

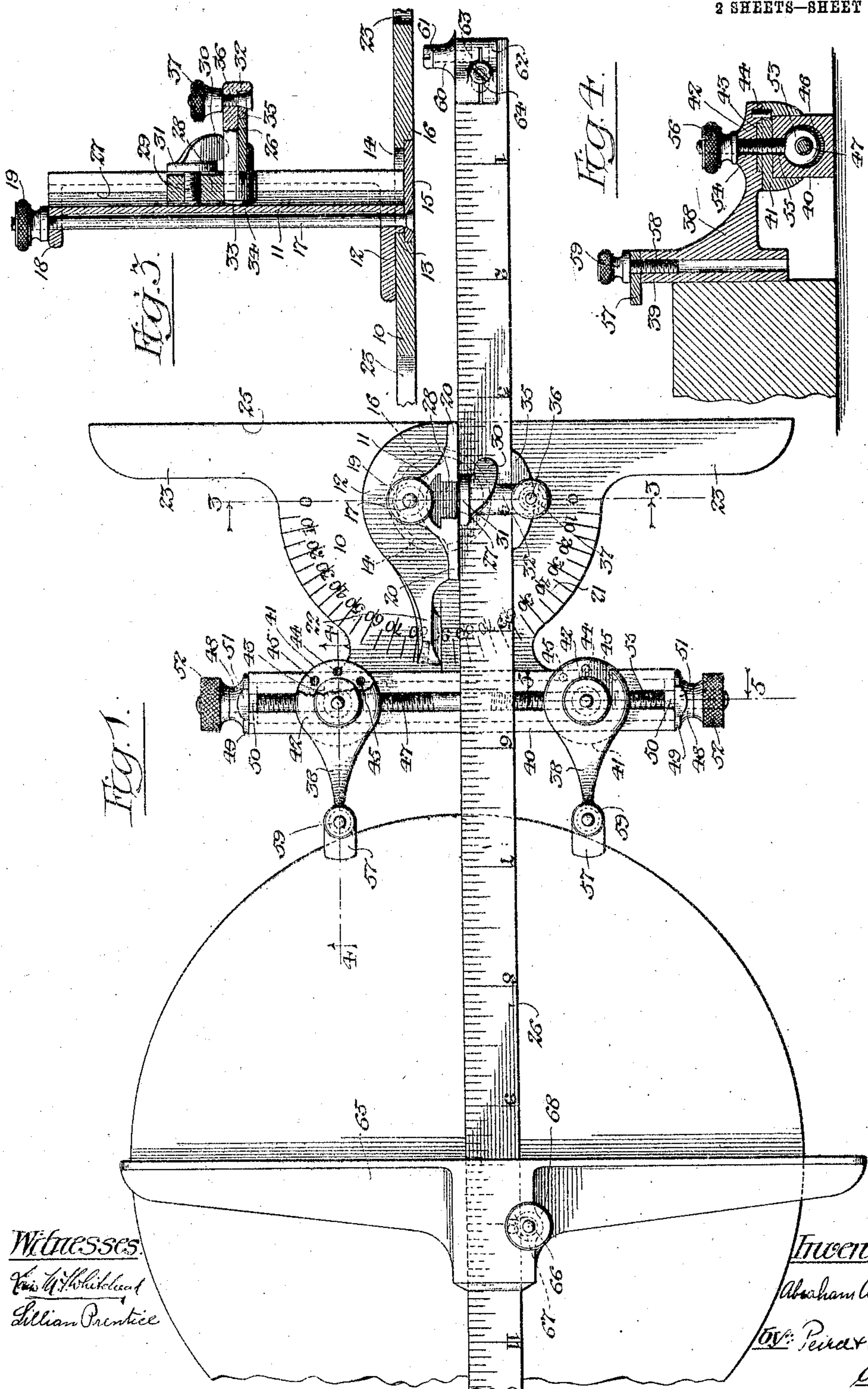
No. 845,043.

PATENTED FEB. 26, 1907.

A. ANDERSON.
PROTRACTOR.

APPLICATION FILED OCT. 5, 1906.

