

E. S. RITCHIE.
AZIMUTH CIRCLE.

No. 481,625.

Patented Aug. 30, 1892.

Fig. 1.

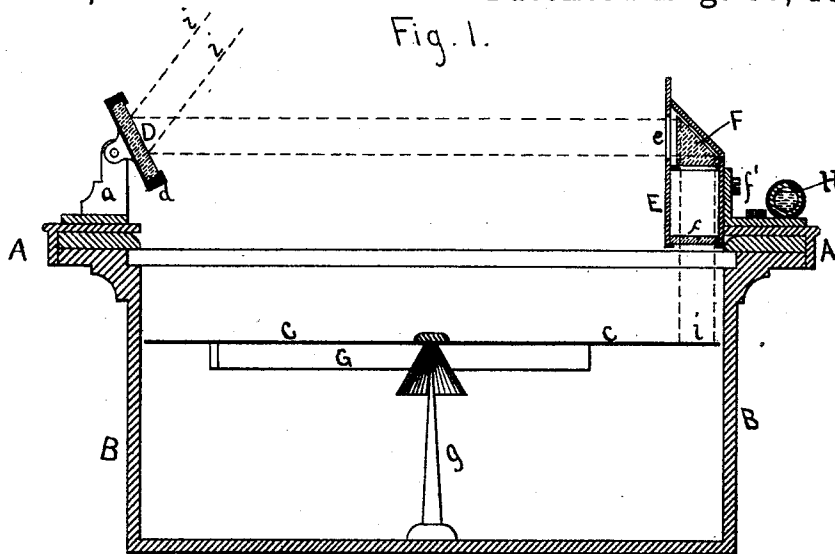
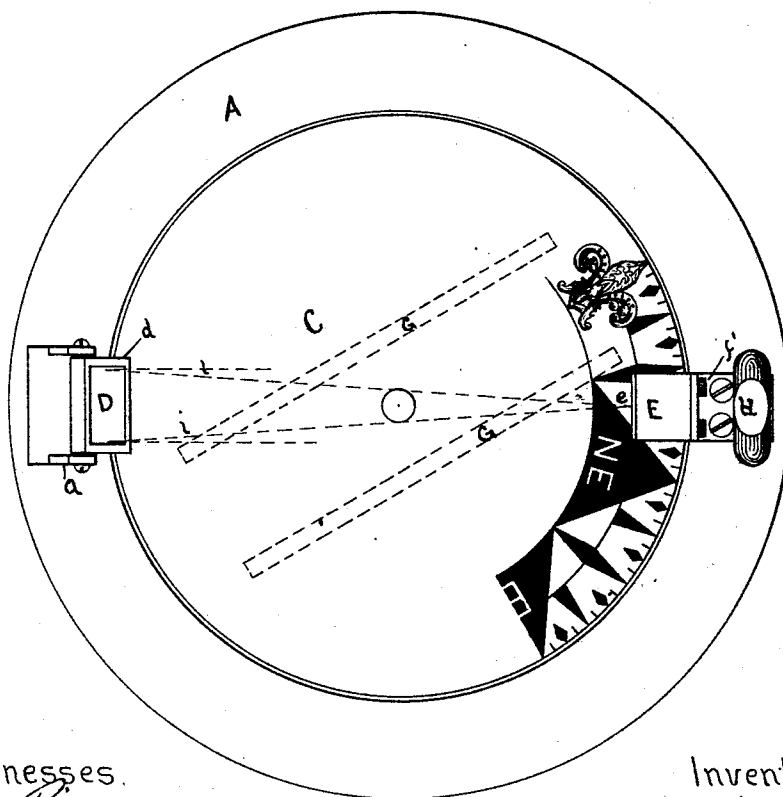


Fig. 2.



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Fig. 3.

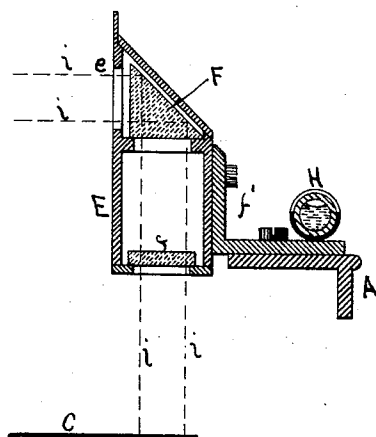


Fig. 4.

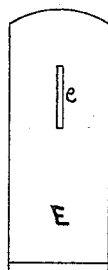


Fig. 5.

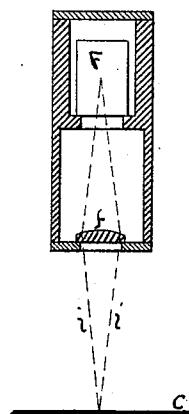


Fig. 6.

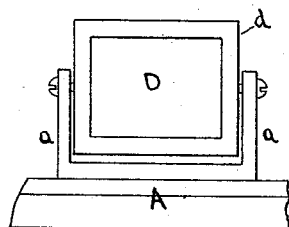


Fig. 7.

