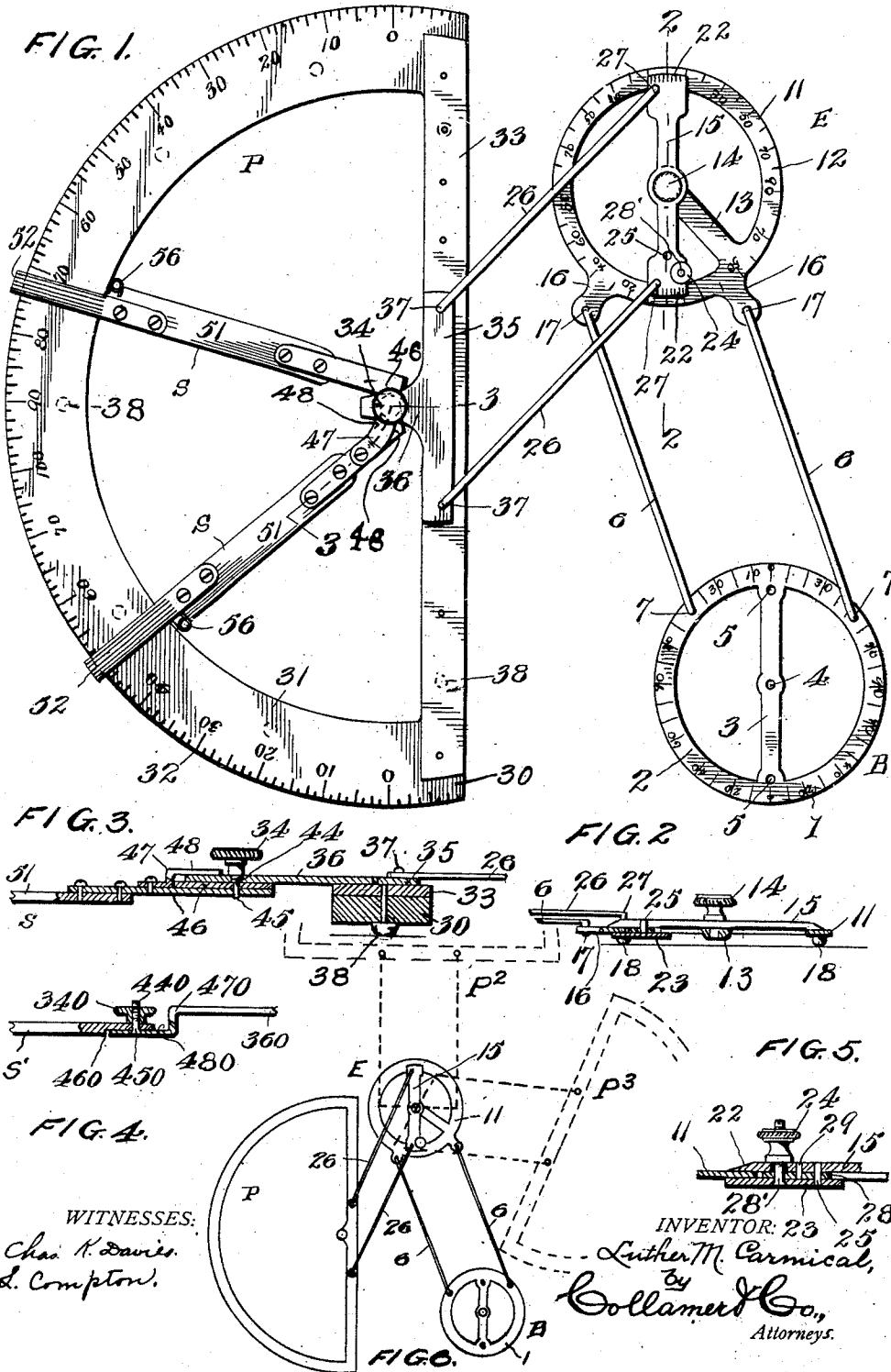


L. M. CARMICAL.
PLOTTER.
APPLICATION FILED JUNE 4, 1910.

986,358.

Patented Mar. 7, 1911.



UNITED STATES PATENT OFFICE.

LUTHER M. CARMICAL, OF JONESVILLE, VIRGINIA.

PLOTTER.

986,358:

Specification of Letters Patent.

Patented Mar. 7, 1911.

Application filed June 4, 1910. Serial No. 565,056.

To all whom it may concern:

Be it known that I, LUTHER M. CARMICAL, a citizen of the United States, and resident of Jonesville, Lee county, State of Virginia, have invented certain new and useful Improvements in Plotters; and my preferred manner of carrying out the invention is set forth in the following full, clear, and exact description, terminating with claims particularly specifying the novelty.

