G. ILES.

Mariners' Compass.

No. 167,452. Patented Sept. 7, 1875.

FIG. 1

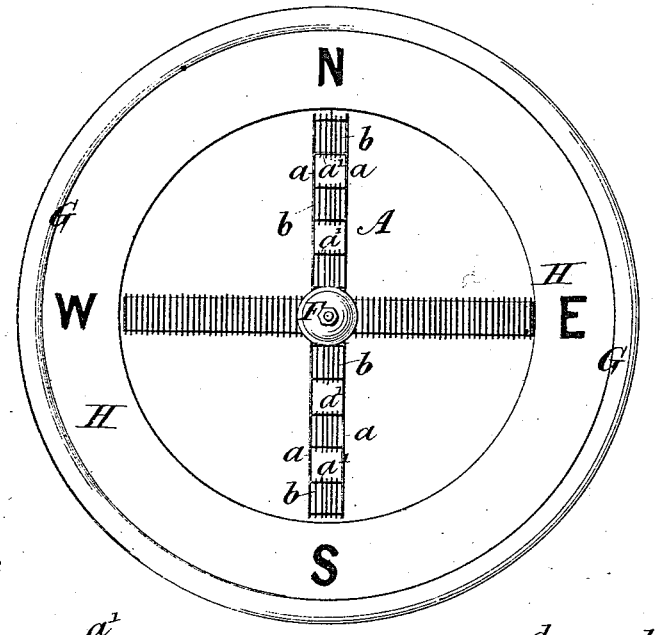


FIG. 3

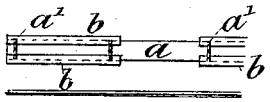


FIG. 4

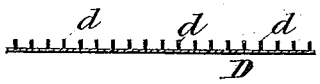


FIG. 2

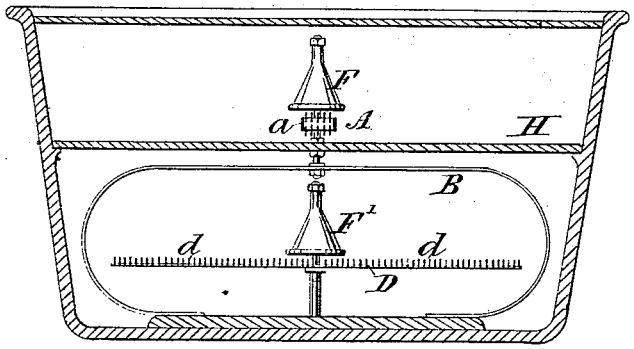
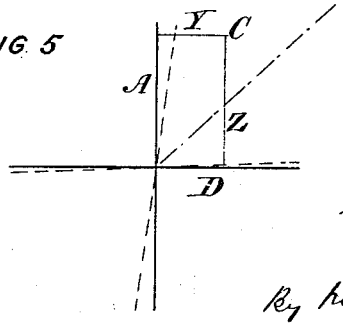


FIG. 5



Witnesses:

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UNITED STATES PATENT OFFICE.

GEORGE ILES, OF MONTREAL, CANADA.

IMPROVEMENT IN MARINERS' COMPASSES.

Specification forming part of Letters Patent No. **167,452**, dated September 7, 1875; application filed July 28, 1875.

To all whom it may concern:

Be it known that I, GEORGE ILES, of the city of Montreal, in the District of Montreal and Province of Quebec, Canada, have invented certain new and useful Improvements in the Adjustment of Magnetic Needles; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention has reference to means used to ascertain more particularly in mariners' compasses the aberration of any magnetic needle, due to local attraction in the ship, its cargo, or machinery, and also for properly compensating the same, so as to bring the needle to its normal position.

This invention is designed to supersede the several modes at present in use for ascertaining the deviation of the needle from the above causes by swinging the ship before leaving port, as it affords an easy and certain method of finding out and compensating for the constantly-varying amount of such aberration, not only in port but also at any time during the voyage, especially in weather which precludes celestial observations—such as heavy fog—when perfect accuracy is most needed.

Although my invention is primarily adapted for the purposes of navigation, it will be found very useful in land surveying, exploration, and mining, and by suspending the apparatus in a vertical instead of a horizontal plane it may be used to eliminate errors in the observation of dip.

