No. 641,486. Patented Jan. 16, 1900.

H. AHLSTRAND.

PROTRACTOR.

(Application filed Oct. 7, 1899.)

(No Model.)

FIG. 2.

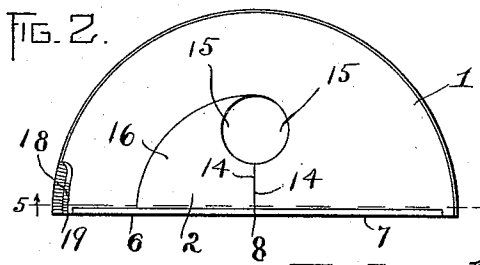


FIG. 1.

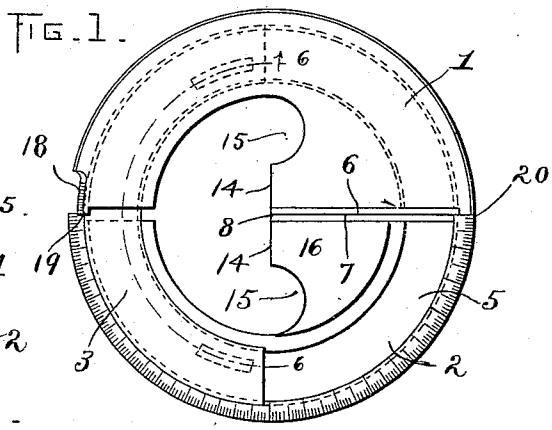


FIG. 3.

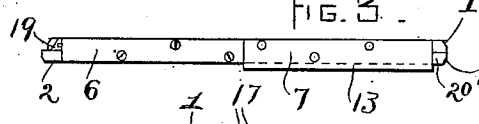


FIG. 4.

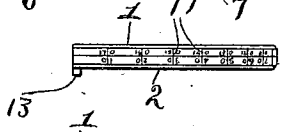


FIG. 5.

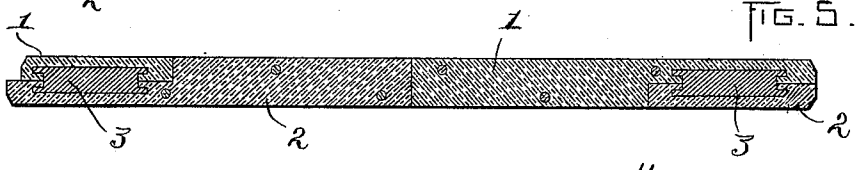
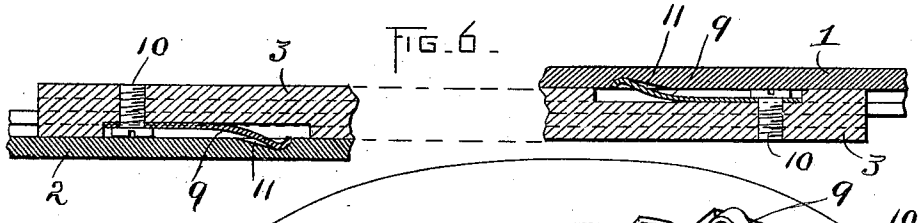


FIG. 6.



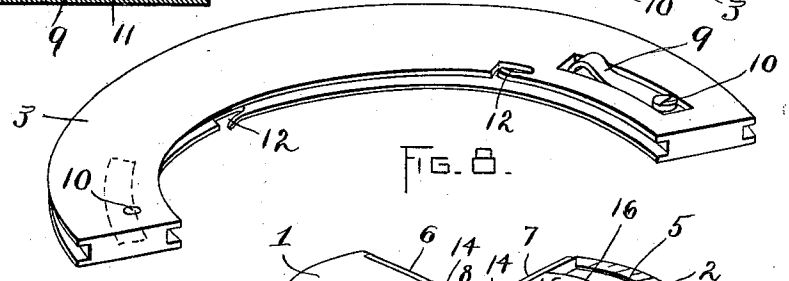
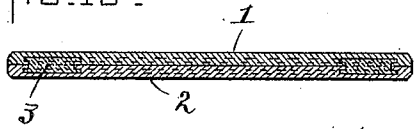


FIG. 8.

FIG. 10.



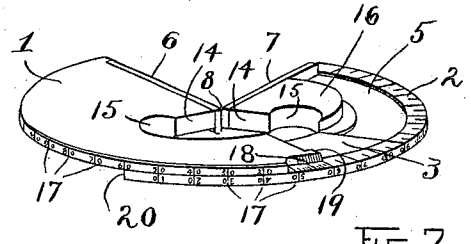


FIG. 7.

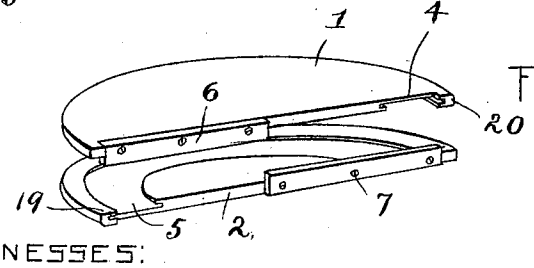


FIG. 9.