This invention relates to drafting instruments, and more especially to plotters; and the object thereof is to improve the construction of the same.

To this end the invention consists broadly, in supporting a protractor from a base by two arms connected by an adjustable elbow pivot, each arm comprising twin links; and the invention consists specifically in certain details for carrying out this broad idea and improving the construction of the parts.

My preferred form of carrying out the idea is described in the following specification and illustrated in the drawings wherein—

Figure 1 is a plan view of the plotter complete. Fig. 2 is a section on the line 2—2 of Fig. 1. Fig. 3 is a section on the line 3—3 thereof. Fig. 4 is a similar section of parts shown in Fig. 3, illustrating a modification thereof. Fig. 5 is an enlarged section through the clamp between the bar and ring of the elbow pivot. Fig. 6 is a detail showing the protractor in several positions with relation to the base.

Referring to the drawings, the letter B designates broadly the base, E the elbow pivot, P the protractor, and S the scale arms or arm moving over the latter; the entire protractor and its scales being connected with the base by two arms, each comprising a pair of links pivoted at their outer ends respectively to the protractor and to the base and adjustably connected to each other at the inner ends by said elbow pivot, the links of each pair standing always in parallelism as shown in the drawings and described in detail below.

The base B is shown in Fig. 1 as consisting of a ring 1 having graduations 2 around its periphery and a fixed strap 3 extending diametrically across it and pierced with a hole 4 at the center of the ring and the two outer holes 5 near the extremities of said strap; although it is obvious that the ring

seriously departing from the spirit of my invention. It is intended that this base shall be secured upon a support such as the drawing board by passing pins through the holes 4 and 5 into the board, although the pins at 5 could be removed and the base turned around its center as the graduations 2 will permit, in order to set the entire instrument differently upon the board. Hence the pins through the outermost holes 5 serve to fasten the base in its adjusted position on the board. The base B is connected with the protractor P by a two-arm member of which each arm comprises parallel links, and the pair of links numbered 6 are pivotally connected at 7, 7 to the ring 1 as shown, while the other pair of links 26 will be described below. The elbow pivot E between the meeting ends of said arms is here shown as comprising an open ring 11 having graduations 12 around its periphery and a radial spoke 13 projecting from one point inward to its center through which latter passes a set screw 14, and on the screw under its head is loosely mounted a revolving bar 15 for a purpose to be presently described. Formed with and projecting rigidly from the ring 11 is a pair of lugs 16 to which the links 6 are pivoted at points 17, 17 that are remote from each other the same distance as the pivots 7, 7 whereby the links 6 will be maintained in parallelism.

The revolving bar 15 overlies the spoke 13 and ring 11 and its opposite extremities may each be provided with a vernier 22 to coact with the graduations 12 so that this bar can be very finely adjusted upon the graduated ring and then tightened by means of the set screw 14. Beneath the bar, as by a rivet 29, is secured a spacing plate or washer 28 which is of about the thickness of the ring 11 and adapted to move within it; and beneath the washer, as by a rivet 25, is loosely held a jaw 23 whose outer end is adapted to extend beneath the ring as best seen in Fig. 5. Fast in this jaw is a screw 28' leading upward through the washer and bar and receiving a milled nut 24. These parts form a clamp additional to the set screw 14, for holding the bar 15 where it is adjusted. In order to allow the pivot E to move freely over the board or the paper thereon, the ring 11 is provided with feet 18 preferably semi-globular and of glass or other smooth material and projecting away slightly below the lower surface of the ring

as best seen in Fig. 2. The links 26 are pivotally connected to the bar 15 near the ends thereof at the points 27, 27, and lie in a plane whereby they move the links 6.

5 The protractor P consists of a rather thick and large segment or semicircle 31 inscribed around its edge with very fine graduations 32 whereby even fractions of degrees may be measured, and the extremities
10 of the segment are continued a little beyond a true diameter through the circle of which it forms a part and are rigidly connected by a straight strap 33, both the strap and the segment having feet 38 in their lower faces
15 corresponding with those numbered 18 beneath the pivot E whereby the entire protractor can be slid over the paper or board. Secured upon the strap 33 is the cross bar 35 of a T-shaped member whose stem 36
20 forms an arm projecting from this bar within the segment 31 so as to carry the set screw 34 which stands at the true center thereof, and the outer ends of the links 26 are pivoted to said bar 35 at points 37, 27
25 that are remote from each other the same distance as the pivots 27, 27 whereby the links 26 will be maintained in parallelism.

