Letters to the Editor

LONGITUDE BY THE GREEN FLASH

SIR,

I have recently been looking into methods of obtaining longitude by noting the time of sunset or sunrise and I wonder if any members of the Institute have any reference to the early use of the method. It was certainly to my knowledge used in about 1925, and for the most part it seems to have been handed down by word of mouth.

The instant of the Sun's disk breaking surface at sunrise and the last sight of it vanishing at sunset is distinguished by the appearance of the well-known green flash. If this instant of time is recorded in G.M.T. from a chronometer, the longitude can then be computed by any of the methods used at sea, starting with the observed altitude of the Sun's upper limb as zero, and applying dip, semi-diameter, refraction and parallax; particular care must of course be taken to adjust for refraction for the prevailing temperature and pressure.

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Australia.

Yours faithfully,
BRETT HILDER.

Tables for finding the longitude by chronometer at sunrise and sunset, compiled by H. B. Weston, were published by the Admiralty in 1851. During the last war tables for use with this method were prepared by H.M. Nautical Almanac Office for lifeboat navigation, and Harold Gatty's *Raft Book* published in 1943 also contained similar tables.

Observation of the instant of sunrise or sunset by the green flash does not appear, from any written accounts, to have been used to any extent, though undoubtedly it would give the precise time of the occurrence. Its observation at sunrise is apt to be missed, however favourable the conditions, unless the precise point on the horizon where the Sun will appear is watched. At sunset it is often observed in a markedly clear and dust-free atmosphere and in conditions of abnormal refraction, though it is by no means always observed when favourable conditions prevail. A great deal of informative matter about the phenomenon, and about the green ray which differs slightly from it, is given in the *Manual of Meteorological Observing* Part II (H.M. Stationery Office, London, 1950), and it is interesting to note that it can be observed with the setting Moon and with the bright planets Venus and Jupiter. Descriptions of what is actually observed, and under what conditions, can be of value to meteorologists and members may care to comment on Captain Brett Hilder's letter and also to write in any interesting details of their own observations of the green flash.—Ed.

ASTRO-FIX BY RANGES

SIR,

I read Professor Collins's paper (Vol. IV, No. 1) with great interest. It seems to me however that the method he proposes has a disadvantage in that the pre-computed data for great circles of position for stars on the same vertical or on the same almucantar are not always accessible. Instead, therefore, of using this pre-computed data, I would suggest an alternative method of calculation as follows.

Having determined the precise moment when two known stars are on the same vertical or the same almucantar, find their declination and Greenwich hour angle. These can be plotted on an ordinary gnomonic chart, using declination as latitude and G.H.A. as longitude. If the stars were observed on the same vertical circle, the position line will be a straight line through the points plotted; if the stars were observed on the same almucantar the normal to a line drawn through the two points plotted will be the position line.

The gnomonic charts in general use are on a comparatively small scale, and this limits the accuracy with which the fix can be determined; however, the accuracy will probably not be less than that with which the moment of observation can be ascertained. For every 4^s error in the determination of this time, the position line will be shifted $1'$ of longitude; a time error will not, of course, affect the latitude of the fix.

Bergen Sjømannsskole,
Bergen, Norway.

Yours faithfully,
C. R. MOHN.

SIR,

In connection with Professor Collins's interesting paper, it is worth while recalling the work carried out by M. Schoenberg of Munich in this field. I am not certain whether he published a paper on his method but a short account of it was given by him in the Fiat Review of German Sciences.

The method proposed by Schoenberg uses the instant when two stars appear on the same almucantar or vertical circle to determine the latitude or the local sidereal time. The formula used is $D \operatorname{tg} \phi \, m \cos(\tau M)$, where D, m and M are simple functions of the star's coordinates, ϕ is the latitude and τ the local sidereal time. Schoenberg restricts the method to differences in azimuth of less than $12°$; the errors caused by accelerations can then be expected to be less than one-tenth of the same errors experienced in ordinary altitude observations.

The use of the method would necessitate the provision of voluminous tables giving pairs of stars at equal altitude for every degree of latitude and every 5–10 minutes of sidereal time.

The instrument proposed is a double telescope with a single eyepiece, mounted in gimbals. At the moment of coincidence in altitude, the star images will be superimposed on each other in the field of view. A knowledge of the approximate altitude and the mid-azimuth of the stars is necessary, but the stars need not be actually identified.

When the moment of coincidence has been determined, the tables will, after interpolation by means of a special table, give directly the latitude or local sidereal time.

The idea of using the passage of two stars through the same almucantar, or their coincidence in azimuth, for navigational purposes is an interesting and promising modification of principles already laid down in the field of the exact determination of geographical coordinates. The use of pairs of stars passing through the same almucantar for determining time was, I think, first proposed by N. Zinger, a Russian astronomer, in about 1880; the possibility of determining latitude by the same method was I think shown for the first time by another Russian astronomer, M. Petzow, in 1890. The well-known Horrebow-Talcott method is still another branch of the same tree.

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Yours faithfully,
LENNART PALM.

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