

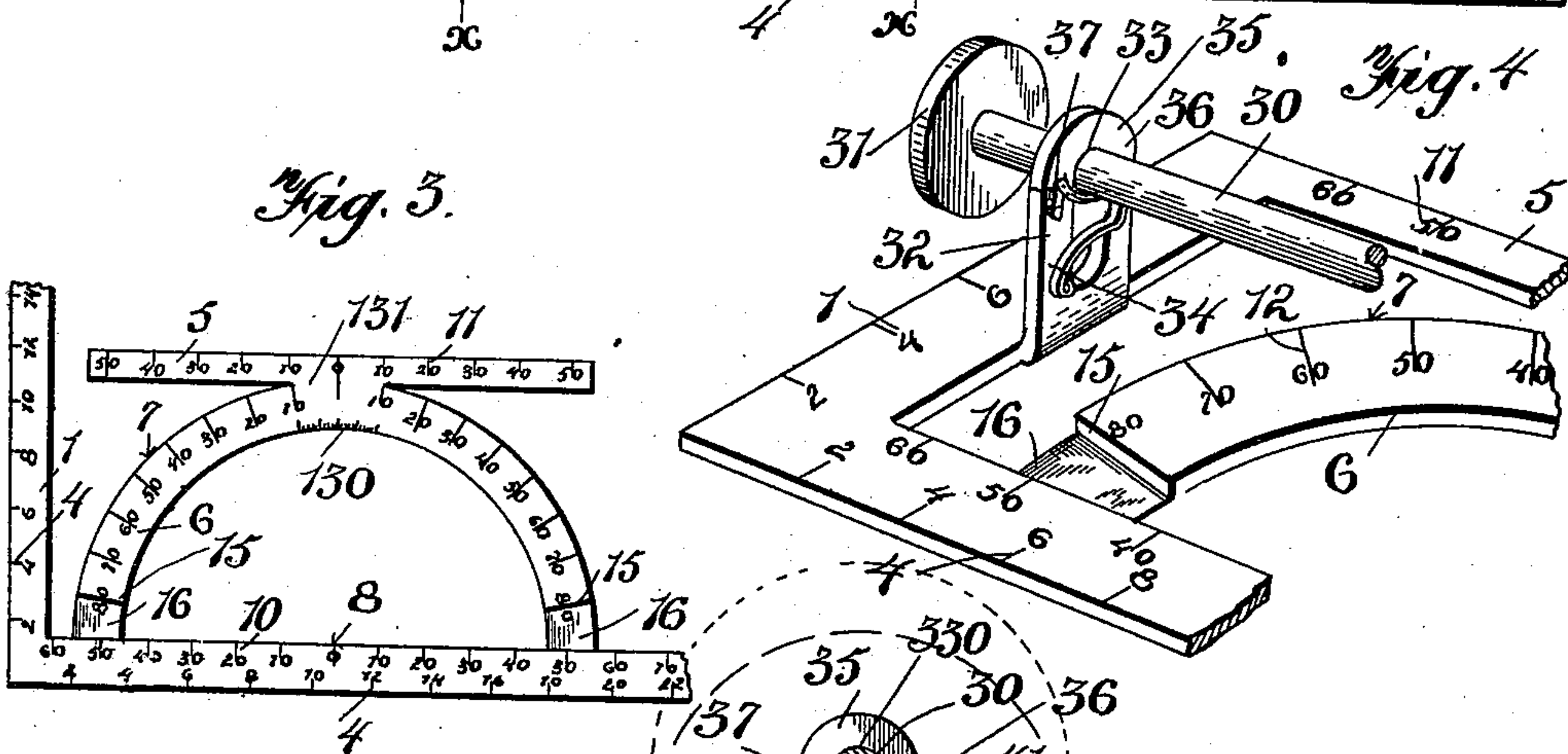
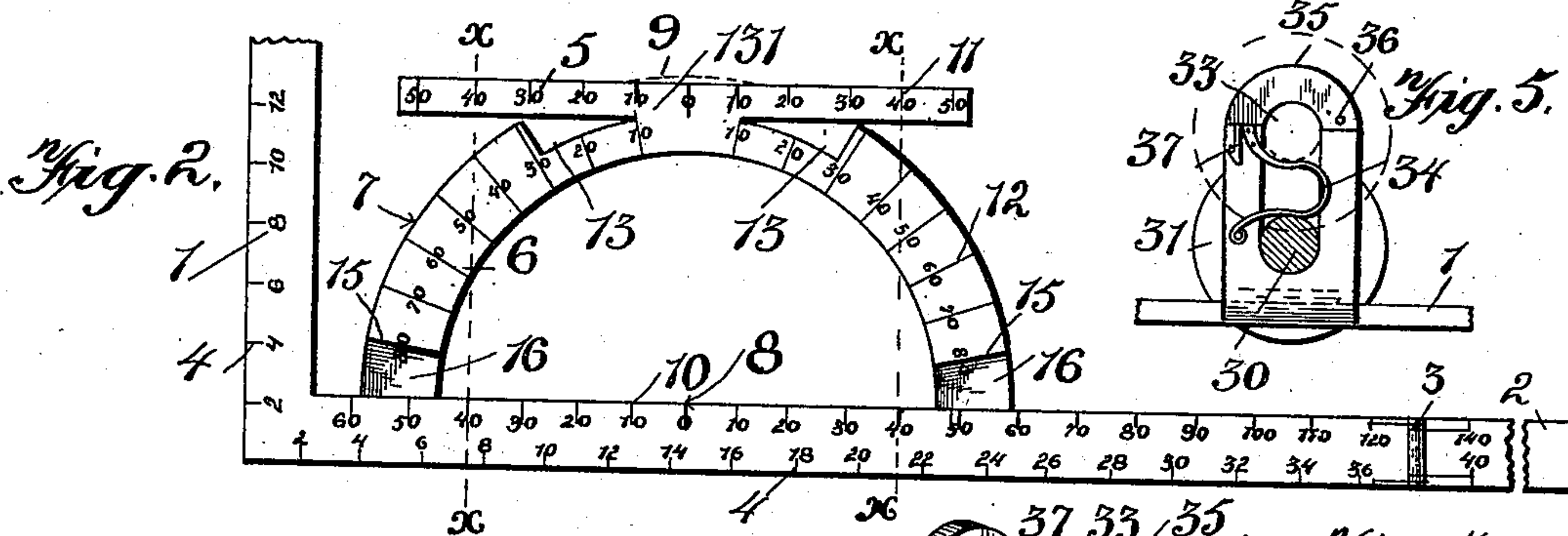
