

# THE TIDE CALCULATOR

of

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This apparatus, of which a photograph is given, is used for the calculation of the tide in any port where the Harmonic Constants are known, with the help of the Tables appended to the publication: *Utilizacion de las Constantes Armonicas*, by Commander R. VAGO.

## DESCRIPTION.

It is composed of a small board of black ebonite, across which run seven small sliding rules of ivory corresponding respectively to the seven constituent tides  $S_2$ ,  $K_2$ ,  $N_2$ ,  $M_2$ ,  $K_1$ ,  $O_1$  and  $P_1$ .

The ebonite board is divided from top to bottom and from side to side by a uniform scale of equal divisions of 12 minutes each, from 0 to 27 hours (mean civil time), thus covering a period of more than one entire tidal day. These divisions stand out clearly in white lines drawn on the black background of the ebonite board.

Each of the sliding rules corresponds to a particular tide and is divided, according to the period of that tide, from a certain origin (in this case from mean level), into divisions which correspond to tenths of the semi-amplitude of the tide under consideration. The divisions are restricted to the indications corresponding respectively to 0 (*i. e.*, mean level), 02, 04, 06, 08, 09 tenths and 1 (*i. e.*, high water or low water of the constituent under consideration).

The positive divisions, *i. e.* those representing the heights *above* mean level, are shown on the white sliding rules in black, the negative divisions, *i. e.* those heights which are *below* mean level, are in red. Thus the series of divisions 0, + 02, + 04, + 06, + 08, + 09, + 1, + 09, + 08, + 06, + 04, + 02, 0, - 02, - 04, - 06, - 08, - 09, - 1, - 09, - 08, - 06, - 04, - 02, 0, extends over a length of rule equal to the period of the constituent expressed in mean hours measured on the general scale employed for the divisions on the ebonite board.

Each sliding rule is thus divided for each particular constituent throughout its length, which corresponds to a period of 27 mean hours covering one or two periods of the wave, plus the fractional complement of 27 hours.

## METHOD OF PROCEDURE.

The apparatus is used concurrently with the Tables appended to the publication: *Utilizacion de las Constantes Armonicas*.

A form for calculation, stuck on the back of the ebonite board, allows these Tables to be used for the calculation, first, of  $fH$ , *i. e.*, the semi amplitude relating to the year under consideration, and, second, of the hour (legal time) of the high water pertaining to each of the constituents  $S_2$ ,  $K_2$ ,  $N_2$ ,  $M_2$ ,  $K_1$ ,  $O_1$  and  $P_1$ .

The following process is then carried out:-

The black division "1" of each sliding rule is made to coincide with the calculated time of high water of the corresponding constituent. Thus all constituent tides are and *remain* distributed over the entire period of 27 hours represented on the board. The coordinates are expressed in tenths of  $fH$ : "1 black" corresponding to High Water and "1 red" to Low Water of each constituent.

Then each  $fH$  is multiplied by the tenth of the corresponding amplitude read off *the same horizontal line* on the board, and the sum of these partial ordinates for any given time is the ordinate of the total tide, which added or subtracted, according to its sign, to the mean level, gives the sea level above datum, the time being expressed in the civil time of the locality.

Thus, a glance at the board shows the relative situations of the various tides for the entire period, the time limits of which correspond to the horizontal lines crossing the divisions of the sliding rules.

H. B.



