

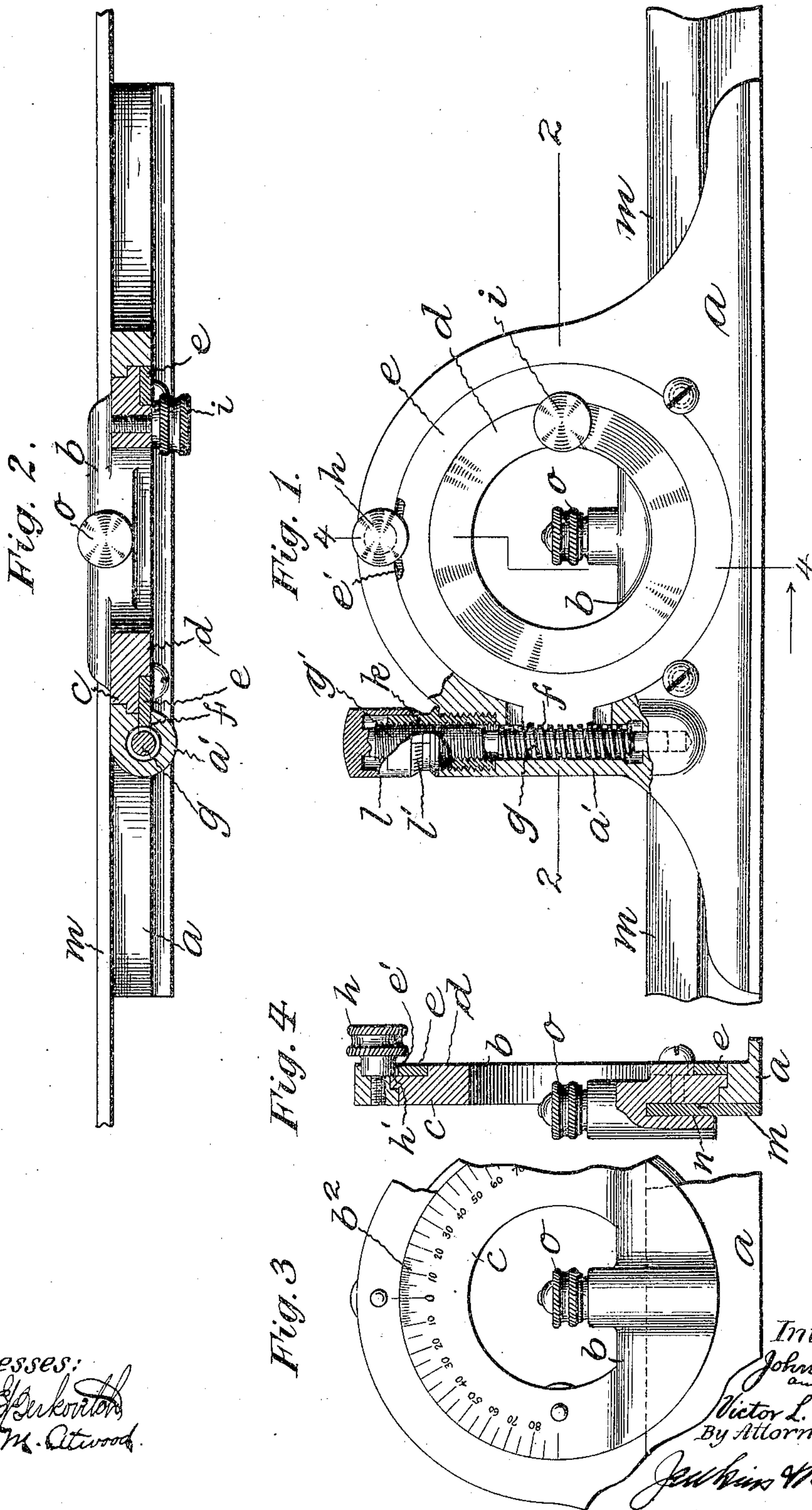
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J. MURDOCK & V. L. LENARD.

