H. L. V. D. GIOT.

STAR TRANSIT CALCULATOR AND INDICATOR FOR MARINERS.

APPLICATION FILED DEC. 1, 1917.

1,383,296. **Patented July 5, 1921.**

Fig. 1.

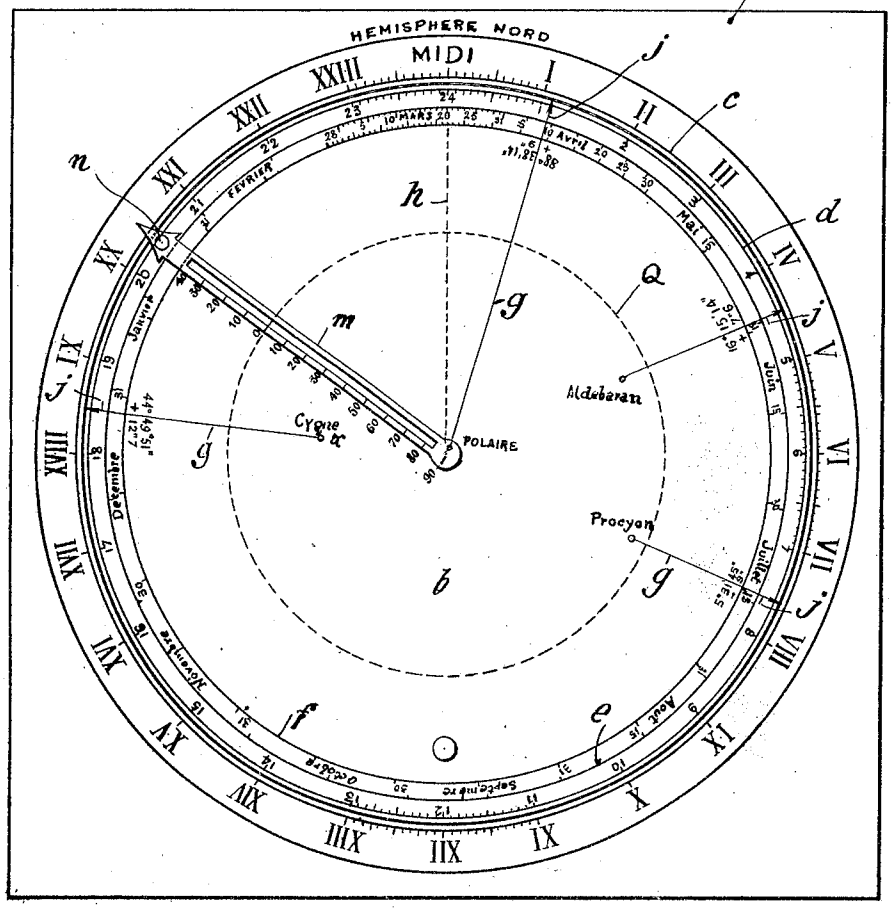
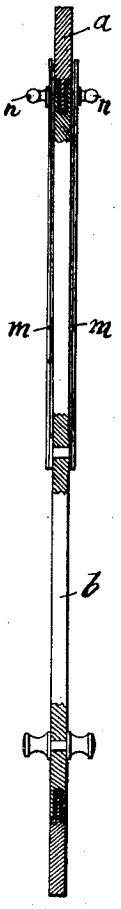


Fig. 2.



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STAR-TRANSIT CALCULATOR AND INDICATOR FOR MARINERS.

1,383,296. Specification of Letters Patent. Patented July 5, 1921.

Application filed December 1, 1917. Serial No. 204,822.

To all whom it may concern:

Be it known that I, HENRI LOUIS VICTOR DÉSIRÉ GIOT, a citizen of the Republic of France, and residing at Le Hâvre, No. 17 Rue G. Cazavan, Seine Inférieure Department, in the Republic of France, have invented certain new and useful Improvements in Star-Transit Calculators and Indicators for Mariners, of which the following is a specification.

