Sept. 2, 1924. 1,507,027

J. D. McLEOD

PROTRACTOR

Filed June 3, 1922

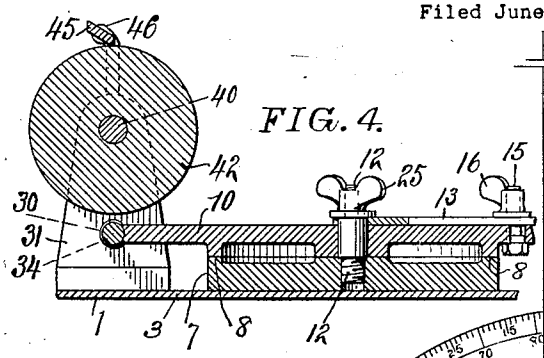


FIG. 4.

FIG. 1.

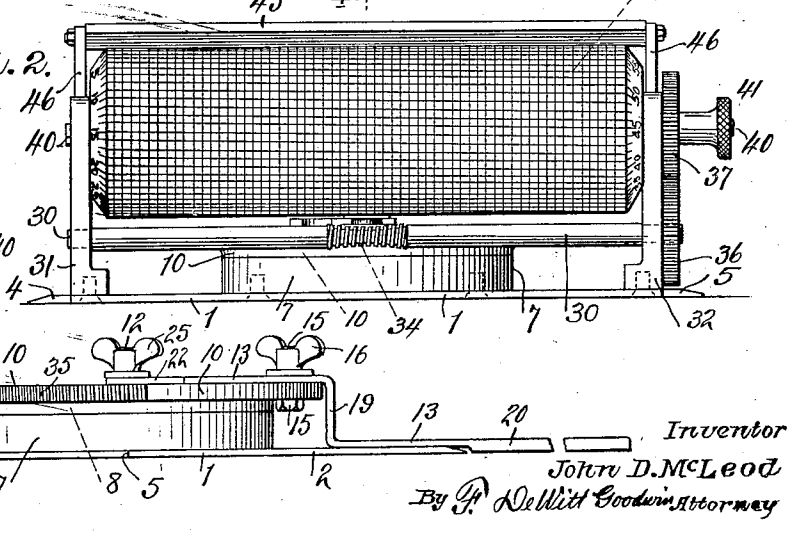


FIG. 2.

FIG. 3.

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UNITED STATES PATENT OFFICE.

JOHN D. McLEOD, OF OAKMONT, PENNSYLVANIA.

PROTRACTOR.

Application filed June 3, 1922. Serial No. 565,636.

To all whom it may concern:

Be it known that I, JOHN D. McLEOD, a citizen of the United States, residing at Oakmont, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in a Protractor, of which the following is a specification.

My invention relates to improvements in a protractor particularly adapted for use by architects and engineers for making drawings, and for other work requiring great accuracy, and which will be of assistance in solving trigonometrical problems.

The object of my invention is to construct a protractor comprising a semicircular plate or base graduated to indicate degrees of an arc, a disk concentrically mounted upon the base and rotatable independently of the base, and an arm, adapted to be adjusted to various radial positions upon the disk. A still further object of my invention is to provide a cylinder which is movable relatively with the disk and having reading marks thereon by which the movement of the disk and arm may be indicated, and showing the relation between said parts and the semi-circular portion of the base; and a still further object of my invention is to provide various novel features of construction and arrangement of the parts, which will be more fully hereinafter described and claimed.

Referring to the accompanying drawing, Fig. 1, is a plan view of my improved protractor; Fig. 2 is a side elevation of the protractor, as shown in Fig. 1; Fig. 3, is an end elevation of the protractor as shown in Fig. 1, and Fig. 4 is a vertical sectional view on line 4—4 Fig. 1.

In the drawings, in which like reference characters refer to like parts, 1 represents a base consisting of a semicircular portion 2, having graduations arranged thereon adjacent to its edge indicating degrees of a circle. Said base having a portion forming a bearing plate 3, of less width than the portion 2, thus forming shoulders 4 and 5 on the portion 2 arranged in alignment with the center of the semicircular portion 2 which facilitate the placing of the protractor upon a given line upon a drawing.

