

(No Model.)

R. OLIVER.
MARINER'S COMPASS.

No. 478,017.

Patented June 28, 1892.

Fig. 1.

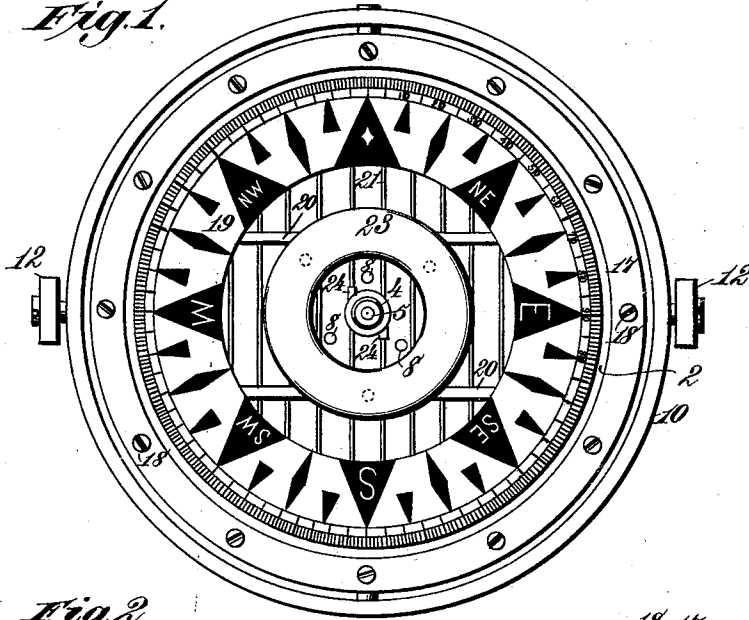


Fig. 2.

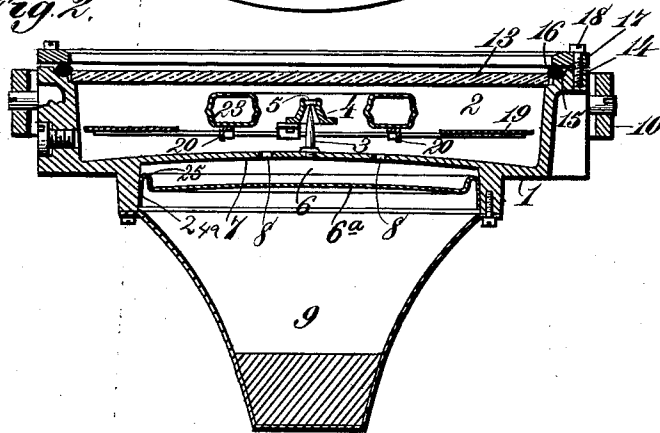
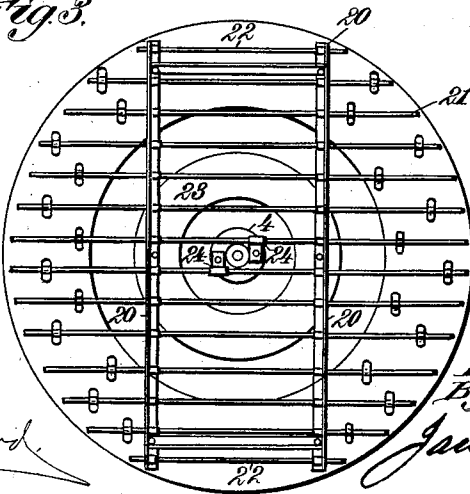


Fig. 3.



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UNITED STATES PATENT OFFICE.

ROBERT OLIVER, OF BROOKLYN, NEW YORK.

MARINER'S COMPASS.

SPECIFICATION forming part of Letters Patent No. 478,017, dated June 28, 1892.

Application filed March 7, 1892, Serial No. 424,047. (No model.)

To all whom it may concern:

Be it known that I, ROBERT OLIVER, a subject of the Queen of Great Britain, but having declared my intention of becoming a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Mariners' Compasses, of which the following is a specification.