2 SHEETS—SHEET 1.



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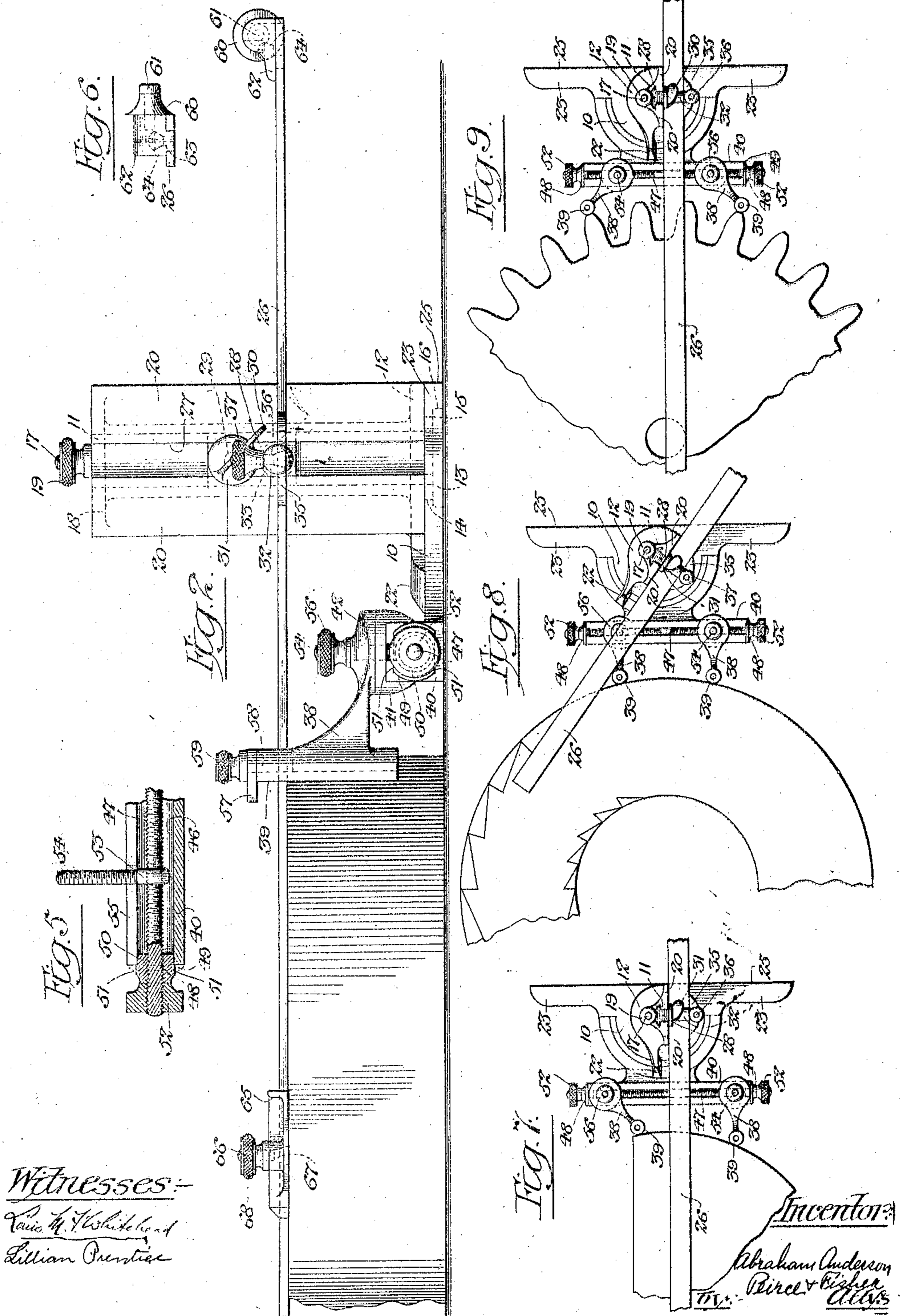
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2 SHEETS—SHEET 2.



UNITED STATES PATENT OFFICE.

ABRAHAM ANDERSON, OF MOLINE, ILLINOIS.

PROTRACTOR.

No. 845,043.

Specification of Letters Patent.

Patented Feb. 26, 1907.

Application filed October 5, 1906. Serial No. 337,547.

To all whom it may concern:

Be it known that I, ABRAHAM ANDERSON, a citizen of the United States, and a resident of Moline, county of Rock Island, and State of Illinois, have invented certain new and useful Improvements in Protractors, of which the following is a full, clear, and exact description.