The base 1 is provided with a bearing block 7, positioned concentrically with the semicircular part 2. Said bearing block 7 is provided with a facing surface 8, upon which is mounted a disk 10, in a plane slightly elevated above the base 1. A pivot pin 12 is secured in the center of the bearing block 7 upon which the disk 10 is rotatable.

An arm 13 is adjustably secured upon the disk 10 by said pivot pin 12 and by a fastening device consisting of a bolt 15 slidably mounted in a semi-circular slot 18 formed in the disk and by a thumb nut 16 upon the bolt 15 for clamping the arm 13 upon the upper surface of the disk 10. The arm 13 is provided with an off-set portion 19, whereby the blade 20, forming part of the arm 13, will extend immediately above the semicircular portion 2 of the base, so that the side edge of the blade 20 will be adjacent to the graduations upon the portion 2.

The inner end of the arm 13 is provided with an enlarged head 22 having notches 23 and 24 formed therein adapted to receive the pivot pin 12. Said notches are positioned, in alignment with the longitudinal side edges of the blade portion 20 of the arm 13, so that either edge of the blade 20 may be used for reading the graduation upon the base. By loosening the thumb nut 25 upon the pivot pin 12 and the thumb nut 16 on the bolt 15, the arm 13 may be shifted so that either of the notches 23 or 24 will embrace the pivot pin 12. The arm 13 is provided with a slot 27 which permits the arm to slide upon the bolt 15 sufficiently to release the head 22 from the pivot pin 12; the arm can then be turned on the bolt 15 as a pivot to bring the opposite notch into alignment with the pivot pin 12, which will position the opposite edge of the blade portion 20, of the arm, in radial alignment with the pivot pin 12. By means of the bolt 15 and thumb nut 16 the arm 13 may be set at any radial position throughout the length of the slot 18 formed in the disk 10. The thumb nut 25 is not clamped tightly upon the head 22 of the arm, as it is intended that the pivot pin 12 remain stationary and the arm and disk are allowed to rotate freely upon the pivot pin 12.

The mechanism for rotating the disk for turning the arm 13 over the graduations upon the base, consists of a shaft 30, rotatably mounted in bearings 31 and 32, secured to the bearing plate 3 forming part of the base 1. The shaft 30 is provided with a worm 34 which meshes with the teeth 35 formed upon the periphery of the disk 10. Upon one end of the shaft 30 is secured a gear-wheel 36 which meshes with a gear-wheel 37, secured to a shaft 40, rotatably mounted in the bearings 31 and 32, and hav-

ing a handle 41 secured thereon for turning the same.

A cylinder 42 is secured upon the shaft 40. The surface of the cylinder is graduated to indicate minutes and seconds. The gearing between the cylinder and the disk is made so that one revolution of the cylinder will be equal to a movement of the arm 13, which is equal to one degree. There are, preferably, one hundred eighty teeth in one-half of the periphery of the disk 10 and the gear-wheels 36 and 37 are equal in diameter, so that one complete revolution of the handle 41 will move the arm one degree of the arc. The divisions extending around the surface of the cylinder 42, represent minutes and are designated by the numbers placed upon the conical surfaces formed upon the ends of the cylinder.

Mounted above the cylinder 42 is a reading bar 45, which is held in a fixed position in the posts 46, secured to the bearings 31 and 32. The bar 45 is provided with graduations which divide the length of the surface of the cylinder into sixty divisions which represent seconds of an arc. The cylinder 42 is provided with lines extending lengthwise thereof. Said lines extend diagonally between the divisions on opposite ends of the cylinder, thus intersecting the edge of the reading bar 45 at various points throughout the length of the latter, when the cylinder is rotated. To better facilitate in reading the divisions arranged along the reading bar 45, the cylinder is provided with sixty parallel lines extending around its circumference, which divide the lines extending lengthwise of the cylinder into sixty parts, forming thirty-six hundred intersections indicating seconds when read upon the bar 45. The sixty longitudinal lines on the cylinder are numbered upon the conical ends formed on the cylinder and indicating minutes. The arm 13 may be turned to any desired position, and a reading upon the semicircular portion 2 of the base will give the degrees; the reading upon the end of the cylinder will give minutes, and the reading along the length of the bar will give seconds; thus showing accurately the angle at which the arm is positioned upon the semicircular portion 2.

