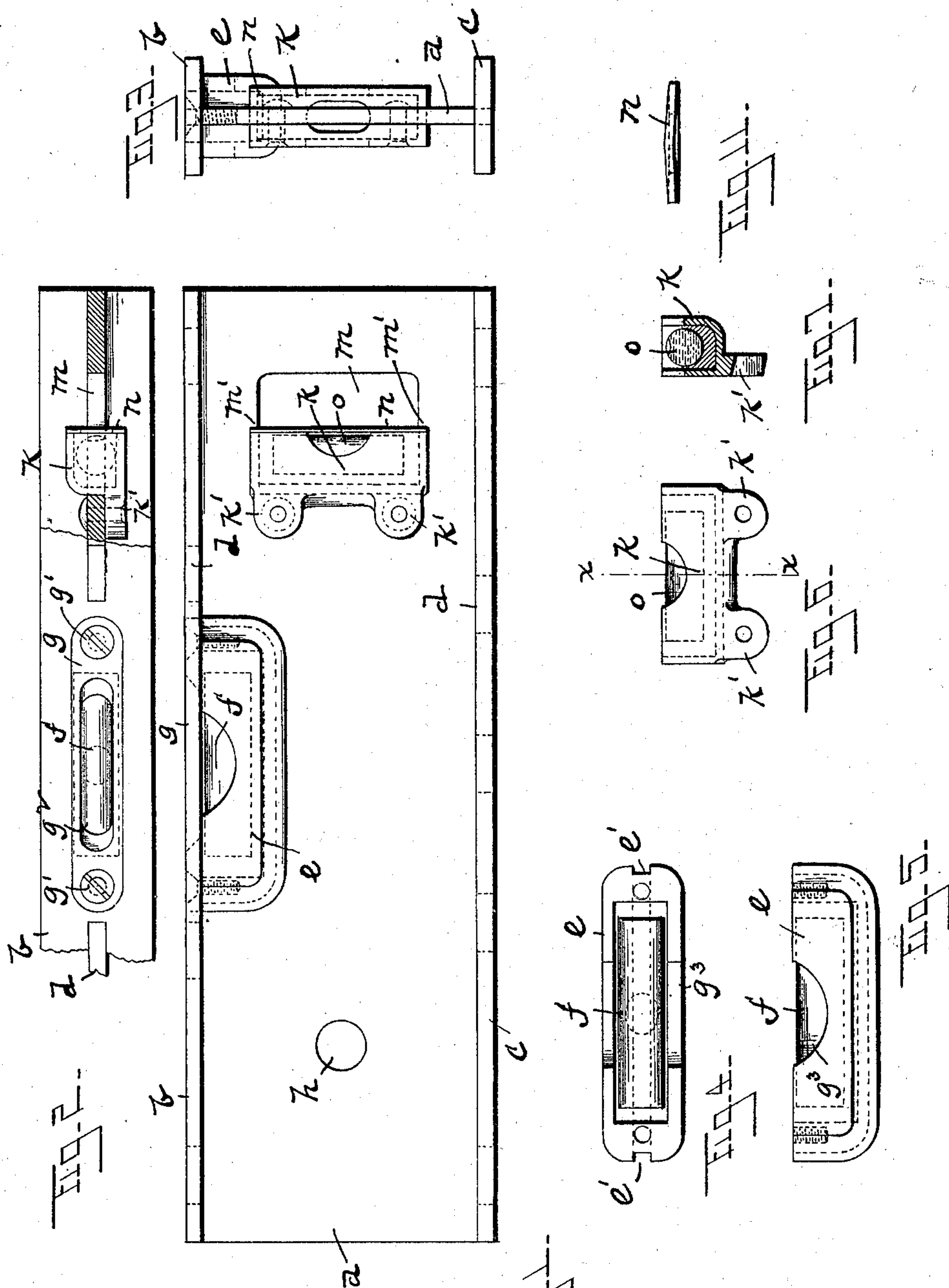


2 Sheets—Sheet 1.

No. 591,139.

Patented Oct. 5, 1897.



