(No Model.) 2 Sheets—Sheet 1.

W. BARTON.

DISTANCE INSTRUMENT.

No. 407,767. Patented July 30, 1889.

Fig. 1.

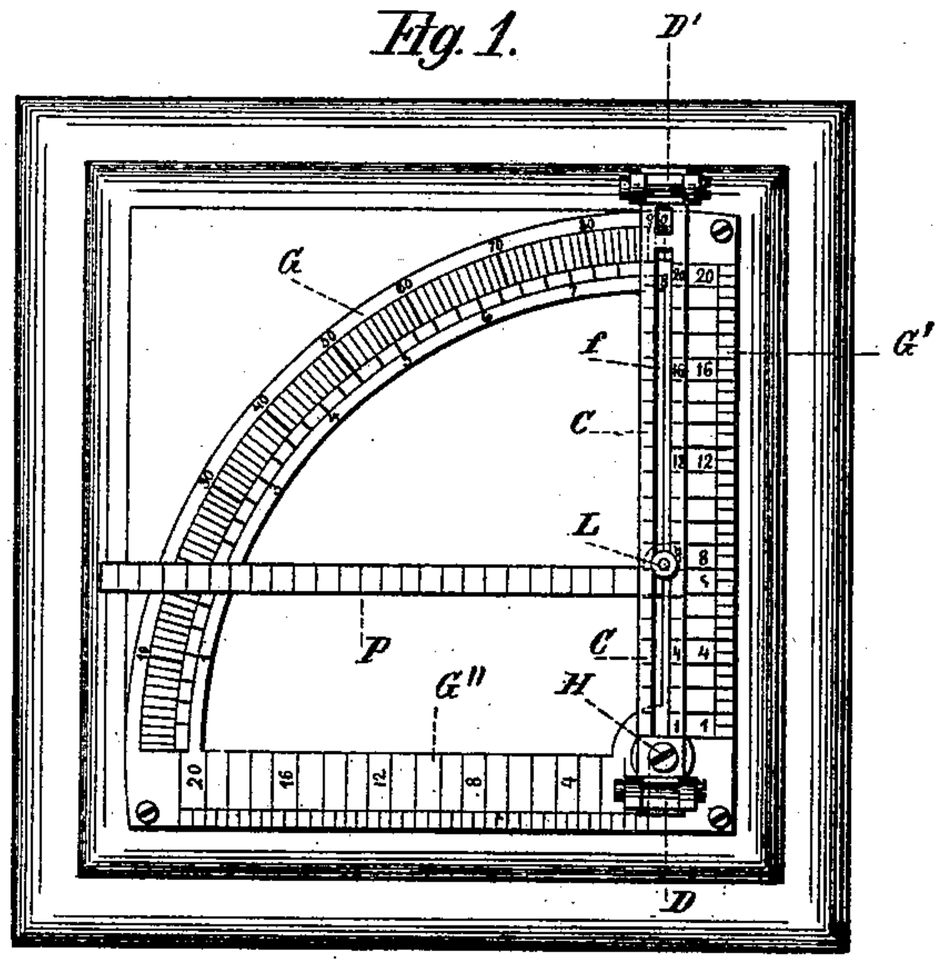


Fig. 2.

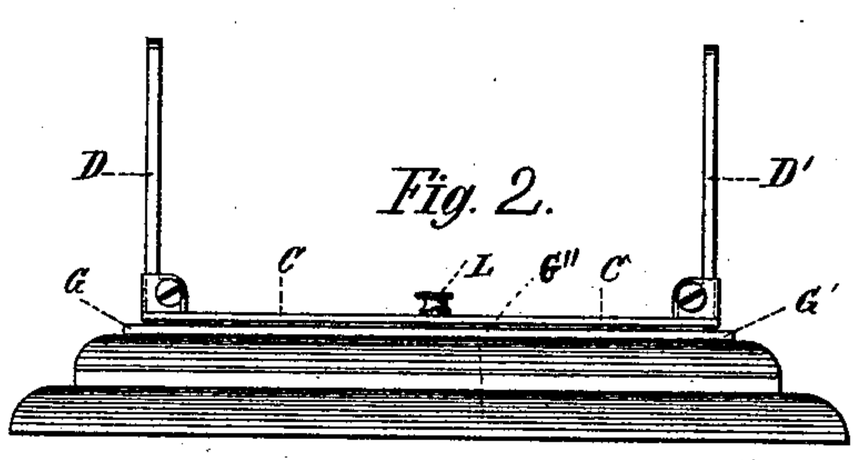
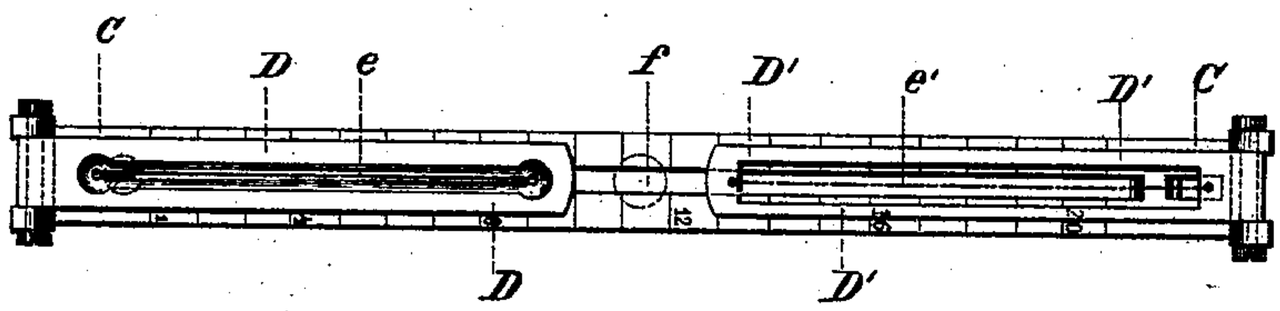


