(No Model.)

D. BAKER.

MARINER'S COMPASS.

No. 568,227. Patented Sept. 22, 1896.

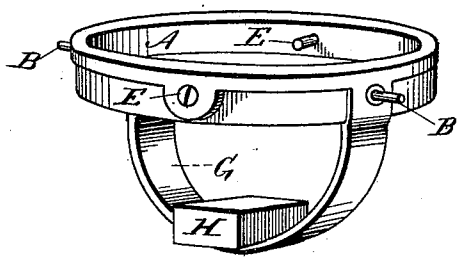

Fig. 1.

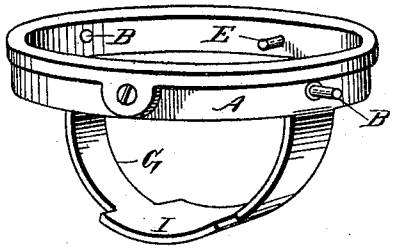

Fig. 2.

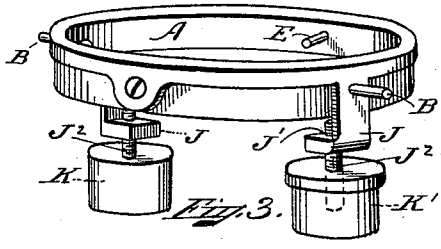

Fig. 3.

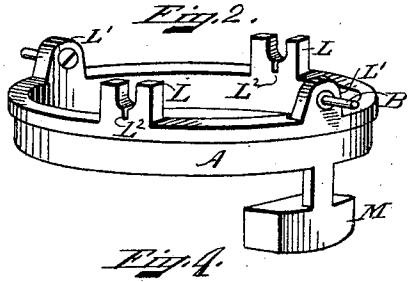

Fig. 4.

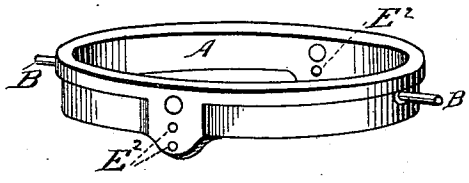

Fig. 5.

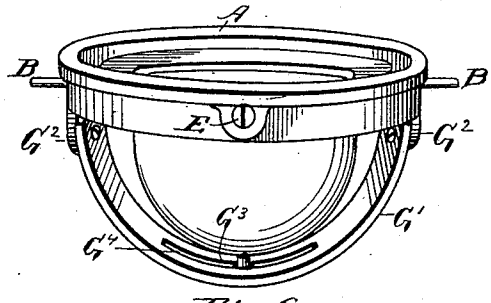

Fig. 6.

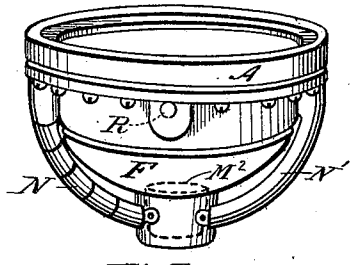

Fig. 7.

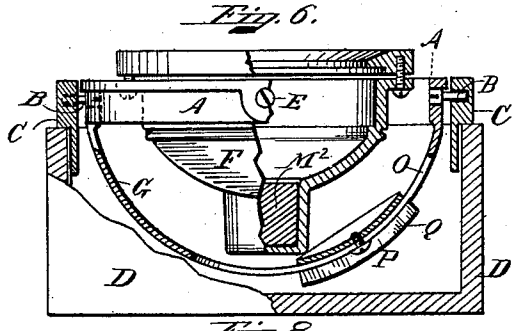

Fig. 8.

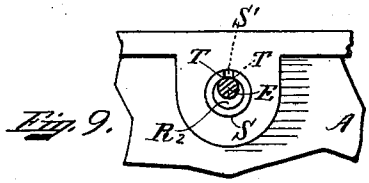

Fig. 9.

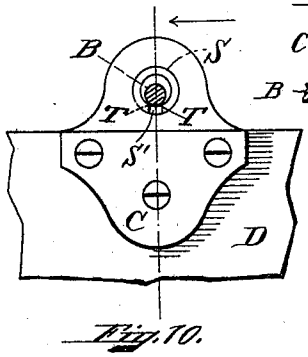

Fig. 10.

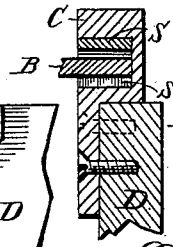

Fig. 11.

Witnesses.
Charles E. Baker
Geo A Baker.

Inventor.
David Baker.
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his atty.

UNITED STATES PATENT OFFICE.

DAVID BAKER, OF MELROSE, MASSACHUSETTS.

MARINER'S COMPASS.

SPECIFICATION forming part of Letters Patent No. 568,227, dated September 22, 1896.

Application filed May 24, 1895. Serial No. 550,579. (No model.)

