From these sections may be deduced the principal peculiarities, of which we need only mention the following: The not very saline water of the upper 50 metres along the Swedish and Norwegian coasts is much heated in summer and much chilled in winter, with a minimum in February and a maximum in summer. The salinity of the upper layers is at its minimum in May; but the waters of low salinity only reach the coasts of Jutland in August. On the west coast of Jutland, the waters of the North Sea have a salinity of 34 to 35 °/₀₀. The penetration of the waters of the North Sea into the Kattegat is only appreciable, according to the means of the month of August, at a level of 50 metres (27 fms.), while according to those of other months (February, May and November), a current entering the Kattegat can be detected even at 20 metres (11 fms.). The water fills the greater depths with a salinity of about 35.1 °/₀₀ and a stable temperature. The computation of the components of the convection currents is based solely on the distribution of densities; it has been impossible to take into account the accidental effects of wind and atmospheric pressure. The results can correspond to mean conditions only; they are none the less extremely well shown in a series of charts, sections and tables.

P. V.

OCEANIC TRANSGRESSIONS.

by

ED. LE DANOIS

Revue des Travaux de l'Office des pêches maritimes. Imprimerie Nationale, Paris, December 1934.

DIE THEORIE DER TRANSGRESSIONEN VON LE DANOIS UND IHRE BEZIEHUNG ZUM GOLFSTROM-PROBLEM.

(LE DANOIS' THEORY OF TRANSGRESSIONS AND ITS BEARING ON THE PROBLEM OF THE GULF STREAM).

by

Dr. O. v. SCHUBERT

Annalen der Hydrographie, Heft IV, 1935. MITTLER & Sohn, Berlin.

More and more interest is being shown in research into the water movements of the Atlantic. M. LE DANOIS has recently published a compendium of the theories which, more than ten years ago, made him give the new name of "transgressions" to the movements of the waters in the north-easterly parts of the Atlantic. Dr. O. v. SCHUBERT, of the Institut für Meereskunde, has analysed and reviewed this book very completely in the *Annalen der Hydrographie.* One must agree with him in showing the liveliest appreciation of the persevering study which has been made of the variations in the state of these water masses; for they are of great importance to fisheries and in climatic phenomena. The aspect of these transgressive phenomena is described in great detail for the different zones in chapter III of M. LE DANOIS' book.

Chapter I deals with some general principles, viz. immiscibility of the waters, classification and distribution of the Atlantic waters. The author distinguishes between waters of tropical origin (equatorial and Atlantic) and the waters of polar origin which he classifies into continental waters, polar waters (Arctic and Antarctic), and abyssal waters of Arctic or Antarctic origin. Differences of salinity and temperature characterise the general distribution of these waters. Dr. O. v. SCHUBERT comments with reason that it is impossible to explain, as the author seems to do, the rapid heating and cooling of the continental waters by their low salinity, for their specific heat increases, on the contrary, when the salinity decreases.

Chapter II deals with the movement of the Atlantic waters. The author will not admit that the current issuing from the Florida Straits continues beyond the 40th degree of longitude West. To characterise the movement of the waters in the eastern and northern part of the Atlantic, he has proposed the name of "transgression", which he defines as follows :-

> "A periodic movement of varied amplitude on the part of the Atlantic waters of tropical origin, entailing a momentary encroachment of these waters into the waters of polar origin and particularly into the continental waters. The waters of the transgressive mass have always a salinity over 35 °/₀₀."

He shows, in fact, by a comprehensive study, given in detail in chapter III, what are the characteristics of the waters of these regions with regard to density and temperature, and what seasonal variations are noted there. These Atlantic waters of tropical origin extend in summer, at the moment of their greatest extension, between Iceland and Scotland as far as Spitsbergen ; in winter they go no further, at the moment of their maximum withdrawal, than the sill joining Scotland and Iceland.

The explanation given of these phenomena is based on more questionable theories. M. LE DANOIS attributes the transgressions and their periodicity to the attraction of the moon, and claims to find many complex periodicities in the movement of this body ; and, to explain the discrepancies which he nevertheless meets with, he falls back on the periodical variation of the earth's magnetism and the displacement in latitude of sunspots. It would seem simpler, to understand this annual seesaw of the Atlantic waters from one hemisphere to the other, to see in it the influence of the variations of the sun's declination and the manifold actions of that body on atmospheric conditions, which also have periods of an order analogous to those which have been found in the case of the transgressions.

One does indeed recognize, as the author says, the various lunar periods in the periodicities of the mean level of the sea, but one fails to see how this movement of the mean level can be connected with the transgressions either in the rôle of cause or of effect. Neither can one follow how the force of the earth's rotation can "provoke currents" ; its action seems to be limited to changing their direction. Must we then abandon the name of "Gulf Stream" for the water movements of this part of the Atlantic ? Let us quote in this respect the opinion of Mr. C. VALLAUX in his *Géographie Générale des Mers :*

> " It is evident that these waters of the Atlantic are not forced forward by the waters of the Florida Current. They represent a phenomenon of another order, with its own variations and laws. But it is no less evident that there is connection and continuity between the two phenomena."

This continuity follows even from the representation of the transgressions given by M. LE DANOIS which is reproduced in *The Hydrographic Review*, Vol. XI, No. 2, Nov. 1934, p. 177, fig. 4. It is well indicated also opposite p. 178 of the same Review, where there is a reproduction of the chart of the surface currents of the Atlantic drawn for the month of August by O. H. FELBER. Nevertheless, some oceanographers have already suggested different names for the various branches of this current ; the name of "transgressions" may appear to be the most suitable for the phenomenon of this part of the Atlantic, but to justify it, it will be necessary for the causes of the phenomenon to have been more completely elucidated.

P. V.

CURRENT TABLES, STRAITS OF MALACCA AND JAVA SEA, 1935.

Published by the *Hoofdkantoor van Scheepvaart* (Head Office of Navigation), Marine Department, Batavia (Centrum), Price Fl. 1.

(Extract from *De Zee*, Den Helder, No. 3, March 1935, page 154) (*).

These current tables are based on current observations carried out in the years 1932-1934 by the surveying vessel *Orion*. From these observations, tidal-stream constants were computed, besides the constant current which prevailed locally during the period of observations ; both are given on page 1 of the publication.

(*) *Original text in Dutch.*