

June 21, 1932.

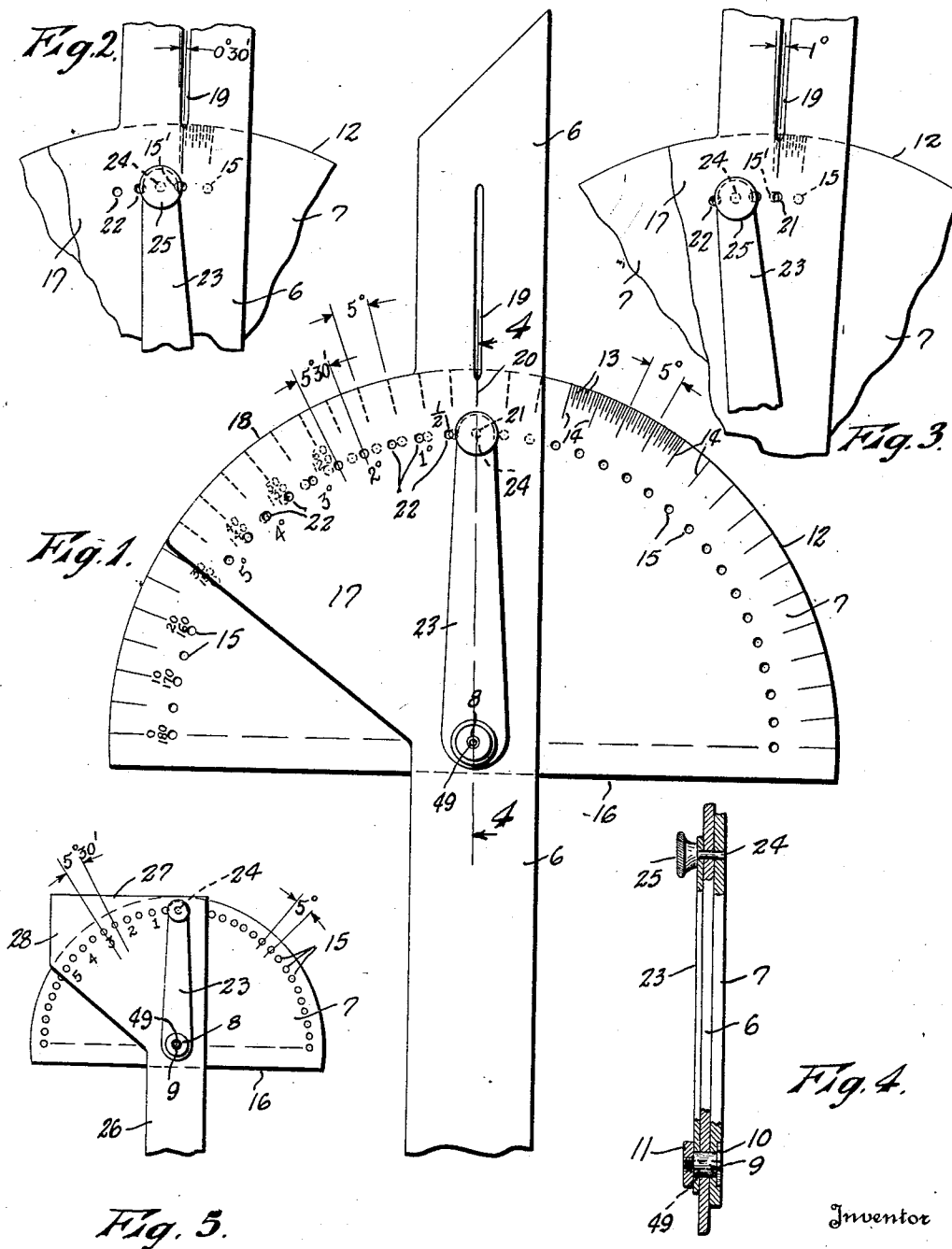
A. DAVIE

1,864,341

DRAFTSMAN'S VERNIER PROTRACTOR

Filed Feb. 9, 1931

2 Sheets-Sheet 1



Inventor

Alexander Davie

By

Hooster & Davis

Attorneys

June 21, 1932.