WITNESSES:

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George E. Hall
J. E. Chapman

INVENTOR

INVENTOR
M. M. Morton

BY  **ATTORNEY.**

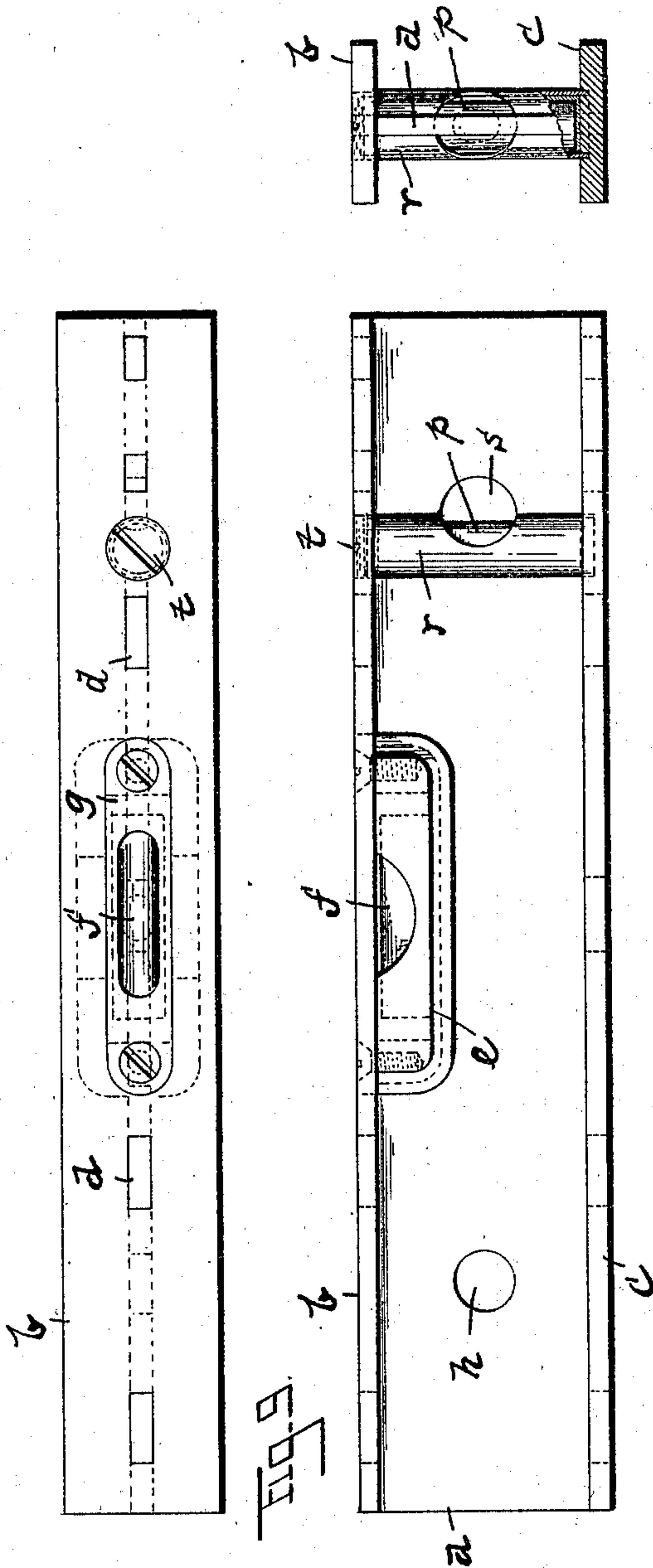
(No Model.)

2 Sheets—Sheet 2.

W. M. MORTON.
COMBINED LEVEL AND PLUMB.

No. 591,139

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UNITED STATES PATENT OFFICE.

WILLIAM M. MORTON, OF NEW HAVEN, CONNECTICUT.

COMBINED LEVEL AND PLUMB.

SPECIFICATION forming part of Letters Patent No. 591,139, dated October 5, 1897.

Application filed February 8, 1896. Serial No. 578,480. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM M. MORTON, a citizen of the United States, residing at New Haven, county of New Haven, and State of Connecticut, have invented a new and useful Improvement in a Combined Level and Plumb, of which the following is a specification, reference being had to the accompanying drawings, forming part thereof.

My invention relates to spirit levels and plumbs; and it has for its object to improve the construction of this class of implements with a view to increasing their strength and durability, while decreasing their weight and bulk and lessening their cost of manufacture.