The graduations upon the base plate 1, arranged along the vertical lines 47 and 48 and along the horizontal line 49, indicate inches. Said scales are placed at a known distance from the vertical and horizontal center lines. By placing the arm 13 at any given angle along these scales, the inclination of the arm may be read in inches per foot. If the scales along the lines 47, 48 and 49 are located two inches or one-sixth of a foot distant from the vertical center line, or from the horizontal center line, the reading on the scale multiplied by six will give the number of inches of inclination per foot of the angle represented by the position of the arm.

Having thus described my invention, I claim and desire to secure by Letters Patent:—

1. A device comprising a base, an arm pivotally mounted upon the base and extending radially therefrom, a cylinder rotatably mounted upon the base, gearing interposed between the arm and the cylinder for communicating a relative motion between the arm, and the cylinder, said cylinder having graduations arranged thereon and a reading bar mounted adjacent to the cylinder.

2. A device comprising a base, an arm pivotally mounted upon the base and extending radially therefrom, a cylinder rotatably mounted upon the base, mechanism in operative engagement between the arm and the cylinder whereby a relative movement of the cylinder will be communicated to the arm, said base having graduations thereon indicating degrees of an arc said cylinder having graduations thereon indicating minutes and seconds of an arc, and a part associated with the cylinder for facilitating the reading of the graduations.

3. A device comprising a base, an arm pivotally mounted upon the base and extending radially therefrom, a cylinder rotatably mounted upon the base, mechanism in operative engagement between the arm and the cylinder whereby a relative movement of the cylinder will be communicated to the arm, said base having graduations thereon indicating degrees of an arc over which the arm may move, said cylinder having graduations thereon forming divisions extending around its circumference indicating minutes of an arc, said cylinder having graduations thereon forming divisions extending throughout the length of the cylinder indicating seconds of an arc, and a part associated with the cylinder for facilitating the reading of the graduations.

4. A protractor comprising a base a disk, a pivot pin upon the base upon which the disk is rotatable, mechanism mounted upon the base for rotating the disk, an arm adjustably mounted upon the disk extending radially therefrom and a fastening device for securing the arm in various radial positions upon the disk.

5. A protractor comprising a base, a disk rotatably mounted upon the base, an arm mounted upon the disk, a pivot pin positioned concentrically upon the disk, a head upon the inner end of the arm, said head being of greater width than the blade portion of the arm, said head having openings formed therein, positioned in alignment with the longitudinal edges of the blade portion of the arm adapted to be occupied by

the pivot pin whereby either edge of the arm may be placed upon a radial line, and a fastening device located adjacent to the periphery of the disk for holding the arm in various radial positions upon the disk.

6. A protractor comprising a base, a semicircular portion upon the base having graduations thereon, a bearing block mounted upon the base and having an elevated facing surface formed thereon, a disk mounted upon the facing surface of the bearing block, said disk having a semicircular slot formed therein located adjacent to one edge thereof, an arm mounted upon the disk having its inner end pivoted concentrically with the semicircular portion of the base and a clamping device slidably mounted upon the disk throughout the length of said slot adapted for holding the arm in different radial positions upon the disk.

7. A protractor, comprising a base, a semicircular portion on the base graduated to indicate fractions of a circle, a bearing block upon the base having a facing surface extending in a plane parallel with the base, a disk rotatably mounted upon the bearing block positioned concentrically in relation to the said semicircular portion of the base, an arm mounted upon the disk and extending radially therefrom, a cylinder having graduations thereon mounted upon the base, and mechanism interposed between the cylinder and the disk for rotating the cylinder and the disk.