The invention relates to an improved instrument for laying down angles and lines upon plain or curved surfaces, and which is adapted for use by machinists, pattern-makers, carpenters, and the like for laying out work. Such an instrument is shown in Letters Patent of the United States No. 802,674, issued to me September 25, 1905.

The present invention seeks to improve and simplify the construction and render it better applicable for the work to be performed.

The invention consists in the features of construction, combinations, and arrangements of parts hereinafter set forth, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a plan view of the improved protractor. Fig. 2 is an elevation thereof. Figs. 3, 4, and 5 are detail sections on the lines 3-3, 4-4, and 5-5, respectively, of Fig. 1. Fig. 6 is an end view of the marking roller and blade. Figs. 7, 8, and 9 are plan views indicating different ways in which the instrument may be used.

Parts of the instrument are mounted upon a flat base or plate 10, which is provided with a flat horizontal lower surface, so that the instrument may be held firmly upon a table, bench, or drawing-board, if desired. The upper surface of the base-plate is also preferably flat, as shown, and a suitable support or upright standard 11 is mounted upon the base-plate to rotate about a vertical axis. This support or upright standard is provided in the form shown at its lower end with a horizontal flange 12, that is somewhat greater than a semicircle. Below the flange the support or standard is provided with a depending pivot or journal portion 13, which fits snugly within a circular opening 14 in the base-plate. A circular clamp disk or plate 15 is set in the under side of the base-plate 10 and fits snugly within a circular recess or opening 16, which is concentric with but slightly larger than the opening 14. A clamp-bolt 17 extends through the plate 15,

the flange 12 at the lower end of the support or standard 11, and a flange 18 at the upper end of the support or standard. A thumb-nut 19 is threaded on the upper end of the bolt, and the bolt and nut may be used to securely clamp the support or standard and disk 15 upon the base-plate 10. The clamp plate or disk 15 is preferably set into the base-plate so that the lower face of these parts are in the same plane, and the head of the clamp-bolt 17 is countersunk in the clamp-disk 15, so that the instrument may be held firmly in place upon a table, bench, or other flat surface. By loosening the nut 19 the support or standard 11 and clamp-disk 15 may be rotated about a vertical axis, extending through the center of the circular openings 14 and 15. By tightening the nut the parts are securely held in adjusted position. The standard or support 11 is provided, as shown, throughout its length with laterally-extending flanges 20, the faces of which are nicely finished and arranged in a vertical plane. The base-flange 12 at the lower end of the support or standard terminates in a straight line at the lower edge of the flange portions 20, and the clamp-screw 17 is arranged midway between this face and the outer edge of the flange 12, so that it will securely hold the support or standard in place without tending to tip it in one or the other direction.

A semicircular portion of the base-plate is provided with a scale 21, indicating angles or degrees and struck from the vertical axis upon which the support or standard 11 rotates. The base-flange 12 of the support or standard is provided with a pointer 22, which coöperates with the scale 21 to indicate the angle between the flat vertical face of the support or standard 11 and a line or plane through the zero-point of the scale and the vertical axis about which the support or standard revolves. The base-plate is provided at one side with extended portions 23, having a straight edge or face 24 parallel to the zero-line of the scale, and a flat laterally-extending marking-blade 26 is held in position with one of its edges against the face of the support or standard, so that the pointer 22 and scale 21 also indicate the angle between the marking-blade 26 and straight-edge 25.

In order that the marking-blade 26 may be properly adjusted for use with different pieces of work, the face of the support or

