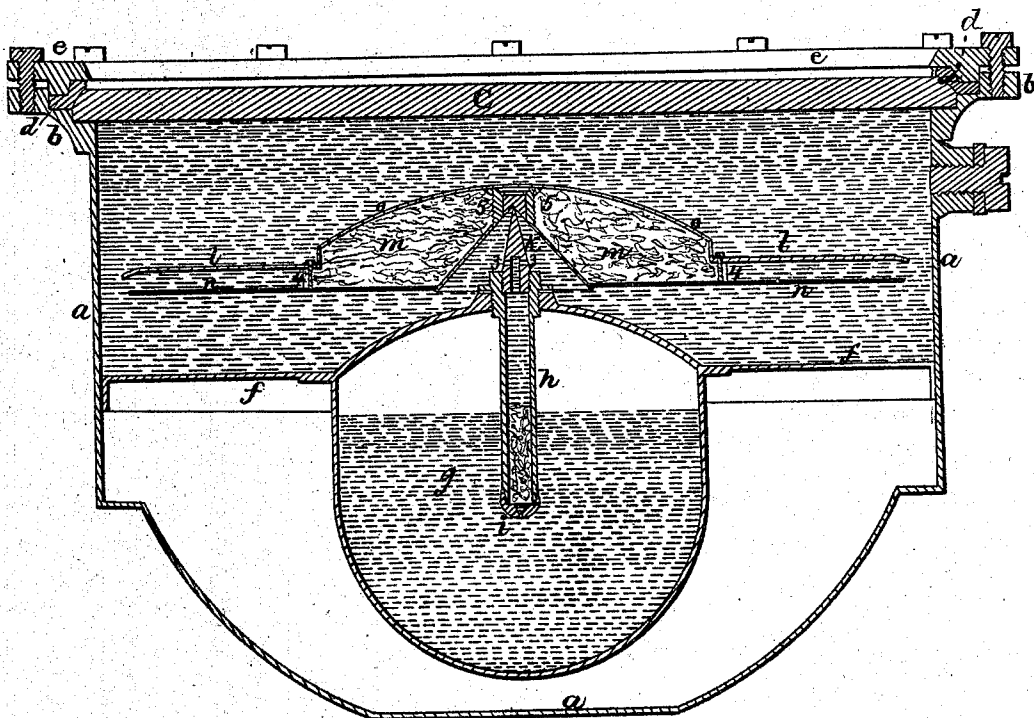


J. & G. H. BLISS.

Compass.

No. 103,286.

Patented May 24, 1870.



Witnesses.

Geo. A. Waller.

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Inventors.

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# United States Patent Office.

JOHN BLISS AND GEORGE H. BLISS, OF BROOKLYN, NEW YORK.

Letters Patent No. 103,286, dated May 24, 1870.

## IMPROVEMENT IN MARINERS COMPASSES.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern :

Be it known that we, JOHN BLISS and GEORGE H. BLISS, of Brooklyn, in the county of Kings and State of New York, have invented and made a new and useful Improvement in Liquid Compasses; and we do hereby declare the following to be a full, clear, and exact description of the said invention, reference being had to the annexed drawing making part of this specification, wherein we have represented the said compass by a vertical section of the same.

Liquid compasses have, heretofore, been made, in which the case was filled with alcohol or other liquid, so as to partially float the card and needle, and the expansion of the liquid under varying temperatures has been allowed for by a portion of the case, or a chamber connected thereto, being of thin sheet metal, and, in some instances, an air-chamber has been proposed.

When the metal is moved by the expanding liquid the case cannot be made of thick metal, and the thin metal is liable to injury.

Where an air-chamber has been used there was a liability for bubbles of air to escape from the expansion air-chamber into the compass-case, or else the compass has been rendered inconvenient or unsightly in consequence of the air-chamber being above the compass-case, and this chamber obstructed the view of the compass-card.

