(No Model.)

3 Sheets—Sheet 1.

W. HART.

SLIDING CALCULATING SCALE.

No. 426,444. Patented Apr. 29, 1890.

Fig. 1

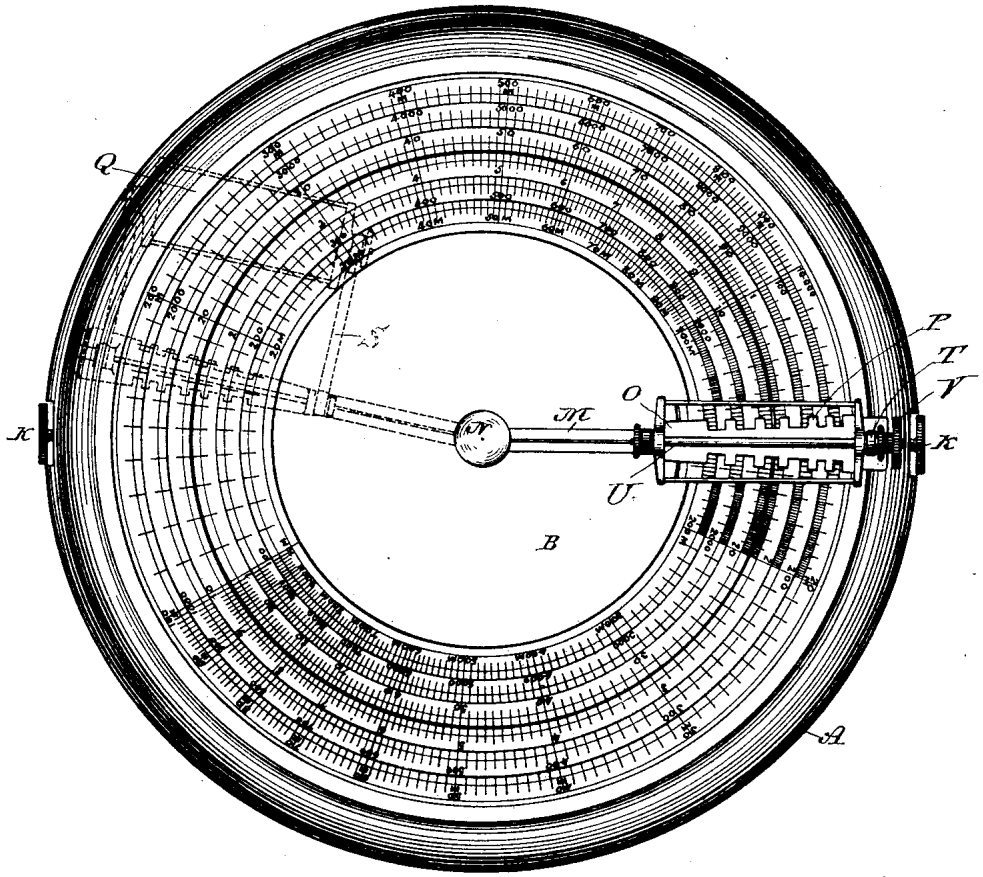

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Fig. 2

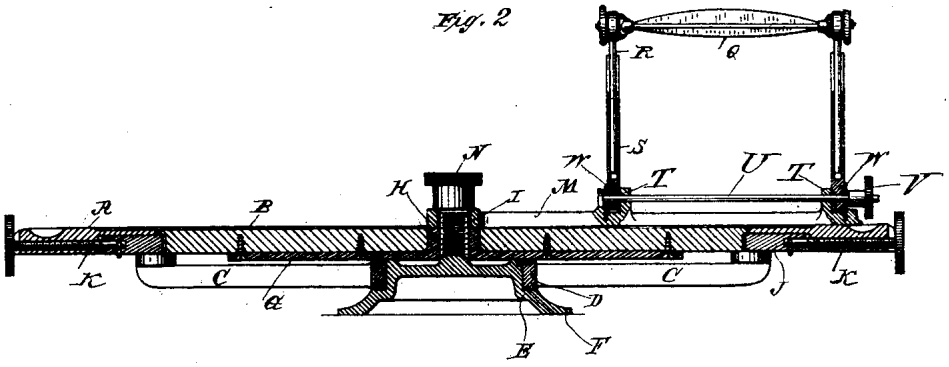

Fig. 3

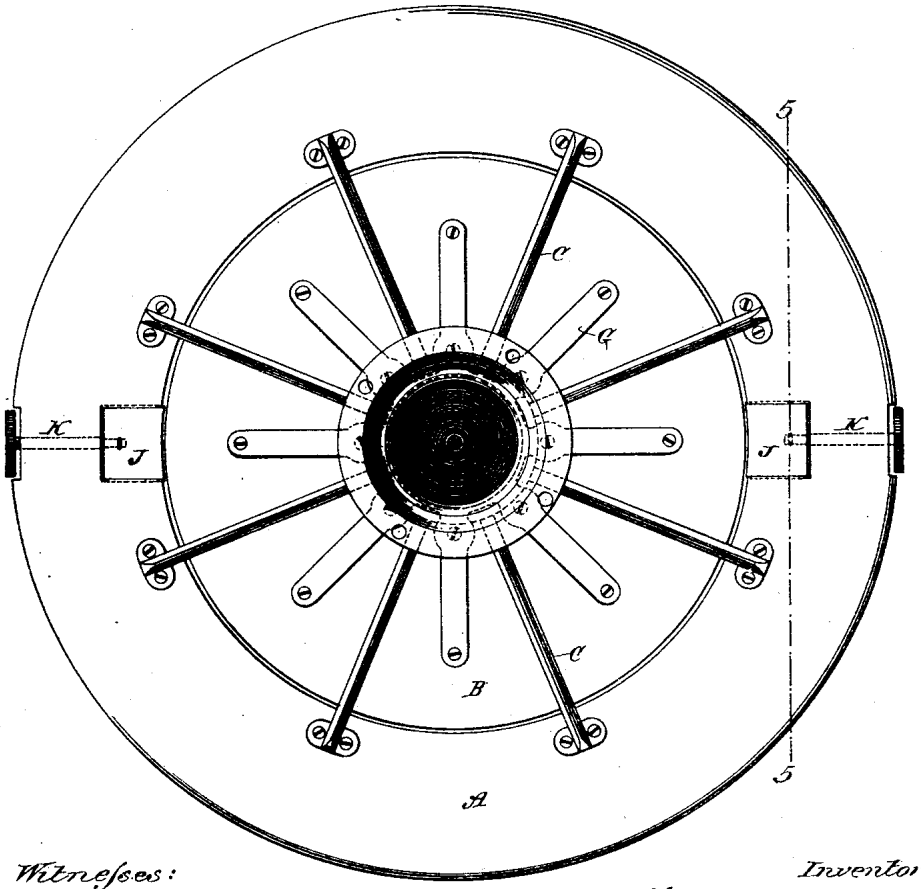

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Fig. 4

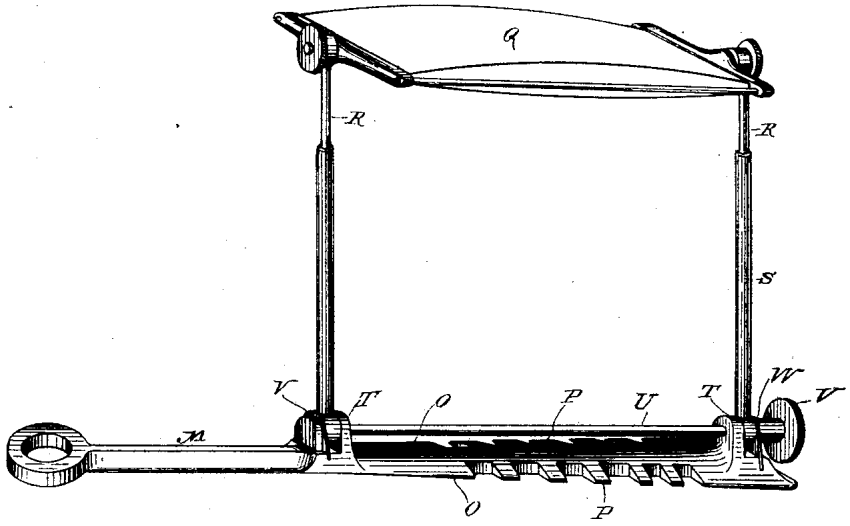
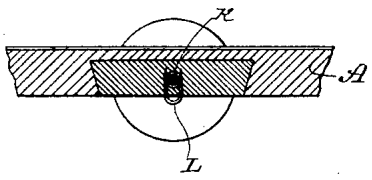


Fig. 5



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UNITED STATES PATENT OFFICE.

WALTER HART, OF NEW YORK, N. Y.

SLIDING CALCULATING-SCALES.

SPECIFICATION forming part of Letters Patent No. 426,444, dated April 29, 1890.

Application filed July 9, 1889. Serial No. 316,953. (No model.)

To all whom it may concern:

Be it known that I, WALTER HART, of the city, county, and State of New York, have invented certain new and useful Improvements in Sliding Scales, of which the following is a full and clear description, reference being had to the accompanying drawings.

The present invention relates particularly to improvements in that kind of logarithmic sliding scale such as is shown and described in United States Patent No. 387,070, granted to me July 31, 1888. This patent describes a sliding scale composed of a circle-ring and a disk concentrically arranged in the same plane and each having independent motion about their common