standard 11 is recessed or slotted to form a vertical guideway or groove 27, T-shaped in cross-section, within which slides a correspondingly-shaped block 28. A clamp-screw 29, threaded into the upper portion of the block 28, is provided with a thumb-piece 30 and a flange 31, adapted to engage the outer edges of the guide-groove 27 to securely clamp the vertically-sliding block 28 in adjusted position upon the support or standard 11. A laterally-projecting cylindrical stud 32 is journaled in the lower portion of the block 28 to rotate on a horizontal axis. The stud is provided on its inner end with a head 33, and its outer portion is provided with a longitudinal slot 34, through which extends the marking-blade 26. The outer end of the slot on the under side of the stud 32 is opened to permit the ready insertion of the marking-blade. The thin flat marking-blade is thus carried by the support or standard in horizontal position, but may be adjusted vertically thereon with the block 28 and stud 32. The blade may also be rotated about the axis of the stud 32 and is shiftable longitudinally through the slot 34 of the stud. A shoe 35, carried by the stud, is arranged to engage the outer edge of the marking-blade, and a clamp-bolt 36, extending transversely through the outer end of the stud 32, is provided with a beveled head engaging the shoe 35 and with an adjusting thumb-nut 37, engaging the outer side of the stud. By tightening the nut 37 the shoe 35 and marking-blade 36 are forced inwardly in the slot 34 of the stud until the blade is clamped firmly in position against the vertical face of the support or upright standard 11. This also serves to hold the stud 32 against rotation.

The instrument is particularly valuable for laying out lines upon pieces of work the edges of which are curved, and to properly position the instrument with reference to such a piece of work the base is provided with a pair of laterally-extending gage-arms 38, the ends of which are provided with vertically-disposed cylindrical bearing portions 39, that are adapted to abut against the curved edge of the work. These gage-arms are mounted to slide upon a horizontal guide 40, that is preferably rectangular in section and formed upon or brazed to the side of the base-plate 10 opposite the straight-edge 25. The bottom face of the guide is preferably in the same plane with the bottom face of the base-plate 10, and its guiding-faces are parallel with the straight-edge 25 and with the zero-line of the scale 21. The gage-arms 38 are preferably adjustably mounted upon a pair of U-shaped slides 41, that snugly fit over the horizontal guide 40. These slides are circular in horizontal section, and the circular heads 42 on the inner ends of the gage-arms 38 rest upon their upper faces. The upper face of each slide is provided with a boss 43,

engaging a recess in the lower face of the head 42 of the corresponding gage-arm. A short vertical pin 44, fixed to the head 42, is arranged to engage one of a series of three holes in the upper face of the slide 41 to hold the gage-arm 38 at right angles to the guide 40 or at an angle of forty-five degrees thereto in one or the other direction.

The guide 40 is provided with a cylindrical bore 46, within which is journaled a right and left hand screw 47. Nuts 48, threaded on the ends of the screw, are provided with flanges 49, which abut against the ends of the guide 40, and with circular bosses 50, (see Figs. 1 and 5,) which fit snugly within the ends of the bore 46 of the guide. Nuts 48 are provided with flattened faces 51 to receive a suitable wrench or other tool for adjusting them on the screw 47. These nuts are adjusted in position with their flanges snugly engaging the ends of the guide to take up the lost motion between the parts, and the nuts 48 are held securely in adjusted position by the lock-nuts 52. These lock-nuts are provided with knurled flanges forming finger-pieces by which the screw 47 may be rotated. The heads 53 of a pair of eyebolts 54 are arranged within the bore 46 of the guide 40 and are threaded upon the opposite ends of the right and left hand screw 47. The bolts 53 extend upwardly through a longitudinal slot 55 in the upper portion of the guide 40 through central openings in the slides 41 and heads 42 of the gage-arms 38, so as to connect the slides and gage-arms with the screw. Thumb-nuts 56 upon the upper ends of the eyebolts 54 serve to clamp the gage-arms upon the slides 41 and also serve to clamp the slides 41 and gage-arms in adjusted position upon the guide 40. By loosening the thumb-nuts 56 screw 47 may be rotated in either direction to simultaneously move the gage-arms 38 outwardly or inwardly to spread or contract the same. By tightening the thumb-screws 56 the guide-arms are securely held in adjusted position and all lost motion is taken up between the adjusting-screw and the gage-arms. The heads 53 of the eyebolts are, however, arranged to abut against the upper portion of the bore 46 of the slot 50, so that it is impossible to place undue strain upon the adjusting-screw 47 by turning the thumb-nuts 56.

Each of the cylindrical bearing ends 39 of the gage-arms is provided at its upper portion with a laterally-offset piece 57, that is held in place by a thumb-screw 58. Thumb-screw 58 is provided with a flanged head 59 and extends loosely through one end of the piece 57 and is threaded into the bore of the bearing end portion 39. Piece 57 is eccentrically pivoted on the clamp-screw 58 and may be adjusted at any desired angle and clamped in adjusted position.

