Aug. 4, 1942. W. THOMAS 2,292,094

BEVEL, PROTRACTOR AND CALCULATOR

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Fig. 1.

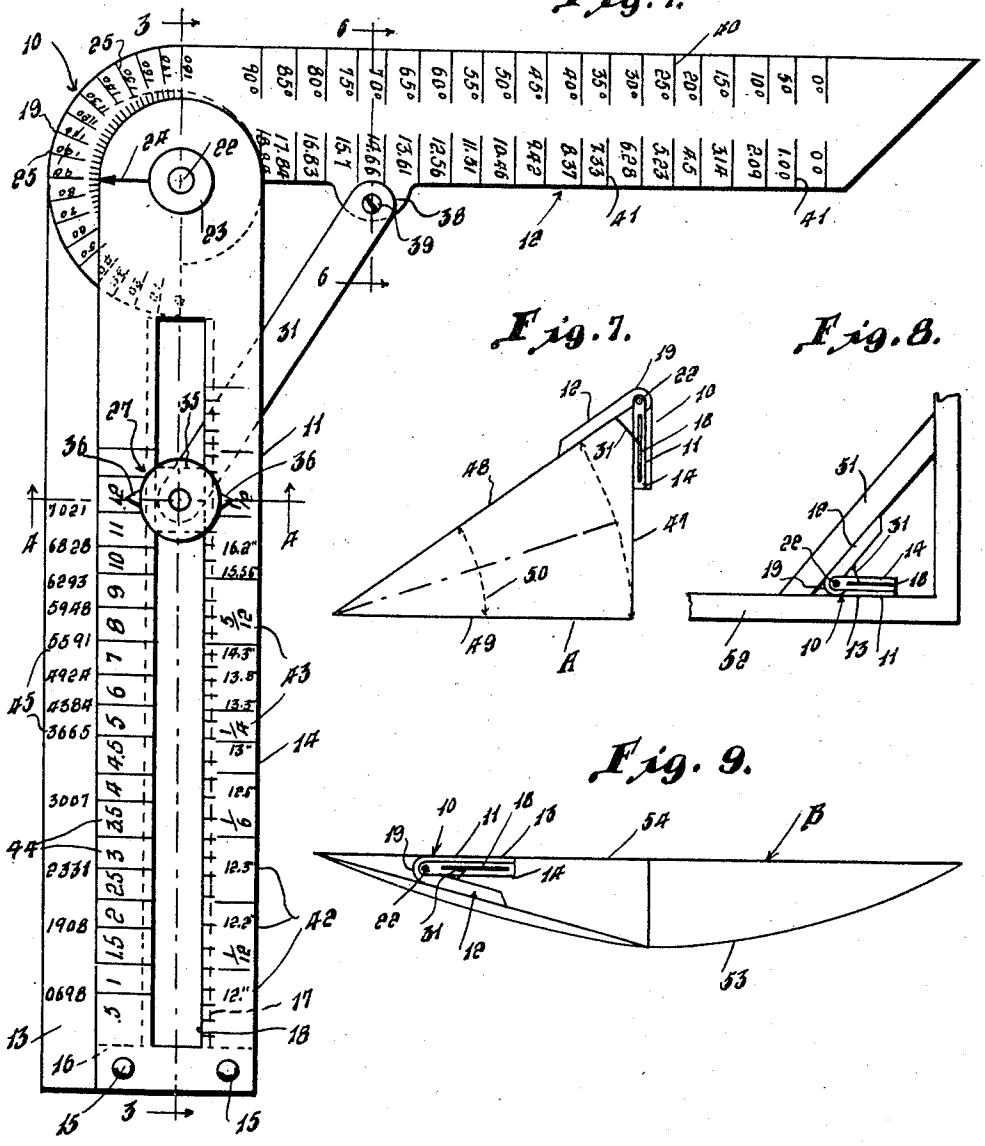


Fig. 7.

Fig. 8.

Fig. 9.

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Fig. 2.