WITNESSES:

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UNITED STATES PATENT OFFICE.

HUGO AHLSTRAND, OF WALTHAM, MASSACHUSETTS.

PROTRACTOR.

SPECIFICATION forming part of Letters Patent No. 641,486, dated January 16, 1900.

Application filed October 7, 1899. Serial No. 732,842. (No model.)

To all whom it may concern:

Be it known that I, HUGO AHLSTRAND, of Waltham, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Protractors, of which the following is a specification.

This invention relates to protractors for measuring or laying out angles.

The invention has for its object to provide a simple, compact, and accurate instrument of this class; and to this end it consists in certain features of novelty of construction and arrangement which I shall now proceed to describe and claim.

Of the accompanying drawings, Figure 1 represents a plan view of a protractor constructed in accordance with my invention extended or opened out. Fig. 2 represents a similar view of the protractor in closed position, in which it measures an angle of one hundred and eighty degrees. Fig. 3 represents a front edge view of the protractor closed. Fig. 4 represents a side edge view closed. Fig. 5 represents a section on line 5 5 of Fig. 2. Fig. 6 represents a circular section, enlarged and partly broken away, on the line 6 6 of Fig. 1. Fig. 7 represents a perspective view of the protractor partly opened. Fig. 8 represents a detail perspective view, enlarged, of the connecting segmental tongue. Fig. 9 represents a perspective view, with the two plates separated, of a modified form of my invention. Fig. 10 represents a sectional view of the same in closed position.

The same reference characters indicate the same parts in all of the figures.

Referring at first to Figs. 9 and 10 of the drawings, which show a very simple form of the invention, 1 and 2 designate two semicircular superimposed flat plates preferably constructed of metal and having a sliding circular guiding connection with each other through a flat segmental tongue 3, interposed between the two plates and lying in segmental grooves 4 and 5, formed in the inner faces of said plates, the said grooves being undercut to engage flanges on the tongue formed by grooving the outer and inner edges of the latter. One-half of the straight edge of each plate 1 2 is provided with a straight-edge strip 6 7, which overlaps the edge of the opposite plate. The plates 1 2 are adapted to slide upon each other circularly around the common center, which is the inner meeting-point of the edge strips 6 7, and the angle to be measured or laid out is bounded by or included between the said edge strips 6 7, the faces of which coincide with radii of the protractor-circle.

The connecting-tongue 3 is a segmental circular plate of about one hundred and eighty degrees extent, and it slides freely with respect to either of the plates 1 2 when the latter are moved, its function being merely to form a positive guiding connection between said plates which will permit the latter to open out to measure an angle of no degrees. The semicircular edges of either or both of the plates 1 2 may be graduated from naught to one hundred and eighty degrees, beginning at the right-hand corner of the upper plate 1, as viewed in Fig. 7, and the left-hand corner of the lower plate 2. In this case the opposed corners 19 20 of the respective plates become indexing-points, which register on the graduated index or indexes of their opposite plates. This will be more readily understood from the inspection of Figs. 1 to 8, inclusive, which I shall now describe.

In Figs. 1 to 8, 1 and 2 represent the two superimposed plates of the protractor, as before, and 3 the connecting segmental tongue. The latter, as illustrated in Fig. 8, is provided with friction-producing devices consisting of spring-lips 12 12, bent outwardly from the edge of the tongue and adapted to press against the bottom of the grooves in the plates 1 2, in which said tongue slides, so as to produce a friction which will prevent the plates from sliding too easily on each other. The said tongue 3 is further provided at either end with spring-detents 9 9, secured in recesses in the opposite faces of the tongue by means of screws 10 10 and adapted to enter notches 11 11, formed in the plates 1 2, the object being to prevent said tongue from becoming extended more than a certain distance with respect to each plate. The tongue is slightly less than one hundred and eighty degrees in length, and when the protractor is opened out the detents 9 and notches 11 cause the tongue 3 to overlap each plate 1 2 about equally, as shown in Fig. 1.