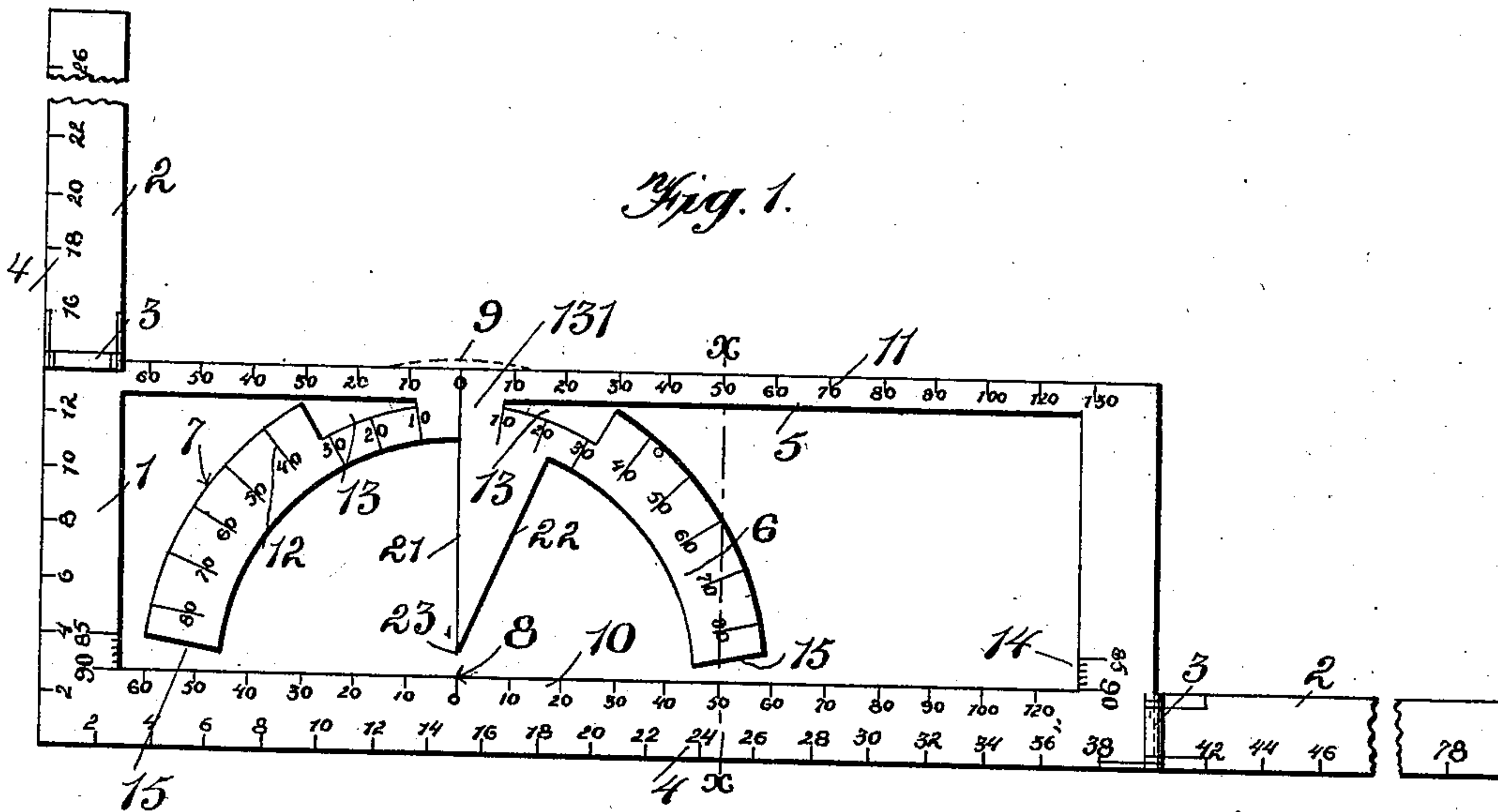
No. 652,832.