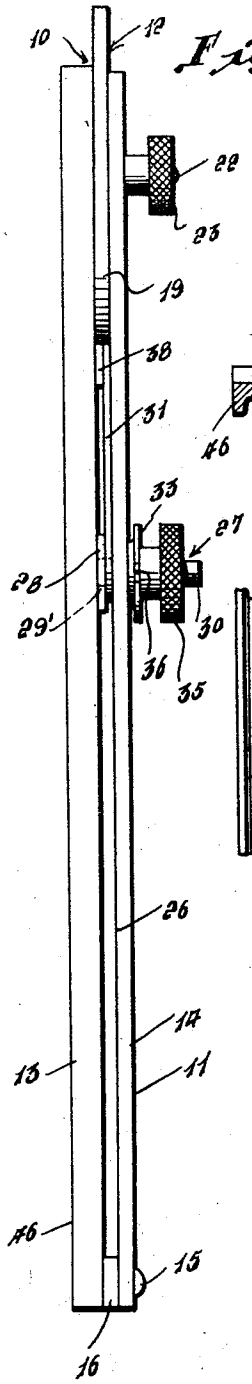


Fig. 4.

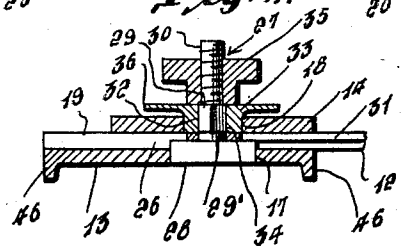


Fig. 5.

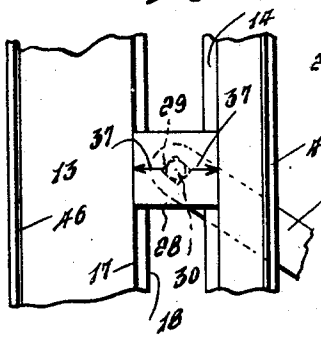


Fig. 6.

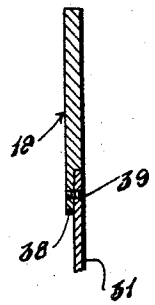
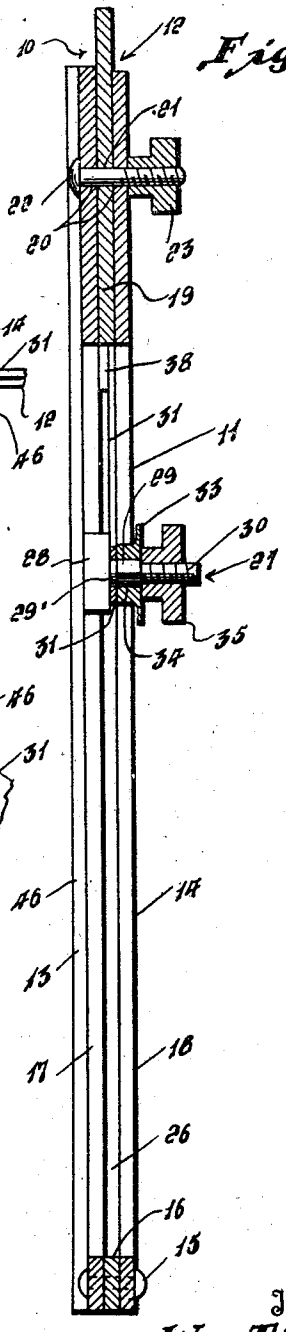


Fig. 3.



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Patented Aug. 4, 1942

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UNITED STATES PATENT OFFICE

2,292,094

BEVEL, PROTRACTOR, AND CALCULATOR

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Application March 20, 1941, Serial No. 384,419

3 Claims. (Cl. 33—75)

This invention relates to a tool for use by mechanics for finding an angle, the degree of an angle, the pitch, the rise, the sine, the cosine, the versed sine, the length of an arc, degree and radius, and radius of any length or degree.