center. Upon each of these parts is inscribed a logarithmic scale and one or more extensions or duplications thereof, the subdivisions of one scale corresponding throughout with those of the other scale—that is, the lines of division are radial lines from the common center. By these means the logarithmic scales are arranged so that they may be used as though endless in extent, and at the same time the whole of each scale is before the operator and any part of them may be read at a glance, as also various readings may be made for a single setting of the scales.

The present invention consists of various parts and combinations of parts by which the circle-ring and disk are supported, operated, locked relatively, and their scales read, all of which will be fully described, and the combinations thereof regarded as new set forth in claims to follow the description.

Figure 1 of the drawings represents a plan view of a logarithmic sliding scale, the scale-bearing parts of which are arranged on the circular plan of my said patent and embodying the present improvements. Fig. 2 is a central cross-section of the same. Fig. 3 is a plan view of the under side of the scale. Fig. 4 is a perspective view of the radial reading-arm, to be hereinafter fully described. Fig. 5 is a detail section on the plane *x x*.

Referring to the views in detail, A represents the outer circle-ring of the scale, which bears one part of the logarithmic scale. B is the inner part or disk of the scale, which bears the other part of the logarithmic scale and closely fills the space included by the outer scale. This circle-ring and disk may be made of any suitable material, and upon each of them will be inscribed a logarithmic scale and one or more duplications or extensions thereof, such scale and its duplication filling the disk and circle-ring and the scales of the two disks being alike and having the same radial divisions. The arrangement of these scales and the purpose and advantages of such arrangement are fully set forth in my said patent, and therefore require no further description here.

To the under side of the circle-ring A is attached a frame-work composed of a series of radial arms C, which spring from a collar D and at their outer ends are each screwed or otherwise secured to the circle-ring A, as shown. The collar D rests upon the hub E, which is shouldered to receive it and hold it steadily, yet permitting the collar D, and, of course, the circle-ring A, to freely revolve thereon. This hub E is continued into a flange F that serves as a base for the instrument. The inner disk B is similarly provided with a supporting-frame, which is composed of radial arms G, springing from a flanged hub H, which is journaled on the axle-pin I, rising vertically from the hub-base E of the instrument.