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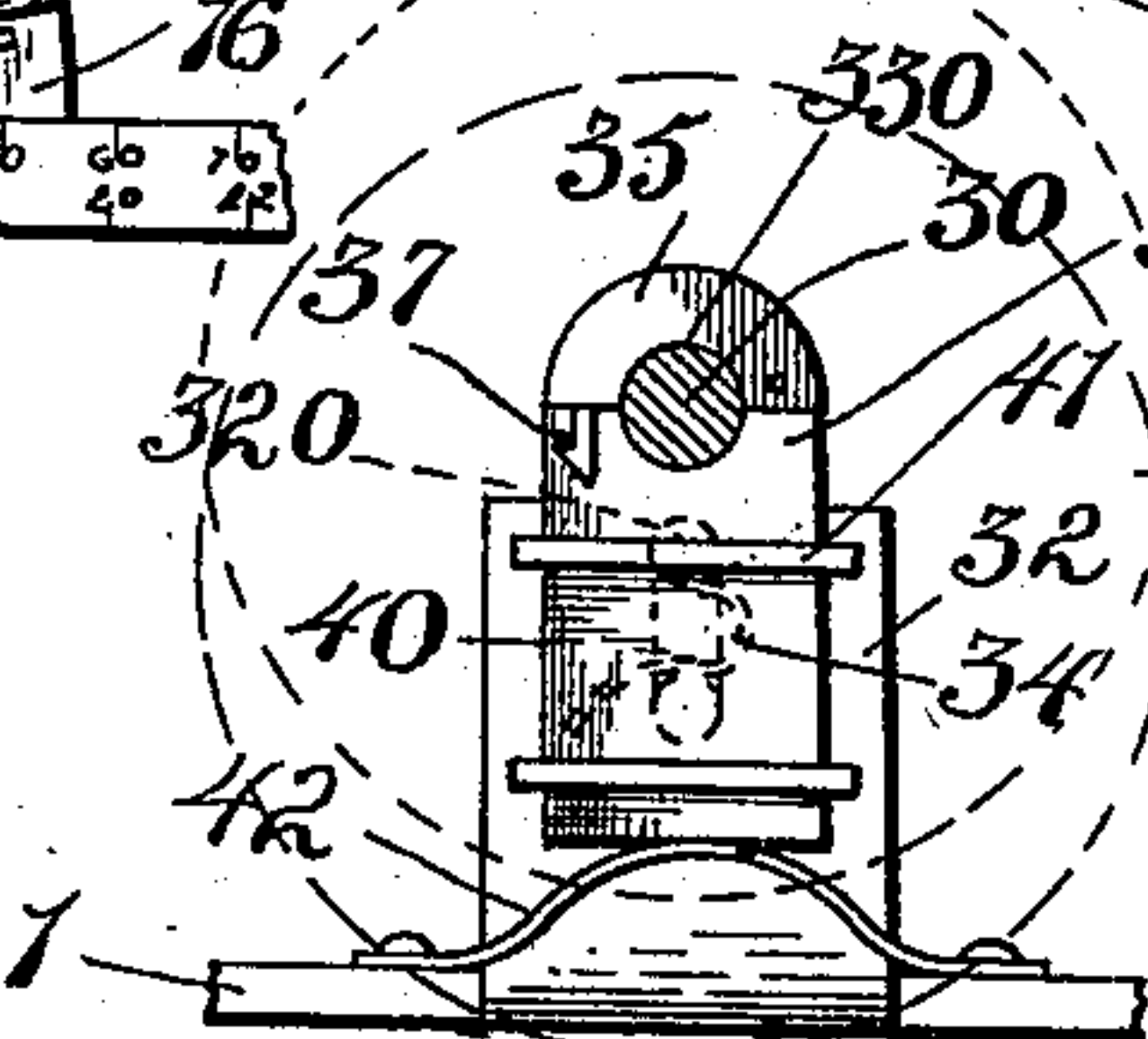
L. M. CARMICAL.
DRAFTSMAN'S INSTRUMENT.