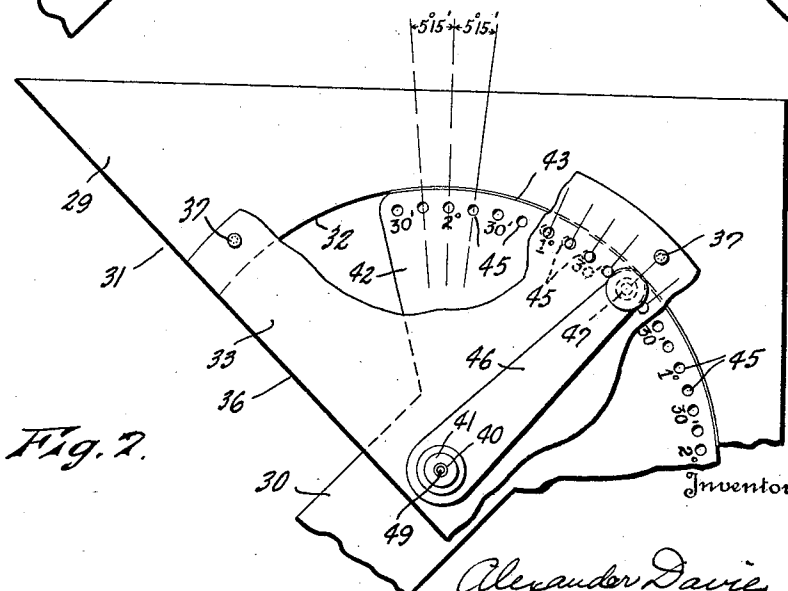
A. DAVIE

1,864,341

DRAFTSMAN'S VERNIER PROTRACTOR

Filed Feb. 9, 1931

2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

ALEXANDER DAVIE, OF BRIDGEPORT, CONNECTICUT

DRAFTSMAN'S VERNIER PROTRACTOR

Application filed February 9, 1931. Serial No. 514,530.

This invention relates to new and useful improvements in vernier protractors such as are used by draftsmen.

An object of the invention is to provide a protractor including a head and a straight edge so constructed and arranged that the head may be set to any desired degree or any fraction of a degree depending on the fineness of adjustment provided for in the manufacture of the instrument.

A further object is to provide a protractor as stated and including means whereby the desired adjustments may be easily and quickly made, the making of an adjustment involving only a more or less mechanical operation, and not requiring the reading of a finely divided scale or the comparing of two such scales.

Other objects and advantages will become apparent from a consideration of the following detailed description taken in connection with the accompanying drawings where-in satisfactory embodiments of the invention are shown. However, it is to be distinctly understood that the invention is not limited to the details shown and described but includes all such variations and modifications as fall within the spirit of the invention or the scope of the appended claims.

In the drawings:

Fig. 1 is a plan view of a protractor complete comprising the invention including the head and straight-edge or arm shown as arranged at 90 degrees whereby to form a T-square.

Fig. 2 is a plan view of a portion of the protractor showing the same set one half of one degree or 30 min. off 90 degrees.

Fig. 3 is a view similar to Fig. 2 the protractor being set one complete degree off 90 degrees.

Fig. 4 is a sectional view on the line 4—4 of Fig. 1.

Fig. 5 is a plan view on a reduced scale showing a slightly modified form of the invention.

Fig. 6 is a view similar to Fig. 1 and showing a further modification.

Fig. 7 is a view somewhat similar to Fig.

6, parts being broken away to better illustrate structure, and

Fig. 8 is a sectional view on the line 8—8 of Fig. 6.

Referring in detail to the drawings, particularly to the invention as illustrated in Figs. 1 through 4, at 6 is shown the straight edge or protractor arm or blade, which while of any suitable material is preferably transparent and of the material usually employed in draftsman's angles and the like. This may be a cellulose compound. A head 7 is pivoted to the straight edge 6 at 8 and it is preferably of the same material as the straight edge. As is best shown in Fig. 4 the pivot 8 is a shouldered stud 9 having its head 10 counter-sunk in the protractor head 7 and secured in place by nut 11.

The head 7 includes a curved edge 12 marked or divided into degrees and half degrees as indicated at 13, the distance between any two of the longer lines 14 of the markings or graduations being five degrees. In the head 7 are a number of openings or perforations 15, one such opening or perforation being arranged in line with each of the lines 14, whereby the openings 15 are each five degrees apart. It is, of course, to be understood that the distance between the marks and openings as above given, that is, fractions of a degree or five degrees, is by way of suggestion or example and that the lines or markings may be arranged further apart or closer together as desired. In addition to the above, head 7 includes an edge 16 forming the edge corresponding to the T-head of a T-square.

