subject matter of this application for patent, are; to provide a simple, durable and efficient construction for a slide rule.

An important feature of this invention is observable in the material employed, the main portions of the instrument being constructed of metal, which is not affected by relative degrees of moisture, thus avoiding the serious objection to the use of wood, which has been the material universally employed in devices of this class, and as this substance is subject to constant shrinking and swelling from atmospheric changes, there is a frequent interference with the free movement of the slide causing inconvenience and annoyance which impairs the usefulness of the instrument.

By making the frame or supporting members of sheet metal which can be readily formed in presses, the cost of manufacture is greatly reduced, and by employing aluminum it is possible to produce a light construction, convenient to handle and much thinner, so that it can be more conveniently carried in the pocket or instrument case than the wooden article.

A further object of my invention is to reduce friction between the bearing surfaces so that the slide will move in its guides with a free and an easy motion, without sticking and binding, and yet permit of sufficient pressure between the members to cause them to be retained in adjusted position under ordinary circumstances.

Especial attention has been given to the construction of an efficient runner, provision being made in this member, also, for reducing friction, producing a smooth gliding movement that permits a quick setting of the device to the required position.

It is also an object of this invention to facilitate the quick adjustment and accurate

reading of the graduations thus enabling the operator to speedily arrive at the required results in working a large variety of problems, without the necessity of having a profound knowledge of the mathematical principles involved therein, the means employed for this purpose being the formation of one or more apertures or "keyholes" in the fixed scales, and supplying the slide which reciprocates beneath the said scales, with arbitrary signs or characters, so arranged that they may be brought successively into view through said keyholes, such an arrangement being clearly shown and described, and the manner of using the rule so equipped thoroughly explained in my former application for slide rules, for which Letters Patent of the United States, No. 983,876, were issued to me January 31, 1911.

I accomplish the desired results above enumerated, and others of importance, by employing the apparatus illustrated in the accompanying drawing, which forms a part of this application, the details of construction being disclosed in the following views:—

Figure 1 is a plan view of a complete slide rule embodying my improvements; Figs. 2 and 3 are sectional views, enlarged, taken on the lines 2—2 and 3—3 respectively, of Fig. 1; Fig. 4 is a longitudinal section of the runner, the cutting plane passing through one of the frame sides, and Fig. 5 is an enlarged view of the stock seen in transverse section.

Referring to the details of the drawing, the numeral 6 indicates the main supporting member, or stock, which is made of sheet metal by the process of stamping or by any other suitable method. I prefer to employ aluminum for this and other parts of the instrument, since this metal presents useful properties not found in other materials, making it particularly advantageous, its light weight and non-corrosive properties especially rendering it preferable to other metals. For these and other reasons it is much to be preferred to wood which is usually employed in devices of this class. The said stock is formed from a rectangular piece of sheet aluminum of suitable gage, the lateral portions of which are bent toward the upper side, forming flanges 7, having their margins bent outward, as indicated at 8, and then bent inward, as shown at 9, forming grooves 10 in which are inserted

edges of fixed scales 11. These scales consist of strips of celluloid upon which are imprinted the usual graduations 12, necessary for the mathematical computations for which the rule is adapted. The said scales are permanently secured by clamping the margins of the stock firmly thereon by compression. I prefer to provide the main portion of the stock with longitudinal corrugations 13, which are preferably located at the junction of the flanges with the body of the plate, as shown in the drawing, although they may be formed at any suitable place. The purpose of these corrugations is primarily to stiffen the plate or strip, rendering it more rigid and capable of resisting any tendency to bend or buckle from accident or rough usage. In addition to the reinforcing feature these ribs or corrugations serve to protect the printed matter which is placed upon the back of the stock from becoming abraded or effaced from constant handling or by contact with the desk or table upon which it is laid. In the form shown the corrugations are so located as to form grooves or seats for the margins of a convex slide member 14. I prefer to make this part of aluminum, having recurved margins, as indicated at 15, forming longitudinal grooves 16, adapted to receive the edges of a scale bearing member 17, formed of a strip of celluloid, superposed upon the convex upper surface of the slide 15, and having imprinted thereon suitable graduations 18. The sides of the groove 16 are compressed upon the inserted edges of the member 17, thus holding the two members forming the slide proper firmly together. The upper surface of the slide is in contact with the under surfaces of the overhanging fixed scales 11, and the margins of the latter are beveled, or chamfered, upon the under side where they lie in contact with the slide, as shown at 19, this thinning of the scale edges bringing the face of the slide more clearly on a level with the graduated surfaces of the scales and thus facilitating an accurate comparison of the corresponding graduations by lessening the parallax. The rounded margins formed by the turned edges of the slide are adapted to engage the grooves or corrugations 13 so as to have a free movement therein, the contact with the flanges 7 being of sufficient extent to form an efficient guide for the slide. By incasing the celluloid plate 17 in metal in this way, it is held firmly supported so as to prevent bending or kinking, this manner of clamping also preventing any shrinkage from atmospheric changes or the lapse of time. At suitable points in each of the strips forming the fixed scales 11, I form apertures or key-holes 20, and upon that portion of the upper surface of the slide lying beneath the scales are linearly arranged series of charac-

ters or keys 21, so positioned as to successively register with said apertures to permit the keys to be seen therethrough.

