J. HAPPLE.

LEVEL.

APPLICATION FILED MAY 19, 1919.

1,384,062. Patented July 12, 1921.

Fig. 2.

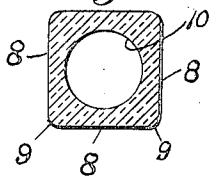


Fig. 1.

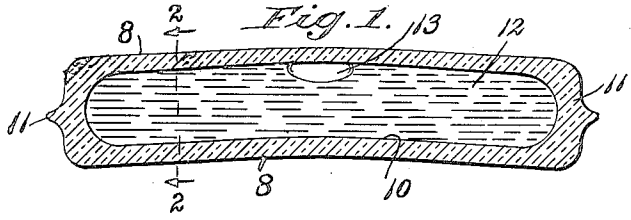


Fig. 3.

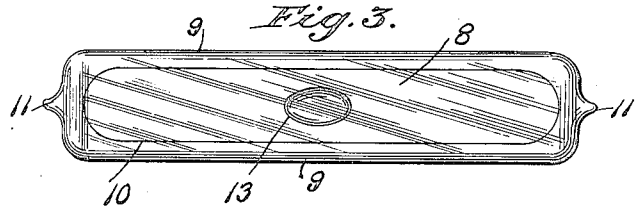


Fig. 6.

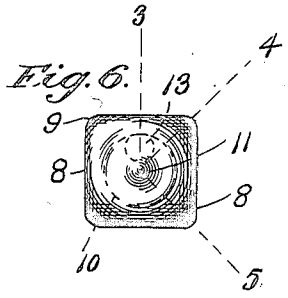


Fig. 4.

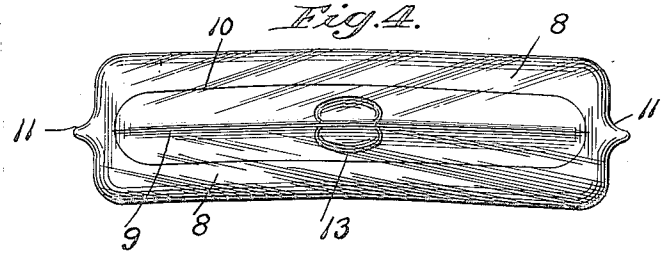


Fig. 5.

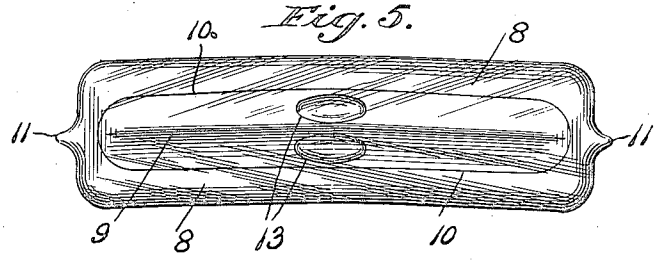
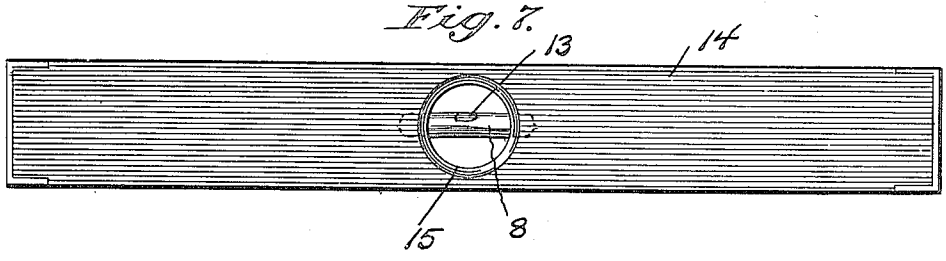


Fig. 7.



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by [illegible]

Att'y.

UNITED STATES PATENT OFFICE.

JOHN HAPPLE, OF SYRACUSE, NEW YORK.

LEVEL.

1,384,062. Specification of Letters Patent. Patented July 12, 1921.

Application filed May 19, 1919. Serial No. 298,018.

To all whom it may concern:

Be it known that I, JOHN HAPPLE, a citizen of the United States, residing at Syracuse, in the county of Onondaga and State of New York, have invented certain new and useful Improvements in Levels, of which the following is a specification.

The present invention relates more particularly to the indicating member of a so-called spirit level or the like, usually consisting of a glass tube partially filled with spirit or other suitable liquid, leaving a bubble or bead that traverses the same. These levels, as is well known, are used for a variety of purposes by carpenters, masons and machinists, and are also employed in plumb levels, surveyors' instruments and the like.

