(No Model.)

A. H. EGE & C. D. WALTERS.

PROTRACTOR.

No. 267,336. Patented Nov. 14, 1882.

Fig. 1.

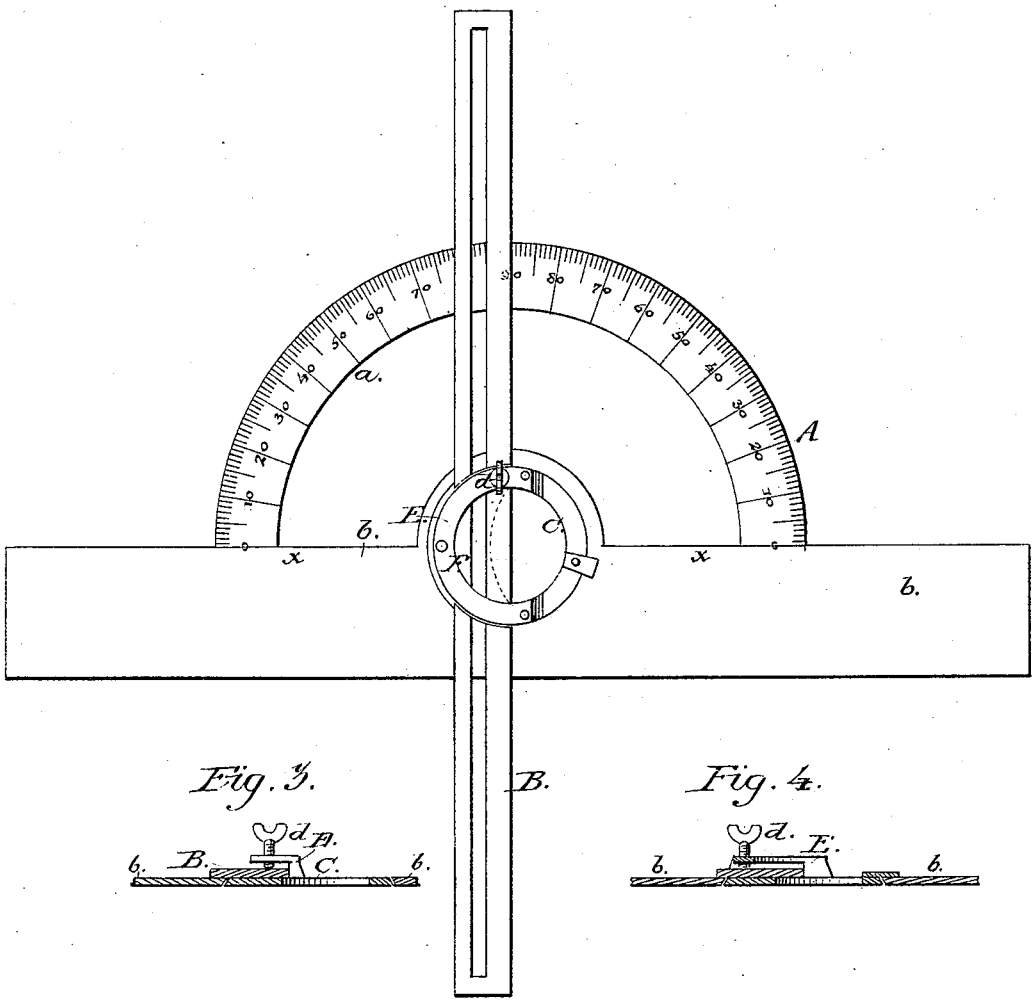

Fig. 3.

Fig. 4.

Fig. 2.

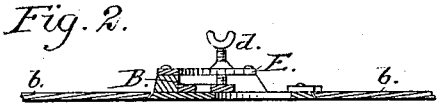

Fig. 5.

Witnesses:
I. N. Kaib.
A. H. Ege

Inventors:
A. H. Ege and C. D. Walters
per Edw. W. Down & Co.
Attys.

UNITED STATES PATENT OFFICE.

ALEXANDER H. EGE, OF MECHANICSBURG, AND CHARLES D. WALTERS, OF HARRISBURG, PENNSYLVANIA.

PROTRACTOR.

SPECIFICATION forming part of Letters Patent No. 267,336, dated November 14, 1882.

Application filed June 15, 1882. (No model.)