My invention relates to mariners' compasses, the purpose thereof being to provide a liquid compass in which the polar force is distributed over the face of the card by independent parallel magnetized needles secured to the card in a novel manner and having their terminals in the peripheral line, whereby the polar attraction is more nearly equalized upon all sides of the pivotal support.

It is my further object to provide a compass having a bowl formed in one piece of metal and provided with an expansion-chamber beneath the bowl.

It is my further purpose to provide a mariner's compass having the compass-card provided with a plurality of needles having novel mounting and provided with an attachable and detachable ring air-chamber, in combination with a bowl having an expansion-chamber beneath, the card being centered by a suitable bearing and sustained by an oil of a suitable color, whereby the rusting of the needles is prevented.

It is an important feature of my invention that I seek to obtain such a distribution of magnetic force or polar attraction that instead of being centered at two points or foci, as in the two-needle compass, it shall be scattered over all the many points in which polar attraction may locate, being apportioned in substantial uniformity to each point, by which construction the compass shows less error.

It is my object, also, to add to the sensitiveness of the compass-card by extending the multiple points of location of polar attraction in parallelism upon each side of the polar-axis fully as far as the edge of the card and arranging the same directly upon the compass-card, or substantially so, whereby I largely increase the directive force, or, in other words, obtain a compass which is more constantly upon the magnetic meridian. I also aim to avoid the presence of a species of magnetic

fulcrum, which is often found in other compasses, whereby the magnetic pull or push will create larger errors than are possible with a compass manufactured in accordance with my invention.

My invention also comprises certain novel features of construction and new combinations of parts, all of which will be fully set forth hereinafter, and then specifically pointed out in the claims following this specification.

To enable others skilled in the art to make, construct, and use my said invention, I will describe the same in detail, reference being had to the accompanying drawings, in which—

Figure 1 is a plan view of a compass, showing my invention. Fig. 2 is a central vertical section of the same. Fig. 3 is a bottom plan view of the compass-card removed from the bowl.

In the said drawings the reference-numeral 1 indicates the compass-bowl, which is circular in plan view and having in its upper and larger portion a bowl 2 of suitable depth to contain a body of oil to give flotation to the card in such degree as to require from the central pivotal bearing merely the function of centering the card in the bowl, the weight sustained being only sufficient to insure maintenance of pivotal engagement between a central needle-pivot 3 in the bowl, which enters a central cap 4 on the card and rests in an agate bearing 5, which is detachable.

The body of the compass below the bowl is contracted in radial dimensions to provide a chamber 6 beneath the bowl, but having its circular wall integral with the other parts described. The expansion-chamber is separated from the bowl by a septum or diaphragm 7, which forms the bottom of the bowl, and is provided with a series of openings 8, suitably arranged in its central portion. One of these openings is in the bowl-center to receive the pivot-bearing 3. The bowl is formed of brass or other suitable metal or material, and the lower part of the body is formed in a separate part 9, attachable by screws, inclosing the bottom of the expansion-chamber 6 and forming a ballast-weight for the compass-body. The latter is supported in a ring 10, which is provided with the usual gimbal-supports 12. The compass-bowl 2 is closed above by a

strong glass plate 13, laid upon the circumferential edge 14, in which a surrounding channel 15 is provided next the edge of the glass. In this channel a rubber or other gasket 16 is laid. Upon this is placed the gasket-annulus 17, and screws 18 are passed through openings in the annulus and into threaded openings in the circumferential edge 14, thereby compressing the gasket in the channel 15 and making an air-tight joint.