To this end my invention consists in the combined level and plumb hereinafter fully described, and particularly pointed out in the claims.

Referring to the drawings, in which like letters designate like parts in the several views, Figure 1 is a side view of a level and plumb embodying my invention. Fig. 2 is a plan view thereof, partly in horizontal section. Fig. 3 is an end view thereof. Fig. 4 is a plan view of the bubble-glass and its case. Fig. 5 is a side view of the same. Fig. 6 is a side view of the plumb bubble-glass. Fig. 7 is a cross-section thereof at line *xx* of Fig. 6. Figs. 8, 9, and 10 are respectively a side view and plan view of a slightly-modified form of the invention. Fig. 11 is a detail view drawn to a larger scale, showing one end of the cap-plate which covers the plumb bubble-glass in Figs. 1 and 2.

The frame of the improved level and plumb devised by me is composed of a plate *a*, of sheet metal, and two similar plates *b c* of considerably less width, united at their center line to the side edges of said plate *a*, thereby forming a frame of double-T shape in cross-section, as shown more clearly in Figs. 3 and 10.

The plates *a*, *b*, and *c* are preferably composed of sheet-steel, and the connection between the plate *a* and the two plates *b c* is preferably made by providing the former at its side edges with a series of tenons *d*, which enter corresponding slots or mortises in the plates *b c* and have their outer ends riveted against the outer surface of said plates, as shown, thereby forming a very firm joint and

one which, after the outer surfaces of the plates *b c* are reduced to a true plane, is practically invisible. The frame thus constructed is possessed of great strength and rigidity, is of considerably less weight than those heretofore used, and can be manufactured at a comparatively small cost. Said frame, moreover, presents a pleasing and graceful appearance, and can be used in many situations in which a level with flush sides cannot be used.

The letter *e* designates the case for the level bubble-glass *f*, which case is of substantially rectangular form, with its bottom rounded transversely and at the ends, as shown, and it is provided with a centrally-disposed exterior groove *e'*, extending from end to end thereof, said groove terminating at its ends in the plane of the flat upper surface of the case, as shown in Fig. 4. At a point midway between its ends the plate *a* is provided with a recess in its upper side corresponding in shape with the shape of said case *e* longitudinally and of sufficiently less dimensions to cause the margin of the recess to enter and closely fill the groove *e'* in the case when the upper face of the latter is flush with the edge of said plate, as shown by dotted lines in Fig. 1. The case *e* is thus placed in position before the plate *b* is secured to the plate *a*, and after said plates are riveted together the case is securely locked in place in such manner as to be incapable of movement in any direction.

The plate *b* is longitudinally slotted to receive the cap-plate *g*, which is removably held in place by two screws *g'*, entering tapped holes in the case *e*, said cap-plate being provided with the slot *g''*, having its end walls beveled, as shown, to expose to view the bubble-glass *f*. Said bubble-glass is of the usual form and is seated in the case *e* by means of cement in the usual manner. By simply removing the cap-plate *g* access to the case is afforded for the purpose of removing a broken glass and substituting a new one, should it become necessary, without disturbing the connection of the case with the frame, an operation which can be performed very quickly and conveniently as compared with previous forms of levels, which usually have to be returned to the makers for the substitution of a new glass. The side walls of the

case *e* are provided with the usual curved recess *g*³ to expose the bubble-glass, to view from the side of the instrument, and the plate *a* is preferably provided with a hole *h*, as shown, to enable the instrument to be suspended from a nail or hook when not in use and to lessen its weight.

As shown in Figs. 1 to 7, inclusive, and in Fig. 10, the plumb-bubble-glass case *k* is seated within an opening *m* in plate *a*, near one end of the latter, and is held in place by two rivets passing through ears or lugs *k'* on the case, which lie flush with one side of said plate when the case is in its operative position, and is thus securely locked against movement in any direction. Said case *k* is provided with a removable cap-plate *n*, slotted, as usual, to expose the bubble-glass *o*, and the opening *m* in plate *a* is provided with two shoulders *m'*, adapted to engage and slightly overlap the opposite ends of said cap-plate when the latter is in its operative position, as shown in Fig. 1. The extreme ends of said cap-plate are slightly bent transversely, as shown in Fig. 11, to cause them to have sufficient frictional action against said shoulders *m'* to retain the cap-plate in position, while permitting it to be removed and replaced by a lateral sliding movement whenever it becomes necessary to do so. When thus removed, the interior of the case is exposed to enable a new glass to be inserted without disturbing the case.