To all whom it may concern:

Be it known that we, ALEXANDER H. EGE and CHARLES DANIEL WALTERS, citizens of the United States, residing at Mechanicsburg and Harrisburg, respectively, in the counties of Cumberland and Dauphin, and State of Pennsylvania, have invented certain new and useful Improvements in Square and Bevel Protractors; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

Our invention is an improvement upon a patent granted Charles D. Walters, March 13, 1882, which was entitled a "square and bevel instrument." It was composed in the main of a semicircular protractor articulating at the angular intersection of the radii thereof to a chair and blade furnished with an index-pointer at one or both extremities, and slotted throughout the greater part of its length, one edge or wall of said slot being coincident with the radii of the protractor, and hence passing through the center of the circle.

Our present invention consists principally of a semicircular protractor having its arc graduated into degrees and fractions thereof, and a rule, either plain or graduated, upon one or both edges, according to some convenient scale, and slotted throughout the greater part of its length, if necessary, for purposes of securing greater facilities of clamping device, as hereinafter more fully set forth. Said rule or blade is fixed upon a bearing or chair that is attached to the diameter side or base of the protractor, and articulates or oscillates freely about the center of the segment of the circle, one edge of said blade being made coincident with the radii, and hence passes through the center of the circle.

Figure 1 shows a plan view of our complete instrument. Fig. 2 is a sectional view of the same on line *x x* of Fig. 1. Fig. 3 is a sectional view, showing a modification in which the blade is without a slot and clamped by a screw passing through a short lug. Fig. 4 is a sectional view, showing a similar clamping device or arrangement, except that there is a long segment of a circle open, so as to admit of a wide blade. Fig. 5 shows a section of still another modification, in which a slotted blade and a bead are used.

Referring to the drawings, A is a semi-circle, composed of the arc *a* and the base *b*. Said base *b* may be rectilinear throughout or partially cut away upon its inner edge; or it may be constructed of open-work to a limited degree for the purpose of reducing the weight of the instrument, and at the same time not unduly weaken the co-operating parts or encroach upon the functional lines of the instrument. In practice, however, we propose to construct the diameter of our semi-circle of such lateral dimensions as will admit of piercing an orifice therein of such size as will afford a suitable seat for our proposed bearing or chair, the edges of said orifice being beveled, rabbeted, or otherwise wrought for the purpose of receiving in close proximity the corresponding engaging parts of said chair, and admitting of the free articulation of the latter therewith or therein. Should it also in practice prove desirable for the purpose of using the combined instrument as a T-square, or for other purposes, we propose, also, to prolong the said diameter *b* longitudinally beyond the limits of the outer arc of the protractor, as hereinafter more fully set forth.

B is a rule or blade of such dimensions as convenience of use may suggest, and for drafting purposes preferably unslotted throughout its entire length. For purposes, however, of affording greater facilities in clamping to any desirable line of graduation it may be desirable to slot the blade more or less, as hereinafter more fully set forth. We propose, also, to graduate one or both edges of one or both sides of said blade B, according to any scale or measure, as convenience in use may suggest. Since it is our intention to use said blade B in conjunction with the protractor A, not only to admit of a free oscillation of the former about the center of curvature of the graduated arc *a*, but also to slide the same radially over the latter, we propose to attach said parts together by means of a chair,

C, of such construction that when said chair is clamped immovably to its bearing or seat it will thereby rigidly clamp said rule B at the same time to any desired line of graduation upon said graduated arc. To this end therefore we propose to make said chair C of such a vertical thickness that when placed in its bearing for operation the under side or surface thereof may be flush with the under side of the semi-circle A, while the upper side is raised above the upper surface of the same to a degree sufficient to secure a seat of sufficient depth for the reception of the blade, and thus admit of the under side of the same moving freely flush with or upon the upper surface of the semi-circle A. We prefer, also, to make the outer edge of the chair C beveled, rabbeted, or otherwise conveniently wrought, to thereby engage more readily with corresponding parts of the seat thereof. We propose, also, to leave a greater part of the central portion of said chair open, in order to expose to view the center of the circle, and thus facilitate greater accuracy in the use of the instrument. Such a portion, too, of the upper projecting surface of the chair is cut away or beveled off to such a depth as the vertical thickness of the blade may require for the reception of the engaging edges of said blade, and their free longitudinal movement therein, when it may be required to move said blade longitudinally over the graduated arc of the semi-circle.

In securing a suitable clamping device, as shown in Fig. 3, in order to confine at will the revolving chair C and the inclosed blade B to the underlying semi-circle or protractor A, several appliances may be used, as economy or convenience may suggest. As shown, we may extend the upper portion of the chair C, so as to form a lug or projection, E, whose under surface shall extend over the upper horizontal surface of the blade B, and having pierced said lug vertically for the reception of a thumb-screw, *d*, and placed said screw therein, the lower extremity of said screw, when driven into contact with the surface of the underlying blade B, holds the co-operating parts rigidly in place at any desired line of graduation, even though by long use the blade may become loose in its inclosing chair.