In the outer circle-ring and at opposite points are arranged clamping-slides J, which are dovetailed in the disk and caused to slide in and out by the screws K, which are threaded in the circle-ring A, but attached to the slides J by staples L, entering grooves in the ends of the screws. By this arrangement the slides may be forced to bear frictionally on the inner disk, and thereby hold the two disks locked together for cases when it is required to set the disks and read from different parts of their scales results depending upon such setting, as a series of problems having a regular constant or constants.

M is an indicating or reading arm. This arm is loosely journaled on the center pin I, which is provided with a screw-cap N, that serves to lock the indicator and the inner disk in any desired position. Thus, when any particular division or reading is found on the inner scale the indicator may be brought to line with it and then locked, which will also lock the inner disk to the base of the instru-

ment, and the outer circle-ring may be turned to bring up any required part or division thereof. The construction of this indicator or reading-arm is important. As will be seen in Figs. 1 and 4, it is constructed with two beveled sides O, which have straight edges corresponding to the radial lines of the scales. These edges are notched or indented, so that the reading-line is the prolongation of the edges of the fingers P. These notches are so located that the circular line of any scale on the disk or circle-ring bisects two opposite fingers, and so that the divisions on the line of such scale may be seen to either side of the fingers, Fig. 1. This arrangement assists to easily and correctly read the scale, particularly where the divisions of the scales are very fine and close together, for when a line to be read falls very near the edge of one of the fingers its projection beyond the side of such finger makes it readily observable and prevents possible inaccuracy in reading, due to its apparently merging into the reading-edge of the finger, and when a line corresponds with the reading-edge its projection proves the coincidence and prevents any tendency to read the line as back of the reading-edge of the finger.

To further facilitate the readings a magnifying-lens Q is arranged over the reading-arm. This lens is mounted in a suitable frame that is pivoted to the uprights R, and these uprights slide in the split tubes S, being frictionally grasped by such tubes. These tubes are hinged to ears T on the reading-arm by the shaft U of the thumb-nut V, and springs W bear against their heads with sufficient pressure to hold them at any desired position to which they may be turned. By these means the lens may be adjusted to any position suiting the eye of the operator and then fixed by setting up the thumb-nut V, thereby locking the parts permanently or until another adjustment be required. These various features are all essential to the easy and rapid manipulation of the instrument. The outer circle-ring may be independently rotated and both rotated on their base without the necessity of lifting the instrument as a whole. They may be locked together in any desired relative position of their scales, and so rotated. Their supporting-frames and structural parts very greatly obviate the difficulties of contraction and expansion and hold them positively in the same plane, and their reading-arm is adapted to instantaneous adjustment to any division.

What is claimed as new is—

1. In a slide-rule, the combination of a circle-ring and a disk concentrically arranged in the same plane and bearing logarithmic scales, the disk and the circle-ring being provided with supporting-frames pivotally connected at their common center.

2. In a slide-rule, the combination of a circle-ring and a disk concentrically arranged in the same plane and bearing logarithmic scales, and frames composed of radial arms for supporting said disk and circle-ring pivotally mounted at a common center both on a base-support for the instrument.

3. In a slide-rule, the combination of a scale-bearing circle-ring and disk concentrically arranged in the same plane and pivotally mounted upon a common supporting-axis, a radial reading-arm mounted upon said axis, and a locking device located on the axis and arranged to secure the disk and reading-arm in fixed relation to each other and to the axis.

4. In a slide-rule, the combination of a concentric disk and a circle-ring arranged in the same horizontal plane and independently movable upon a common axial base central to both, and a clamp borne upon said circle-ring for locking said disk and circle-ring together.

5. In a slide-rule, the combination of the circle-ring A and the disk B, concentrically mounted upon a common axis, the reading-arm M, also mounted upon said axis, the lens Q, and its adjustable supports R and S, with the clamping-rod U and screw V.

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