

Appendix II gives a short history of the hydrographic work accomplished in the Archipelago of the Netherlands East Indies, by Admiral J. M. PHAFF.

There is also a chronological list of the various vessels which have been engaged in surveying operations in the Archipelago from 1822 to 1937, prepared by Captain J. L. H. LUYMES.

The Manual ends with a few plates illustrating, among others, the various Netherlands surveying vessels.

H. B.

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## CARTOGRAPHY

by

CHARLES H. DEETZ.

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The purpose of this publication is to supply in outline form the underlying principles of constructive cartography, while tracing briefly the attempts made through the ages to depict on paper accurate geographic information which leads to a better understanding of the terrain and the sea, their history, their characteristics and phenomena. The publication also summarises what are now considered the best methods of securing and utilising map data, and studies in a general way maps and charts and methods of constructing and printing them. Part of a previous Special Publication of the Coast and Geodetic Survey (N° 66) which deals with the rules and practice relating to the construction of nautical charts as followed in the Division of Charts of the Survey, has been embodied in the present publication.

The new manual, however, deals rather with cartography in general, It is meant to serve the compiler in the application of his technical knowledge and skill, being mainly an attempt to co-ordinate available cartographic information; it should also serve those who by their operations in the field produce the material from which maps and charts are constructed; it points out the conditions and restrictions under which map-producing organisations are functioning.

Chapter I is introduced by a brief historical account of the most ancient cartography known and of that pertaining to the more recent period of MERCATOR and ORTELIVS, followed by a summary of present day chart- and map-making methods and instruments.

Chapter II reviews the different types of charts and the purposes for which they are published, classifying them according to the main study which they are meant to serve:- Geology, Geodesy, Littoral and Continental Shelf, Oceanography, Aeronautical Charts, Weather Maps, Navigational Charts.

In the third chapter:- *Compilation of Material*, the selection of the different elements which enter into the construction of a chart is considered. Mention is made of original surveys, control points, datum planes for elevations and for soundings; selection and checking of cartographic material; projection and framework; project and specifications to insure a scheme of uniformity; construction of a projection; selection of scale of paper; methods of reduction. Some interesting remarks concerning reproduction and photo-aluminography, hereafter given in full, terminate this chapter.

Chapter IV is devoted to the study of cartographic projections: without entering into details of the mathematical formulæ and developments attached to the kind and properties of the different projections, the manual sets out in a general way the advantages of the various systems of cartographic projection, also the distortions which they carry with them, having in view the solution of the construction problems met with in cartography: facility of construction and the rapid plotting or scaling of geographical positions as, for instance, in the case of the MERCATOR projection or of the polyconic system, for which general tables have been calculated for the spheroid; definition of conformality: equivalence; representation of Great Circles or lines of shortest distance as straight lines; true bearings; true distances and azimuths. A study of the usual projections follows:- polyconic projections, the LAMBERT conformal conic projection, MERCATOR's transverse projection. The author then passes on to a study of the grid system and the establishment of rectangular co-ordinates the complete system of which is becoming more and more extensively used in the United States. Chapter IV concludes by a few general remarks

concerning the different projection systems and a guide for the identification, in the majority of cases, of the projections of a chart according to the appearance of the meridians and parallels; a brief outline of the principal properties of the projections is also given.

In Chapter V the different ways of defining direction are dealt with: sight; winds and currents; cardinal points and the mariner's compass; orientation; bearing; course; radio and mercatorial bearings; azimuths; forward and back azimuths; geodetic lines.

Chapter VI touches upon the technique of chart construction, taking up first the important question of the selection of the scale, construction of the natural scale in general and, in particular, the marginal scale of the MERCATOR chart; this is followed by considerations on representation of the relief, either by contour lines or by hachures, special adaptation to the contour lines of charts; selection of soundings; representation of shoals and dangers; (extracts under these two headings are given below); general remarks on echo sounding.

A few descriptions of new instruments used in chart construction terminate the volume. These instruments, tending to maintain the accuracy of and to speed up production, include, for instance, a projection ruling machine; the 50-inch precision camera, which is capable of making negatives 50×50 inches in size, mechanical stippling devices. Advice is given as to precautions to be taken when selecting the form, size, spacing, etc. of letters whether the lettering be by hand or by machine; the use of conventional symbols, retention of original geographical names; artistic finishing; engraving of views of the coast.

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## REPRODUCTION

(Extract from *Cartography*, Special Publication No 205, U.S. Coast and Geodetic Survey, Washington, 1936).

Changes in the methods of chart production during the past 15 years have been radical and essential, particularly with respect to methods of printing. The chief concern of the day is, first, to place before the public the benefit of surveys and information before they become obsolete, and, secondly, to eliminate appreciable scale distortion inherent in former processes. Much has been accomplished in these two problems: the *first* has been accomplished through a lesser number of intermediate steps between the commencement of compilation and the printing of a chart, and by the distribution of various parts of the reproducing work among different individuals; the *second* has been accomplished by a new method, the description of which will follow.

Scaling errors of charts pulled directly from copperplates, in former years had errors of shrinkage and distortion of as much as 4 per cent. This error was not due to the copperplate itself but to the process of printing. By the present use of baryta paper an impression is taken from the inked copperplate, and by the photolithographic process a transfer practically true to scale is made to a sensitized aluminium plate, from which the chart is printed.

Scaling errors of charts by lithographic process from vellum drawings were also considerable. Due to unequal shrinkage or the meeting of opposites in granular texture, the forced matching of adjacent vellum sheets frequently caused great annoyance in the processes of reproduction and in the final result.

While serious attention has been given to errors of map projection, the greater errors of reproduction have heretofore too often escaped notice. In the present rigorous requirements of military operations and navigation, shrinkage and distortion errors of the magnitude of former years are too serious for the purposes which maps and charts are intended to serve, and are inadmissible in calculations. The new mechanical processes have indeed added in recent years as much glory to the progress of cartography as have the improvements in methods of survey and the mathematics of map projection.

The copper engraving medium or method which has the benefit of certain advantages, had formerly certain decided inadequacies. Modifications in this method resulting in the saving of time in printing and in scale improvement were originated in the Coast and Geodetic Survey. A new procedure in the copperplate process which offers facility in handling, consists in constructing a projection on copper which provides for cutting the plate into sections or quarters similar to the method used in the following chapter. This does away with the large-size plates of former years, thus enabling two or more engravers to work on the same chart at the same time.