NAVIGATION AND NAUTICAL ASTRONOMY

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649100071

Navigation and nautical astronomy by J. H. C. Coffin

Except for use in any review, the reproduction or utilisation of this work in whole or in part in any form by any electronic, mechanical or other means, now known or hereafter invented, including xerography, photocopying and recording, or in any information storage or retrieval system, is forbidden without the permission of the publisher, Trieste Publishing Pty Ltd, PO Box 1576 Collingwood, Victoria 3066 Australia.

All rights reserved.

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, re-sold, hired out, or otherwise circulated without the publisher's prior consent in any form or binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser.

www.triestepublishing.com

J. H. C. COFFIN

NAVIGATION AND NAUTICAL ASTRONOMY

Trieste

NAVIGATION

AND

NAUTICAL ASTRONOMY

BY

PROF. J. H. C. COFFIN

Late Professor of Astronomy, Navigation, and Surveying at the U.S. Naval Academy

REVISED

BY

COMMANDER CHARLES BELKNAP

U. S. NAVY

PREPARED

FOR THE USE OF THE U.S. NAVAL ACADEMY

SEVENTH EDITION, REVISED

NEW YORK
D. VAN NOSTRAND COMPANY
1898

COPYRIGHT, 1898,
BY D. VAN NOSTRAND COMPANY.

TYPOGRAPHY BY C. J. PETERS & SON,
BOSTON.

Plimpton Press
H. M. PLIMPTON & CO., PRINTERS & BINDERS,
NORWOOD, MASS., U.S.A.

VK 555
C58
1898

PUBLISHER'S NOTE.

THE continued demand for the late Professor Coffin's treatise, at the Naval Academy and by the profession, rendered necessary a thorough revision, which has been made by Commander Charles Belknap, U.S.N., who has brought the work fully up to date, all the examples being based on the Ephemeris of 1898.

Commander Belknap being called to Manila, was unable to see the work through the press, and in his absence the proofs were read by Lieutenant E. H. Tillman U.S.N., Assistant Instructor in Navigation, U. S. Naval Academy, to whom the publishers take this means of expressing their acknowledgment.

October, 1898.

M347103

CONTENTS.

CHAPTER.

I. The Sailings : Plane, pp. 1–4 ; Traverse, pp. 5–6 ; Parallel, pp. 7–8 ; Middle Latitude, pp. 8–10 ; Mercator's, pp. 11–20 ; Mercator Chart, pp. 20–24 ; Great-Circle Sailing, pp. 24–31.

II. Refraction, pp. 32–36.

Dip of the Horizon, pp. 36–41. Distance of the horizon, p. 63.

Parallax, pp. 41–44 ; Apparent Semi-Diameters, pp. 45–47 ; Augmentation of the Moon's Semi-Diameter, p. 47.

III. Time : Sidereal, Solar, Apparent, Mean, pp. 48–50 ; Equation of Time, p. 50 ; Astronomical, Civil, and Sea Time, pp. 49–51 ; The Relation of Local Times and Longitudes, pp. 52–54 ; Standard Time, p. 56.

IV. The Nautical Almanac, pp. 57–73 ; Interpolation, pp. 57–60 ; To find a required Quantity for a given Mean Time, pp. 61–63 : Sun's Right Ascension, etc., for apparent Time, pp. 66–68 ; Mean Time of the Moon's Transit, pp. 68–69 ; Of a Planet's Transit, pp. 69–70 ; Right Ascension and Declination of the Moon or a Planet at the Time of Transit, p. 70 ; Greenwich Mean Time of a Lunar Distance, pp. 71–74.

V. Conversion of the several kinds of Time — Relation of Time and hour-angle. — To convert : — Apparent into Mean Time or Mean into Apparent, p. 75 ; Mean into Sidereal Time or Sidereal into Mean, p. 76 ; Mean Time at a given place into Sidereal, pp. 77–79 ; Examples of conversion of Time, p. 80 ; Sidereal Time at any place into Mean, pp. 81–83 ; Examples of Conversion of Time, pp. 83–84. Relation of Hour-Angle and Time, pp. 84–89 ; Examples, 89–90.

VI. The Astronomical Triangle, p. 91–92.

Altitude and Azimuth for a Given Time, pp. 95–98 ; Azimuth from an Observed Altitude, pp. 99–100 ; Amplitude, p. 101.

Examples, pp. 102–104 ; Hour-Angle and Local Time from an Observed Altitude, pp. 105–109 ; Hour-Angle on, or nearest to, the Prime Vertical, pp. 112–113 ; Examples, 110–113.

CHAPTER.

VII. LATITUDE from a Meridian Altitude, pp. 114–115 ; Examples, pp. 116–117; An Altitude at any Time, pp. 121–122 ; An Altitude near the Meridian, pp. 125–127; Examples, pp. 128–130 ; Circum-Meridian Altitudes, pp. 130–133 ; Example, pp. 133–134. To find the latitude from two altitudes when the time is not known, Chauvenet's Method, pp. 134–136 ; Example, p. 137 ; An Altitude of Polaris, pp. 138–140.

VIII. CHRONOMETERS, p. 142 ; To find the Rate of a Chronometer, p. 145 ; Comparison of Watches and Chronometers, p. 146 ; To find the Chronometer Correction from Single Altitudes, p. 147 ; Double Altitudes, p. 149 ; Equal Altitudes of a Star, p. 153 ; Equal Altitudes of the Sun, p. 154 ; Equal Altitudes of the Moon, or a Planet, p. 159 ; By Meridian Transits, p. 164 ; By time signals, p. 165.

LONGITUDE, p. 166 ; By a Portable Chronometer, p. 167 ; Reports of Longitudes, p. 169 ; Finding the Local Time from Single Altitudes, p. 169 ; Double Altitudes, p. 173 ; Two Altitudes of the Sun near Noon (Littrow's Method), p. 175 ; Equal Altitudes, p. 178 ; From Meridian Transits, p. 183 ; Longitude from Lunar Distances, pp. 184–192 ; Other Lunar Methods, p. 192.

IX. Finding a Line of Position (SUMNER'S METHOD), p. 194.

LATITUDE AND LONGITUDE by Two Lines of Position, p. 200 ; Reducing an Altitude for Change of Position, p. 207 ; Other Methods, p. 210. To find the latitude by rate of change of altitude near the prime vertical (Prestel's Method), p. 211.

X. AZIMUTH OF A TERRESTRIAL OBJECT, p. 213 ; Azimuth of a Terrestrial Object, by a Theodolite or other Azimuth Instrument, pp. 214–215 ; By a Sextant (sometimes called an Astronomical Bearing), p. 217–221.

NAVIGATION.

CHAPTER I.

THE SAILINGS.

PLANE SAILING.

1. Suppose the compass-needle constantly to point to the north, a ship which is steered by it upon any given course must *cross every meridian at the same angle;* namely, the angle given by the compass. She does not sail on a great circle, except when she sails on the equator, east or west, or on a meridian, north or south. All other great circles intersect successive meridians at varying angles.

A line which makes the same angle with each successive meridian is called a *loxodromic curve;* in old nautical works, a *rhumb-line;* more commonly, the *ship's track.*

The constant angle which it makes with the meridian is the *course,* and is called the *true course,* to distinguish it from the *compass course.*

The length of the line considered, or the distance sailed, is called the *distance.*

The corresponding increase or decrease of latitude is the *difference of latitude.*

The distance between the meridian left, and that arrived at, measured on a parallel of latitude, is the *departure* on that parallel.