

No. 613,946.

Patented Nov. 8, 1898.

L. S. STARRETT.
COMBINED LEVEL, SQUARE, AND PLUMB.

(Application filed Nov. 29, 1897.)

(No Model.)

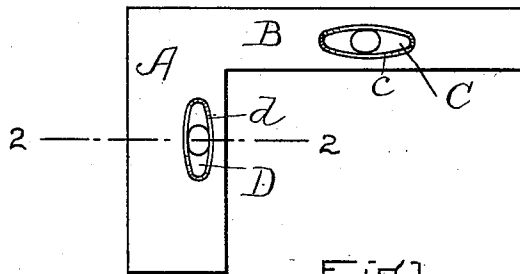


Fig. 1.

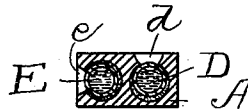


Fig. 2.

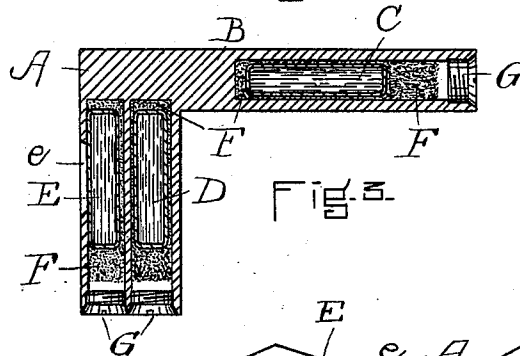


Fig. 3.



Fig. 5.

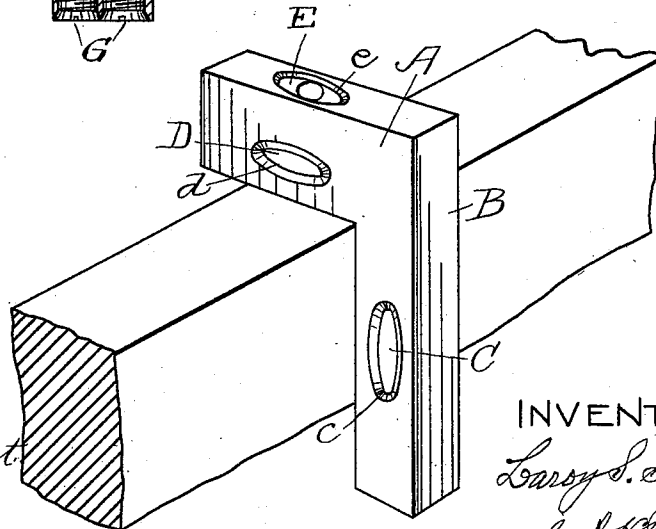


Fig. 4.

WITNESSES.

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LAROCY S. STARRETT, OF ATHOL, MASSACHUSETTS.

COMBINED LEVEL, SQUARE, AND PLUMB.

SPECIFICATION forming part of Letters Patent No. 613,946, dated November 8, 1898.

Application filed November 29, 1897. Serial No. 660,043. (No model.)

To all whom it may concern:

Be it known that I, LAROCY S. STARRETT, of Athol, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in a Level, Square, and Plumb, of which the following, taken in connection with the accompanying drawings, is a specification.

The object of this invention is to provide for carpenters, machinists, and others a most convenient leveling-tool, which I term a "cross-test level, square, and plumb." This name suggests the uses and to some extent the construction of my improved tool, which is designed to show at a glance whether a surface apparently horizontal is actually so, both lengthwise and crosswise, and which is also adapted to serve as a try-square and as a plumb to determine vertical surfaces.

My invention consists in a level-frame in the form of a thickened try-square, having its stock and blade integral and of equal thickness, the stock inclosing one or two leveling-glasses extending lengthwise and exposed through its side and through its edge and the blade inclosing one such glass exposed through the same side of the tool and arranged longitudinally of the blade at right angles to that or those in the stock or head. Thus when the tool is laid on a surface approximately horizontal the two laterally-exposed glasses act simultaneously without moving the tool to show whether or not such surface is in both directions true to the horizon. When the tool is used as a plumb, the blade hangs downwardly, the laterally-exposed glasses are dormant, and the edgewise glass in the stock shows whether or not the edges of the blade are vertical. These glasses are introduced endwise into the members of the tool in which they are located and are adjusted and set therein with plaster-of-paris. Each hole is then plugged by a single blunt screw threaded into the walls of the aperture. The openings which expose the glasses are milled through the side and edge of the tool and are preferably of an elongated oval form with beveled margins.

The glasses in levels are not absolutely cylindrical, but are made on a very slight curve, the highest point when the level is set being uppermost, where the air-space shows when

in use. It is for this reason that I prefer to use two glasses in the stock or head. I can use one exposed through the side and edge by making it straight, with its internal diameter slightly greater at the middle than at the ends, giving the effect of a slight bend sidewise and edgewise; but owing to the difficulty in getting reliable glasses of this sort and in adjusting them accurately in two directions I prefer the other construction.

In the drawings, Figure 1 is a plan of the tool in position for use as a cross-test level. Fig. 2 is a transverse section on line 2 2 of Fig. 1. Fig. 3 is a horizontal central section. Fig. 4 is a perspective view showing the tool used as a try-square and plumb. Fig. 5 is a cross-section through a head having a single glass exposed through the side and edge.

A represents the wider member of the tool, constituting the stock or head, and B the longer and narrower member, corresponding to the blade of an ordinary try-square. These parts are formed integral, of metal or other suitable material, stand at a right angle to each other, and are of equal thickness. I introduce endwise into these members A and B three leveling-glasses C, D, and E, the glasses C and D being exposed to view through beveled openings *c d*, formed through the upper surface of parts A and B in planes at a right angle to each other, and the glass E (parallel to glass D) showing through a like opening *e*, formed through the outer edge of the part A. A packing F, of plaster-of-paris or the like, serves to hold the glasses in position accurately, and the apertures through which they were inserted are closed by screws G. One glass may be substituted for those marked D and E if located, as in Fig. 5, to show through side and edge of the head. In such case the openings *d* and *e* will expose the same glass, and the parts A and B may be of equal width.

It will be seen that with my improved tool the glasses C and D, being placed at right angles to each other, one in each of the members A B, operating simultaneously and exposed through the same plane lateral surface, will without moving the tool indicate any departure from the horizontal in the surface being tested, while the ordinary straight level must be turned and applied in both directions to accomplish the test. Its utility as a self-sup-

porting plumb and as a try-square is also apparent.

The patent to Walter, No. 201,371, dated March 19, 1878, shows a rigid body of try-square form having lengthwise and crosswise leveling-glasses exposed in the inner edge of both its members, but with no such glass in its sides. The absence of lateral openings and of the combination of an edge opening therewith distinguishes the Walter tool from my device clearly.

I claim as my invention—

1. A level-frame having the members A and B of equal thickness, rigidly joined at right angles to each other and provided with the lateral openings *c d* through one side of said frame, one of said openings being formed in each of said members, and the edge opening *e*, formed in the edge of said frame perpendicular to said side, in combination with

leveling-glasses inclosed longitudinally in said members and exposed through said openings, substantially as set forth.

2. The described level, square and plumb, comprising the integral members A and B at right angles to each other, formed with longitudinal perforations and with surface openings thereto, in combination with the leveling-glasses C D and E in said perforations, two of said glasses lying parallel in the head A and the other being perpendicular thereto in the blade B, substantially as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 6th day of November, A. D. 1897.

LARROY S. STARRETT.

Witnesses:

FRANK E. WING,
DAVID FINDLAY.