Straight edge 6 has a lateral extension 17 provided with a curved edge 18 corresponding in curvature with the edge 12 of the head 7. Further the straight edge may in its upper portion be provided with a conspicuous marking as for example the slot 19 and extending from the inner end of this slot is an indicator line 20. This slot 20 also provides convenient means for insertion of the lead of a pencil to draw a line through the center of pivot 8 at whatever angle to line or edge 16 the device happens to be set. Immediately beneath the line 20 there is provided in extension 17 an opening 21 and arranged in an arc

of which the opening 21 forms one end are a series of openings 22 in extension 17. Each of the openings 22 is spaced five and one half degrees from the next adjacent opening 22.

- 5 However, as the description proceeds it will become evident that the openings 22 may be spaced apart five and one-quarter degrees or any other fraction which may be found desirable.
- 10 Opening 21 and openings 22 are so arranged that they may be aligned with the openings 15 of the protractor head 7. Pivoted to the protractor by means of the pivot 8 is a carrier member or arm 23 at its outer
- 15 end carrying a pin 24 having a head 25. The member 23 is preferably formed by the same material as the remainder of the protractor and is somewhat flexible and may therefore be bent or sprung away from the straight edge
- 20 in order that the pin 24 may be transferred from one of the openings in the straight edge to another of said openings when making adjustments.

- In the operation of the device assuming
- 25 that the pin 24 is through the opening or perforation 21 in the straight edge or arm and through the opening 15 representing ninety degrees on the head 7, a T-square will be formed since the arm or straight edge 6 will be at right angles to the edge 16 of the head.
- 30 Fig. 2 shows the device adjusted to ninety and one-half degrees or to ninety degrees and thirty minutes. To accomplish this all that is necessary is insert pin 24 through the next
- 35 opening 22 marked $\frac{1}{2}$ and the next opening 15 to one side of the central opening 15' of the series 15 or that is the opening in member 7 corresponding to the 90° position. Therefore to set the device to any degree or half
- 40 degree it is only necessary that the indicator line 20 be brought above the reading representing the closest by five to the exact degree desired. In the example chosen since ninety will be the closest coarse reading on the scale
- 45 when the desired degree is ninety degrees and thirty minutes, line 20 will be brought above the reading "90" and the head 25 of the pin 24 will be grasped and the member 23 will be swung about the pivot 8 to insert the pin
- 50 through the opening 22 adjacent the opening 21 and marked $\frac{1}{2}$ and then the straight edge will be swung slightly to the right to have the pin enter the opening 15 which is immediately to the left of the ninety degree opening 15
- 55 and indicated at 15'. As the opening 22 into which the pin has been inserted is five and one-half degrees off or away from the ninety degree opening 21, it will be necessary to move the straight edge one-half degree off of
- 60 a right angle in order that the pin 24 may be inserted in that opening 15 immediately to the left of the ninety degree opening 15'. Therefore the protractor will be set to give ninety and one-half degrees or ninety degrees and thirty minutes at one side of the

straight edge. In other words the straight edge will be one-half degree or 30 minutes off a right angle to edge 16.

Figure 3 shows the protractor set to give an angle of ninety-one degrees. To set the protractor to give this angle it is but necessary to set the parts as described and to then manipulate the pin 24 to dispose the same in the second opening 22 removed from the opening 21 and to then while pressing inwardly on the head 25 of the pin 24 move the straight edge to the right about its pivots until the said opening in the straight edge comes into registry or alignment with the second opening 15 removed from the ninety degree opening 15' and marked 1° when the pin will pass into such second opening and secure the parts in adjusted position. Since the pin has been inserted in the second opening 22 it will be understood that the straight edge is set a complete degree off ninety degrees since each opening 22 adds one-half of a degree. To get any other angle it is but necessary to carry out the operations as above described each opening 22 removed from the opening 21 representing an additional one-half degree.

From the above it will be seen that the protractor may be easily and quickly adjusted to a whole or fractional degree since it is not necessary to read the fine markings 13 but it is only necessary to position the line 20 above that line 14 representing the closest by five to the degree desired and then move the pin 24 over a sufficient number of openings 22 so that each half degree contributed by each opening will equal the desired degrees above the main marking chosen. Of course it will be understood that other than a half degree may be added by each of the openings 22 whereby finer adjustments or coarser adjustments may be obtained. An example of a different arrangement whereby $\frac{1}{4}$ degree adjustments may be secured is shown in Figs. 6, 7 and 8.