Our invention relates to an air-chamber combined with the liquid-chamber of the compass-case, the two being connected together by small openings or pores in the liquid portions of the chamber, in such a manner that only the liquid can pass from one chamber to the other, in consequence of expansion or contraction under varying temperature, and the air will be confined effectually, but act as an elastic cushion.

In the drawing—

*a* is the bowl of the compass, formed of sheet metal spun up to shape, instead of being cast as heretofore, so as to be lighter and of more dense and reliable metal, and not liable to leak.

The ring *b* is soldered or brazed to the upper edge of the bowl *a*, and receives the glass *c*, rubber or elastic packing *d*, and clamping-ring *e*, pressed down by screws.

The diaphragm *f* is introduced within the bowl *a*, so that the space for the liquid and compass-card will be lessened, but the swing of the card will not be interfered with.

Below the diaphragm *f* is the expansion vessel *g*, that is to be filled with liquid to about the height shown previously, to introduce the tube *h*, that is secured firmly to its seat upon *f*, so as to be air-tight.

The lower end of this tube *h* terminates near the center of the chamber or vessel *g*, so that it will always remain in the liquid, even if the compass is turned on its side, or inverted so that air will not enter this tube.

As an additional precaution we make use of a screw-cap, *i*, with a very small hole, that is sufficient for the liquid to pass gradually from one vessel to the other.

The end of this cap *i* is rounding, so that bubbles of air cannot lodge, even if the compass is shaken.

Furthermore, we introduce porous material where the liquid passes from one chamber to the other.

We find that sponge introduced in the tube *h*, a piece of porous stone or packing of fibrous material, or other like substance, applied between the said chambers, will allow the liquid to pass, but, being saturated with liquid, will not allow air to pass.

Small spring valves, opening in opposite directions when employed, are the equivalent of the porous material.

The porous materials or valves allow of the air-expansion chamber being located in some other part of the compass-bowl than the bottom thereof, such as in the sides of the bowl or in the compass-card.

The tube *h* is extended up, to form the pivot *k* for the compass-card. The openings, *3*, through the base of said pivot, communicate with the tube *h*.

The compass card is formed of a sheet metal annulus, *l*, coated with vitrified enamel. The necessary points and letters are formed and burnt in by vitrifying the enamel in a manner similar to that adopted in the manufacture of watch and clock-faces.

This mode of making the compass-card insures great accuracy and beauty, and prevents injury to the compass-case, either as to the color or the accuracy of the divisions, by the action of the liquid.

The annular compass-card *l* is supported by the float *m*, of cork or other wooden material, formed with a flange, *4*, for the card to rest upon.

The magnetic needle *n* is provided with the conical socket for the pivot, as usual; said conical socket is shown as entering the cork-float *m*, and being retained by a nut, *5*.

This cork or wood float projecting through the annular compass-card causes the weight to be partially floated, so that it does not rest so heavily on the pivot *k*, and there is no tendency to tip or incline the card, as there would be if the floating power was entirely below the compass-card.

A thin sheet-metal cap, *o*, may be placed over the float *m*, to render the appearance more acceptable.

In order to prevent the cork or wood absorbing the liquid and lessening its buoyancy, we employ a coat-

ing of collodion, mixed with a pigment, such as zinc-white, and the same can be employed for painting the inside of the bowl.

Alcohol does not affect said collodion, hence it is admirably adapted to this object.

What we claim, and desire to secure by Letters Patent, is—

1. A liquid compass, formed with two spaces, one for the compass-card, the other containing liquid and air, when the two are connected by a tube or opening provided with porous material, or its equivalent, for preventing air passing into the compass-space, substantially as set forth.

2. The chamber *g*, below the compass-chamber, in combination with the tube *h*, the opening of which is located at or near the center of the vessel *g*, as and for the purposes specified.

In witness whereof we have hereunto set our signatures this 3d day of May, A. D. 1869.

JOHN BLISS.  
GEO. H. BLISS.

Witnesses:

GEO. D. WALKER,  
GEO. T. PINCKNEY.