The compass-card is composed of a flat annulus 19 of suitable material—such as linen—having a hard-paint surface. Its width is sufficient to allow the points and proper indications or markings to be placed thereon. Crossing the open interior space of the annulus on each side of the center is a bridge-piece 20, formed of brass or other suitable metal in very thin strips, bent longitudinally to form two strips, one lying at right angles with the other. One of these strips is laid flat against the under face of the card, to which its end portions are attached by screws or in any other suitable manner. The bridge-pieces being parallel, they will have their angular strips projecting at right angles to the face of the card, and through these angular strips holes are drilled at suitable intervals to receive the magnetized needles 21, which may be fastened by a small drop of soft solder or by any preferred means. The ends of these needles extend to the outer periphery of the card, and the series of said needles extend over the whole card-space from east to west, separated by uniform intervals. The extremes 22 of the series lying at the east and west extremes of the equatorial line are short, but equal to each other, and upon each side of the line joining the polar extremes I provide a field of polar attraction, which is substantially equal in force and extent to the similar field upon the other side of said line, the diminished length of the extremes 22 being partly compensated by the greater radial distance from the center.

Over the needles is arranged an air-chamber 23 of annular form and attached to the bridge-pieces by screws. This ring-shaped air-chamber is of suitable dimensions to contain a body of air sufficient to nearly float the compass-card and raised above the same far enough to locate the center of gravity below the point of pivotal support. The latter consists of a central cap 4, having an agate bearing 5, which receives the central point rising from the bowl. The cap 4 is connected to two of the needles, one on each side of the polar diameter, the fastening being by means of attachable and detachable clasps 24.

The construction set forth affords great delicacy of oscillation upon the pivotal center and insures a corresponding high degree of accuracy. The oil reduces the vibrations of the needles and practically eliminates its axial movement while the nature of said liquid prevents the accumulation of rust on the needles, and also is free from excessive ex-

pansion and contraction by change of temperature.

The lower portion of the expansion-chamber 6 is closed by a diaphragm 6^a, which preferably is slightly convex on its upper face, as shown in Fig. 2, and its marginal portion is bent to form an outer rim or flange 24^a, which lies closely against the inner circular face of the flange, which depends from the bottom of the compass-bowl. Between the flange 24^a and the bottom 6^a of the expansion-chamber a circumferential elastic rim 25 is formed by carrying the metal a little above the floor 6^a and then bending it upon itself to form the outer rim or flange 24^a. The convexity of the floor and the elastic yield of these parts is such as to enable the chamber 6 to adapt its capacity to all the changes produced by changes of temperature, &c. As the body of oil expands with a rise of temperature, the floor 6^a of the expansion-chamber yields slightly, and is put under such a degree of elastic tension that as contraction takes place it will be restored to its original position, and in this manner there will be a constant compensation for variations by which the volume or bulk of oil is increased or diminished, with the effect of keeping the compass-bowl always filled.

It will be understood that the air is wholly removed from the bowl and expansion-chamber.

By separating the compass-bowl from the expansion-chamber by means of the diaphragm 7, having openings 8 for communication, I am able to remove a large part of the whole volume of oil from the compass-bowl without detracting in any respect from the results sought and with material benefit in obtaining a perfect light upon the compass-card, since the bowl being so much shallower the reflection of light from the bottom is much greater. The disturbance of the oil in the bowl, due to the oscillation of the vessel, is less with a small than with a large body of oil, and the creation of counter-currents is practically avoided.

In securing the cap 4 to the card I usually insert screws through openings in the flange of the cap, said screws being tapped into the clasps 24, resting on the needles adjacent to the central support. This is the preferred construction.

It is essential in this class of compasses that the elastic yield of the bottom of the expansion-chamber be sufficient to compensate for the expansion and contraction of the fluid in the compass-bowl under extremes of temperature ranging from freezing up to the heat of a tropical sun. If the yield is not ample in degree, the pressure will be exerted upon the glass, which has frequently been broken thereby. Moreover, the construction must be such that the yielding element shall always recover itself when the expansion ceases and contraction sets in. If the convex bottom of the expansion-chamber snaps into the oppo-

site form—that is to say, if it is pushed downward until its liquid-containing face is concave—it is possible that it may remain in that form, especially if a considerable force is required in order to press the inclosing rim outward far enough to permit the bottom to spring back to its normal position.