More particularly, it is an aim of the invention to provide a device which will be particularly useful to carpenters in laying out work and in checking from blueprints, and which is also well adapted for use by other classes of mechanics such as boiler makers, shipbuilders, machinists, blacksmiths, structural workers, ornamental iron workers and the like.

Other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the drawings, which illustrate a preferred embodiment thereof, and wherein:

Figure 1 is a top plan view of the device,

Figure 2 is an edge view in elevation of the same, looking toward the outer edge of the body portion of the device,

Figure 3 is a longitudinal sectional view taken substantially along the plane of the line 3—3 of Figure 1,

Figure 4 is a transverse sectional view taken substantially along the plane of the line 4—4 of Figure 1,

Figure 5 is a fragmentary bottom plan view of a portion of the device,

Figure 6 is a transverse sectional view taken substantially along the plane of the line 6—6 of Figure 1, and

Figures 7, 8 and 9 are plan views illustrating various applications and uses of the invention.

Referring more particularly to the drawings, wherein like reference characters designate like or corresponding parts throughout the different views, 10 designates generally the bevel, protractor and calculator in its entirety and which includes a bar 11 forming the main body portion of the tool and a tongue 12.

The body 11 includes a lower bar section 13 and an upper bar section 14, as best seen in Figure 4, which sections are connected at their outer ends by fastenings 15. A spacing strip or block 16 is disposed between the outer ends of the sections 13 and 14 and secured in position by the fastenings 15 which extend therethrough. The bar sections 13 and 14 are provided with longitudinal slots 17 and 18, respectively, which extend substantially the length of the bar 11 and which are disposed in alignment. As best seen in Figure 4, the slot 17 is wider than the slot 18, for a purpose which will hereinafter become apparent.

The tongue 12, at its inner end, is enlarged to provide a semi-circular portion 19 which is partially disposed between the inner ends of the bar sections 13 and 14. Bar sections 13 and 14 are provided with alined openings 20 which are adapted to be alined with an opening 21 in the inner end of the tongue 12 for receiving a bolt 22 for pivotally connecting the body 11 and tongue 12 and which is provided with a thumb nut 23 for holding said parts in adjusted positions relatively to each other. The opening 21 is centrally disposed relatively to the outer edge of the semi-circular portion 19. The bar 14 at its inner end and on its upper side is provided with an arrow 24 which alines with the inner edge of the tongue 12 and the axis of its opening 21 and the head of which points toward the outer rounded edge of the portion 19. The upper side of the semi-circular portion 19 is calibrated in degrees and provided with degree markings, as seen at 25 to combine with the arrow 24 to form a protractor.

The portion 19 combines with the spacing block 16 to form the space 26 between the bar sections 13 and 14. A bolt 27 is provided with a head 28 which is sized to slidably engage the slot 17. The shank of the bolt 27 projects upwardly through the slot 18 and is provided with an enlarged inner squared portion 29 having an inner circular portion 29' and an outer, circular threaded portion 30. An arm 31 has an opening 32 at one end thereof for loosely engaging the portion 29', adjacent the head 28. A washer 33 is provided with a hub portion which depends downwardly therefrom and which is provided with a squared bore 34 for engaging the squared portion 29 for keying the washer 33 thereto. A thumb nut 35 is mounted on the threaded portion 30 for holding the parts connected. As best seen in Figure 1, the washer 33, the body portion of which is disposed above the bar 14, is provided with diametrically opposed outwardly projecting pointed extensions 36, and the squared portions 29 and 34 are provided so that the washer 33 can be held in a position so that the extensions 36 will point transversely of the bar 11. The under, outer side of the head 28, as best seen in Figure 5, is provided with a line 37 which is disposed transversely of the bar 11 and which is provided with arrow tipped ends.