Fig. 5 shows a slightly modified form of the invention. In this figure the head 7 is used and a straight edge 26 is secured to the head 7 by means of the pivot 8 which also serves to secure the member 23 carrying the pin 24. The straight edge or arm 26 has its upper end squared off as at 27, the extension 28 of this straight edge having a somewhat different configuration from that shown at 17 in the figures previously described. However, the straight edge 26 has an opening 21 corresponding with the opening 21 of the straight edge 17 and also has the openings 22. Since the operation of the modified form of protractor shown in Fig. 5 is the same as that of the protractor shown in the other figures a further description of operation is believed unnecessary.

In Figs. 6, 7 and 8 is shown a further modified form of the invention. The protractor of

these figures includes a head 29 and a straight edge or protractor arm or blade 30. Head 29 is shown as in the form of a 45 degree triangle and may be used as such. Also the instrument may be used as a T-square or a
 5 forty-five degree angle when the head and arm are set at right angles as shown in Figs. 6 and 7 and whereby various other angles may be obtained by adjusting the head and arm relatively.

10 As herein disclosed the head or triangle 29 is cut away along its hypotenuse 31 whereby to provide an arcuate recess 32. Disposed over this recess 32 is a member 33 in the form of a half circle disc graduated along its arcuate edge 34 as at 35 and having its straight edge 36 arranged flush or in alignment with the edge 31 of the head or triangle 29. The member 33 is secured to the head as by means
 15 of rivets 37 whereby the member forms part of or is movable with the head or triangle 29.

20 From the above it will be seen that the member 33 is not disposed in the recess 32 but merely closes one side of the recess. The member 33 may be provided with relatively long graduation or indicator lines 38 arranged five degrees apart as in the case of the line 14 of the head 7. For each of the lines 38 there is an opening 39, the openings 39
 25 corresponding with the openings 15 in the head 7. Since the openings 39 are spaced apart as are the lines 38 it will be understood that the openings are five degrees apart.

30 The straight edge 30 is pivoted to the member 33 as by means of a stud 40 which passes through the straight edge and member and is secured as by means of a nut 41. Stud 40 passes through the straight edge intermediate the ends of the latter and one end portion of the straight edge is disposed within the recess 32. This end of the straight edge
 35 which is indicated at 42 is enlarged and as disclosed is in the form of a segment having an arcuate edge 43 corresponding with the arcuate edge of the recess.

40 The portion 42 of the straight edge is provided with an opening 44 adapted to be brought into registry with the 90 degree opening 39 in the member 33. When the parts are thus arranged the straight edge 30 will be
 45 arranged at 90 degrees to the edge 31 of the head 29 and a T-square will be provided. Head 42 includes other openings 45 spaced from each other five and one quarter degrees or five degrees and fifteen minutes. It is through this arrangement or spacing of the openings that fine adjustments of the head and straight edge relative to each other may be made.

50 Secured on the stud 40 is a member or arm 46 adapted for pivotal movement about the stud and at its free end carrying a pin 47 having a head 48. This member 46 is somewhat flexible in order that it may be shifted
 55 to dispose the pin 47 in the desired openings

39. When the opening 44 has been brought into registry with the ninety degree opening 39 of the member 33 to form a T-square the member 46 may be shifted to dispose the pin 47 through these registering openings and thus secure the parts in adjusted position.

The operation of the form of invention shown in Figs. 6 through 8 is substantially the same as for the form of invention shown in the other figures. The only difference is that with the device disclosed in Fig. 6 through 8 the protractor may be adjusted to quarter of degrees whereas with the device first disclosed provision is not made for adjustments closer than half degrees.

By way of illustrating the operation a description of the necessary adjustments in order to secure the device or protractor adjusted to give say eighty degrees and forty-five minutes will be given. Assuming the parts to be as shown in the drawings it is first necessary to remove the pin 47 from the registering openings. Next, the head and straight edge will be shifted relatively to bring the eighty degree mark on the member 33 into position above the opening 44 in the straight edge. Then the pin will be moved across the member 33 three openings which will also represent three openings in the straight edge and the pin will be inserted in the third opening 39 in the member 33 and the straight edge will then be moved a slight distance to bring its third opening into registry with the third opening of the member 33. By inserting the pin into the openings which have now been brought into registry the head and straight edge will be secured in adjusted position and at an angle of eighty degrees and forty-five minutes relative to each other. Other adjustments may be made in a similar manner and it is not believed that a further description is necessary.

