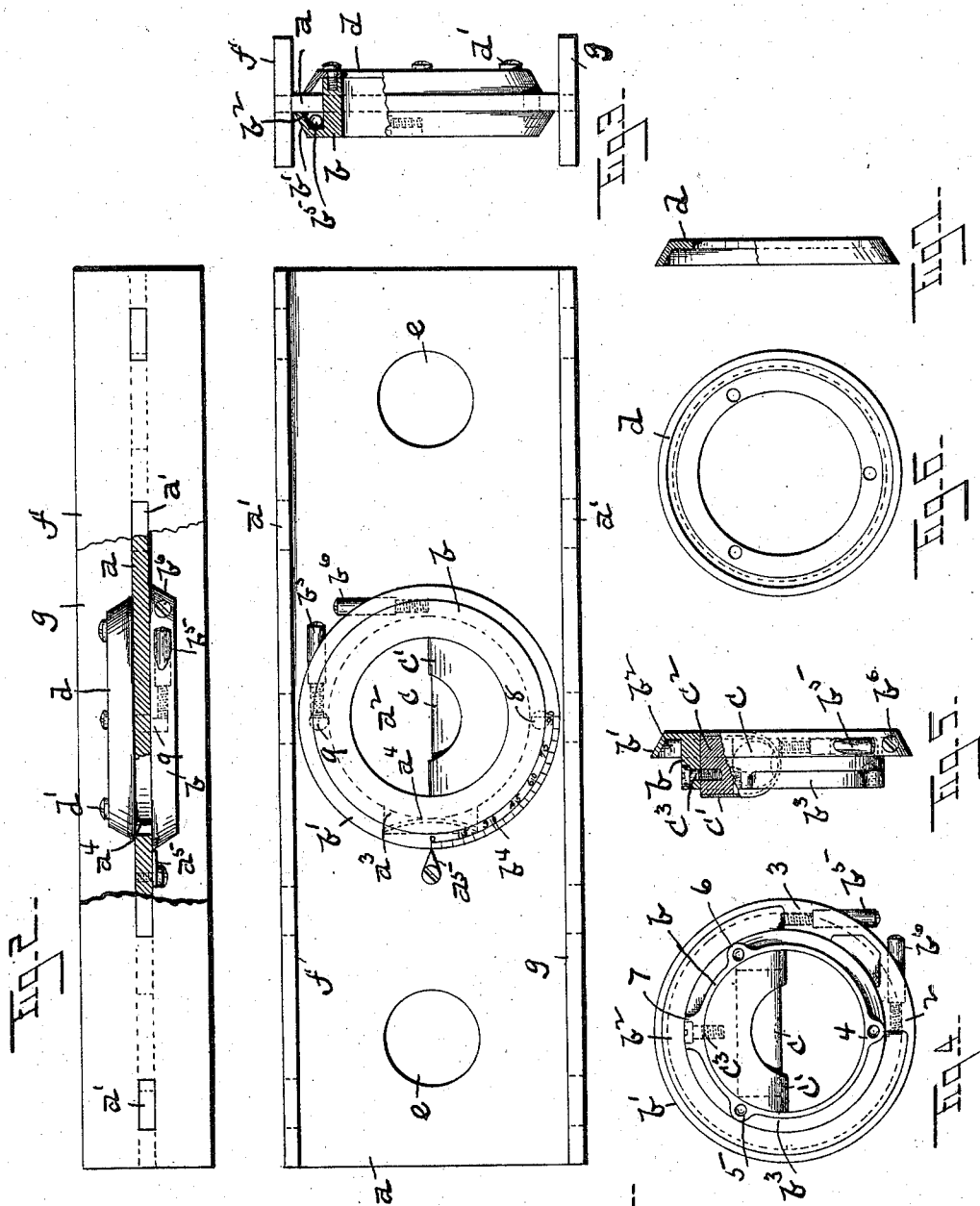


(No Model.)

W. M. MORTON.
SPIRIT INCLINOMETER.

No. 577,772.

Patented Feb. 23, 1897.



WITNESSES:

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SPIRIT-INCLINOMETER.

SPECIFICATION forming part of Letters Patent No. 577,772, dated February 23, 1897.

Application filed February 8, 1896. Serial No. 578,479. (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 Spirit-Inclinometers, of which the following is a specification, reference being had to the accompanying drawings, forming part thereof.

The object of my invention is to provide a spirit-inclinometer which, while possessing even greater strength and durability, will be of considerably less weight than those heretofore used and which can be manufactured at a comparatively small cost.

To this end my invention consists in the inclinometer constructed and operating as hereinafter fully described, and particularly pointed out in the claims.

Referring to the drawings, in which like letters and numerals designate like parts in the several figures, Figure 1 is side view of an inclinometer embodying my invention. Fig. 2 is a plan view thereof with the central portion of the frame shown in horizontal section. Fig. 3 is an end view, partly in vertical section. Fig. 4 is a rear view of the bubble-glass case detached from the frame. Fig. 5 is an edge view of the same, partly in cross-section. Fig. 6 is an inner face view of the cap. Fig. 7 is an edge view thereof, partly in cross-section.