In order to facilitate the reading of the scales, I employ a runner of special construction, which is particularly adapted for use with the metallic stock hereinbefore described. This runner comprises a rectangular frame or plate 22, formed of a single piece of sheet metal of a desirable degree of resiliency and having a central aperture 23 cut therethrough. The ends of the frame thus formed are provided with projecting lips 24, which are bent in the manner shown to embrace the opposite margins of the stock, and being made from spring metal these lips will grip the edges 8 with a uniform pressure at whatever point the runner may be placed along the stock. Applied to the under surface of the runner frame and coextensive therewith is a thin plate of transparent material 25, preferably made of celluloid which forms a resilient lining for the frame and prevents any contact between the metal of the runner and that of the stock. The said celluloid plate has lips similar to the lips 24 on the frame and adapted to form linings therefor. This manner of constructing the runner with the anti-friction bearing plate 25, insures a smooth and even movement when the runner is slid along the stock, and prevents the rough and uneven motion which would result if the similar metals were allowed to be in contact. This form of runner also permits me to dispense with a spring, which has heretofore been required in connection with runners as usually arranged. The frame 22 and its transparent lining 25 are held together by ears 26 which are struck from the metal of the frame and bent downward through suitable holes formed by the celluloid plate 25, and then clamped by compression of the latter, as shown in the drawing. The lining plate 25, being transparent, the figures and graduations upon the scales and slide beneath may be readily observed therethrough and to enable the readings to be made quickly and accurately the usual index or hair line 26 is marked longitudinally upon the said plate.

Having thus described my invention, what I claim as new, is:—

1. In a slide rule, the combination with a stock having parallel upturned marginal flanges, and scales fixed on said flanges, of a resilient curved slide arranged between said scales and the stock and having its margins frictionally engaging said flanges.

2. In a slide rule, the combination of a stock, parallel scale bearing strips mounted thereon, said strips having their inner edges reduced in thickness, and a convexly curved slide arranged beneath said strips and in contact with said reduced edges of the strip.

3. In a slide rule, the combination of a plate, parallel scale bearing strips mounted upon said plate, said strips being secured to the plate along one margin and having their free edges chamfered, and a slidable scale bearing member arranged between said strips and the plate.

4. In a slide rule, the combination of a plate forming a stock, parallel scale bearing strips fixed on said plate and spaced therefrom, said strips having their adjacent margins chamfered and a longitudinally curved slide arranged between said strips, said slide comprising a plurality of superposed plates.

5. In a slide rule, the combination with a stock, and parallel scale bearing members fixed thereon, of a resilient curved slide arranged below said members, and a resilient laminated runner mounted on said stock.

6. In a slide rule, the combination of a stock having raised margins, parallel scale bearing members fixed thereon, a slide arranged below said members, turned margins on said slide, and a resilient scale bearing member having its edges engaging said turned margins.

7. In a slide rule, the combination with a stock, of a slide comprising a plate having a convex upper surface, turned margins on said plate forming grooves, and a resilient scale bearing member having its edges engaging said groove.

8. In a slide rule, the combination with a stock, of a slide comprising a plate having a convex upper surface, turned margins on said plate forming grooves, and a resilient scale bearing member superposed upon said plate and having its edges engaging said grooves, said scale bearing members being in contact with the plate at the margins only.

9. In a slide rule, the combination with a stock comprising a plate, marginal flanges on said plate, parallel scale bearing strips engaging said flanges and having their approximated edges chamfered, a resilient scale arranged to make contact with said chamfered edges, a slide mounted between said flanges, and means for clamping said scale, said clamping means consisting of turned margins on said slide adapted to clamp the edges of the scale.

10. In a slide rule, the combination with a stock having raised margins, and scales attached to the stock along one edge and having the other edge chamfered, of a curved slide arranged beneath said scales and in contact with said chamfered edges,

and a runner having portions bent to clasp the margins of said stock.

11. In a slide rule, including parallel scales and a runner, a stock consisting of a rectangular plate of aluminum having two of its margins bent at right angles to form flanges, grooves formed by turning the margins of the said flanges and adapted to engage the margins of said scales, and longitudinal corrugations adapted to form seats to receive the edges of said slide.

12. A laminated runner for a slide rule, comprising an apertured aluminum plate having projections adapted to clasp the margins of the stock, a transparent celluloid plate secured to the under surface of said apertured plate and co-extensive therewith, and means for securing said plates in fixed relation to each other.

13. In a slide rule, the combination with a stock and scale bearing members attached thereto, of a slide arranged beneath said members, said slide comprising two superposed curved plates, one of said plates being made of aluminum and having grooves in its margins, and the other plate formed of celluloid and having its edges engaging said grooves, said plates being spaced apart intermediate their margins.

14. In a slide rule, the combination with a stock having raised margins forming a channel, of a resilient slide consisting of a supporting strip of sheet material curved longitudinally and having its margins frictionally engaging the sides of said channel, and a superposed resilient scale bearing plate secured to said strip and spaced therefrom intermediate its lateral margins.

15. In a slide rule, the combination with a stock having raised margins forming a channel, of parallel scale bearing members secured to the margins of the stock and having their free edges chamfered, a resilient curved plate having its margins frictionally engaging the sides of said channel and movable therein, a resilient scale bearing plate superposed upon the said curved plate and spaced therefrom intermediate its margins, said scale bearing plate being in frictional contact with the chamfered edges of the first mentioned scale.

In testimony whereof I have fixed my signature in the presence of two witnesses.

GEORGE W. RICHARDSON.

Witnesses:

CLARA A. RICHARDSON,  
HENRY MISKELLY.