Heretofore, so far as I am aware the level-glasses have been made from cylindrical glass tubes and have comparatively thin walls. Such glasses have two defects. In the first place, it is not possible to see the bead or bubble clearly and distinctly except when looking almost directly down upon it. If viewed from the side or from underneath, the glass cylinder and the contained liquid constitute in effect a lens which distorts the image of the bead or bubble, so that it cannot be seen with that sharpness and distinctness desirable for determining the position of the same accurately. In the second place, the glasses are exceedingly fragile, and consequently are liable to be broken if the instruments in which they are incorporated are dropped or subjected to considerable jar.

The object of the present invention is to overcome both the above defects by providing a level-glass in which the bead or bubble itself or one or more distinct images of it may be seen clearly from practically any viewpoint, and especially when the eye of the beholder is perpendicular to the axis of the level-glass; furthermore, to provide a structure of unusual strength and one that is consequently not liable to breakage from accident or careless or rough handling.

In the accompanying drawings:—

Figure 1 is a longitudinal sectional view through an embodiment of the invention.

Fig. 2 is a cross sectional view on the line 2—2 of Fig. 1.

Figs. 3, 4 and 5 are views in elevation, respectively indicated by the lines 3, 4 and 5 of Fig. 6, which is an end view, and

Fig. 7 is a view in elevation illustrating one manner of mounting the level-glass body in a stock.

Similar reference numerals designate corresponding parts in all the figures of the drawings.

In order to accomplish the desired results, glass tubing is employed that is drawn preferably with a substantially cylindrical bore and a prismoidal outer surface, having angularly disposed approximately flat sides. In other words a cross section through the tube would show a more or less regular polygon with a circular hole approximately through the center. While the external side faces of the level-glass body are preferably plane surfaces intersecting each other sharply, a slight concavity or convexity of the surfaces and a slight rounding of the corners formed by the intersection of the same, either intended or resulting from commercial methods of producing the tubing, will of course come within the scope of the invention.

In the embodiment disclosed, the body is formed of transparent material, preferably glass, and is square in cross section, the external faces 8 being substantially flat and shown as meeting in rounded corners 9. The longitudinal bore or liquid containing chamber is designated 10, and is preferably cylindrical or substantially circular in cross section, as illustrated in Fig. 2. The ends of the bore are hermetically sealed in any desired manner, preferably by fusing the ends of the tube, as indicated at 11. The liquid contained in the bore or chamber is designated 12 and may be of any character desired or found suitable.. This liquid does not completely fill the bore or chamber, but leaves a bead or bubble 13 that can freely traverse the bore, as will be readily understood. It will be noted that in the particular embodiment shown, the body is bent slightly to the arc of a circle of large diameter, the degree of curvature determining the sensitiveness of the instrument, as will be appreciated by those skilled in the art.

The bead or bubble will, of course, be maintained centrally with respect to all the flat surfaces, and consequently if viewed from above, as indicated by the line 3 in Fig. 6, the bubble will be shown clearly and distinctly, as illustrated in Fig. 3. Moreover the refraction of the rays of light

passing through the cylindrical body of liquid in the bore is largely corrected by the eccentrically disposed walls of the tube, so that the view of the bead 13 from any position is not seriously distorted. Thus, Figs. 4 and 5 illustrate the appearance of the glass when viewed respectively from angles of approximately 45° above and below the horizontal plane intersecting the axis of the level-glass body, as indicated by the lines 4 and 5 of Fig. 6. In Fig. 7, there is disclosed a mounting of the level-glass body in order that its advantages may be utilized. As shown the stock 14 may be of any well known type and is provided with a relatively large central opening 15 therethrough. The level-glass body bridges this opening and being spaced from the upper and lower walls thereof, has all of its sides exposed to view. With this arrangement the instrument therefore can be used conveniently and accurately when held either above or below the eye of the observer.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art, without further description, and it will be understood that various changes in the size, shape, proportion, and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

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

1. As an article of manufacture, an elongated level glass body having a longitudinal fluid holding bore with closed ends, the interior and exterior faces of the body having different cross sectional shapes and one of said faces comprising portions that are substantially flat and angularly disposed in cross section.

2. As an article of manufacture, a level-glass body polygonal with substantially flat faces in cross section and having a fluid holding bore therein, the walls of said bore being curved in cross section.

3. As an article of manufacture, a level-glass body comprising an elongated prismatic body with substantially flat faces and having a longitudinal substantially cylindrical fluid holding bore.

4. As an article of manufacture, a level-glass comprising an elongated prismatic body with substantially flat faces and having a longitudinal substantially cylindrical fluid holding bore, a fluid contained within the bore and partially filling the same, leaving an indicating bead therein, the ends of said bore being hermetically sealed.

In testimony whereof I affix my signature in the presence of two witnesses.

JOHN HAPPLE.

Witnesses:

FREDERICK H. BAILER,

SADIE B. BAILER.