(No Model.) 2 Sheets—Sheet 1.

C. ENSMINGER.

COMBINED SQUARE, LEVEL, PROTRACTOR, &c.

No. 407,285. Patented July 16, 1889.

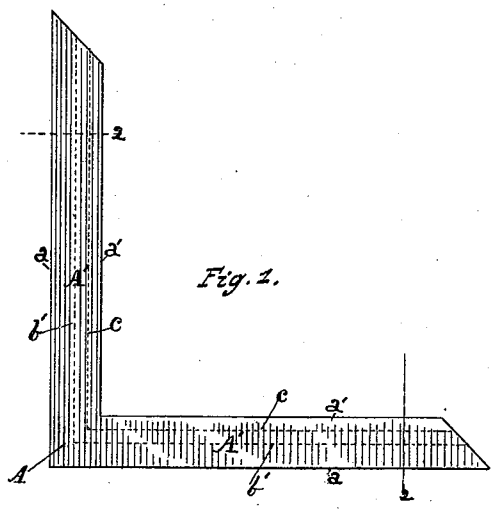


Fig. 1.

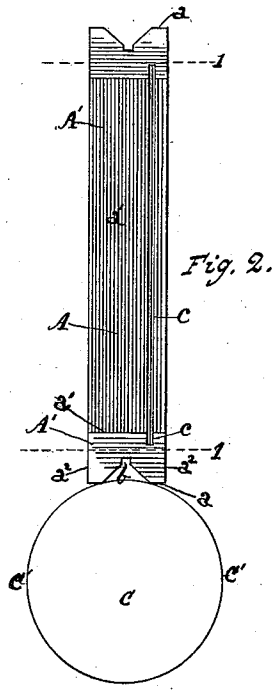


Fig. 2.

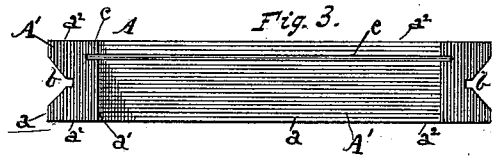


Fig. 3.

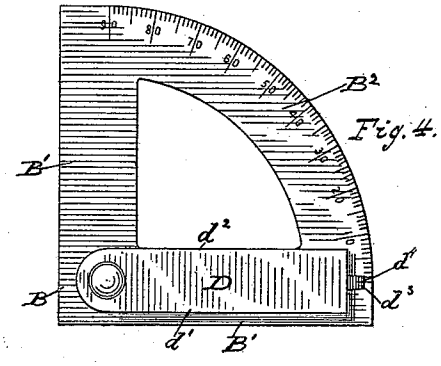


Fig. 4.

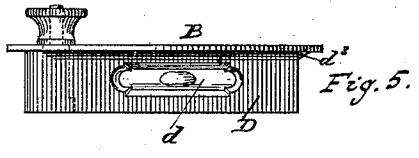


Fig. 5.

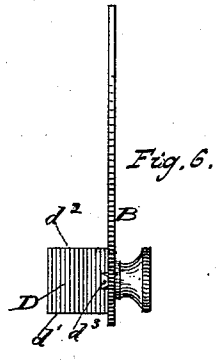


Fig. 6.

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Christian Ensminger
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by his Attorney
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(No Model.) 2 Sheets—Sheet 2.

C. ENSMINGER.

COMBINED SQUARE, LEVEL, PROTRACTOR, &c.

No. 407,285. Patented July 16, 1889.

