the operator. The same process is repeated with the second photograph, and where the two lines intersect on the paper is the position of the point on the map. Then, by placing the pencil at this intersection and lowering tne perspective center and the photograph as a unit the image of the index mark again covers the photographic image of the point, one may read the difference of height between air station and point directly on the height scale without computation. The distance from the air station to the point can also be read on the distance scale, and the necessary correction to the height for curvature and refraction can be applied at once from tables."

However, the use of a photograph invariably necessitates the determination of its position and orientation in space; and for this purpose three control points are required. An approximate value of the tilt of the axis below the horizon is first assumed and also the swing of the horizon in respect to the sides of the photograph. This enables values of the horizontal angles between the control points to be measured and a position of the station in horizontal projection to be obtained. If then the values deduced from each control point for the altitude of the station should not be in agreement, the first approximate values used for this determination will be corrected by means of a differential equation based on its actual measured differences. In cases where more than three control points can be used, it is recommended to select those most distant for the determination of tilt and orientation, and those nearest for obtaining the horizontal projection of the station. Again, points situated relatively near each other may be grouped, and the mean of the results furnished by the group may be used as if coming from a single point. Photographs containing common points may also be used in this manner provided agreement between their results is assured through the solution of simultaneous differential equations. The errors then entering are generally sufficiently small to allow relatively easy calculation, yielding valuable results.

. . . .

On this same East coast of Labrador, but a little farther south, in the vicinity of Nain, a hydrographic survey was undertaken in 1932 by the British Admiralty surveying vessel *Challenger*.

More recently, in Spring 1935, Mr. E. P. WHEELER of the Cornell University crossed the Labrador peninsula, starting from Tsiuyarsuakh Bay south of Nain, following the course of Whale River to Ungava Bay, then returning to Saglek Bay on the Atlantic Coast. Astronomical observations by the author of this journey led him to the conclusion that there existed an important displacement of Whale River towards the west when referred to the position indicated on Canadian charts (about 17 miles towards the S., 56 W. near the mouth).

(See *Geographical Review*, July 1938, pp. 475-481).

P. V.

TABLES FOR CALCULATING THE SPECIFIC VOLUME OF SEA-WATER UNDER PRESSURE

by

DONALD J. MATTHEWS.

(Published by the *Conseil Permanent International pour l'Exploration de la Mer*, Charlottenlund Slot, Denmark: sold by Andr. Fred. HOST & Fils, Copenhagen. Price Kr. 5.00).

On the gram-millilitre system the density of pure water at 4°C under atmospheric pressure is equal to 1.000000.

Where s is the specific gravity it is usual to give the value of the expression 1000 (s — 1); this expression is denoted by the Greek letter σ.

$\sigma = 1000\ (s - 1)$, at any pressure.

In the same way,

$\sigma_0 = 1000\ (s_0 - 1)$ where s_0 is the specific gravity at 0°C under atmospheric pressure.

$\sigma_0 = 1000\ (s_t - 1)$, where s_t is the specific gravity at t°C under atmospheric pressure.

At 0°C $\sigma_0 = \sigma_t$.

The specific volume is the reciprocal of the density. It is denoted by the Greek letter α.

The specific gravity of the average oceanic water at 0°C under atmospheric pressure is 1.02800, or $\sigma_0 = 28.00$. This water, the salinity of which is 34.85 °/oo, is commonly used as a standard of reference.

Its specific volume is known for various pressures, and the specific volume of another water at another temperature at these pressures can be obtained by adding certain corrections called "differences" or "anomalies". These corrections are tabulated here for standard pressures and referred to σ_t and the temperature. The formula is as follows :

$$\alpha\sigma_{t,}\, t = \alpha 28.0^{\circ} + \sigma_t + \delta\sigma_t + \delta\sigma_{t,}\, t$$

The tables are intended for the calculation of the specific volume of ocean waters to 5 places of decimals, but they have been carried to 6 places in order to increase the accuracy. The intervals in t and σ_t are so small that interpolation is easy or unnecessary. The corrections for the less saline waters, for which σ_t is less than 18.00, are given only to 5 places.

The first part of the tables gives the correction for temperature, $\sigma_{t,}$ to 6 places. The second part gives the corrections for $\sigma_{t,}$ $\delta\sigma_{t,}$ to 6 places, and also a third small correction for $\sigma_{t,}$ t. This correction is negligible in many cases.

At the end there is a table of the specific volume of the reference water, $\sigma_0 = 28.00$ and $t = 0$°C., for standard pressures, and another for use in interpolation.

The tables were calculated with the help of KNUDSEN's *Hydrographical Tables* 1901 and W. EKMAN's *Tables for Sea-Water under Pressure*, Copenhagen, 1910.

HYDROGRAPHIC AND GEODETIC SURVEYING MANUAL FOR THE USE OF U.S. NAVAL SURVEYS

(H.O. Publication N° 215 of the U.S. Hydrographic Office, Washington, D.C., 1937)

by

JOHN G. KELLAR, HYDROGRAPHIC ENGINEER, HYDROGRAPHIC OFFICE.

(252 pp., 106 figures, 23 Tables and Appendices : Price $ 3.00).

The object of this new publication brought out by the U.S. Hydrographic Office is to present in convenient form all the necessary elements required for the execution of hydrographic and geodetic surveys together with a description of the equipment and methods employed. The subject matter is based primarily on the experience acquired and on the reports furnished by the personnel participating in the surveying expeditions of the U.S. Navy during the past forty years.

The first three chapters are devoted to descriptions of the equipment, reconnaissance and erection of the survey signals.

With regard to equipment, descriptions and very complete lists are provided of the instruments, tools, machinery and materials required for the ordinary surveys. The most important among those described are :— invar tapes Bureau of Standards model with the portable tripod, the stainless steel tapes and piano wire tapes for precise traverse; the sextants and quintants used in connection with sounding operations, the latter being fitted with a vernier having a quick-clamping device; the eight-inch, ten-second transit theodolite which is particularly useful for observing the angles from tower-heads; the altazimuth instrument which is more convenient for the observation of stars from the ground and the surveyors' transits fitted with stadia wires. For naval survey operations a small light theodolite has been chosen, weighing eleven pounds with tripod, having a 5 1/2 inch horizontal circle and an eyepiece magnifying about 18 diameters. The signal lamps for long sights in geodetic surveys equipped with a telescope for perfecting the alignment; the various types of stadia rods, levels and poles and the stadia boards, are also mentioned. Three different types of protractors are indicated: one with 3 arms, 18-inch size with an extension of 13 1/2 inches, diameter of limb 6 inches, vernier reading to one minute; another type with three arms of xylonite, arm of 13 1/2 inches, reading to two minutes; and