In each of the forms it is preferred to provide the pivot studs 9, and 40 with a longitudinal central opening 49 for insertion of a steel point such as a needle, the point of a compass or the like to engage the paper at any desired point to form a pivot center about which the device may be adjusted to any desired position.

Having thus set forth the nature of my invention what I claim is:

1. A protractor comprising a head having perforations spaced a given number of degrees apart, a straight edge pivoted to said head, said straight edge having a lateral extension overlapping the perforations in the head, the straight edge and extension having spaced perforations, the distance between the perforations in the straight edge and extension being a fraction of a degree greater than the distance between the perforations in the head, and said perforations in the straight edge and extension being sufficient in number whereby the sum of the additional

fractions of degrees represented by them equal the distance between two adjacent perforations in the head.

2. A protractor comprising a head member having perforations spaced a given number of degrees apart, a straight edge member pivoted to said head and including a portion overlapping the perforations of the head, said straight edge member having perforations spaced a given number of degrees apart, the perforations of one member adapted to be brought into registry with the perforations of the other member, the perforations in one of said members being spaced apart a fraction of a degree greater than are the perforations of the other member, and means adapted to enter registering perforations to secure the head and straight edge in adjusted position.

3. A protractor comprising a head member having perforations spaced a given number of degrees apart, a straight edge member pivoted to said head member and including a portion overlapping the perforations of the head member, said straight edge member having perforations in said portion and spaced a given number of degrees apart, the perforations of one member adapted to be brought into registry with the perforations of the other member, the perforations of one of said members being spaced apart a fraction of a degree greater than are the perforations of the other member, a member on said pivot and adapted to be moved relative to the head and straight edge, and a pin carried by said member and adapted to be passed through registering perforations in the members to secure them in adjusted position.

4. A protractor comprising a head member having perforations spaced a given number of degrees apart, a straight edged member having perforations spaced a given number of degrees apart, the perforations in one of said members being spaced apart a fraction of a degree greater than are the perforations of the other member, means pivoting the straight edge member and the head member together whereby a perforation of one of said members may be brought into registry with a perforation of the other of said members for adjustment, means adapted to be disposed in the registering perforations to secure the members in adjusted position, said head having an arcuate edge and a straight edge, and said straight edge member projecting in opposite directions from each of said edges of the head.

5. A protractor comprising a triangular head member having an arcuate recess opening through one edge thereof, an arcuate member disposed over said recess and secured to said triangle, a straight edge pivoted to said arcuate member and having a portion extending into said recess, said arcuate member and extending portion of the straight edge each having a series of perforations, the perforations of one of said series being spaced

apart a fraction of a degree greater than are the perforations of the other of said series, said head member and straight edge adapted to be moved relatively to bring a perforation of one of them into registry with a perforation of the other of them, and means to enter the registering perforations to secure the parts in adjusted position.

6. A protractor comprising a triangular head member having an arcuate recess opening through one edge thereof, an arcuate member disposed over said recess and secured to said triangle, a straight edge member pivoted to said arcuate member and having a portion extending into said recess, said portion having an arcuate edge corresponding with the arcuate edge of the recess, said arcuate member and extending portion of the straight edge each having a series of perforations, the perforations of the series in the straight edge being spaced apart a fraction of a degree greater than are the perforations in the arcuate member, said head member and straight edge adapted to be moved relatively to bring a perforation in one of them into registry with a perforation in the other of them for the purpose of adjustment, and means to enter the registering perforations to secure the parts in adjusted position.

7. A protractor comprising a head member having perforations spaced a given number of degrees apart, a straight edge member pivoted to said head member and including a portion overlapping the perforations in the head member, said straight edge member having perforations spaced a given number of degrees apart, the perforations of one member adapted to be brought into registry with the perforations of the other member, the perforations in one of said members being spaced apart a fraction of a degree greater than are the perforations in the other member, the perforations in said former member being sufficient in number whereby the sum of the additional fractions of degrees represented by them equal the distance between two adjacent perforations in the other member, and means adapted to be passed through registering perforations to secure the head member and straight edge member in adjusted position.

In testimony whereof I affix my signature.
ALEXANDER DAVIE.