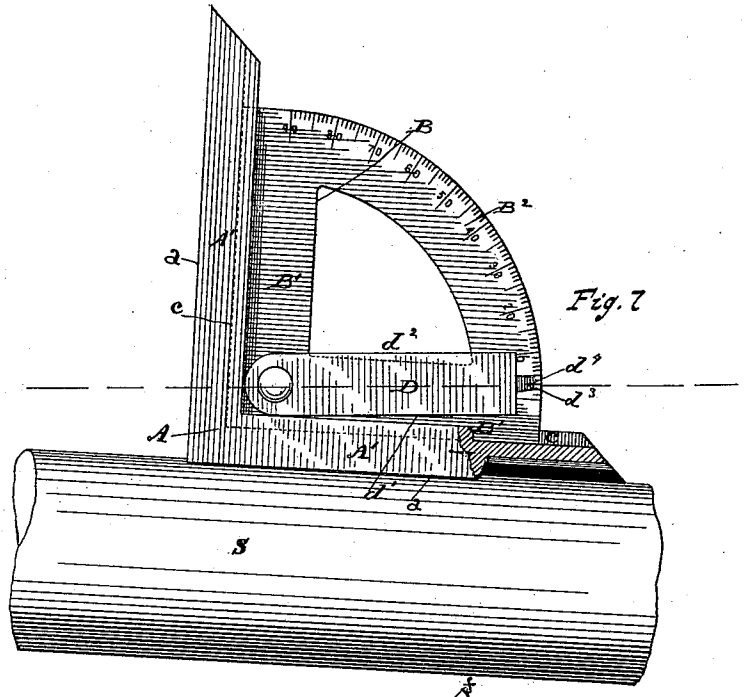


Fig. 7

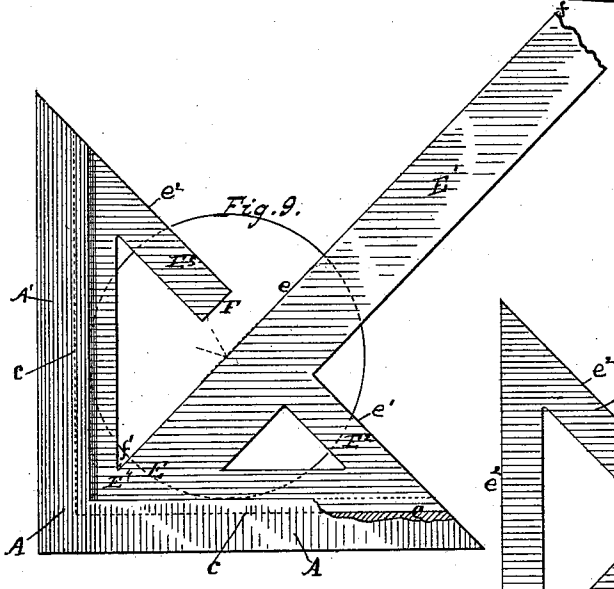


Fig. 9.

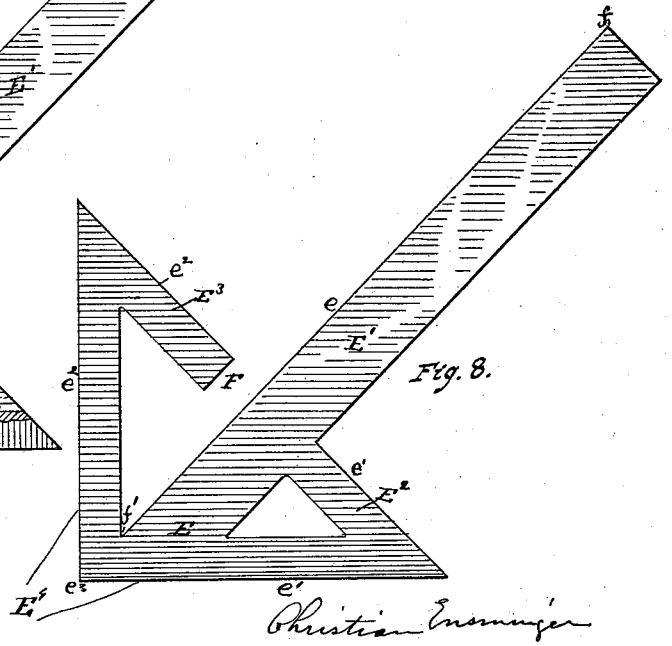


Fig. 8.

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H. C. Kelly
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by his Atty. Lebkicher

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

CHRISTIAN ENSMINGER, OF ALBANY, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, OF ONE-HALF TO CORTLAND S. BABCOCK, OF SAME PLACE.

COMBINED SQUARE, LEVEL, PROTRACTOR, &c.

SPECIFICATION forming part of Letters Patent No. 407,285, dated July 16, 1889.

Application filed December 16, 1887. Serial No. 258,078. (No model.)

To all whom it may concern:

Be it known that I, CHRISTIAN ENSMINGER, a citizen of the United States, and a resident of Albany, in the county of Albany and State of New York, have invented certain new and useful Improvements in a Combined Square, Level, Protractor, Centering-Square, &c., of which the following is a specification.