(Application filed Nov. 11, 1899.)

(No Model.)



Witnesses:
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UNITED STATES PATENT OFFICE.

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DRAFTSMAN'S INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 652,832, dated July 3, 1900.

Application filed November 11, 1899. Serial No. 736,640. (No model.)

To all whom it may concern:

Be it known that I, LUTHER M. CARMICAL, a citizen of the United States, and a resident of Jonesville, Lee county, State of Virginia, have invented certain new and useful Improvements in Draftsmen's Instruments; 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 measuring instruments, and more particularly to that class known as "protractors;" and the object of the same is to produce an instrument of this character having varied and various capabilities.

To this end the invention consists in a protractor constructed, marked with scales, and used in any of the several ways hereinafter described and as shown in the drawings, wherein—

Figure 1 is a plan view of my instrument in its preferred form. Figs. 2, 3, and 4 are views of the same in somewhat-modified form. Figs. 5 and 6 are elevations of the ears and other devices for supporting the shaft.

In the said drawings the numeral 1 designates the body, which is shown in Fig. 1 as a rectangular frame, and 2 are extension-arms which may be hinged, as at 3, to certain extremities of the body, so as to extend its dimensions when desired or to fold into small compass when not in use, and the outer edges of the body and arms are marked with ordinary drafting-scales 4 for measuring purposes.

5 designates what I shall call the "tangent-arm," which in Fig. 1 forms the upper side of the frame 1, while in Figs. 2 and 3 its extremities are not extended into union with said frame.

6 is the protractor proper, which consists of a curved body, about as usual, and whose outer edge or arc 7 is struck around a center 8 and nearly intersects the outer edge of the tangent-arm 5, although the true arc is slightly broken, as indicated in dotted lines at 9. Excepting the extension-arms, whose use is optional, the features thus far described are common to all forms of my instrument save that shown in Fig. 3.

The inner edge of the lower arm of the body is marked with a computing-scale 10, and a

similar scale 11 is marked along the outer edge of the tangent-arm 5, whereby the graduations of the two scales are opposite each other. Both these scales start at "0" at a vertical line intersecting the center 8 and the middle of the broken arc 9 and increase outwardly in both directions, as shown. The arc 7 of the protractor 6 is marked with a scale 12, whose graduations radiate from the center 8 and may extend entirely across the protractor, if desired. The edge of the latter is cut out, as at 13, from about the graduation "10" on the protractor to about the graduation "26," leaving a web 131 between the arm 5 and the protractor 6, so as to hold all parts rigidly in relative position, and the scale 12 is continued along the protractor where it is cut out, as shown. This cut-out is for the purpose of permitting the insertion of a pencil-point nearly up to the zero-line at the center of the broken arc 9, and the fact that the arc 7 is thus broken makes it possible to use the computing-scale 11 from its points "10" inward to zero for marking those points on the arc 7 which are hidden by the web 13. In Fig. 3 these cut-outs are omitted; but the scale 12 is continued, as at 130, on at the inner edge of the protractor 6 opposite the web 13, which supports the arm 5. In Fig. 2 the cut-outs are not so large, and hence the web 13 cannot be so wide. For measuring wide angles with the protractor shown in Fig. 1 this scale 12 is used as far as possible, (here to the point "85,") and then the supplemental inside scale 14 is used up to ninety degrees. This scale extends along the inside of the frame for some distance, and it is obvious it could be carried up the ends thereof. As it weakens the protractor to a certain extent to cut it away, as at 15 in Fig. 1, in some cases I fill said cut-away portion with an extension 16, which is transparent or translucent and is graduated, as seen in Fig. 2, and this dispenses with the necessity for the inside scale 14.