The scale S may be made in one or more arms as explained below, but when made in
30 two arms as shown in Figs. 1 and 3 their pivotal connection with the protractor at its center will in its preferred form be about as follows: The set screw 34 has a threaded portion 44 and beyond that a smooth tip
35 45 (see Fig. 3) and the threaded portion is of a length to engage through the stem 36 which stands in a plane above the segment 31 by reason of the fact that such stem is supported by the strap 33 and the latter in
40 turn is secured upon the segment. To make up for the increased thickness of the strap 33, each scale arm S is provided with a metal plate 46 secured upon the inner end of the arm and pivotally mounted on the
45 smooth tip 45 of the set screw; and when there are two arms the plates 46 will be of elbow-shape as described below and will overlie each other beneath the stem 36 as best seen in Fig. 3. In order to hold the
50 plate upon the smooth tip of the set screw a hook 47 is attached thereto (or to the lowermost plate 46 if there are two of them) and its bill 48 overlies the inner end of the stem 36 and moves around the set screw
55 when the scale arm is swung as will be clear. In order to detach the arm or arms, the set screw 34 is withdrawn from the stem and the arms removed laterally, first removing the arm carrying the hook if there should be
60 two of the arms; and they can be reinserted by a reverse operation.

In the modification illustrated in Fig. 4 the plate 46 is omitted, and the scale arm S' extended and reduced at its inner end as at
65 460 and pierced with a hole which can be

passed downward over the smooth end of a pin 450 which is threaded as at 440 for the reception of a button 340 to hold the scale arm in place. In this construction said pin rises rigidly from the plate 360 which is
70 here depressed or hooked as at 470 so that its outer end or bill 480 lies in a plane beneath the thinner inner end 460 of the scale arm.

The scale arm S can obviously be made in
75 one piece connected with the stem 36 by either of the pivot methods described above, but as shown in Fig. 1 I prefer to make it in two members 51 in which case the plates 46 will be elbows so that their bodies can be
80 secured upon the inner ends of the members 51 and their bent portions can lap each other and be pivoted on the set screw 34 as already described. When brought together the adjacent edges of the two members 51 meet
85 each other on a line which is truly radial from the center 34 across the graduations upon the segment 31, and the outer end of each member overlies the segment and is provided with a transparent vernier 52 to
90 coact with said graduations in a manner which will be clear. In order to prevent the member from accidentally moving after it has been set in the desired position, it is provided with a spring 56 at a suitable point to
95 press radially outward against the inner edge of the segment 31 which I have said was purposely made rather thick; and while these springs are shown as employed with a scale arm comprising two members 51, it
100 will be clear that if there is but one member or arm a single spring only will be required.

The use of this instrument, when constructed about as above described, I have thought best to illustrate by showing it in
105 dotted lines in Fig. 6 in some of the many positions it may assume around the base B without adjusting the latter at all after first fixing it upon the drawing board. In the position shown in full lines the protractor P stands quite near the base B and the angle of the elbow pivot is rather acute, but it will be obvious that the bar 15 could be adjusted to make the angle greater or perhaps even less than shown so as to set the
115 protractor farther from or nearer to the base. Another position of the protractor indicated by the letter P², is obtained by loosening the set screw 14 and the clamp 23 and turning the bar 90 degrees to the right
120 upon the ring 11 and resetting it, and here the twin links 26 are shown as standing at right angles to said bar instead of at acute angles to it as in the full lined position. Still a third position is shown by the
125 protractor dotted at P³, where the bar 15 has been turned from the full lined position about 170 degrees to the left and the protractor has moved across the base B to its dotted position nearly opposite that shown
130

in full lines. In any of these or other positions which the protractor may assume, it will be clear that after securing the bar 15 in place in the elbow the protractor can be swung from side to side and the twin links 26 will keep its base 30 always parallel with the bar. I have not considered it necessary to illustrate how the pins at 5 through the base B might be removed and the base turned on its center 4, and it will be clear that when this is done and the base reset upon the drawing board the elbow pivot E may be projected to the east or west of the base, or even to the south of it by giving the base an adjustment of 180 degrees; and here also the twin links 6 permit the pivot E to be adjusted with reference to the base after the latter has been set. Nor do I consider it necessary to amplify the uses of an instrument of this character, as the same are well known to those skilled in the art and accustomed to handling such instruments; but it will be obvious that the mechanical construction described permits a wide range of adjustment of the protractor around and toward and from the base without moving the latter after it has been attached to the drawing board, and a still wider range of adjustment by simply removing and resetting the pins through the holes 5 though without removing the central pin 4 from the center of the base. Hence it is quite possible, if the parts are properly proportioned, to first fix the center of the base at practically the center of a large sheet of paper, and then by following the instructions above given reach all parts of that sheet with a protractor having a comparatively large segment so that its graduations will be as fine as the most delicate requirements may necessitate. Further than this it will not be necessary to specify the size, proportions, or materials of parts, and I reserve the right to make changes in or additions to the details of construction set forth as far as consistent with the terms of the following claims.

