

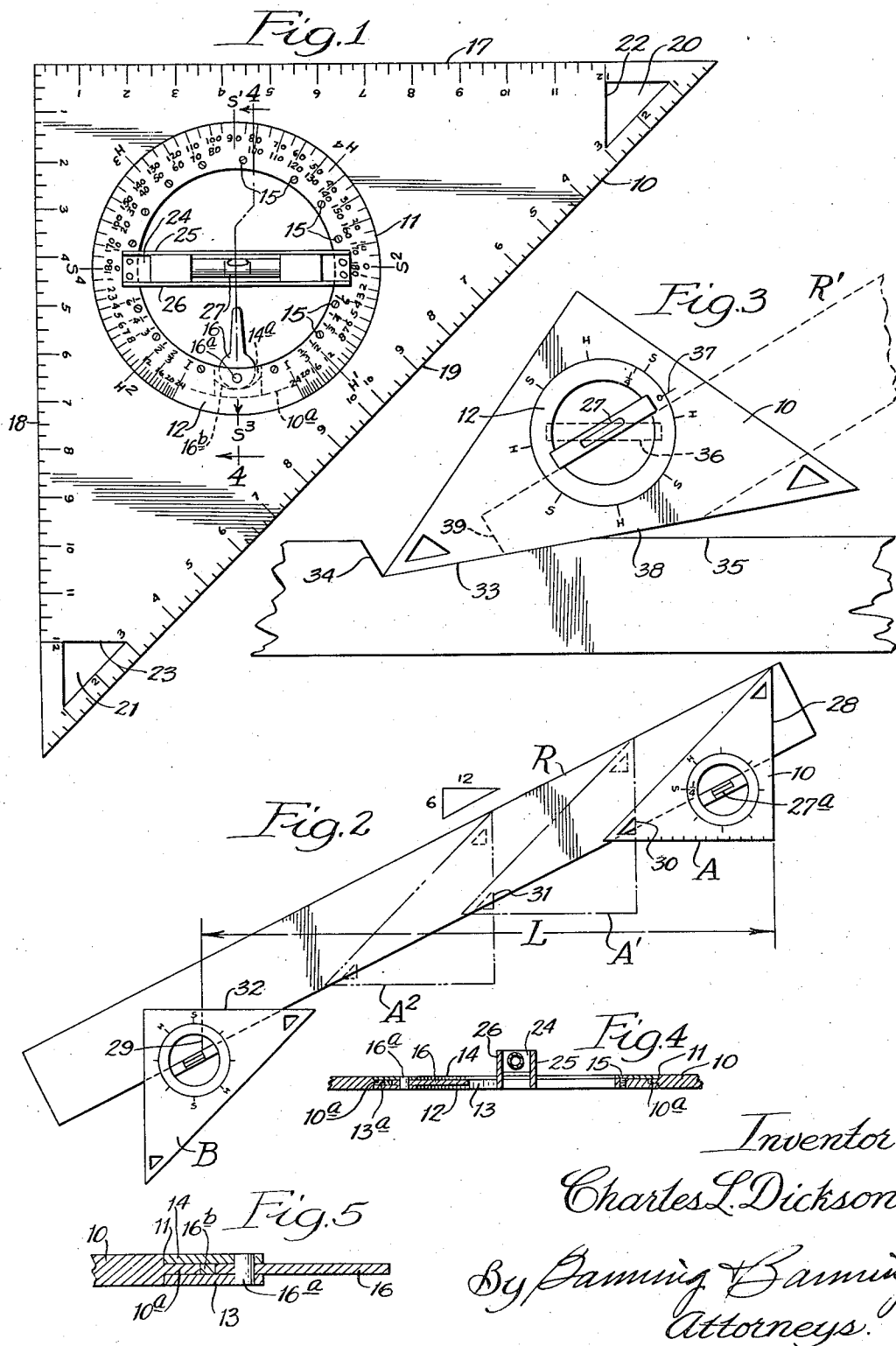
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COMBINED SQUARE, LEVEL, PROTRACTOR, ETC

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COMBINED SQUARE, LEVEL, PROTRACTOR, ETC.

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7 Claims. (Cl. 33—89)

An object of this invention is to provide a novel combined square, level, protractor, etc., for a wide variety of uses by carpenters, sheet metal workers and the like.

Another object is to provide such an instrument for laying out rafters and the like with a single adjustment.

Still another object is the provision of a triangle with a series of measuring scales on its sides and hypotenuse so that measurements may be made thereon from different positions and from inaccessible points.

These and other objects as will hereinafter appear are accomplished by this invention which is fully described in the following specification and shown in the accompanying drawing in which:

Figure 1 is a front elevation of an instrument embodying the invention;

Figs. 2 and 3 are elevations illustrating on a reduced scale the use of the instrument for laying out rafters;

Fig. 4 is a partial section on the broken line 4—4 of Fig. 1; and

Fig. 5 is a partial enlarged section on line 4 showing the locking cam.