21 designates a point which may be formed within the protractor 6 and the operative edge of which is in line with the zero-marks of the two computing-scales 10 and 11, while its other edge 22 is a matter of indifference, and its extremity 23 stops short of the center 8.

All parts thus far described are of the de-

sired size, shape, proportion, and material, though the instrument must be cheap and light without sacrificing strength and durability.

5 The particular utility of the device above described is as follows: The computing-scales on the frame and extension-arm are obviously used for measuring purposes, being preferably in inches. The protractor is employed
10 as usual for ascertaining angles from the center 8, and, as above explained, the breaking of the arc 7, as at 9, makes it possible to use the computing-scale 11 of the tangent-arm for the smaller angles to a vertical with almost
15 the same precision as though the arc were complete. The cut-outs 13 permit the insertion of a pencil-point up to "10" on the protractor and yet do not seriously weaken the web 131. Parallel lines are drawn along the
20 outer or inner parallel edges of the frame, or after drawing one line the two zeros at 8 and 9 are placed thereon, and lines parallel thereto can be indicated along the registering-scales 10 and 11 and the indication-marks afterward connected by lines parallel with that
25 which passes through the zeros. In making these indicating-points if it should happen that the scale 10 must be used opposite "50" on the dotted line x of Fig. 1 the cut-away
30 portion 15 permits the insertion of the pencil-point, as will be clear. This dotted line x occurs in Fig. 2 through the scale-numerals "40," but if it should here intersect "50" it can be seen through the transparent extension
35 16, as will be clear. Then the operator would place the line first drawn on the two numerals "50" and would indicate his parallel line opposite the two zeros and afterward draw it. Thus the same object is at-
40 tained even though the cut-away portion 15 is filled by a transparent extension 16. The point 20 may be used along its vertical edge 21 in this last operation, or if it is desired to measure the area of a triangle its base may
45 be laid along the line of the two zeros and the edge 21 after having first been measured by the scale 4 and when the computing-scale 10 intersects the apex of the triangle its altitude can be measured, as will be clear.

50 In Fig. 4, 30 is a shaft extending across the instrument and having rollers 31 at its extremities. This and all that follows may be omitted, if desired. The end bars of the frame have upturned ears 32, preferably struck from
55 the same material and provided with upright slots 33, in which the shaft 30 may work loosely, and 34 indicates L-shaped spring-catches carried by said ears with their bends extending across the slots in such manner as to hold
60 the shaft at the lower end thereof with the rollers 31 resting on the table or paper and raise the instrument slightly above it or to permit the shaft to rise by the yielding of the spring into the upper end of the slots, which
65 will lift the rollers off of the paper. As best seen in Fig. 5, the upper end of each ear is a member 35, pivoted at 36 at one end, its body

extending across and closing the upper end of the slot 33 and its other end latched, as at 37, whereby the slot may be opened when
70 desired to entirely withdraw the shaft and rollers.

Fig. 6 is a detail of a slightly-modified form. Here the ear 32 has the same slot and spring; but there is a plate 40 sliding in
75 guides 41 on the ear and having a stub-shaft 320 moving in the slot of the ear. The plate is normally supported by a spring 42, and its upper end has a circular bearing 330 for the shaft, the upper side of the bearing being
80 closed by a pivoted latch 35, constructed as above described. The spring 42 holds this plate raised and the rollers 31 normally above the paper; but both plates, the shaft, and the
85 rollers can be lowered by forcing the pins downward past the spring-catches 34 to the lower end of the slots 33.

The utility of the devices just described is obvious. If the parts are accurate, the rollers will raise the instrument only a very
90 slight distance from the paper and will permit its movement up and down over the same, so that parallel horizontal lines can be drawn, indicated, and measured very rapidly. I do not confine myself to the precise con-
95 struction of the parts of this detail, nor, in fact, to its use at all.

What I claim as new is—

1. A draftsman's instrument consisting of a frame, a protractor carried therein, an ex-
100 tension-arm hinged to one corner of the frame on a line parallel with its plane and adapted to extend from one side thereof, and graduation-marks on all parts, substantially as described.

