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COMPLETE SPECIFICATION.

Improvements in Slide Rules.

I, THADDEUS NORRIS, a citizen of the United States of America, residing at No. 1751 N Street, North-west, in the City of Washington, County of Washington, District of Columbia, United States of America, Inventor, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention contemplates certain new and useful improvements in and relating to slide rules or instruments of calculation for use in solving mathematical problems, and relates particularly to those composed of two or more concentrically arranged disks pivoted together, but certain features of the improvements are, however, applicable to rules having longitudinally movable members.

The objects of the invention are, first, to provide a simple and inexpensive marker or runner by which the scales or marks of graduation can be quickly and easily read; and, second, to enable the upper one of two removable concentric disks to be readily and easily grasped and turned independently of the lower disk.

The first object I accomplish by mounting on the marker or runner a plano-convex lens which magnifies transversely, that is, the spaces between the division lines on the scale are magnified as are also the widths of such division lines, while the lengths of the latter are not perceptibly elongated. The second object is effected by providing the lower disk with one or more elongated openings to permit the upper or smaller disk to be grasped between the thumb and finger in order to turn it independently of the other disk, thus permitting both disks to be manipulated by the fingers of one hand of the operator.

The invention will be hereinafter fully set forth and particularly pointed out in the claims.

In the accompanying drawing:—

Figure 1 is a plan view showing a portion of a circular slide-rule with my improved runner.

Figure 2 is a side view, parts being broken away.

Figure 3 is a transverse sectional view on the line 3—3 Figure 1.

Figure 4 is a similar view of a slight modification.

Figure 5 is a plan view of a second modification, parts being broken away.

Figure 6 is a transverse sectional view on the line 6—6 Figure 5.

Referring to the drawing, A and A<sup>1</sup> designate two disks pivotally connected together at their centres by a headed rivet *a*. Upon these disks are circularly arranged series of scales or divisional lines which may be of any preferred mathematical method and hence further reference hereto is not necessary. The under disk is of greater diameter than the upper disk, and it is provided with one or more, preferably three, openings *a*<sup>1</sup>, which are elongated or curved concentrically with the upper disk. These openings allow the upper disk to be grasped between the thumb and finger, one touching the upper and the other the under sides of said upper disk, whereby the latter can be turned to bring it in position for performing different calculations without moving the lower disk, both disks being manipulated by the fingers of the hand of the operator in which the two disks are held.

B is the marker or runner, which comprises an approximately rectangular frame *b* pivoted at its inner end by rivet *a* and having at its outer end two inwardly bent fingers *b*<sup>1</sup> which overlap the periphery of disk A and serve as guides for the

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marker or runner. A lip or tongue  $b^2$  projects from the outer end of this frame. The runner can be readily turned by grasping this lip or tongue. A longitudinal slot or opening  $b^3$  is formed in the frame. From the parallel side-bars of this frame project opposite lips or flanges  $b^4$ .

C is a lens of semi or partially cylindrical form in cross-section, that is, it is convex on its upper side and flat on its underside. This lens is fitted on frame  $b$  with its flat side down. It extends entirely over the slot in said frame and is held in place by the lips or flanges  $b^4$ . At its inner end this lens fits against two short lugs  $d$ . Extending longitudinally beneath the lens, from one end of the slot  $b^3$  to the other, is a straight line  $d^1$ , which serves as a guide and may consist of a wire or hair secured at its ends to perforated portions of the frame, or in lieu thereof, a groove or scratch  $d^2$  may be formed in the under or flat side of the lens, as shown in Figure 4. 5- 10-

In Figure 5 I have shown the marker or runner applied to an ordinary straight slide-rule D. The frame  $B^1$  is made oblong and has a central opening  $d^3$  and two end-slots  $d^4$ . Over these slots are two lenses E and  $E^1$ . The division lines at the extreme ends of the rule are to be read preferably through the outer lens E or  $E^1$ , while those in the centre can be read through either lens. The sides of the runner may be bent or curved to overhang the grooved edges of the rule which serve as guides therefor. This form of marker or runner is for the purpose of securing a long bearing in order that the lens and the guide-line thereunder may remain perfectly perpendicular or at right angles to the rule when reading from scales at its extreme ends. 15- 20-

The advantages of my invention are apparent to those skilled in the art and it will be specially observed that by providing a marker or runner with a semi or partially cylindrical lens the division lines and intermediate spaces are magnified transversely and but little, if any, longitudinally. Hence, by attaching this lens directly to the marker the reading of a scale can be quickly and easily accomplished and by making the lower disk with curved openings the upper disk can be easily turned without moving the former. 25- 30-

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is :—

1. A marker or runner for slide rules, having a slot or opening, a translucent covering for said slot or opening, and a guide line extending longitudinally across said slot or opening beneath said translucent covering, substantially as set forth. 35-

2. A marker or runner for slide rules having a longitudinal opening therein and a lens carried by said marker or runner and located over said opening, said lens being of semi-cylindrical form in cross-section and flat on its underside, substantially as set forth. 40-

3. A marker or runner for slide rules having a slot or opening therein, a lens corresponding to but slightly larger than said slot or opening secured over the latter, said lens being of semi-cylindrical form and having a flat side, and a guide-line extending longitudinally beneath said lens, substantially as set forth. 45-

4. A marker or runner for slide rules having a slot or opening therein, a lens corresponding to but slightly larger than said slot or opening secured over the latter, said lens being of semi-cylindrical form and having a flat side provided with a central longitudinal groove forming a guide-line, substantially as set forth.