My invention relates to the combination of the devices and elements hereinafter described, and specifically set forth in the claims; and the objects of my invention are to combine, with a square having the backs of its limbs provided with longitudinal recesses and the inner sides of the same with grooves, a protractor and a level pivoted to the former at the point of center of the same, whereby the angles of inclination of objects can be readily ascertained and lengths of objects be determined; and also to provide with the square a second square which has with it a limb at an angle of forty-five degrees between the two limbs of this second square, whereby the device can be employed as a T-square, a centering-square, a miter-square, and, with the first-mentioned square, form a tool for ascertaining and marking the centers of circles or cylinders. I attain these objects by the means illustrated in the accompanying drawings, forming a part of this specification, in which—

Figure 1 represents a side elevation of my improved square, with which the other parts of this invention are employed. Fig. 2 is a view of the same from one end thereof, and illustrating the same applied to the surface of a shaft. Fig. 3 is a view from above with one limb horizontal and the other vertical. Fig. 4 is a side view of the protractor and its attached level detached from the square. Fig. 5 is a view of the same from above. Fig. 6 is a view of the same from the front end of the same. Fig. 7 is a side elevation of the square with the protractor and level in place with the same, and illustrating the same applied to an inclined shaft for the purpose of ascertaining the degree of its inclination. Fig. 8 is a plan view of the improved T-square detached from the square proper. Fig. 9 is a side elevation of the square with the improved T-square in place for joint operation of both devices.

The same letters of reference refer to like parts throughout the several views.

In the drawings, A is the improved square, which is composed of the limbs A′ A′, which have the respective lines *a a′* of surfaces parallel with each other, as shown. These limbs A′ A′ are connected, as shown, and are each a duplicate of the other in proportions of parts, sizes, &c., and are each made with a wide body from side to side in direction of lines 1 in Fig. 2, and of like thickness in their transverse directions, as in direction of lines 2 in Fig. 1. Made in the backs of these limbs A′ A′ from their surface *a* are the recesses *b b*, preferably of angular form, as shown in Figs. 2 and 3, and to any suitable depth from said surfaces *a*, as to dotted lines *b′* in Fig. 1. By means of these recesses the square can be readily applied to cylinders, so as to have the outer side surfaces *a* of the applied limb parallel to the line of axis of the same, and with the sides a^2 of the applied limb relatively parallel with the sides C′ C′ of the cylinder C. Made in the sides *a′ a′* of these limbs A′ A′ of this square are the grooves *c c*. (Shown by full lines in Figs. 2 and 3 and indicated by dotted lines in Figs. 1, 7, and 9.) These grooves are preferably made on lines at one side of the center of width of the limbs of the square, as shown in Figs. 2 and 3, and they connect with each other at the corner or point of intersection of said limbs, so as to be in fact continuous from the outer end of one limb to the corner of the square, and thence to the outer end of the other limb, as indicated by dotted lines in Fig. 1. These grooves *c c* in this square are intended to receive the other parts of this invention, to hold the same secure and in place when employed.

B is a protractor, made of any suitable material, preferably of steel, with a thickness corresponding with the width of the grooves *c c*, so that the latter will nicely receive the angular limbs B′ B′ of this protractor and hold the same. The segmental portion

B′ of this protractor is provided with a scale of degrees, as shown in Figs. 4 and 7.

D is a level, made of any suitable material, preferably of metal, and has fixed in it the glass spirit-level d, Fig. 5. This level is pivoted with the protractor at the point of center of the circle on which the segmental portion B^2 is made, and from which the degree-lines of the degree-scale are drawn. The sides d' d^2 of this level are parallel with each other, and with the free end of this level and projected from the same is the finger d^3, on which is the index-line d^4, which is in a situation relatively exactly central between the lines of the surfaces d' d^2, as shown in Fig. 4. This level can be set at zero and be turned at will to any degree of angle in relation to the right-angular limbs B′ B′ of the protractor and limbs A′ A′ of the square A, when the protractor is in place in the grooves c c of said square, as shown in Fig. 7.

E is a T-square, made of thin sheet metal, preferably of steel, and with the form of parts substantially as shown in Figs. 8 and 9, so that there will be produced with the limb E′ the right-angular cross-bar E^2 and E^3 and right-angular head E^4, all connected with the limb E′, as shown in Fig. 8. One edge, as edge e, of the limb E′ is made at an angle of forty-five (45°) degrees in relation to the edges e' e^2 of the head E^4 and this edge e is made on a line drawn from the corner e^3 of the right-angular head E^4, at the angle of forty-five (45°) degrees to the edges e' e^2, as shown, and between this edge e and bar E^3 is the opening F, which permits any suitable marking-instrument being moved along edge e from point f to f' continuously. The metal or material of this T-square is in thickness to nicely correspond with the width of the grooves c c in the angular limbs of the square A, as shown in Fig. 9.