2. A draftsman's instrument consisting of a frame whose top and bottom bars are parallel and inscribed with computing-scales both
110 commencing at zero and extending outward in both directions, all of the graduations being opposite each other; and a protractor held rigidly between said bars with the center of its arc at one of said zero-marks, the computing edge of the upper bar forming a small chord of said arc which is thus broken at
115 either side of its center, for use substantially as described.

3. A draftsman's instrument consisting of a frame whose top and bottom bars are parallel and inscribed with computing-scales both
120 commencing at zero and extending outward in both directions, all of the graduations being opposite each other; and a protractor held rigidly between said bars with the center of its arc at one of said zero-marks, the
125 body of the protractor being integrally connected with the upper bar by a web and being cut out at either side of the same, as and for the purpose set forth.

4. A draftsman's instrument consisting of
130 a frame whose top and bottom bars are parallel and inscribed with computing-scales both commencing at zero and extending outward in both directions, all of the graduations be-

ing opposite each other; and a protractor held rigidly between said bars with the center of its arc at one of said zero-marks, the computing edge of the upper bar forming a small chord of said arc which is thus broken at either side of its center, and the body of the protractor being united to said bar by a narrow web which is cut out at either side for the insertion of a pencil-point, substantially as described.

5. A draftsman's instrument consisting of a frame having parallel bars with correspondingly-disposed computing-scales each running from zero both ways, and a protractor within said frame with the center of its arc opposite the zero on one bar and its body connected at its mid-length with the other bar, its ends being cut away, as and for the purpose set forth.

6. A draftsman's instrument consisting of a frame having parallel bars with correspondingly-disposed computing-scales each running from zero both ways, and a protractor within said frame with the center of its arc opposite the zero on one bar and its body connected at its mid-length with the other bar, its ends being cut away, and transparent graduated extensions filling the cut-away portions and uniting the ends of the protractor-body to the lower bar of the frame, as and for the purpose set forth.

7. A draftsman's instrument comprising a frame having two parallel bars with scales thereon, a protractor whose body is united at the center of its length to one bar and inscribed with graduations, and a point extending from said body inward toward the other bar with one straight edge at right angles to the length of the two bars, as and for the purpose set forth.

8. A draftsman's instrument comprising a frame having two parallel bars with scales thereon, a protractor whose body is united at the center of its length to one bar and inscribed with graduations, and a point extending from said body inward toward the other bar with one straight edge at right angles to the length of the two bars, all said parts being integral and with the extremities of the protractor-body and the tip of the point slightly remote from the lower bar, as and for the purpose set forth.

9. A draftsman's instrument comprising a frame having scales marked thereon, ears rising from the frame, and bearings supported by the ears; combined with a shaft removably

mounted in said bearings, rollers on the shaft standing beyond the end bars of the frame, and means for permitting a limited vertical movement of the shaft with respect to the frame whereby in one position the rollers are raised above the paper and in the other position of said shaft the frame is raised above the paper and the rollers rest thereon, as set forth.

10. A draftsman's instrument comprising a frame having scales marked thereon, ears rising from the frame, and bearings supported by the ears; combined with a shaft mounted in said bearings and carrying rollers, and spring-catches supported by the ears and adapted to retain the shaft and rollers in an elevated or depressed position with respect to the frame, as and for the purpose set forth.

11. A draftsman's instrument comprising a rectangular frame with scales marked thereon, ears rising from the end bars of the frame, and spring-catches on the ears; combined with plates moving in guides on said ears and engaged by said catches, springs normally supporting said plates, and rollers having their axes journaled in the plates, substantially as described.

12. A draftsman's instrument comprising a rectangular frame with scales marked thereon, ears rising from the end bars of the frame and vertically slotted, and spring-catches in the slots; combined with plates having stub-shafts moving in the slots of the ears and engaged by said catches, bearings on the plates, and rollers having their axes journaled in said bearings, substantially as described.

13. A draftsman's instrument comprising a rectangular frame with scales marked thereon, ears rising from the end bars of the frame and vertically slotted, and spring-catches in the slots; combined with plates moving in guides on the ears, stub-shafts on the plates moving in said slots and engaged by the catches, bearings in the upper ends of the plates, a shaft extending across the instrument and journaled in said bearings, and rollers on the extremities of the shaft, substantially as described.

In testimony whereof I have hereunto subscribed my signature this the 9th day of November, 1899.

LUTHER M. CARMICAL.

Witnesses:

HENRY J. MORGAN,
A. W. COOK.