6 and 7 are the radial straight angle-bound-

ing edges of the plates 1 2, which meet at the geometrical center 8 of the protractor. Those portions of the plates 1 2 which terminate in the edges 6 7 lie in the same plane, so that said edges abut when brought into coincidence, as shown in Fig. 1. The plates are adapted to be slid on each other through an angle of one hundred and eighty degrees, so as to measure between the edges 6 7 any angle from no degrees, Fig. 1, to one hundred and eighty degrees, Fig. 2. The semicircular edges of one, and preferably both, of the plates 1 2 are graduated in degrees and in opposite directions, as indicated in Figs. 4 and 7, spaces of ten degrees each, as represented at 17 17 in Figs. 4 and 7, being marked and numbered on the edges of the plates, and smaller divisions, as of one degree each, being marked on the flat inner face of each plate. The corners 19 and 20 on each plate 1 2 are located on the diameters continuing radii 6 7 and are employed as indicating-points to register with the graduations on the opposed plate. It is evident that if the plates 1 2 are moved from the position shown in Fig. 1, so as to spread the edges 6 7 out to an angle of, say, sixty degrees, the point 19 on the plate 1 will register with the graduation sixty degrees on the plate 2, as indicated in Fig. 7, and in like manner the point 20 of the plate 2 will register with the graduation sixty degrees on the plate 1. The sum of all the intermediate coinciding graduations on the two plates will equal the angle subtended, and thus having an index on each plate gives a means for checking the accuracy of the protractor's indications. A vernier 18 may be provided on the end of either of the plates for reading off fractions of degrees.

As seen in Figs. 1, 2, and 7, the plates 1 and 2 are formed with abutting faces 14 14 at right angles to the edges 6 7 and terminating in recesses 15 15, which when the protractor is closed, as shown in Fig. 2, form an aperture in which the fingers may be placed in opening the protractor or for hanging the protractor on a support. Each plate 1 2 is, as shown in Figs. 1 to 8, provided with a marginal portion which actually overlaps or is superimposed upon the opposite plate and a central raised portion 16, which is in the same plane with the opposite plate. Both plates therefore form part of the two plane faces of the protractor. One of the edge plates 7 may be extended laterally, as at 13, beyond the face of the protractor to form a lip adapted to be applied to a straight edge. The opposite faces of the plates 1 2 may be knurled or otherwise roughened to provide holding-surfaces for the fingers.

I do not confine myself to the exact details of construction herein shown, as the same may be variously modified without departing from the spirit of my invention.

I claim—

1. A protractor comprising two superimposed connected plates guided to slide circularly with respect to each other about a center, and provided with indicating means for measuring angles, said plates being provided with straight edges adapted to open to one hundred and eighty degrees or close parallel with each other, and means for preventing separation of the plates when said straight edges are in the latter position.

2. A protractor comprising two superimposed connected plates guided to slide circularly with respect to each other about a center, said plates having terminal radial straight edges for bounding the angle to be measured and indicating means for measuring said angle, said straight edges being adapted to open to one hundred and eighty degrees or close parallel with each other, and means for preventing separation of the plates when said straight edges are in the latter position.

3. A protractor comprising two superimposed connected plates guided to slide circularly with respect to each other about a center, said plates having terminal radial straight edges which meet at said center and are arranged to include a free angular space to coincide with the angle to be measured, and indicating means for measuring said angle, said straight edges being adapted to open to one hundred and eighty degrees or close parallel with each other, and means for preventing separation of the plates when said straight edges are in the latter position.

4. A protractor comprising two superimposed connected plates guided to slide circularly with respect to each other about a center, said plates having terminal radial straight edges for bounding the angle to be measured, and coregistering semicircular indexes on the respective plates, said straight edges being adapted to open to one hundred and eighty degrees or close parallel with each other, and means for preventing separation of the plates when said straight edges are in the latter position.

5. A protractor comprising two superimposed plates, a tongue interposed between the two and having a sliding circular connection with each, permitting said plates to slide with respect to each other and to the tongue about a common center, and indicating means for measuring angles.

6. A protractor comprising two superimposed plates, a tongue interposed between the two and having a sliding circular connection with each, permitting said plates to slide with respect to each other and to the tongue about a common center, said plates having terminal radial straight edges for bounding the angle to be measured and indicating means for measuring said angle.

7. A protractor comprising two superimposed plates, a tongue interposed between the two and having a sliding circular connection with each, permitting said plates to slide with respect to each other and to the tongue about

a common center, spring friction-producing means for increasing friction between said tongue and plates, and indicating means for measuring angles.

8. A protractor comprising two superimposed plates, a tongue interposed between the two and having a sliding circular connection with each, permitting said plates to slide with respect to each other and to the tongue about a common center, stops for limiting the movement of extension of said tongue with respect to said plates and indicating means for measuring angles.

9. A protractor comprising two semicircular superimposed plates, a segmental tongue interposed between the two and having a sliding connection with each permitting said plates to slide with respect to each other and to said tongue about a common center, coregistering indexes on the semicircular edges of each of said plates, radial terminal abutting straight edges on said plates for bounding the angle to be measured, and indexing-points in diametrical line with said straight edges.

10. A protractor comprising two superimposed connected flat plates guided to slide circularly with respect to each other about a center, said plates having terminal radial abutting straight edges for bounding the angles to be measured, said straight edges being adapted to open to one hundred and eighty degrees or close parallel with each other, and means for preventing separation of the plates when said straight edges are in the latter position, and one of said plates having a guiding-lip extended laterally beyond the remote face of the other plate, and indicating means for measuring the said angle.

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

HUGO AHLSTRAND.

Witnesses:
JOHN W. EKWALL,
E. A. MARSH.