I claim—

1. A drafting instrument comprising a base having graduations around its periphery and pierced with a hole at its center and with others remote therefrom, said holes adapted for the insertion of pins whereby the base may be secured upon a sheet of paper spread over a drawing board; a measuring instrument; an elbow pivot consisting of two members rotarily adjustable upon each other; and arms respectively connecting the base with one pivot member and the other pivot member with said measuring instrument, each arm consisting of a pair of parallel links pivoted at their extremities to the parts which they connect.

2. A drafting instrument comprising a

base consisting of a ring having graduations around its periphery and a fixed strap extending diametrically across it and pierced with a hole at its center and with others remote therefrom, said holes adapted for the insertion of pins whereby the base may be secured upon a sheet of paper spread over a drawing board; a measuring instrument; an elbow pivot consisting of two members rotarily adjustable upon each other, and one of them having lugs; and arms respectively connecting the ring of the base with the lugs of one pivot member and the other pivot member with said measuring instrument, each arm consisting of a pair of parallel links pivoted at their extremities to the parts which they connect.

3. A drafting instrument comprising a base having graduations around its periphery and pierced with a hole at its center and with others remote therefrom, said holes adapted for the insertion of pins whereby the base may be secured upon a sheet of paper spread over a drawing board; a protractor having graduations around its segment; an elbow pivot consisting of an open ring having graduations around its periphery and a radial spoke extending from the ring to its center, a bar pivoted to said center and moving over the graduations of the ring, and means for locking the bar upon the spoke after the bar has been adjusted; and arms respectively connecting the base with the ring and the bar with the protractor, each arm consisting of a pair of parallel links pivoted at their extremities to the parts which they connect.

4. A drafting instrument comprising a base consisting of a ring having graduations around its periphery and a fixed strap extending diametrically across it and pierced with a hole at its center and with others remote therefrom, said holes adapted for the insertion of pins whereby the base may be secured upon a sheet of paper spread over a drawing board; a protractor having graduations around its segment; an elbow pivot consisting of an open ring having graduations around its periphery and a radial spoke extending from the ring to its center, a bar pivoted to said center and moving over the graduations of the ring, and means for locking the bar upon the spoke after the bar has been adjusted; and arms respectively connecting the base with the ring and the bar with the protractor, each arm consisting of a pair of parallel links pivoted at their extremities to the parts which they connect.

5. A drafting instrument comprising a base having graduations around its periphery and pierced with a hole at its center and with others remote therefrom, said holes adapted for the insertion of pins whereby the base may be secured upon a sheet of paper spread over a drawing board; a pro-

tractor having graduations around its segment; an elbow pivot consisting of an open ring having graduations around its periphery and a radial spoke extending from the ring to its center, a bar pivoted to said center and moving over the graduations of the ring, a clamp for connecting one extremity of the bar with the ring, and additional means for locking the bar upon the spoke after the bar has been adjusted; and arms respectively connecting the base with the ring and the bar with the protractor, each arm consisting of a pair of parallel links pivoted at their extremities to the parts which they connect.

6. A drafting instrument comprising a base adapted to be secured upon a sheet of drawing paper, a protractor, an elbow pivot in two members, an arm consisting of parallel links connecting the base with one member of the pivot, an arm consisting of parallel links standing in a higher plane than the first pair and connecting the other member of the pivot with said measuring instrument, and feet beneath the pivot and measuring instrument adapted to slide over the paper.

7. In a drafting instrument, the combination with a protractor consisting of a straight base and a segment which is larger than a semicircle, a strap secured upon

said base and having a stem projecting into the true center of the segment, and means for adjustably supporting said strap from a fixed point on the drawing board; of a scale arm whose outer end moves over the segment, a plate secured to its inner end, a set screw threaded through said stem and having a smooth tip passing through said plate, and a hook secured to the latter with its bill resting upon said stem when the parts are in position.

8. In a protractor comprising a graduated segment and a straight base, the combination with a strap secured upon the base and having a stem projecting into the true center of the segment, and a set screw threaded through said stem and having a smooth tip beneath it; of a scale comprising members whose outer ends move over the segment and coact with its graduations, elbow plates secured to their inner ends and pivoted on said tip, and a hook secured to the lowermost plate with its bill resting upon said stem when the parts are in position.

In testimony whereof I have hereunto subscribed my signature this the 1st day of June, A. D. 1910.

LUTHER M. CARMICAL.

Witnesses:

CARL H. WILLOUGHBY,
GEORGE W. BLANKENSHIP.