At one end the blade 26 is provided with a

conical marking-roller 60, having a sharpened edge arranged in line with the inner edge of the blade. The roller is journaled upon a stud-bolt 61, fixed to a supporting member 62. This supporting member is partially split, as indicated in Fig. 1, and the split sections extend within a slot 63 (see Fig. 6) in the end of the blade. A screw 64, having a conical head, is arranged to spread the sections of the supporting member 62 and firmly clamp it, together with a roller 60, upon the end of the marking-blade. The blade is also provided with a T-head or straight-edge 65, which is suitably slotted on its under face to engage the blade and is removably and slidably mounted thereon. A clamp-screw 66 is provided with a conical head 67, arranged to engage one edge of the blade, and a thumb-nut 68 on the upper end of the screw 66 is adapted to force the conical head 67 against the edge of the blade 26 and securely clamp the straight-edge 65 thereon.

It should be noted that the edge of the marking-blade and the face of the support or standard 11, against which the blade is held, are arranged in a vertical plane and the gage-arms 38 are arranged at equal distance on opposite sides of this plane when the pointer 22 is at "90" on the scale, so that by holding the instrument in position with the gage-arms abutting against a rounded or cylindrical piece of work radial lines or lines at any desired angle to the radius may be drawn thereon by properly positioning the rotatable support or standard 11 upon the base plate 10. All parts of the instrument are above the lower flat face of the base-plate, so that it can be placed firmly upon a table, bench, or other flat surface and placed in position against the work, as indicated in Fig. 2. The instrument may also be held in the hand and placed against the edge of the work, and in such cases the pieces 57 on the cylindrical bearing ends 39 of the gage-arms serve to engage the upper face of the work and firmly hold the instrument in position.

The marking-blade is rotatably adjustable in a horizontal plane about a vertical axis with the support or standard 11 and in a vertical plane upon a horizontal axis with the stud 33. The blade may be also raised and lowered with the block 29 to bring it in proper relation with the surface of the work and may be shifted longitudinally through the stud 32 as desired. Lines may be formed by using the edge of the blade as a guide for a pencil or a marker or by shifting the blade longitudinally through the stud 32 to form lines with the marking-roller 60. The straight-edge 65 may be conveniently used for laying out lines on the work at right angles to the marking-blade or for equally dividing a circular surface into quarters.

In Fig. 8 the use of the instrument for laying out ratchet-teeth, external or internal, is

illustrated. By adjusting the gage-arms 38 upon the slides 41 the instrument may be conveniently used for laying out lines upon the face of a gear-wheel, as indicated in Fig. 9, or for laying out lines upon a semicircular surface, as indicated in Fig. 7. The instrument is capable of many other uses and may be employed with great advantage by machinists and pattern-makers. When the edge of the work is straight, the straight-edge 25 may of course be conveniently employed for positioning the instrument.

It is obvious that numerous changes may be made in the details of structure without departure from the essentials of the invention.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A protractor comprising a base, a support rotatably mounted on said base, a laterally-extending marking-blade carried by said support, said rotatable support and said base having a cooperating pointer and scale to determine the adjustment of said support, means for clamping the same in adjusted position, said base having a portion thereof forming a straight-edge, a pair of gage-arms mounted on said base and arranged to engage the rounded edges of the work and means for adjusting said arms to spread and contract the same, substantially as described.

2. A protractor comprising a base, a support rotatably mounted on said base, a laterally-extending marking-blade carried by said support, said rotatable support and said base having a cooperating pointer and scale to determine the adjustment of said support, means for clamping the same in adjusted position, said base having a flat lower face and a portion at one side thereof forming a straight-edge, a pair of gage-arms carried by said base and extending laterally therefrom, said gage-arms having rounded, vertically-disposed, bearing end portions arranged above the lower flat surface of said base and means for adjusting said arms to spread or contract the same, substantially as described.

3. A protractor comprising a base having a portion thereof on one side forming a straight-edge and a portion on its opposite side parallel to said straight-edge forming a guide, a pair of gage-arms mounted to slide on said guide, means for adjusting said arms and for clamping them in adjusted position, a support rotatably mounted on said base and a marking-blade carried by said support, substantially as described.