In the form of the invention shown in Figs. 8, 9, and 10 the form of the frame and the manner of securing the level bubble-glass thereto are the same as in the form just described, but as a case for the plumb bubble-glass *p* I utilize in this instance a tube *r*, of sheet metal, which is seated in an opening extending transversely across the plate *a* and has its ends entered within annular recesses in the inner sides of the plates *b* *c*, as shown in Figs. 8 and 10, whereby it is securely locked in position when said plates are riveted to the plate *a*. Said tubular case has the usual opening in one side thereof to expose to view the bubble-glass, one of the divisions of plate *a* being provided with a corresponding recess *s* in its abutting end, as shown. The plate *b* is provided with a hole extending therethrough which registers with the bore of the case *r*, through which the bubble-glass can be withdrawn and a new one substituted without disturbing said case, said opening being normally closed by a plug-screw *t*, the head of which is flush with the outer surface of said plate, as shown.

In both forms of the invention herein shown and described it will be observed that I combine with my novel form of frame means for holding the cases for the bubble-glasses rigidly in place within said frame and also means for quickly and conveniently removing said glasses from said cases and inserting new ones without in any manner disturbing the true position of the cases. I am thus enabled

to provide a level and plumb the accuracy of indication of which is assured at all times and which can be repaired by the user himself, should a bubble-glass be broken, at a trifling cost.

So far as the particular form of frame herein described is concerned I do not wish to limit myself to its use in connection with the particular form of bubble-glass cases herein shown or their manner of connection thereto, as it is obvious that various other forms of means for securing such connection can be employed without impairing the advantages incident to the form of frame itself for this class of instruments.

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

1. In a spirit-level, a frame composed of a top plate, a bottom plate, and an intermediate plate, of sheet metal, said intermediate plate being perpendicular to the top and bottom plates and being united to the latter at their center line; a bubble-glass case seated within a recess in the upper edge of said intermediate plate and retained therein by the overlapping top plate; and a cap-plate detachably secured to and covering a slot in the top plate of said frame, said cap-plate containing an opening which exposes to view the bubble-glass in said case, substantially as described.

2. In a spirit-level, the combination with a frame composed of three plates of sheet metal, to wit, a top plate, a bottom plate, and an intermediate plate forming a right angle with said top and bottom plates and riveted to the latter along the center line, of a level-bubble-glass case and a plumb-bubble-glass case seated within recesses or openings in said intermediate plate, each of said cases being provided with a slotted cap-plate adapted to be removed therefrom and returned thereto without disturbing the cases, substantially as and for the purpose described.

3. In a spirit-level, the combination with a frame composed of an intermediate plate of sheet metal having projecting from its side edges a series of tenons, and a top plate and a bottom plate also of sheet metal provided at their center line with a series of slots or mortises to receive the tenons on said intermediate plate, of a level-bubble-glass case and a plumb-bubble-glass case seated within recesses or openings in said intermediate plate, each of said cases being provided with means whereby its bubble-glass can be removed and returned thereto without disturbing the position of the case on said plate, substantially as and for the purpose described.

4. In a spirit-level, the combination with the frame composed of the sheet-metal plates *a* *b* *c* united together substantially as described, of the bubble-glass case *e* seated within a recess in said plate *a* and having the exterior groove *e'* to receive the edge of said plate, said case being provided with the removable cap-plate

g located within a slot in said plate *b*, substantially as described.

5 In a spirit-level, the combination with the frame composed of the plates *a b c*, said plate *a* having therein the opening *m* in the wall of which are located the shoulders *m'*, of the bubble-glass case *k* seated within said opening, said case being provided with the remov-

able cap-plate *n* the ends of which are engaged by said shoulders *m'* when said cap-plate is in its operative position. 10

WILLIAM M. MORTON.

Witnesses:

WM. H. CHAPMAN,
GEORGE E. HALL.