This invention relates to mariners' planispheres.

Owing to circumstances of time and speed that navigation is now required to satisfy, it is indispensable for mariners to determine as often as possible their position by observation of the stars; the dead reckoning is often a cause of very grave errors which may result in the worst catastrophies, especially in waters where there are currents or tides. The sun, particularly in bad weather, very frequently failing and scarcely allowing of taking the latitude except about mid-day, it is necessary to have recourse to the stars.

The object of my invention is to provide an improved planisphere which will allow of facilitating and considerably expediting the observation by avoiding research groping with regard to points to be observed. This planisphere, all the parts of which are especially combined to minimize the work of the officer of the watch, is arranged for use in both hemispheres. The declination of the stars is indicated on the planisphere for a given year. The annual variation is also indicated on the planisphere, so that it is possible to calculate the actual declination at any time.

This apparatus allows in a very practical and rapid manner, without calculation, and without requiring to know the time, of ascertaining the hour of the passage of the stars at the meridian of any particular place at a given date and, consequently, of taking latitudes as often as the captain may judge necessary during one night. Consequently it allows of verifying the variation of the compass at each passage of the stars at the meridian. It is, therefore, also from this point of view of great use in the low parts of the northern hemisphere where the polar star is too low on the horizon for determining the latitude, and in the southern hemisphere where the said star is not visible.

In the accompanying drawing,

Figure 1 is a diagrammatic elevation of one face of the planisphere. For the sake of clearness only a small number of stars are represented and only a portion of each of the graduations.

Fig. 2 is a transverse section of the apparatus.

a indicates a plate or frame in which is cut a circular opening, and *b* is a disk which is fitted in this opening in such a manner as to be able to turn freely therein. The adjacent edges of the frame and of the disk are connected by tongue and groove so that these two members cannot be separated when once they have been joined together and are only free to turn with relation to each other.

On the two faces of the disk *b* are stuck celestial charts corresponding one with the northern hemisphere and one with the southern hemisphere.

On the circular edge of the frame is drawn a circumferential line *c* graduated in hours and in intervals of five minutes expressing in Roman figures from 0 to 24 hours the various fractions of the astronomic day.

Certain terms, characters and abbreviations used in the following description are defined as follows:

AR signifies right ascension.

AR ⊖ signifies right ascension of the sun.

ARt signifies right ascension true.

ARm signifies right ascension mean.

AR* signifies right ascension of a star.

D* or declination signifies zenith distance of a star.

Ha signifies approximate height.

Midi signifies mid-day.

Midi (mid-day) is inscribed in place of 0.

On the movable disk the largest graduated circumferential line *d* like that of the frame expresses in hours and minutes the right ascension of the sun.

Between two other circumferential lines *e* and *f* of rather less radii are interposed the months and days of the year, represented by lines spaced so that each of them corresponds, on the larger circumference, to the true right ascension of the sun, on the smaller circumference, to the mean right ascension, relatively to the noon (midi) of each day.

On each chart are marked the principal constellations of one hemisphere plus those of the other up to 45°.

From each of the stars of first and second magnitude extends an arrow *g* which, on the movable frame, corresponds to the right as-

cension of the said star and indicates upon the fixed frame, when the instrument is adjusted, the hour of its passage at the upper meridian of any place, that is the half circle passing through the zenith of that locality.

On the arrow *h* extending from the center to the 21st March can be read the approximate height (Ha) of the star in taking count of the latitude.

The declination of the stars of first and second magnitude is indicated for a given year, for example, 1874. The actual declination can be obtained by means of the annual variation which is indicated beneath the declination.

With regard to the right ascension displacement of these stars it is represented by the small lines *j* placed at the side and near the end of each arrow *g*, the length of each line corresponding to the displacement during a given time, for example, 60 years.

At the center of the planisphere is placed a pivot which upon each side of the disk carries a flat metal hand or pointer *m*. This pointer is slotted through its length and graduated from the polar star (90°) to the equator (0°) indicated by the dotted circle Q and afterward from 0° to 45°. In the slot of this pointer the observer can easily perceive the star observed and determine or verify the height thereof (Ha).