4. A protractor comprising a base having a portion thereof on one side forming a straight-edge and a portion on its opposite side parallel to said straight-edge forming a guide, a pair of gage-arms mounted to slide on said guide, means for adjusting said arms and for clamping them in adjusted position,

a support rotatably mounted on said base, a vertically-adjustable, rotatable member on said support and a marking-blade carried by said member and longitudinally shiftable therethrough, substantially as described.

5 5. A protractor comprising a base having a portion on one side forming a straight-edge, a pair of gage-arms mounted on the opposite side of said base and having rounded bearing ends adapted to abut against the rounded edge of the work, a support mounted on said base to rotate on a vertical axis, means for clamping said support in adjusted position, and a marking-blade carried by said support, substantially as described.

6. A protractor comprising a base having a portion on one side forming a straight-edge, a pair of gage-arms mounted on the opposite side of said base and having rounded bearing ends adapted to abut against the rounded edge of the work, a support mounted on said base to rotate on a vertical axis, means for clamping said support in adjusted position, a stud mounted on said support to rotate on a horizontal axis and a longitudinally-shifting marking-blade carried by said stud, substantially as described.

7. A protractor comprising a base having a portion on one side forming a straight-edge, a pair of gage-arms mounted on the opposite side of said base and having rounded bearing ends adapted to abut against the rounded edge of the work, a support mounted on said base to rotate on a vertical axis, means for clamping said support in adjusted position, a vertically-shifting block mounted to slide in guideways in said support, a stud mounted on said block to rotate on a horizontal axis, a longitudinally-shifting marking-blade carried by said stud, means for clamping said block to said support and means for clamping said blade to said stud, substantially as described.

8. A protractor comprising a flat base having a portion thereof at one side forming a straight-edge, a pair of gage-arms mounted on the opposite side of said support and having bearing ends adapted to abut against the rounded edge of the piece of work, means engaging said arms to spread or contract the same, a support mounted on said base to rotate on a horizontal axis and a marking-blade carried by said support, substantially as described.

9. A protractor comprising a flat base having a portion thereof at one side forming a straight-edge, a pair of gage-arms mounted on the opposite side of said support and having bearing ends adapted to abut against the rounded edge of the piece of work, means engaging said arms to spread or contract the same, a support mounted on said base to rotate on a horizontal axis, a stud on said support, said stud being vertically adjusted thereon and mounted to rotate on a horizon-

tal axis and a longitudinally-shiftable marking-blade carried by said stud, substantially as described.

10. A protractor comprising a base having a flat, lower surface, a pair of laterally-extending gage-arms mounted on said support and having rounded vertical end portions for engaging the rounded edge of a piece of work, said arms and the end portions thereof being arranged above the plane of the lower face of said base, means engaging said arms to spread or contract the same, a support mounted on said base to rotate on a vertical axis and a laterally-extending marking-blade carried by said support, substantially as described.

11. A protractor comprising a base, a support rotatably mounted thereon, a laterally-extending marking-blade carried by said support, said base having a guide formed thereon, a pair of gage-arms mounted to slide on said guide and a right and left hand screw connected to said arms to spread and contract the same, substantially as described.

12. A protractor comprising a base, a support mounted thereon to rotate on a vertical axis, a laterally-extending marking-blade carried by said support, said base having a guide formed thereon, a pair of gage-arms mounted to slide on said guide, a right and left hand screw extending through said guide and connected to said arms to spread and contract the same and nuts on the ends of said screw abutting against the ends of said guide, substantially as described.

13. A protractor comprising a base, a support mounted thereon to rotate on a vertical axis, a laterally-extending marking-blade carried by said support, said base having a guide formed thereon, a pair of gage-arms mounted to slide on said guide, a right and left hand screw extending through said guide and connected to said arm to spread and contract the same and nuts on the ends of said screw abutting against the ends of said guide and having portions thereof journaled to rotate in suitable bearings formed on the ends of said guide, substantially as described.

14. A protractor comprising a base, a support mounted thereon to rotate on a vertical axis, a laterally-extending marking-blade carried by said support, said base having a guide formed thereon, a pair of gage-arms mounted to slide on said guide, a right and left hand screw extending through said guide and connected to said arm to spread and contract the same, nuts on the ends of said screw engaging the ends of said guide and lock-nuts on said screw engaging said first-mentioned nuts, substantially as described.