The tongue 12 is provided with an apertured ear 38 which projects from the inner edge of

the tongue, adjacent its inner end and which, as best seen in Figure 6, is of a thickness substantially less than that of the tongue 12. The ear 38 is offset downwardly relatively to the upper side of the tongue 12 to receive the opposite end of the arm 31 which is disposed thereon and which is pivotally connected thereto by a fastening 39 which is countersunk in the arm 31 and the ear 38. The combined thickness of the ear 38 and the arm 31 substantially corresponds to that of the tongue 12 and likewise to the width of the slot 26 so that when the tongue 12 is swung toward the bar 11, to move the bolt 27, and parts mounted thereon, toward the outer end of the bar 11, the ear 38 and last mentioned end of the arm 31 can be moved into the slot 26 together with the tongue 12. It will thus be apparent that movement of the parts 11 and 12 relatively to each other will likewise move the bolt 27, and parts carried thereby, lengthwise of the bar 11 so that when the tongue 12 is moved toward the bar 11 the parts carried by the bolt 27 will be moved outwardly of the bar 11 and inwardly thereof when the tongue 12 is moved away from the bar 11.

The upper side of the tongue 12, along its outer edge is provided with calibrations 40 indicating the degrees of an arc and along its inner edge is calibrated at 41 for ascertaining the length of an arc to a twelve inch radius. Other calibrations, not illustrated, may be inscribed on the back side of the tongue 12 for ascertaining the radius, chord and ordinate. The upper side of the bar section 14, along its inner edge is provided with markings 42 for ascertaining the hypotenuse of a right angle triangle and with markings 43 forming pitch markings for ascertaining the pitch or slope of a surface. The opposite, outer edge of the bar section 14 is provided with the markings 44 for indicating the rise on a twelve inch base and which are arranged in proper relationship to the markings 42 and 43, as will hereinafter become apparent. The upper side of the outer edge of the bar section 13, which is exposed and which projects beyond the outer edge of the bar section 14, is inscribed, as seen at 45, for ascertaining the sine. The reverse side of the bar section 13 is provided with markings, not shown, for indicating cosines and versed sines.

The bar section 13 is preferably provided with depending flanges 46, as best seen in Figure 4, for holding the under side of the bar 13 and the head 28 out of engagement with a surface on which the device 10 is resting.

For example, the degree for a plate for a cone of, for example, 10 degrees, is three times this amount or 30 degrees. The tongue 12 can be adjusted until the arrow 24 points to the 30 degree marking 25. This will result in the arm 31 moving the parts carried by the bolt 27 until the arrow 36, which points toward the outer edge of the bar section 13, is in alinement with the correct sine calibration 45 and the arrows formed by the line 37 will be indicating the correct cosine and versed sine on the opposite side of the bar section 13, and which are not illustrated. By then consulting the tables, not shown, on the reverse side of the tongue 12 the chord, ordinate and arc may be ascertained and drawn. The tool is also capable of being used for finding the length of arcs of any radius and degree. For example, the length of an arc of 45 degrees having a 9 foot radius can be ascertained by consulting the markings 40 and 41 where, opposite 45 degrees on the tongue 12 appears the marking "9.42." By multiplying this number by 9, the length of the radius, it can be ascertained that the length of the arc is 84.78 inches.

In Figure 7, the tool 10 is shown applied with the bar 11 thereof having its inner side alined with the rise 47 of a right angled triangle A and with the inner edge of the tongue 12 alined with the hypothenuse 48 of the triangle A. With the parts 11 and 12 thus disposed the arrow 24 will be pointing to the calibrations 25 designating the degree of the angle formed by the sides 47 and 48. Also assuming that the base 49 of the triangle A is 12 inches long the point 36 to the left of the slot 18, as seen in Figure 1, will indicate the rise of the triangle or the length of the side 47. Assuming that this happens to be 4 inches, the other oppositely disposed point 36 will be substantially in alinement with indicia 12.6 inches of the markings 42 to indicate the length of the line 48 or the hypothenuse of triangle A. Likewise, the tool 10 can obviously be adjusted to ascertain the degree of the angle indicated by the line 50.

The device 10 can also be used, as illustrated in Figure 8, to ascertain the degree of angle of a brace 51 relatively to a member 52.