Fig. 3.



Witnesses
Fred^k W. Rubien.
C. E. McDonald

Inventor
William Barton
By his Attorneys Singer & Ebner

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Fig. 4.

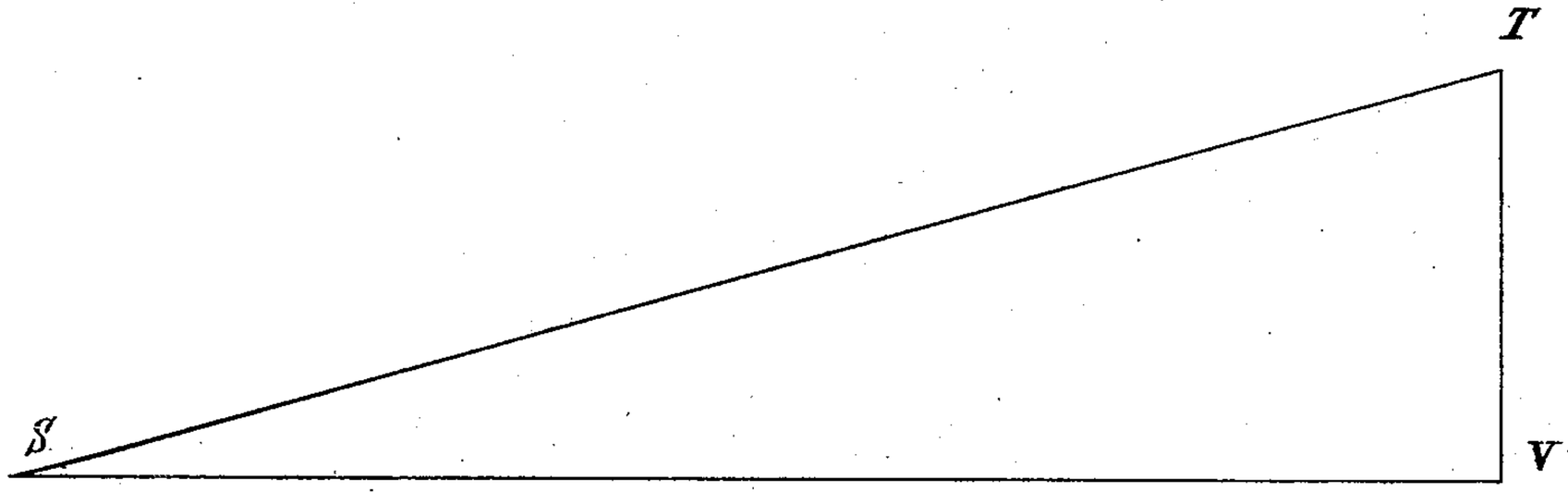
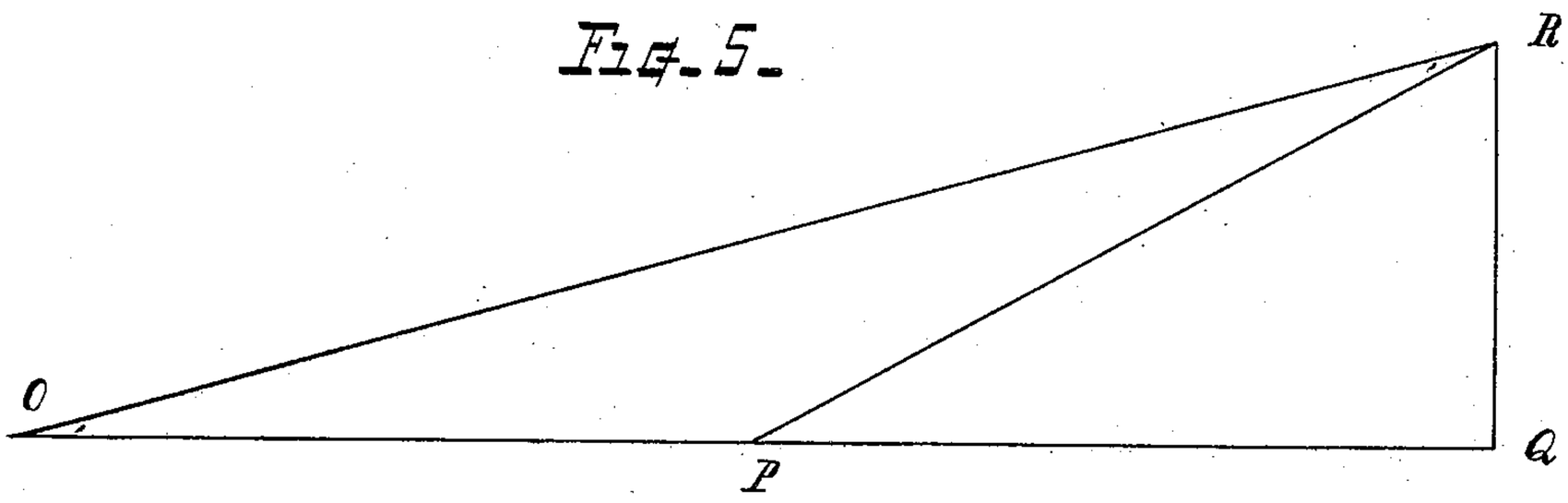