To all whom it may concern:

Be it known that I, DAVID BAKER, a citizen of the United States, and a resident of Melrose, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Mariners' Compasses, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to certain new and useful improvements in a mariner's liquid compass—specifically, the equalizing of the period of oscillations of both the compass-bowl and its attendant gimbal-ring, and in the manner of suspending the compass-bowl and gimbal-ring in their journal-bearings. I entitle my invention "the axial-balance compass." I accomplish these valuable requisites by novel improvements to the compass-bowl and to the gimbal-ring, and also in the improved construction of the journal-bearings of said bowl and of the ring, the former unifying the oscillating period of the aggrouped bowl and ring, while the latter shortens the semirotation of their journals and reduces quickly their subsequent rocking motion. By my invention, therefore, any motion of the vessel will not sufficiently disturb the equilibrium of the compass-card to produce a perceptible rotation or deviation from the true magnetic meridian. An explicit description of these features I will hereinafter specify and claim.

In the accompanying drawings, illustrating my invention, Figure 1 indicates in perspective a gimbal-ring provided with a depending semicircular arm and an added weight elongated transversely to the compass-bowl journals. Fig. 2 represents a gimbal-ring having a similar depending arm and a weight integral therewith. Fig. 3 designates my method of adding reflexed ears in a line with the journals of the gimbal-ring, supporting weights vertically adjustable. Fig. 4 illustrates a gimbal-ring provided with four journal-supports projecting from its upper plane and a permanent predetermined weight below said ring-journals. Fig. 5 exhibits my method of equalizing the action of the gimbal-ring and compass-bowl by changing the relative position of their journals. Fig. 6 shows a gimbal-ring and compass-bowl, the former provided with depending ears supporting a single curved arm. Fig. 7 represents a compass-bowl provided with weights in a line transversely to its journals. Fig. 8 illustrates a combined side elevation and a vertical central section of a compass-bowl, gimbal-ring, and binnacle assembled provided with my invention. Fig. 9 is a detail of the journal-bearing supporting the compass-bowl, Fig. 10 being a detailed elevation of the journal-bearings upholding the gimbal-ring, and Fig. 11 a vertical central section of the device shown in Fig. 10.

Heretofore in the manufacture of mariners' compasses little or no attention has been paid to a proper equipoise of the compass-bowl and gimbal-ring in their relation to each other, the universal practice being to construct the compass with a fixed weight in the lowest portion of the compass-bowl for the purpose of maintaining said bowl in an upright position. In all compasses so constructed the bowl swinging on its inner axis necessarily has a shorter period of oscillation than the combined weight of the compass-bowl and its attendant gimbal-ring on the outer or "ring" axis. The occasion of this differential motion is the combined inertia of said bowl and ring, and the position and distribution of their relative weights with respect to each other, the ring being of greater diameter than the bowl and all of its weight being distant from the vertical center, compels the motions about the outer or ring axis to be more sluggish than those about the inner or bowl axis. This unequal period of oscillation produces great unsteadiness in the compass-card.

When the compass is in use at sea, it frequently happens that the vessel in riding the waves lurches heavily. This sudden movement is frequently in such direction that its energy is felt by the compass in a line diagonal to the axes, in which case the period of movement about the two axes, respectively, being dissimilar, a concentric undulatory motion is given to the bowl, and through the medium of the liquid it is imparted to the card within, causing it to rotate and consequently misrepresent the true course of the vessel in proportion to the violence of the shock received by the compass. In the practical adaptation of my devices, however, any propagated al-

ternating motion affecting both pairs of axes will have but one oscillating period, while the resultant of the alternating motions or forces will be responded to by the compass-card in a perfectly vertical plane, annihilating all tendency to rotation. I consider, therefore, that these improved features cooperate to produce new results which cannot be accomplished with the mariner's compass as ordinarily constructed and organized.

I will now proceed to a specific description of my invention by reference to the annexed drawings, forming a part of this specification, wherein corresponding characters designate like features throughout the several views, referring to which—

A, Fig. 1, is a gimbal-ring, with journals B for its support in the bearing C, secured to the binnacle in the usual manner, while the journals E support the compass-bowl F in the gimbal-ring A, as illustrated in Fig. 8. The pendent semicircular arm G here forms an integral part of said ring in a line parallel with the journals B, being in a degree a factor, together with the predetermined added weight H, to cause the oscillations of the compass-bowl on its inner journals E and said bowl and ring together on the outer journals B to be performed in exactly the same period of time.

I, Fig. 2, represents a weight integral with the curved arm, otherwise constructed as in Fig. 1. Said weight accelerates the oscillations of the gimbal-ring and compass-bowl together on the journals B to agree with the oscillations of the bowl alone on its journals E.

In Fig. 3 the reflexed ears J have threaded holes J′, receiving the screws J^2 to adjustably support a solid weight K or the loaded cylinder K′, the preponderance of such added weight being so placed in alinement to the journals B as to determine the movements of bowl and ring together on said journals to be in unison with those of the bowl on the journals E.

In Fig. 4 I construct four journal-supports, as at L and L′, projecting from its upper plane, the former provided with slots L^2 to limit the movement of the compass-bowl journals and the latter upholding the gimbal-ring and bowl in the binnacle D. A fixed weight M in a line with the journals B establishes equilibrium of bowl and ring. In a gimbal-ring of this design smaller weights may be used.