These above-described devices will be found to be of great value and convenience to mechanics generally, and for machinists, carpenters, engineers, and others, particularly for ascertaining the degree of inclination of objects from a perpendicular or horizontal line, leveling objects, ascertaining heights of objects, for drawing parallel lines on shaftings in direction of their length, as for slotting key-seats in shaft, &c.; for setting bevel-squares for operations, as for both an inside and outside squaring; for ascertaining the centers of circles or cylinders or squares, and for miter-square, and for other purposes. When the square A is placed on a cylinder, as shown in Fig. 2, the recess b in the outer side of the limb resting on the cylinder will operate with the curved surface of the cylinder in direction of its length to present to a suitable marking-tool a straight-line edge—as one of the edges a^2 of the limb A′ on the cylinder—by which an operator can draw on the cylinder in direction of its length a line which will be parallel with the axis of the shaft or cylinder, and by turning or shifting this limb of the square on the cylinder in either direction any number of these parallel lines can be marked thereon. By placing one of these limbs A with its surface side a' on the surface of the bore of a wheel, gear, or cylinder an operator can with a suitable instrument draw parallel lines—one or more—which will be parallel with the axis of said wheel or gear. When the protractor B, with its pivoted level D, is placed in position with the outer edge margins of the limbs B′ B′ seated in the grooves c c in the inner sides of the limbs of the square A, as shown in Fig. 7, this instrument thus formed can be used for ascertaining the degree of inclination of a shaft S or of a vertical size of an object. The drawings, Fig. 7, illustrate the use of this square, protractor, and level for ascertaining the inclinations of a shaft, as shaft S, preparatory to leveling the same, and it shows the horizontal limb of the square seated on the said shaft with the level D raised from the zero-line on the scale of the protractor to a line indicated by the index-line d^4 on the said scale, which will be on the true horizontal line, (indicated by broken line 1 in Fig. 7,) and when the degree of inclination of the line of the shaft S from a true horizontal line is known the operator can readily elevate the lower end or depress the highest end of the shaft to a degree corresponding with the degree of inclination shown by the instrument to attend the position of the said shaft.

Heights of objects—such as buildings or structures—can be readily ascertained by resting the square on the surface of some suitable support at a convenient distance from the ground—say at a height of from three to five feet—and sighting the top of the object from over the upper outer corner of the level D, with the said level at an elevation or angle which will correspond, when the angle—the top of the object viewed—will be given in degrees and fractions of the same, and with this known, together with the distance the instrument is from the base of the object, the height of the same can be readily calculated. When the center of a circle or cylinder is to be found, the angular head of the T-square E will be placed in the grooves c c in lieu of the protractor B in the square A from the inner sides a' a' of the limbs of the same, when the instrument will be ready to apply to the circumference of the circle or periphery of the cylinder, wheel, or other circular object, for ascertaining the center of the same, as shown in Fig. 9, when the operator can, with a suitable marking-tool and by moving the instrument in either direction on the circumference of the article, mark lines—two or more—crossing each other, as illustrated by dotted lines in Fig. 9, on the surface to which the circumferential is a boundary. When the centers of squares are to be ascertained, the instrument will be applied to one corner of the square, when the operator

will draw a line on the surface of the square at the edge *e* of the limb E′ of the T-square, and then apply the instrument to another corner of the square and mark at said edge *e* of limb E′ a second line transversely to the first.

Other uses can be made of this improved instrument which a skilled mechanic will readily recognize or understand.

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

1. The square A, having each of its angular limbs made with surfaces *a a′*, which are parallel with each other, and having in the same from their inner surfaces the grooves *c c*, parallel with the side surfaces a^2 a^2 of said limbs, for operation with a protractor and T-square at will, substantially as and for the purposes set forth.

2. The combination, with a square constructed as described, of a protractor which is attachable at will with said square, and a level which is pivoted at one of its ends to the protractor at the point of the center of curve of the same, and provided with an index, substantially as and for the purposes set forth.

CHRISTIAN ENSMINGER.

Witnesses:
ALEX. SELKIRK,
CHARLES SELKIRK.