At its upper end in the middle of the point of the hand is fixed a stud *n* for rotating it over the movable frame so that any desired star can be considered.

In order to adjust the movable frame it is only necessary to place in coincidence with midi of the fixed frame, the true or mean right ascension of the sun (ARt or ARm) according to whether it is required to have the passage of the true or mean time by means of the sun for the given day.

The upper passage at the meridian of the stars observed during the night will then be indicated on the fixed frame by the arrows *g* which extend from these stars.

Therefore, in order to adjust the apparatus it is only necessary to know the date of the day and the observer has immediately under his eyes,

AR⊖ ARt ARm AR* D* or declination Ha

and the hours of the "passage of the stars at the upper and lower meridian and this for any place."

When the observer desires to take account of the stars crossing the meridian at a given time, he should begin operations by adjusting the planisphere; then having determined the sidereal time for the given moment, he places the end of the pointer upon the said sidereal time, and in the slot of the pointer will be found the stars to be observed at that time.

Since at each star, the annual variation and its sign (+ or −) are read beneath the relative declination at a given year, it is only necessary, in order to find the actual declination, to calculate the correction by rule of three; for example for "Aldebaran"

D. 16° 15′ 14″, North +7″ 6

is read on the planisphere.

The year 1874 is used as the starting point of the variations in declination, this being the epoch at which astronomers commenced the general work of an exact calculation of the relative position of the stars.

Now, forty-two years have elapsed from 1874 to 1916. We have therefore the proportion

$$x : 7'' 6 : : 42 : 60$$

whence

$$x = 5'' 32$$

This correction is added to 16° 15′ 14″.

In the case of a planet it is advisable to mark its right ascension and its declination.

It is understood that the mean hour of the passages is obtained like the true hour by using the mean AR of the sun or of the date relative thereto instead of its true AR.

The hereinbefore described apparatus, therefore, gives very rapidly and very easily and in a precise manner:—

(1) The true hour of the passage of a star at the meridian.

(2) The mean hour of the passage of a star at the meridian.

(3) The right ascension of a star.

(4) The declination of the stars of first and second magnitude.

By means of the pointer the astral height (Ha) can also be easily determined or verified.

To sum up, all the indispensable elements are easily obtained for calculating the latitude, for calculating the right ascension of a star, for exactly determining the point, and for calculating the variation of the compass.

The apparatus allows of verifying the variation of the compass at each passage of the stars at the meridian. The apparatus, is therefore, also from this point of view, of great interest and importance, in the low parts of the northern hemisphere where the polar star is too low on the horizon for determining the latitude, and in the southern hemisphere where the polar star is not visible. It is understood that in order to determine the latitude of the locality, measurements are to be made in the usual way by means of a sextant of the meridian altitude above the horizon of a star whose declination is known.

Having now particularly described and ascertained the nature of my said invention

and in what manner the same is to be performed, I declare that what I claim is:—

A planisphere for navigators' use comprising, in combination, a plate having a circular aperture therein, a disk revoluble within the said aperture, a pivot disposed at the center of the said disk and a revoluble pointer mounted upon the said pivot, the said pointer containing a graduated scale in degrees of altitude counting from the equator, the said plate containing upon the edge of the aperture thereof a circular graduated scale representing a day divided into 24 hours and the subdivisions of the hours, the said disk having represented upon its surface a map of the heavens and near the periphery thereof a graduated time scale of like nature to that of the said plate as well as two concentric graduated scales representing the year divided into 365 days according to the actual time and the mean time respectively, the same disk also having represented upon the surface thereof the declination of the principal stars at a given period of time as well as the annual variations of the declinations, substantially as described.

In testimony, that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

HENRI LOUIS VICTOR DÉSIRÉ GIOT. [L. S.]

Witnesses:

CANSTAN GNERARE,

B. SIEROUT.