The embodiment illustrated comprises a flat body 10 which is preferably a 45-degree right triangle of substantially uniform thickness throughout and having a circular opening 11 therein within which is rotatably mounted a circular member 12 consisting preferably of members 13 and 14 which overlie each other in registration and which are secured together throughout a large part of their length as by means of screws 15.

The member 13 is provided with a circular groove 13a adapted to slidably fit a circular tongue 10a within the opening 11. An eccentric cam 16 has a pin 16a rigidly mounted therein and journaled in registering holes in the members 13 and 14.

The cam engages a shoe 16b which bears against the inner edge of the tongue 10a and lies in a slot 14a in the member 14. To lock the protractor in adjusted position, the operator rocks the cam 16 to one side or the other thereby forcing the shoe against the tongue. Friction will hold the parts until the cam is released.

The sides 17 and 18 are graduated from the 90-degree point where they meet while the hypotenuse 19 is graduated inwardly toward the center from both the points where the hypotenuse meets a side. This method of graduation is important as will later be seen.

Small triangles 20, 21 are formed in the 45-degree points of the triangle body with the sides of these small triangles preferably parallel to the

sides of the triangular body of the instrument. Thus, the side 22 of the triangle 20 is parallel to the side 18 of the body of the instrument and at a definite predetermined distance therefrom, preferably twelve inches. Likewise the side 23 of the triangle 21 is parallel to the side 17 of the body of the instrument. This is of importance in laying out certain classes of work as will presently be seen.

The circular member 12 is graduated throughout one-half of its circumference from zero to 180 degrees in both directions. Beginning with the zero markings, this circular member is also graduated over a portion of the other half of its circumference in terms of inches of rise per foot of length of run and also in terms of the pitch of a roof expressed as a fraction of the rise in terms of each two feet of width which is the way architects frequently express the pitch of a roof. The main body of the instrument is then scribed with markings S^1 , S^2 , S^3 and S^4 which correspond to the locations of the sides 17 and 18 of the triangle. It is also scribed with markings H^1 , H^2 , H^3 and H^4 corresponding to this position of the hypotenuse of the triangle and to points at right angles thereto. All the graduations on the body of the triangle and on the circular member are repeated on the opposite side so that the user may read both sides of the instrument with equal facility.

The circular member has secured thereto a straight edge 24 of H-shaped cross section and having two spaced parallel sides 25, 26 which lie parallel to the zero marks of the graduation on the scale of the circular member. These sides extend through to the opposite side of the body with which they are flush as shown in Fig. 4. This straight edge may be secured to the circular member in any desired manner. A spirit-level 27 is secured between the flanges of the straight edge and is set to indicate a horizontal position when the zero-zero graduations of the circular member are horizontal. The web of the straight edge is provided with an opening 27a opposite the spirit-level as shown in Fig. 2 to permit the spirit-level to be observed from the opposite side.

An example of the use of this device is shown in Fig. 2 for laying out a rafter R. In this case the rafter is to have a $\frac{1}{4}$ pitch, that is, it will have a rise of six inches for each twelve inches of run as measured on this instrument. The operator therefore sets the circular member to the pitch $\frac{1}{4}$ on the marking S^1 and clamps it with the screw 16 in this adjusted position and then reverses the instrument and lays it with

the straight edge against the under side of the rafter R. He then moves the instrument to the upper end of the rafter and scribes the line 28 for the "top cut" of the rafter. He then finds from his blue print that the horizontal length L from the top cut 28 to the "seat cut" 29 is expressed in feet and inches. To measure off the distance L he starts with the instrument in the position A of Fig. 2 and, having scribed the line 28, he makes a mark 30 on the rafter corresponding to the side of the triangle. Then he moves the instrument to the position A¹ and makes a second mark 31 which is now two feet of horizontal distance from the top cut 28. He thus proceeds through succeeding positions A², etc., and finally is able to scribe the line 29 which is the seat cut for the plate of the building. Having measured the depth of the seat cut, he sets the instrument in the position B, Fig. 2, and scribes the line 32 for the "heel cut." Thus it will be seen that with a single setting by turning his instrument around and by reversing it and making use of both sides of the square and of both sides 25 and 26 of the straight edge, he is able to lay out all the cuts necessary on the rafter. If desired, the operator may start with the top cut 28 at the left end of the rafter and work to the right.