The tool 10 will also indicate the pitch by means of the markings 43, as for example, with a 12 inch base and a 3 inch rise, with the device 10 adjusted, one of the points 36 will be over the marking indicating 3 of the calibrations 44 while the other point 36 will substantially aline with the marking 43 designated 1/6 to indicate the ratio of the pitch.

In Figure 9, the device 10 is shown applied to a figure B having an arc 53 and a chord 54 and with the device 10 applied between the chord and a line drawn from the center of the arc 53 to one end of the chord and in which position the tongue and bar 12 and 11, respectively, will be positioned so that the length of the arc 53 having a known radius can be ascertained in the manner previously described by obtaining the degree of the arc and employing the calibrations 40 and 41 to then ascertain the length of the arc. The length of the chord 54 and of the ordinate 55 can then be obtained by use of the tables on the reverse side of the tongue 12.

The bolt 27 is disconnected from the nut 35 and the fastening 39 is removed for detaching the arm 31 when it is desired to use the device 10 in the manner, as illustrated in Figure 7.

Various other uses of the device 10 will be obvious to the skilled mechanic.

Various modifications and changes are contemplated and may obviously be resorted to as only a preferred embodiment of the invention has been disclosed.

I claim as my invention:

1. A device of the character described comprising an elongated bar forming a body member, said bar being formed of coextensive sections, an elongated member forming a tongue, one end of said tongue being pivotally mounted on said bar and turnably disposed between corresponding ends of the sections thereof, a slide mounted to move longitudinally of said bar, an arm pivotally connected at one end to said tongue and pivotally connected at its opposite end to said slide, said slide including transversely projecting pointers, and said bar sections being provided with indicia, arranged on either side of said slide for indicating the rise on a 12 inch base, and the hy-

pothenuse and pitch of a 12 inch base, having a given rise, said tongue being provided at its inner, pivoted end with a semi-circular portion provided with degree markings, and the upper bar section being provided with an arrow inscribed thereon and arranged in relationship to said degree markings to form a protractor for indicating the angle formed by the bar and tongue, to permit the device to be set, when the base it 12 inches and the angle formed by the base and hypothenuse is known, so that the device will indicate the rise, hypothenuse and pitch.

2. A device of the character described comprising a bar formed of coextensive sections arranged in superposed spaced relationship, an elongated member forming a tongue having one end disposed between and pivotally connected to corresponding ends of said bar sections, said bar having related scales for indicating the rise, hypothenuse and pitch of a triangle having a 12 inch base, a slide mounted in the sections for movement longitudinally of the bar, pointers carried by the slide for indicating related markings of the scales when the slide is moved to any position relatively to the bar, an arm pivotally connected at one end to said tongue and at its opposite end to the slide, said slide including a bolt having a squared head, said bar sections having longitudinally disposed slots, the slot of the lower bar section being sized to slidably engage the bolt head, a washer carrying said pointers and provided with a squared bore, the shank of the bolt having a squared portion for engaging said squared bore, for preventing the pointers from turning relatively to the bar.

3. A device of the character described comprising a bar formed of coextensive sections arranged in superposed spaced relationship, an elongated member forming a tongue having one end disposed between and pivotally connected to corresponding ends of said bar sections, said bar having related scales for indicating the rise, hypothenuse and pitch of a triangle having a 12 inch base, a slide mounted in the sections for movement longitudinally of the bar, pointers carried by the slide for indicating related markings of the scales when the slide is moved to any position relatively to the bar, an arm pivotally connected at one end to the tongue and pivotally connected at its opposite end to the slide, said tongue having an enlarged inner, pivoted end, semi-circular in shape and containing degree markings, the outer edge of the enlarged inner end of the tongue forming an inwardly curved continuation of the outer edge of the tongue, said inner end of the tongue being arranged so that no part thereof will extend beyond the plane of the outer edge of the bar, and an arrow inscribed on the upper section of the bar and arranged to cooperate with said degree markings to form a protractor for use in conjunction with the scales, for ascertaining the hypothenuse, rise and pitch of a triangle having a 12 inch base and a known angle formed by the base and hypothenuse.

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