In its preferred form the frame of the instrument is composed of three plates of sheet-steel—viz., a top plate *f*, a bottom plate *g*, and an intermediate plate *a*, the latter standing at a right angle to said top and bottom plates and being securely united thereto by means of tenons *a'*, projecting into mortises or recesses in said plates, which tenons are riveted at the outer side of the top and bottom plates, thus forming a very strong and rigid connection, which is practically invisible after the outer surface of said plates is reduced to a true plane. The frame thus constructed, while being stronger and more durable than those heretofore used for this class of instruments, is of very much less weight and can be manufactured at a considerably less cost. At a point midway between its ends the intermediate plate *a* of the frame is provided with a circular opening *a²* to receive the bubble-glass case, which is constructed as follows:

A circular ring *b*, having an outer diameter to cause it to closely fit within said opening *a²* in the frame, is provided at its front end with a projecting flange *b'*, adapted to bear against the front side of the plate *a* at the margin of said opening. To lessen the weight of the case, the rear side of said flange *b'* is provided with the groove or channel *b²*, which extends continuously around said flange, except at the points 2 3, (see Fig. 4,) where the original thickness of the metal is left to form bearings for the adjusting-screws presently to be described.

For the same reason I prefer to form the channel *b³* in the outer surface of the ring *b* at its rear end, which extends continuously about said ring except at the points 4 5 6 7, where sufficient thickness of metal is left to receive the tapped holes for the screws by which the cap is secured in place and the bubble-glass is fastened in position, as hereinafter described. As before stated, said ring *b* closely fits within the opening *a²* in plate *a*, it being, however, free to revolve therein, and to augment the frictional drag on the ring to prevent any accidental turning movement thereof I prefer to provide the plate *a* with a rectangular recess or offset *a³* in the wall of said opening and to locate within said opening a flat bow-spring *a⁴*, bearing at its center against the periphery of the ring *b*, as shown in Fig. 2 and by dotted lines in Fig. 1. The outer surface of flange *b'* of said ring *b* is preferably beveled, as shown, and it carries the series of graduations *b⁴* adapted, in connection with a stationary pointer *a⁵* on the frame, to indicate degrees of inclination of the instrument. The bubble-glass *c* is seated within the ring *b* and is held in place by the band *c'*, which band is formed from a circular piece of thin sheet metal having a diameter corresponding to the inner diameter of the ring and bent transversely to a U shape, (see Figs. 1 and 5,) with a filling piece of metal *c²* inserted between its outer edges to receive the screw *c³*, passing through the ring *b*, whereby the band is secured to the ring. Said band is provided with the central opening to expose the bubble-glass to view, as shown, and the latter is seated in the band by cement in the usual manner.

The ring *b* is retained within the opening

a^2 of the frame by a cap d in the form of an annular ring, which is secured to the rear end of said ring by the screws d' entering tapped holes in the enlargements 4 5 6 of the ring before referred to, said cap having a beveled edge, which bears against the rear side of plate a of the frame at the margin of the opening a^2 . Provision is thus made for retaining the bubble-glass case within the opening in the frame in such manner as to be capable of a rotary movement to change the bubble-glass from a horizontal position to a vertical position, and vice versa, and to limit its movement in opposite directions at those two points I locate on the plate a , at the margin of the opening a^2 , the two stop-pins 8 9, (shown by dotted lines in Figs. 1 and 2,) which pins project into the channel b^2 of ring b , and provide said ring with the two tangentially-disposed adjusting-screws $b^5 b^6$, which enter tapped holes in the thickened portions 2 3 of said ring and project at their inner ends into said channel, the ends of said screws making contact with said stop-pins, respectively, at the two extremities of the movement of the case. By the adjustment afforded by said screws the bubble in glass c can be caused to accurately register with the center point of said glass at both extremities of the movement of the case, and the pointer a^5 being set to indicate the zero-point of the graduations b^4 when the bubble-glass occupies its horizontal position, as shown in Fig. 1, said pointer and graduations will accurately indicate any degree of inclination of said glass between its horizontal and vertical positions.

The intermediate plate a of the frame will, preferably, be provided with additional openings e , of any desired size and shape, to still further reduce the weight of the frame.

The inclinometer thus constructed is adapted for all of the uses for which such instruments are usually employed. It is very strong and durable in its construction, is of light weight, and can be manufactured at a comparatively small cost. The adjustment afforded by the screws $b^5 b^6$ can be

made without removing the bubble-glass case from the frame, while at the same time said screws are so protected by the projecting top and bottom of the frame as to insure them against accidental movement. By removing the cap d and withdrawing the ring b from the frame access is afforded to the screw c^3 , by removing which the band c' can be removed from said ring for the substitution of a new bubble-glass for a broken one or for any purpose, an operation which can be performed very quickly and conveniently.

I do not herein claim, broadly, the form of frame shown and described, the same forming the subject of claim in an application for Letters Patent filed by me February 8, 1896, Serial No. 578,480.

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

1. In an inclinometer, the combination with a frame composed of three plates of sheet metal, viz;—a top plate, a bottom plate, and an intermediate plate standing at a right angle to said top and bottom plates and united to the latter at their center line, of an annular bubble-glass case revolubly seated within a circular opening in said intermediate plate and having a bubble-glass detachably secured to the inner side thereof, two stop-pins located on said intermediate plate of the frame and projecting into an annular groove or channel in said case, and adjustable contact devices on said case adapted to engage said stop-pins respectively to limit the movement of the case in opposite directions, substantially as described.

2. The combination with the frame and the ring b revolubly seated in said frame, of the bubble-glass c , U-shaped band c' partially inclosing said glass and having the filling-piece c^2 between its outer edges, and the screw c^3 passing through said ring and into said filling-piece, substantially as set forth.

WILLIAM M. MORTON.

Witnesses:

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 GEORGE E. HALL.