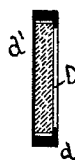


Fig. 8.

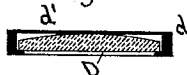
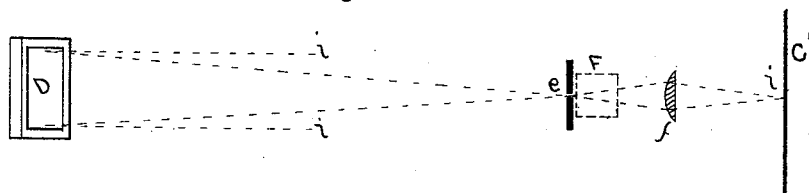


Fig. 9.



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UNITED STATES PATENT OFFICE.

EDWARD S. RITCHIE, OF NEWTON, MASSACHUSETTS.

AZIMUTH-CIRCLE.

SPECIFICATION forming part of Letters Patent No. 481,625, dated August 30, 1892.

Application filed October 8, 1891. Serial No. 408,188. (No model.)

To all whom it may concern:

Be it known that I, EDWARD SAMUEL RITCHIE, a citizen of the United States, residing at Newton, in the county of Middlesex and State of Massachusetts, have invented a new and useful Improvement in Azimuth-Circles; and I do hereby declare the same to be described in the following specification and represented in the accompanying drawings, of which—

Figure 1 is a vertical transverse section, and Fig. 2 is a top view, of a mariner's compass and my azimuth-circle. Fig. 3 is an enlarged copy of the section of the case E. Fig. 4 is a front view of the case E. Fig. 5 is a front view of the case F with the front side plate removed. Fig. 6 is a front view of the mirror D and its frame *d* and support *a*. Fig. 7 is a vertical section, and Fig. 8 a horizontal section, of the mirror D and its frame *d*. Fig. 9 illustrates the course of rays from the sun to the card G.

Similar letters refer to similar parts throughout the several views.

The instrument relates to what is known as an "azimuth-circle" used upon a mariner's compass for showing the direction of the sun by the compass-card at the time of an observation; and the object of my invention is to show the direction by throwing a line of solar light directly upon the compass-card, visible to one or more observers without inconvenience to them, whereas in the instruments heretofore used the observer is obliged to look through an eye-hole or slit and to note the position of a hair-line on the card and also on the reflected image of the sun.

The instrument consists of a ring A with a flange to rest and to be turned round upon a mariner's compass bowl B. Attached to the ring A, I place a support *a*, holding the frame *d* of a concave cylindrical mirror D, which I prefer to make of a convex cylindrical lens silvered on its convex side. The frame *d* is held on its support *a* by axes or screws, allowing free motion in a vertical plane passing through the center of the ring A with friction enough to hold it in any position. The curvature of the mirror is such as will reflect solar rays to a focal line at *e*. The frame has a back plate *d'*. Directly opposite to the mir-

ror D, I place a square case E, fixed to the ring A by a bracket *f'*. The side of the case E facing the mirror D has a narrow slit *e*. Within the case E, I place a right-angled prism F in position to receive the solar rays from the mirror D, passing through the slit *e*, and to reflect them vertically downward. Near the lower end of the case E, I place a cylindrical lens *f*, its central line being in line of the center of the ring A. Upon the bracket *f'* or on the ring A, I place a spirit-level H.

The operation is as follows: Solar rays reflected by the mirror D to a focal line passing through the slit *e* are again reflected by the prism F vertically downward through the cylindrical lens *f* and are again brought to a focal line upon the compass-card C, as shown in Fig. 1. The march of the rays as affected by the concave mirror D and convex lens *f* is illustrated by Fig. 9, in which the prism F is removed, and the lens *f* is placed at the same distance in horizontal line. Parallel solar rays *i i*, reflected by the mirror D, are brought to a focal line at *e* and again diverge and fall upon the lens *f* and are refracted by it to a focal vertical line at C'. The prism-reflector F simply changes the direction from horizontal to vertical at same distance. The dotted lines in Fig. 5 show the rays also. I will remark that used on board a vessel and properly adjusted the rolling motion of the vessel will prevent a constant line of light; but the light will flash upon the card at the times that the vessel passes the mean of the oscillation.

I am aware that prior to my invention an azimuth-circle has been made having a cylindrical convex lens capable of being adjusted to converge rays from the sun directly upon the compass-card and having a tube on opposite side with lenses and a prism and an eye-slit on the outer side of the tube opposite from the said cylindrical lens for the observer to see the compass-card with indicator point or hair-line to observe the position of the card-surface illuminated by the sunlight thrown upon it by the said convex lens.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, in an azimuth-circle, of the mirror D, the reflecting-prism F, placed

beyond the focus of the said mirror, and the cylindrical lens *f*, placed between the reflecting-prism and the compass-card, substantially as set forth.

- 5 2. The combination, in an azimuth-circle, of the mirror D, the reflecting-prism F, and the case E, having the slit *e* between the said

mirror and prism for the passage of solar rays to the compass-card.

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Witnesses:

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