Fig. 3 shows the layout of a more complicated rafter. In this case, the rafter R¹, having a seven inch pitch, must be cut at its lower end to fit into a notch having a bottom 33 and a side 34 in a joist 35. With the rafter 35 held in a level position, as may be determined by means of the spirit-level of this instrument, the instrument is then laid with the hypotenuse on the line 33 and in this position the circular member is turned until the spirit-level assumes a horizontal position indicated by the dotted lines 36, Fig. 3. The user will then make a light mark 37, as by means of a pencil, on the face of the instrument opposite the seven inch pitch. He will then rotate the circular member backward until the zero mark of the circular member is opposite the mark 37 as shown in Fig. 3. This will then give the desired pitch of the rafter with respect to the bottom cut 33. Accordingly, to make the corresponding cut on the rafter or thrust-member R¹ the straight edge of the protractor is laid on the top of the rafter as shown in Fig. 3 after which the line 38 is scribed and the rafter cut. The A line 39 is then scribed of the same length as the side 34 and when the rafter is cut on the lines 38 and 39, it will fit accurately into the cut in the joist 35.

The illustrations given of the use of the instrument in Figs. 2 and 3 are illustrative only since the instrument is capable of a wide variety of uses. This is particularly true because of the fact that in addition to the straight edge carried by the protractor, the user has three edges of the triangle to work from. As a result, he is able to get the angle to both the vertical and horizontal at a single setting of the instrument. By turning the instrument over, he can work also both to the right and to the left from a single setting.

By inserting one of the points of the triangle into a depression with the corresponding edge of the hypotenuse in contact with the side of the depression, the depth of the depression can be measured directly on the scale which is graduated from the point. At the same time the protractor can be adjusted to a level position and

the inclination of the surface read from either the horizontal or the vertical.

While I have shown and described but a single form of my invention, it is to be understood that it is capable of many modifications. Changes therefore in the arrangement and construction may be made which do not depart from the spirit and scope of the invention as disclosed in the appended claims.

I claim:

1. In an instrument of the class described, a flat body in the form of a right triangle, a circular member rotatably mounted in the plane of the triangle, a straight edge secured on one side of the circular member, a spirit-level carried by and set to read with the straight edge, marks on the triangle corresponding to the edges of the triangle, and graduations on the circular member for indicating the rotative positions of said straight edge, the body having at one end an opening having an edge parallel to one side of the triangle, the body being graduated from the last-mentioned side to the last-mentioned edge whereby the length of a rafter may be laid out in terms of horizontal run.

2. In an instrument of the class described, a flat body in the form of a right triangle, a circular member rotatably mounted in the plane of the triangle, a straight edge secured on the circular member, a spirit-level carried by and set to read with the straight edge, marks on the triangle corresponding to the edges of the triangle, and graduations on the circular member for indicating the rotative positions of said straight edge, the straight edge being of metal in the form of a channel having two spaced flanges.

3. In an instrument of the class described, a flat body in the form of a right triangle, a circular member rotatably mounted in the plane of the triangle, a straight edge secured on the circular member, a spirit-level carried by and set to read with the straight edge, marks on the triangle corresponding to the edges of the triangle, and graduations on the circular member for indicating the rotative positions of said straight edge, the straight edge being of metal in the form of a channel having two spaced flanges with the spirit level between them.

4. In an instrument of the class described, a flat body in the form of a right triangle presenting a straight uninterrupted edge along each of its three sides, the hypotenuse and at least one of the adjacent edges being graduated to display units of linear measurement, a circular member rotatably mounted within the plane of the body, a straight edge carried by said circular member and presenting its sides outwardly beyond the plane of the body and limited in length to rotate within the confines of the edges of the body, and markings on said instrument for indicating the rotative positions of said straight edge.

5. In an instrument of the class described, a flat body in the form of a right triangle presenting a straight uninterrupted edge along each of its three sides, the hypotenuse and at least one of the adjacent edges being graduated to display units of linear measurement, a straight edge rotatably mounted with respect to the body and presenting its sides outwardly beyond the plane of the body and limited in length to rotate entirely within the confines of the edges of the body, and markings on said instrument for indicating the rotative positions of said straight edge.

6. In an instrument of the class described, a
flat body in the form of a right triangle pre-
sented a straight uninterrupted edge along each
of its three sides, the hypotenuse and at least
5 one of the adjacent edges being graduated to
display units of linear measurement, a circular
member rotatably mounted within the plane of
the body, a straight edge carried by said circular
member and presenting its sides outwardly be-
10 yond the plane of the body and limited in length
to rotate within the confines of the edges of the
body, markings on said instrument for indicating
the rotative positions of said straight edge, and
a spirit-level carried by and set to read with
15 the straight edge.

7. In an instrument of the class described, a
flat body in the form of a right triangle present-
ing a straight uninterrupted edge along each of
its three sides, the hypotenuse and at least one
of the adjacent edges being graduated to dis- 5
play units of linear measurement, a straight edge
rotatively mounted with respect to the body and
presenting its sides outwardly beyond the plane
of the body and limited in length to rotate en-
tirely within the confines of the edges of the 10
body, markings on said instrument for indicat-
ing the rotative positions of said straight edge,
and a spirit-level carried by and set to read with
the straight edge.

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