I will now proceed to describe the construction and operation of my invention, but for fuller comprehension thereof reference must be had to the annexed drawings, in which similar letters of reference indicate like parts, and where—

Figure 1 is a plan view of my apparatus. Fig. 2 is a vertical sectional elevation of same. Fig. 3 is a longitudinal section, enlarged, of needle or longitudinal bar. Fig. 4 is a longitudinal section of transverse bar. Fig. 5 is a diagram, showing method of compensation.

A is the magnetic needle of any compass, pivoted in any usual manner upon a metal bar, B, as shown, or upon any ordinary means of support. This needle may be of any approved construction and conformation; but I prefer to use a thin flat bar of aluminium or any other practically non-magnetic metal, to which are suitably fastened, in the line of the bar, any number of small magnets of the best form and magnetized to saturation, placed as closely together as may be done without undue influence upon each other, and having like poles pointing one way. This bar must be so constructed that the three planes of division will bisect equal quantities in bulk, weight, and magnetic force, and the reason that it is by preference built up to carry a large number of small magnets is that the magnetic force may be distributed over its whole body instead of being, as in the ordinary needle, concentrated at one or two points.

A very convenient construction of this needle is shown in Figs. 1, 2, and 3, in which the needle A is formed of two parallel bars, *a a*, of aluminium or other practically non-magnetic metal joined together by transverse bars a^1 a^1, of like substance, carrying both on their upper and under sides the magnets *b*, as above described.

D is a bar, of the same metal as above described, pivoted on any suitable axis concentrically with the needle A, and being in its normal position exactly at right angles to it. Upon this bar D are secured any required number of small magnets, *d*, with like poles pointing one way, placed across the bar as closely together as possible without undue influence between themselves. It is absolutely necessary that the amount of the magnetic force in the bar D should be equal to that of needle A, and that in this bar D, also, the three planes of division shall bisect equal quantities in weight, bulk, and magnetic force. Immediately above D and at right angles to it is secured a wire, E, of aluminium or like metal, of equal length with the bar D, and serving for more convenient comparison with the bar or needle A. The distance between the bar D and needle A is to be as little as may consistently be left without undue influence between them. F F^1 are bell-caps, placed as usual, respectively, above the needle A and bar D to prevent vertical vibration, G being a compass bowl of any ordinary construction, and hung in the usual way, and H is the dial-

plate, divided as usual, and placed most conveniently between the needle A and transverse bar D.

The operation of my invention will be easily understood and may be thus explained: Presuming that the cause of disturbance lies in the N. E., the needle will be deflected in that direction—*i. e.*, eastwardly—and the transverse bar D, which is practically a magnet, pointing E. and W. will also turn toward the disturbing cause, thus making the angle between the needle A and bar D in that direction, and the one opposite to it less than a right angle.

The way in which I propose to compensate for this attraction and to restore the bar and needle not only to their normal angle of ninety degrees, but also to their former position, is by means of a steel magnetic compensator placed, when in use, so that similar or repelling poles of the compensator and compass are nearest together. This compensator is brought toward the axis of the compass along a radial line, 1, bisecting either acute angle until ninety degrees is marked, the relative movements of the needle A and bar D being noted. The compensator is then gradually moved toward the more inert point, ninety degrees being maintained until lines drawn from center of repulsion (marked C) to each of the two immediately affected halves of the bars shall be found to correspond as the square root of the original aberration of such point. Thus, if N. has been found to have been disturbed before compensation four degrees and E. one degree, the center of compensator must be joined by lines of the proportions shown by Y and Z—*i. e.*, as 1 and 2—drawn perpendicularly to the two bar halves.

This device may be used in combination with any approved form of compass, and, if desired, the bars may be made hollow and immersed in spirit, as in Ritchie's compass.

It must be clearly understood that I do not propose to ascertain and compensate for the deviation of the magnetic needle due to earth-currents or other cosmical influence; but

What I claim as my invention, and wish secured by Letters Patent, is—

1. In combination with any magnetic needle the transverse bar D, carrying many minute magnets placed with like poles one way, and being practically a magnet pointing E. and W., attracted toward a piece of iron like an ordinary magnetic needle, as shown and described.

2. In combination with any compass the longitudinal bar carrying many minute magnets of like poles pointing one way, and acting as a magnetic needle, as shown and described.

3. In any compass the combination of the longitudinal bar A and transverse bar D equally attracted by any object, substantially as described.

4. In combination with the magnetic needle A and bar D, a compensator, of iron or steel, operating in the manner described, and for the purposes set forth.

Montreal, 22d day of July, A. D. 1875.

GEORGE ILES.

Witnesses:
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