In Fig. 4 we have another mode of clamping the unslotted blade B to its chair, in which the horizontal upper surface of the chair is raised into two or more projections or lugs of sufficient size or strength as to afford the requisite bearing upon their upper surfaces for the riveting or otherwise fastening thereto a supplemental piece or segmental annulus, F, of the chair, of such vertical thickness, when in position, as will supply a sufficient interval between the under surface of said segment and the upper surface of the chair and the diameter side of semi-circle flush therewith as will admit of the lateral introduction of the blade B, and the subsequent clamping of the latter rigidly therein by means of the thumb-screw passing vertically through said segmental piece F, previously perforated therefor, at such point as may be most convenient in practice.

By slotting the rule B throughout the greater part of its length we are able to use another modification of the chair C, as shown in Fig. 5, that is effective, simple, and of easy construction. The lateral engagement of the chair with its seat is the same as in the other modifications, as above set forth; but the mode of confining the blade B rigidly, when desired, to the upper surfaces of the chair and semi-circle consists simply of a bead, *e*, either wrought upon or riveted fast to said upper surface of the chair, said bead being of such lateral dimensions and vertical thickness as will enable said bead to move freely and snugly in said slot of said blade, said bead being of such length as the dimensions of the chair will admit of. Moreover, said bead is also perforated, preferably about the longitudinal center of its upper surface, at such a depth as may be sufficient for the reception of the threaded end of the thumb-screw when in position for use. To secure said position said bead *e* is first inserted in said slot. The threaded end of the thumb-screw is then inserted into said perforation, and, through the medium of a permanent or movable washer of a breadth somewhat greater than the lateral dimensions of the slot, the blade B is confined immovably to the chair when the thumb-screw has been driven to such a depth into said perforation as will bring said washer, at the limit of its opposite bearings, into close engagement with the horizontal surface of said bead, as shown.

Having thus described the co-operating parts of our invention, the improvements thereof over or upon our previously-mentioned patents are readily perceived upon examination. In causing the edge of the blade to pass through the center of the circle, instead of one wall of a longitudinal slot, in order to secure the advantages of a protractor, continuous lines are more readily drawn, the center of curvature is more readily seen, and the cost of production materially diminished in our present invention than in the aforementioned.

The improved instrument, as above described, which we claim as our invention has a broad range of adaptation in mechanical and professional use, the following, for example, being the most prominent among its many uses, as is readily seen by those skilled in the use of such instruments. As a simple protractor for measuring angles, we lay the semi-circle upon the plotting-surface, with the outer edge of the diameter brought into coincidence with the base-line already drawn. We next revolve or oscillate the blade B by means of its embracing-chair in its bearings until the edge of said blade passing through the center of curvature coincides with the line of graduation on the horizontal face of the arc which represents the desired angle sought. We next mark one or more points in contact with said edge and con-

necting the same with the center of the circle upon said base-line, and it will give the desired obliquity; or, upon the other hand, if it be desired to measure the obliquity of a given angle, the diameter of the semi-circle is made to coincide with one limb of the angle, and the edge of the blade B, as in the former case, is made to coincide with the other limb of the angle, when, upon being clamped rigidly thereto, said edge at its prolongation upon the graduated arc will indicate the obliquity sought after.

From the fact that the rule B slides radially over the face of the semi-circle a particular advantage is attainable, in thereby securing a long reach and one or more points both upon the arc and diameter side of the semi-circle, with which to form, in connection with the center of curvature, a continuous right line. The instrument may be used with great advantage as a parallel rule, or to serve the general purpose attained by the use of two triangles. Suppose, for instance, a number of lines to represent a section are to be drawn. A simple ruler being adjusted in place, we next place the diameter side of the semi-circle against the edge of said simple ruler, and adjusting the edge of the rule B on the protractor to the desired angle and clamping the same fast thereto we have the adjustment required. Now, by moving the adjustment along the edge against which it bears, lines may be drawn which are exactly parallel to each other. By other similar adjustments other lines may be drawn parallel to each other and intersecting the aforesaid parallel lines at any desired angle.

We claim—

A protractor provided with a circular opening at its base, beveled from the under side, in combination with a rotating chair correspondingly beveled, and a radially-movable rule so located with reference to the said protractor that one of its edges will be coincident with the axis of the same, as and for the purpose set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

ALEXANDER H. EGE.
CHARLES DANIEL WALTERS.

Witnesses:
JOHN H. KEATH,
JOHN P. MELICK.