15. A protractor comprising a base, a support mounted on said base to rotate on a vertical axis, a laterally-extending marking-blade carried by said support, said base having a guide formed thereon, a pair of laterally-

extending gage-arms mounted to slide on said guide, a right and left hand screw engaging said arms to spread and contract the same and means for clamping said arms in adjusted position, substantially as described.

16. A protractor comprising a base, a support mounted on said base to rotate on a vertical axis, a laterally-extending marking-blade carried by said support, said base having a guide formed thereon, a pair of laterally-extending gage-arms mounted to slide on said guide, a right and left hand screw journaled on said base portion, eyebolts threaded on said screw and extending through said arms and nuts on said eyebolts for clamping said arms in adjusted position, substantially as described.

17. A protractor comprising a base portion, a support on said base portion mounted to rotate on a vertical axis, a laterally-extending marking-blade carried by said support, said base having a hollow guide formed thereon, a right and left hand screw journaled within the bore of said guide, a pair of gage-arms mounted to slide on said guide, eyebolts having their head portions arranged within the bore of said guide and threaded on said screw, said eyebolts extending through the inner ends of said arms and having nuts thereon for clamping said arms in said adjusted position, substantially as described.

18. A protractor comprising a base portion, a support on said base portion mounted to rotate on a vertical axis, a laterally-extending marking-blade carried by said support, said base having a hollow guide formed thereon, a right and left hand screw journaled within the bore of said guide, a pair of U-shaped slides mounted on said guide, a pair of gage-arms adjustably mounted on said slides, eyebolts having their head portions arranged within said bore and threaded on said screw, said eyebolts extending through said slides at the inner ends of said arms and having nuts thereon for clamping said arms in adjusted position, substantially as described.

19. A protractor comprising a base portion, a support mounted thereon to rotate on a vertical axis, a laterally-extending marking-blade carried by said support and longitudinally shiftable with respect thereto, said base having a guide formed thereon, a pair of laterally-extending gage-arms mounted to slide on said guide and a right and left hand screw journaled in said guide and connected to said arms to spread and contract the same, substantially as described.

20. A protractor comprising a base portion, a support mounted on said base portion to rotate on a vertical axis, a stud mounted on said support to rotate on a horizontal axis, a longitudinally-shiftable marking-blade carried by said stud, means for clamping said support and blade in position, said base having a guide formed thereon, a pair of laterally-

extending gage-arms mounted to slide on said guide and a right and left hand screw journaled in said guide and connected to said arms to spread and contract the same, substantially as described.

21. A protractor comprising a base portion, a support mounted on said base portion to rotate on a vertical axis, a block mounted to slide on vertical guideways in said support, a stud carried by said block to rotate on a horizontal axis, a longitudinally-shiftable marking-blade carried by said stud, means for clamping said support, said block and said blade in position, said base having a horizontal guide formed thereon a pair of laterally-projecting gage-arms having rounded bearing ends mounted to slide on said guide and a right and left hand screw journaled in said guide and connected to said arms to spread and contract the same, substantially as described.

22. A protractor comprising a base portion, a support or standard journaled on said base portion to rotate on the vertical axis and having a flange engaging the upper surface thereof, a clamp-plate on the under side of said base, a clamp-screw extending through said plate and support or standard having a nut thereon holding the support or standard in adjusted position and a laterally-extending marking-blade carried by said support or standard, substantially as described.

23. A protractor comprising a base portion, a support or standard journaled on said base portion to rotate on the vertical axis and having a flange engaging the upper surface thereof, a clamp-plate on the under side of said base, a clamp-screw extending through said plate and support or standard having a nut thereon holding the support or standard in adjusted position, said standard having a vertical guideway formed on its face, a block mounted to slide in said guide, means for clamping said block in adjusted position, and a laterally-extending marking-blade carried by said block, substantially as described.

24. A protractor comprising a base, a support mounted thereon to rotate on a vertical axis, a laterally-extending marking-blade carried by said support, said base having a horizontal guideway formed thereon, a pair of laterally-extending gage-arms mounted to slide on said horizontal guide and means engaging said gage-arms to spread and contract the same, substantially as described.