Fig. 5.



Witnesses
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Inventor
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By his Attorney Singer & Ebner

UNITED STATES PATENT OFFICE.

WILLIAM BARTON, OF LIVERPOOL, COUNTY OF LANCASTER, ENGLAND.

DISTANCE-INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 407,767, dated July 30, 1889.

Application filed June 14, 1888. Serial No. 277,112. (No model.) Patented in England May 12, 1888, No. 7,110.

To all whom it may concern:

Be it known that I, WILLIAM BARTON, a subject of the Queen of Great Britain, residing at Liverpool, in the county of Lancaster and Kingdom of Great Britain, have invented a new and useful Improvement in Nautical Distance-Indicators, (for which I have received Patent No. 7,110 of the said Kingdom of Great Britain, dated May 12, 1888,) of which the following is a specification.

The nature of the invention consists in the details of construction and combination substantially as illustrated in the drawings, hereinafter described, and subsequently pointed out in the claim.

Figure 1 is a plan view illustrating my newly-invented distance-indicator. Fig. 2 is a side view of the same in elevation. Fig. 3 is a detail view illustrating the pivoted bar C and the sight-vanes, more fully hereinafter described. Figs. 4 and 5 are diagrams for the illustration of the use of my invention, more fully hereinafter set forth.

The quadrant arc G is formed with radial arms G′ G″, which stand at right angles to each other. The arc G is graduated with two scales. The outer scale is graduated for the degrees of a circle, the inner scale for points and quarter-points of the mariner's compass. The two arms G′ and G″ are graduated to corresponding scales of equal parts. For convenience, the scales on these arms will hereinafter be called "margin" scales.

At H is pivoted an arm C, which can be moved on its pivot around the arc G, said arm always standing radially to said arc and the pivot at H being stationary in the geometrical center of said arc. A long slot *f*, having parallel sides, extends almost through the entire length of said arm C. Either end of this arm is provided with a sight-vane. These vanes, which are designated, respectively, by D and D′, are hinged on the ends of this arm, so that they can be raised upright, as represented in Figs. 1 and 2, or folded down, as represented in Fig. 3. Another and a movable arm (designated by P) is pivoted in the slot *f* of the arm C, and may be fastened at any desired place in said slot by the screw and thumb nut L. Both of these arms are graduated to the same scale of equal parts as the margin-scales G′ and G″. This instrument is mounted upon a proper and convenient wooden base, the whole instrument to be as illustrated in the drawings.

In using this instrument a right-angle triangle is formed by bringing the movable arm P parallel to the scale-marks on the margin, which are cut long enough for that purpose, for if any side and an angle of the triangle be known the other sides may be read off the instrument.