In Fig. 5 I equalize the motion of bowl and ring by changing the position of the compass-bowl journals at established distances below the circumferential line of said ring-journals, as at E^2, as said bowl then occupies a lower position in the ring, and in such position it quickens the ring motions to an approximate extent, according to the distance below the plane of the ring, to establish the equipoise of the organized compass.

In Fig. 6 I retain uniformity of oscillation between bowl and ring through the predetermined weight of the curved arm G′, attached to right and left lugs G^2, depending in a line transverse to the compass-bowl journals E, and steadied from lateral motion by a central stop G^3 playing in a slot G^4 in the curved arm G′.

In Fig. 7 I show a compass-bowl of ordinary construction having its usual weight M^2 in the bottom. In addition to said weight I secure right or left auxiliary weights N N′, remote from the vertical center of the bowl and in line with the bearings of the gimbal-ring, conforming in their adjustment somewhat to the shape of the bowl, and which may consist in one or several parts, as illustrated, and in such position and proportion as to accomplish the desired result of quickening the ring motion while simultaneously slowing the bowl motion, thus equalizing the periods of oscillation in the bowl and ring when the compass is organized.

In Fig. 8 I exhibit the aggrouped parts of a mariner's compass bearing my invention. Therein the curved depending arm G forms an integral part of the gimbal-ring A and lies parallel with the journals B. Said arm is provided longitudinally with a slot O to receive the screw P, which supports the adjustable weight Q. Said weight accelerates the combined oscillations of the ring A and bowl F on the journals B to act in unison with the oscillations of the bowl F on its journals E, the weight being previously brought to a position on the arm where an equilibrium of the antagonistic motions is exactly established. In the assemblage of these devices, should the ring be slower in its oscillations than the bowl, the weight Q is moved to a lower place on its arm G until its position equipoises the ring; or, in the first position of the weight, should the ring be quicker in its oscillations than the bowl, the weight is moved upward to the point which establishes an equipoise, in this manner quickly and accurately securing the desired equilibrium. The facilities of this method of adjustment have advantages that my other methods do not possess.

I will now describe my improved journal-bearings, first prefacing the disadvantages of the ordinary construction. (Shown in Fig. 7.) Therein the bearings R, supported by the journals E, would exceed the circumference of said journal, as at R^2, Fig. 9, to an extent that would permit its semirotation when the compass and its appurtenances are agitated. The journal in such instance will rock quickly upon its bearing without appreciable friction when motion is first instigated. As it is increased and prolonged the journal will slide upon its bearing, occasioning friction and resulting in a diversity of motion. This rocking period may be quite prolonged, and contributes materially to the undesirable erratic movement of the compass-card. To obviate this difficulty, I place a bushing S,

Fig. 9, having its periphery intersected at its points of contact with the journal E, as at S′, to form two opposing frictional angles T. This reduces the diverse or compound motion (sliding and rocking) to the former—sliding—with no appreciable variation throughout the oscillating period.

The same inverted feature adaptable to the gimbal-ring bearings C is exhibited in the subsequent views, while in Fig. 10 the journal B appears in section to show the contact of the angles T at the bottom of said bearing.

Obviously there are divergent methods of construction to unify the periods of oscillation between bowl and ring, which will not affect the underlying principle on which my invention is founded. I do not therefore desire to confine myself to any one of the methods to the exclusion of others illustrated, as it is evident that the same results may be obtained by proportioning the weights unitedly upon the ring and bowl.

Having ascertained the nature of my invention, I desire to secure by Letters Patent and I claim—

1. As a new article of manufacture a mariner's compass-bowl constructed in a manner that its period of oscillation on its axis will exactly coincide with the period of oscillation of its attendant gimbal-ring on its axis, substantially as specified.

2. A gimbal-ring provided with means to insure coincidental oscillation with its organized compass-bowl, substantially as described.

3. A mariner's liquid compass provided with one or a series of counterpoises arranged and adapted to unify the period of oscillation of the bowl and of the attached gimbal-ring substantially as described.

4. In a mariner's compass, the gimbal-ring provided with supports adapted to sustain weights so as to counterponderate the compass-bowl and preserve a unity of oscillatory motion substantially as set forth.

5. In a mariner's liquid compass the herein-described journal-bearing comprising a bushing S, provided with an intersecting slot S′ at the point of contact with the journal, the slot S and the opposing angles T producing friction to slow the rocking motion of said journal, substantially in the manner and for the purpose herein specified.

6. In combination with a compass-bowl, a gimbal-ring provided with bifurcated journal-bearings having intersections L^2 adapted to divide the original point of contact of the journal and bearing in a manner to produce two frictional surfaces to retard the oscillations of the compass-bowl substantially as specified.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 14th day of May, A. D. 1895.

DAVID BAKER.

Witnesses:
BLANCHE IRENE BRACKETT,
CHAS. HALL ADAMS.