My invention makes ample provision for all these requirements. The elastic rim surrounding the bottom and connected integrally with the outer surrounding flange or rim will readily spring outward and inward, and as the bottom is pressed by the oil the elastic yield is ample to accommodate even greater volumes of fluid than that driven into the expansion-chamber by the maximum expansion met with. The normal tendency of this elastic rim to return to its place also assists the elastic bottom in resuming its normal form, and I am thus able to use lighter metal for the bottom of said expansion-chamber, as part of the elasticity is located in the rim 25. If this rim were rigid and unyielding, the pressure upon the convex bottom of the expansion-chamber would when excessive spring the convex bottom outward, and as there would be no yield in the rim the bottom would necessarily buckle, and part of its elasticity would be destroyed, besides the danger of rupturing the metal. It would be very likely, also, to so weaken the tendency of the bottom to resume its position that it would after a few expansions remain permanently in the expanded position unless external force were used to restore it. My construction also greatly facilitates the repairing of the compass, as the expansion-chamber may be removed by simply detaching the ballast-weight and applying pressure by means of the screw-plug closing the filling-opening, by which the flange 24^a will be driven out of the flange on the bottom of the compass-bowl.

What I claim is—

1. In a mariner's compass, a compass-card consisting of a card-annulus having bridge-pieces on opposite sides of its center, their ends upon the surface of the card, and magnetized needles passing through openings in angular strips forming part of said bridge-pieces and extending at suitable intervals over and upon the surface of the card, the terminals of said needles being substantially coincident with the periphery of the card, substantially as described.

2. In a liquid-compass, the combination, with a bowl, of an expansion-chamber with which the bowl communicates, the expansion-chamber having a bottom which is convex upon its inner or liquid-containing surface, said bottom having an integral surrounding rim which is bent over outwardly upon itself to form an outer rim or flange, by which the bottom of the chamber is attached beneath

the compass-bowl, and to provide an elastic ring between the outer rim or flange and the convex bottom of the expansion-chamber, which will yield outwardly when pressure is applied to the convex face of the bottom of said expansion-chamber, substantially as described.

3. In a mariner's compass, the combination, with a card having a card-annulus, of a series of magnetized needles arranged in parallelism and supported in bridge-pieces extending on opposite sides of the equatorial center, a ring air-chamber mounted on said bridge-pieces, and a pivot-bearing having a detachable agate seat for the pin, substantially as described.

4. In a mariner's compass, a compass-card composed of a card-annulus, magnetized needles arranged in bridge-pieces lying parallel with the equatorial line and having angular strips provided with openings to receive the needles, the latter having their ends coincident with the periphery of the card, a compass-bowl having a central pivotal bearing entering a seat attachably and detachably mounted on the needles of the card, and a body of juniper or other oil contained in the bowl, substantially as described.

5. In a mariner's compass, a closed compass-bowl having an expansion-chamber, the bottom of which is convex on its upper face and provided with an elastic circumferential rim uniting said bottom to an outer rim or flange, by which said bottom may be secured in position, substantially as described.

6. In a mariner's compass, the combination, with a compass-bowl, of a communicating expansion-chamber, the bottom of which is slightly convex on its liquid-containing face and provided with a circumferential rim or flange, between which and the bottom of said chamber is an elastic rim rising above the floor and formed by bending the metal upon itself to form the flange, the circumferential rim or flange being rigidly attached to a circular flange depending from the compass-bowl, substantially as described.

7. In a mariner's compass, the combination, with a card, of a series of magnetized needles arranged in parallelism and supported in bridge-pieces extending on opposite sides of the equatorial center, an attachable and detachable ring air-chamber mounted on said bridge-pieces, and a pivot-bearing having a detachable agate seat, substantially as described.

In testimony whereof I have hereunto set my hand and affixed my seal in presence of two subscribing witnesses.

ROBERT OLIVER. [L. S.]

Witnesses:

GEO. W. HUNT,
DE HART BERGEN, Jr.