25. A protractor comprising a base, a support mounted thereon to rotate on a vertical axis, a laterally-extending marking-blade carried by said support, said base having a horizontal guideway formed thereon, a pair of laterally-extending gage-arms mounted to slide on said horizontal guide, means engaging said arms to spread and contract the same and means for clamping said arms in adjusted position, substantially as described.

26. A protractor comprising a base portion, a standard mounted on said base portion to rotate on a vertical axis and having a vertical guideway formed thereon, a block mounted to slide in said guideway, a stud mounted on said block to rotate on a horizontal axis and a laterally-extending and longitudinally-shiftable marking-blade carried by said stud, substantially as described.

27. A protractor comprising a base portion, a standard mounted on said base portion to rotate on a vertical axis and having a vertical guideway formed thereon, a block mounted to slide in said guideway, a stud mounted on said block to rotate on a horizontal axis, a laterally-extending marking-blade carried by said stud and longitudinally shiftable therethrough, means for clamping said block in position on said support and means for clamping said blade to said stud and for holding the latter against rotation, substantially as described.

28. A protractor comprising a base, a support mounted thereon to rotate on a vertical axis, a slotted stud carried on said support, a laterally-extending marking-blade extending through the slot of said stud, a shoe engaging one edge of said blade and a clamp-bolt extending through said stud and having a beveled head engaging said shoe and a clamp-nut on said bolt and engaging said stud for holding said blade in position, substantially as described.

29. A protractor comprising a base, a vertical support or standard mounted thereon to rotate in a vertical axis, means for clamping said support or standard to said base, said support or standard having a vertical guideway formed thereon, a slide-block in said guideway, a clamp-screw threaded into said block having a head for engaging the edges of said guideway to hold said block in position, a slotted stud mounted on said block to rotate in a horizontal axis, a marking-blade extending through the slot of said stud, a shoe engaging one edge of said blade and a clamp-bolt carried by said stud engaging said shoe to lock said blade and stud against movement, substantially as described.

30. A protractor comprising a base portion, a pair of laterally-projecting gage-arms mounted on said support and having bearing ends adapted to abut against the rounded edge of a piece of work, means engaging said arms to spread and contract the same, a support mounted on said base to rotate on a vertical axis, means for clamping said support in adjusted position, a longitudinally-shiftable marking-blade carried by said support, a straight-edge mounted to slide on said blade and means for clamping said straight-edge in adjusted position on said blade, substantially as described.

31. A protractor comprising a base portion, a support mounted thereon to rotate on a vertical axis, a longitudinally-shiftable marking-blade carried by said support, a marking-roller, a member whereon said marking-roller is journaled and means for removably clamping said member to the end of said blade, substantially as described.

32. A protractor comprising a base, a support mounted on said base to rotate on a vertical axis, a laterally-extending marking-blade carried by said support, a pair of laterally-extending gage-arms connected to said base and having bearing ends adapted to abut against the edge of the work, members whereon said arms are adjustably mounted and means engaging said members to spread and contract the same, substantially as described.

33. A protractor comprising a base, a support mounted on said base to rotate on a vertical axis, a laterally-extending marking-blade carried by said support, a pair of laterally-extending gage-arms connected to said base and having bearing ends adapted to abut against the edge of the work, members whereon said arms are adjustably mounted, means engaging said members to spread and contract the same and means for securing said arms to said members and for locking the latter in adjusted position, substantially as described.

34. A protractor comprising a base, a support or standard mounted thereon to rotate on a vertical axis, a laterally-extending marking-blade carried by said support or standard, said base having a horizontal guide formed thereon, a pair of slides on said guide, a right and left hand screw for spreading and contracting said slides, a pair of laterally-extending gage-arms adjustably mounted on said slides and means for locking said slides in adjusted position and for clamping said arms to said slides, substantially as described.

35. A protractor comprising a base portion, a support or standard mounted thereon to rotate on a vertical axis, a longitudinally-shiftable marking-blade carried by said support, said base having a horizontal guide formed thereon, a pair of slides mounted on said guide, a right and left hand screw journaled in said guide, a pair of laterally-extending gage-arms adjustably mounted on said slides and eyebolts connecting said arms and slides to said right and left hand screw and nuts on said eyebolts for clamping said arms and slides in adjusted position, substantially as described.

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