PROTRACTOR.

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PROTRACTOR.

SPECIFICATION forming part of Letters Patent No. 793,602, dated June 27, 1905.

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To all whom it may concern:

Be it known that we, JOHN MURDOCK, a resident of Hartford, and VICTOR L. LENARD, a resident of Poquonock, in the county of Hartford and State of Connecticut, citizens of the United States, have invented a certain new and useful Improvement in Protractors, of which the following is a specification.

The invention relates to protractors or measuring devices for laying off predetermined angles from a given point.

The object of the invention is to provide a protractor which will have great strength and will endure unusually hard usage, at the same time giving readings of extreme accuracy.

A further object is to provide a protractor in which the protractor-arm may be readily swung to any desired position or may be set with the nicest degree of adjustment, reading either to degrees or to degrees and fractions thereof—as, for instance, minutes.

A still further object is to provide a protractor having a plurality of rings mounted in a base and rotatable irrespective of each other or in conjunction with each other.

A still further object is to provide a base with a degree dial or ring and a minute dial or ring, the two arranged in conjunction with locking devices by which the two rings may be locked together or one of them may be locked to the frame.

Finally, it is desired to produce a protractor in which the degree-readings may be secured on one scale while the minute or fractional readings are secured on an entirely separate and distinct scale, securing what is practically a micrometer adjustment for the degree-readings through the use of the minute-reading scale.

Referring to the drawings, Figure 1 is a view in elevation with parts broken away to show construction. Fig. 2 is a cross-sectional view through the device on the line 2 2 of Fig. 1. Fig. 3 is a detail view showing the degree-ring and scale. Fig. 4 is a central vertical sectional view through the device on the line 4 4 of Fig. 1.

In the accompanying drawings the letter *a* denotes the base having a ring-like opening,

within which is mounted a degree-plate *b*. This plate is mortised into the frame and has on one side a scale *b*², divided into degrees. The degree-plate has a hub *c*, extending through one face of the base, and a hub *d*, about which fits a second ring *e*. This ring at one side terminates in a rack *f* or segment of a worm-wheel. It meshes with a worm *g*, mounted in an extension *a'* of the frame *a*. The ring *e* is cut away, as at *e'*, and a binding-screw *h*, having a shoulder *h'*, passes through the opening *e'* and engages the edge of the degree-plate *b* for the purpose of securing it positively to the frame in any desired position of adjustment. A set-screw *i* is also borne in the degree-plate *b* and has its edge projecting over the hub *d* and arranged to engage and lock the plate *e* to the degree-plate *b*.

The extension *a'* has at or near its upper end a sleeve *k*, threaded on its interior and engaged by a fine thread *g'* on the spindle which bears the worm *g*. This spindle may be formed integral with or properly secured to a barrel-like thumb-piece *l*, which at its lower edge contains a clearly-marked scale *l'* and has its shell overlying the sleeve *k*. This piece *l*, together with the spindle, form merely a micrometer adjustment for rotating either the plate *e* or the degree-plate *b* when the plates *e* and *b* are clamped together by the adjusting-screw *i*. They further provide a means for reading fractions of a degree.

It is to be noted that the worm *g* is of comparatively coarse pitch, while the threading at *g'* is very fine, and thus the travel of the spindle due to the turning of the member *l* will cause a comparatively slight reciprocating movement of the spindle while it is turned, and a differential movement is given to the plate *e*.

The protractor-blade *m* is secured to the degree-ring *b* in any desired manner, as by being inserted in the saw-cut *n*, where it is held in proper adjustment by a set-screw *o*.