8. A protractor comprising a base, a semicircular portion upon the base having graduations thereon, a bearing block mounted upon the base and having an elevated facing surface formed thereon, a disk mounted upon the facing surface of the bearing block, mechanism upon the base for rotating the disk, an arm mounted upon the disk extending radially therefrom, and said arm having an offset portion formed therein whereby the free end of the arm will be positioned adjacent to the surface of the base carrying said graduations.

9. A protractor comprising a base, a semicircular portion on the base graduated to indicate fractions of a circle, a pivot pin centrally mounted upon the base, a disk rotatably mounted upon the pin, an arm adjustably mounted upon the disk, bearings upon the base, a shaft rotatably mounted in the bearings for rotating the disk, a cylinder mounted upon the bearings, mechanism for rotating the cylinder and the shaft simultaneously, a bar extending lengthwise of the cylinder, posts at either end of the bar for holding the latter in a fixed position, reading marks upon the bar, and graduations upon the cylinder indicating fractions of the graduations upon the semicircular portion of the base when read upon the bar.

10. A protractor comprising a base, a semicircular portion on the base graduated to indicate fractions of a circle, a pivot pin centrally mounted upon the base, a disk rotatably mounted upon the pin, an arm adjustably mounted upon the disk, a shaft rotatably mounted upon the base, a worm upon the shaft, teeth formed upon the periphery of the disk in engagement with the worm, a cylinder mounted upon the base, graduations upon the cylinder, gear wheels for communicating motion from the shaft to the cylinder, and a member mounted upon the base and associated with the cylinder for reading the graduations on the cylinder indicating fractions of the graduations on said semicircular portion of the base.

11. A protractor comprising a base, a semicircular portion on the base graduated to indicate fractions of a circle, a pivot pin centrally mounted upon the base, a disk rotatably mounted upon the pin, an arm adjustably mounted upon the disk, a shaft rotatably mounted upon the base in operative engagement with the disk for rotating the latter, a cylinder mounted upon the base and in rotatable engagement with the shaft, said cylinder having graduations arranged thereon proportional to the graduations upon the semicircular portion of the base and a member mounted upon the base and associated with the cylinder for reading the graduations on the cylinder.

12. A protractor comprising a base, a semicircular portion on the base graduated to indicate fractions of a circle, a pivot pin centrally mounted upon the base, a disk rotatably mounted upon the pin, an arm adjustably mounted upon the disk, gear-teeth formed upon the periphery of the disk, a shaft mounted upon the base, a worm upon the shaft meshing with the teeth upon the disk, a cylinder mounted upon the base, gear wheels interposed between the cylinder and the shaft whereby one revolution of the cylinder will move the arm over one of the said graduations formed upon the base, said cylinder having graduations arranged thereon, and a bar mounted upon the base and associated with the cylinder for reading the graduations on the cylinder.

13. A protractor comprising a base, a semicircular portion on the base graduated to indicate fractions of a circle, a pivot pin centrally mounted upon the base, a disk rotatably mounted upon the pin, an arm mounted upon the disk, a clamping device for adjustably securing the arm in various radial positions upon the disk, a shaft rotatably mounted upon the base, gearing associated with the shaft and the disk for rotating the disk by the shaft, a cylinder rotatably mounted upon the base, gear wheels for rotating the cylinder with the shaft, a handle for rotating the gear wheels,

a bar mounted in a fixed position in relation to the surface of the cylinder, said cylinder having graduations arranged thereon dividing its periphery into equal parts, said cylinder having graduations arranged thereon dividing its length into equal parts, said bar having reading marks thereon corresponding to the last mentioned graduations upon the cylinder, and said bar positioned obliquely in relation to the graduations extending lengthwise of the cylinder.

In testimony whereof I affix my signature.

JOHN D. McLEOD.