5. The combination with two graduated disks pivotally connected together at their centres, of a marker or runner pivoted at its inner end to said disks and at its outer end overlapping the periphery of one of said disks, said marker or runner having a longitudinal opening therein, and a semi-cylindrical lens located over said opening, said lens being flat on its underside, substantially as set forth. 50-

6. A slide rule composed of two concentrically mounted disks pivotally connected at their centres, one of said disks being of greater diameter than the other and 55-

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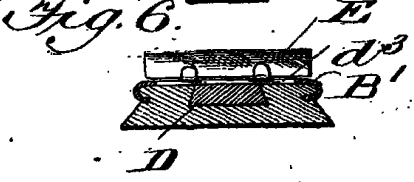
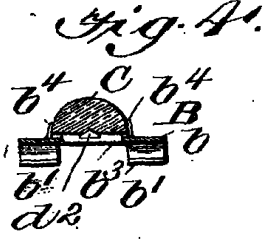
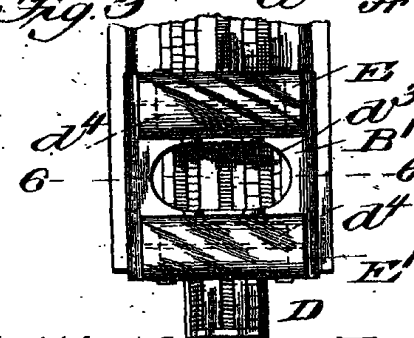
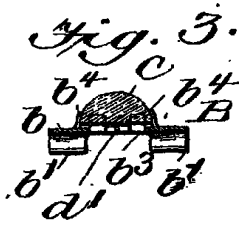
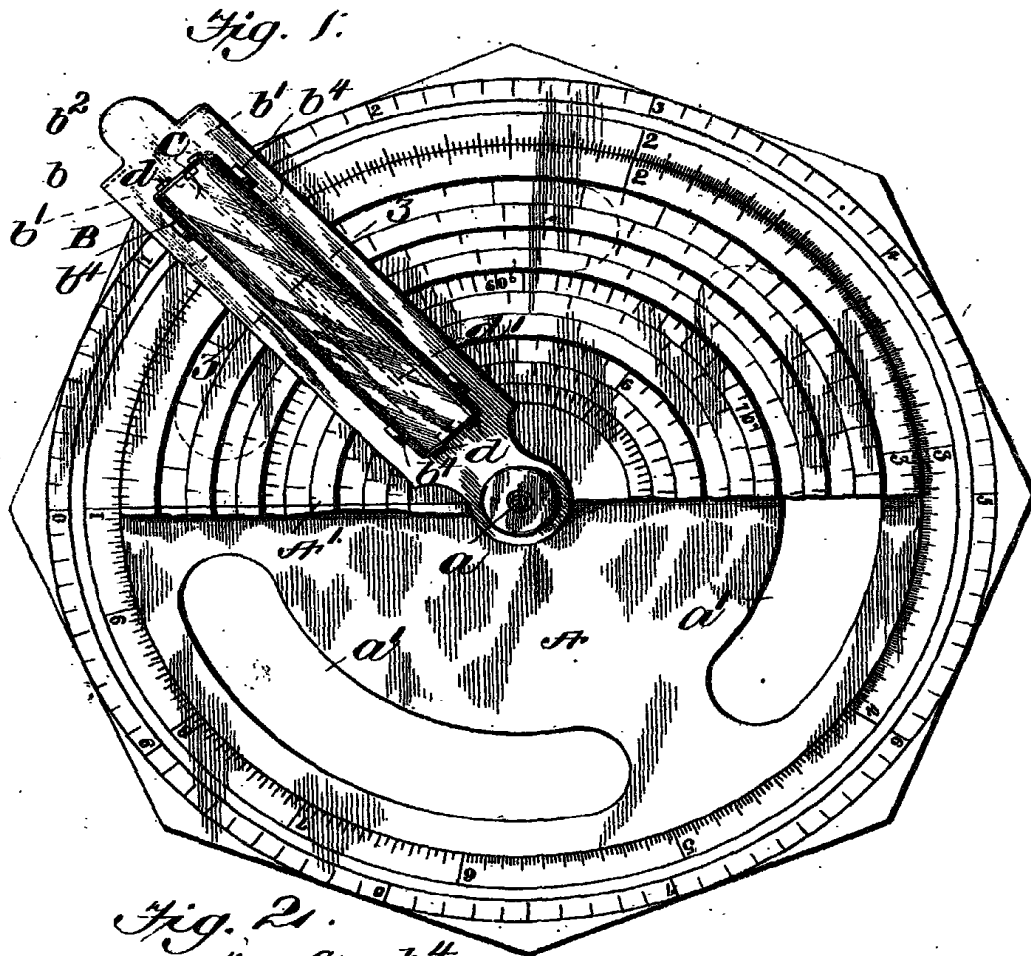
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provided with a series of circularly arranged disconnected finger slots, substantially as and for the purpose set forth.

7. The herein-described improved slide-rule, consisting of the two disks pivotally connected together at their centres, one of said disks being of greater diameter than the other and provided with a series of circularly arranged disconnected finger slots, the marker or runner pivoted at its inner end to the centre of said disks and having its outer end provided with fingers for overlapping the periphery of said larger disk, said marker or runner having a longitudinal opening therein, a semi-cylindrical lens fitted directly over said longitudinal opening, and a guide-line extending longitudinally over said opening, substantially as set forth.

Dated this 28th day of May 1895.

JENSEN & SON,  
77 Chancery Lane, London, W.C., Patent Agents.



[This Drawing is a reproduction of the Original on a reduced scale.]