The operation of the device is as follows: The set-screws *h* and *i* are loosened and the degree-plate is swung to any desired position approximately to zero. Thereupon the two plates *b* and *e* are clamped together by the set-

screw *i*. The micrometer adjustment is now used for setting the degree-scale on the absolute zero with the finest precision. When one is set at zero, the degree-plate *b* is fixed with reference to the support *a* by tightening the set-screw *h*. The set-screw *i* is now loosened, and the micrometer-handle *l* is turned until its scale reads zero. By now turning the set-screw *i* and clamping the plates *b* and *c* together and at the same time loosening the set-screw *h* the micrometer-barrel may be turned through the desired number of markings of its scale to give the required minute-reading. It will thus be seen that the degree-readings are always taken from the degree-plate *b*, while the minute-readings are secured on the scale of the micrometer-barrel *l*, and it is to be noted that the micrometer-barrel has a double function. First of all, it may be used for securing an accurate setting of the degree-plate, and subsequently it may be used with great facility for securing readings intermediate the degree-marks, thus giving the fractional readings for minutes.

Obviously various changes might be made in the details of construction without departing from the intent or purpose of the invention, and various connections might be used in lieu of the worm and thread between the spindle of the micrometer-barrel and the worm-plate *c*.

It will be observed that the worm-plate *c* forms an adjusting means for the degree-plate when clamped to it and also forms a connection for translating the movements of the minute-reading spindle to the degree-plate with the greatest amount of accuracy.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. A protractor including a base, a degree-ring mounted to rotate therein, a degree-scale on the degree-ring a spindle operatively arranged with reference to the degree-plate and having another scale appurtenant thereto but independent of the degree-scale, and connections intermediate the spindle and degree-plate whereby certain readings may be secured upon the degree-plate and fractional readings secured upon the scale of the spindle.

2. In combination in a device of the class specified, a base or support, a degree-ring rotarily mounted therein and provided with a degree-scale, a protractor-blade secured thereto, an adjusting-ring operatively arranged with reference to said degree-plate, a spindle, and connections intermediate the spindle and adjusting-ring for transmitting movements of the former to the latter, and a scale appurtenant to the spindle for reading fractions of the scale of the degree-plate.

3. In combination in a device of the class

specified, a base or support, a plurality of rings rotarily mounted therein, means for clamping said rings together and means for locking one or both of said rings to the support, a spindle appurtenant to the support and connected with one of said rings to rotate it, and a scale appurtenant to the spindle whereby the angular movements of the plate or plates effected by the spindle may be read.

4. In combination in a device of the class specified, a base or support, a degree-ring mounted therein, an adjusting-ring operatively arranged with reference to the degree-ring, means for clamping said rings together, a spindle appurtenant to the support and connected with said adjusting-ring whereby movements of the spindle are transmitted to said ring, and a scale appurtenant to the spindle indicating the movements of the adjusting-ring.

5. In a device of the class specified, a base or support, a degree-ring mounted to rotate therein, an adjusting-ring concentrically arranged with reference to the degree-ring, a spindle appurtenant to the support and provided with a threaded portion, an interengaging thread arranged upon the adjusting-ring, and clamping devices for securing said rings together for simultaneous movement or locking the degree-ring with reference to the support, irrespective of the adjusting-ring.

6. In a device of the class specified, a support, a degree-ring rotarily mounted therein and provided with a scale of certain units, a micrometer-spindle appurtenant to said degree-plate and frame, and provided with a scale for reading fractions of the units of the scale of the degree-ring, and connections intermediate said spindle and degree-ring whereby the scale of the degree-ring or the scale of the micrometer-spindle may be set to the zero-point independently.

7. In combination in a device of the class specified, a support arranged to receive a degree-ring, a boss appurtenant to said support provided with an opening, a screw-threaded sleeve arranged within the opening and projecting therefrom, a spindle having a screw-thread meshing with the thread of said sleeve and provided with a barrel overlying the sleeve, a second thread arranged upon the sleeve, and connections intermediate said thread and the degree-plate for moving the latter upon a predetermined movement of the spindle.

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