This instrument is to be used, first, to find the distance a ship will pass, if its course be made good, from a light-house, point of land, or other visible object, when the distance from the ship to that object is known. To illustrate this, I refer to Fig. 4. Let the line S V represent the ship's course, S the position of the ship, and T the object. Having from the ship taken the angle at S between the ship's course S V and the bearing of the object S T, and found it, for example, to be fifteen degrees—supposing, also, for example, the distance S T to be twelve miles—then the arm C is set at fifteen degrees on the arc G, counting from the zero side. Next move the pivot of the arm P to the graduation marked 12 on the arm C, keeping the arm P on the side of the arm C next to the margin-scale G″, and bring it to such a position on the margin-scale G″ that its edge will be parallel with one of the graduations of that scale. Then the margin-scale G″ will represent the ship's course S V, the arm C the bearing of the object S T, the distance of the pivot of the arm P from the pivot of the arm C, the distance from the ship to the object, and the distance from the arm C to the margin-scale G″ on the arm P, the distance from T to V the distance the ship will pass from the object if the course be made good. Now, if the graduations on the arms and scales represent miles, the required number of miles may be read off the arm P from the graduations between the arm C and the margin-scale G″.

To check the course, (having observed the angles and set the instrument as before described), run any desired number of miles, then slip the pivot of the arm P that many graduations down the arm C toward its pivot, keeping the arm P always parallel to the

graduations on the margin-scale G'' and at the same distance as to its own graduation where it is crossed by the margin-scale. This will move the arm C back, so as to make a wider angle. Observe the angle the ship's course makes with the bearing of the object with some other instrument, as a sextant. If it be the same as that registered on the instrument, the course has been made good; but if the observed angle be less than the registered angle the ship has set to the object; if the observed angle be larger, the ship has set away from the object. In either case of variation proper alterations of the course may be made.

To determine what the ship's course shall be to pass a required distance from an object when the distance from the ship to that object is known, move the pivot of the arm P along the arm C to the graduation of this arm C corresponding to the distance from the ship to the object. Next bring the graduation of the arm P corresponding to the required distance to the edge of the margin-scale G'', with the edge of said arm P parallel to the graduation-marks of the margin-scale G''. Then the number of degrees from zero to the arm C on the arc G will give the angle the ship's course must make with the bearing of the object to pass the required distance from the object.

In all these cases the proposition presupposes that the distance from the ship to the object is known; but when this distance is not known it may be ascertained as follows: In this case, for the convenience of the operator, the angle between the ship's course and the bearing of the object should not be more than thirty degrees. I now refer to Fig. 5 for a clearer explanation. In this figure, O designates the ship's first position; O P Q, the ship's course; R, the object, and O R the bearing of the object. The angle between O R and O Q is supposed to be fifteen degrees—that is, we suppose the ship's course to be at an angle of fifteen degrees from the bearing of the object. Having now ascertained this by proper observation, next note the reading of the patent log. Then, as the ship proceeds, watch the increase of the angle between the ship's course and the bearing of the object until it shall have exactly doubled itself, in which case the ship will have passed from O to P, and the angle R P Q will be thirty degrees. Then note the reading of the log and take the difference between the two readings. In the first triangle O R Q the angle at O was fifteen degrees, the angle at Q was ninety degrees; then we had $15 + 90 = 105$, and the whole number of degrees in a triangle $180 - 105 = 75$, the angle at R. Now, we have with the ship at P the angle at P equal thirty degrees, the angle at Q equal to ninety degrees, then $30 + 90 = 120$ and $180 - 120 = 60$, the angle now at R, but $75 - 60 = 15$. Then the angle at O and the new angle bounded by the sides R O and R P are equal, fifteen degrees each. Then it follows that the triangle O P R is isosceles, the two equal sides being O P and P R. The difference of the readings of the log at O and at P shows the distance O P, through which the ship has passed. This is one of the two equal sides of the isosceles triangle; the other is P R, the distance from the ship to the object.

Having thus obtained the distance from the ship to the object, the three first-named operations may be performed as hereinbefore described.

This instrument may be also adjusted by using the sight-vanes D and D′ in the usual and well-known way; or the angles may be taken by a sextant or in any other and well-known way, and the instrument afterward adjusted accordingly.

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

In a distance-indicator, the combination, with the graduated arc G and the graduated margin-scales G′ and G'' thereof, of the graduated arm C, pivoted at H and formed with the slot *f*, the sight-vanes D D′, hinged to either end of said arm C, the graduated movable arm P, pivoted in said slot *f*, and the screw and thumb nut L, whereby said movable arm P is adjustably fastened in said slot, all substantially as and for the purpose set forth.

In witness whereof I hereunto set my hand in presence of two witnesses.

WM. BARTON.

Witnesses:
FREDC. W. RUBIEN,
C. E. MCDONALD.