Prediction.

The predictions have been carried out generally in a similar manner to that of last year. The following modifications have, however, been made. The M curve is now composed of all the M tides (M_1, M_2, M_3, M_4, and M_6); the S curve of S_1, S_2, S_4, and S_6 tides; and the K curve of K_1 and K_2 tides. In Figs. 1 and 2 the separate K_1 and K_2 curves are shown as well as the combined curve $K_1 + K_2$, both for Auckland and Wellington, and on the same scale. The assumption involved in the use of the template curves is that the resultant curve, made up of the M curve with the addition of the corrections due to the other tides, is practically an M_2 curve of different amplitude. That this assumption is justified within practical limits is shown by the tests of the predictions, which agree very closely with actuality. As a further check on this assumption, whenever the correction to the M_2 tide of H. or L. water approaches 1 hour, a fourth measurement is made of the combined curves 2 hours from the time of M_2, H. or L. water, and it has been found that the template curve invariably goes through the fourth point so determined. An example of this check is shown in Fig. 3, where ACEJ represents the M combined curve for the 400th L.W. of Auckland, 1913. AB, CD, EF are the three measured corrections due to the other short-period tides. The template curve ($k = -8$) is fitted over the points BDF, keeping its centre-line FH parallel to CD, EF, and AB. In this case the apex to the curve coincides with F, and the correction to the time is -1 h., while the height is 1·83 ft. The fourth measurement made at -2 h. gave the correction JI, and it was found that the template curve passed exactly through the point I, thus showing, as far as the scale of the drawing permits, that the assumption is correct.

Check of Predictions.

Through the courtesy of the Engineer to the Auckland Harbour Board (Mr. W. H. Hamer, M.Inst.C.E.) the Auckland tide-records for 1912, January, were sent here as soon as they were available, and a portion of the check fo the prediction is shown in Fig. 4, where the results for the January 25th to 28th are shown plotted on a copy of the tide-record. The whole of the January record was checked in this way, and gave equally good results.

Datum Levels.

As in the case of Wellington, the suggested adoption of the datum of the Indian spring low-water mark for Auckland would result in the datum being—

Tide.	Semi-range.
M_2	3·814 ft.
S_2	0·583 ft.
K_1	0·233 ft.
O	0·059 ft.
	4·689 ft.

below mean sea-level. In this case also the comparatively large tides—

Tide.	Semi-range.
N_2	0·797 ft.
ν	0·236 ft.
L	0·221 ft.
MS	0·169 ft.
K_2	0·145 ft.
μ	0·126 ft.
P	0·068 ft.

are all greater than the O tide.

Other Methods of Harmonic Analysis.

Following a valuable suggestion made by Dr. P. H. Cowell, Superintendent of the Nautical Almanac, London, a method of analysis of tidal observations, where the observations are summed—first every 24 mean solar hours, and secondly every 25 mean solar hours—has been partly developed. An example as applied to the M_2 tide will show the general procedure, and reference should also be made to Dr. Börgen's papers. For this and other tides which have a period nearer to 25 than to 24 hours, the observations are summed every 25 hours throughout the year: thus, for the Auckland tides the following schedule of sums is made:—

List of Sums, beginning 1908, December 1.

Day.	0 h.	1 h.	2 h.	..	22 h.	23 h.	24 h.
0	80	85	78	..	44	59	71
1	160	167	154	..	88	117	142
2	239	249	230	..	130	176	214
353	17891	17574	17220	..	18363	18281	18087
354	17920	17600	17251	..	18418	18325	18121

In this schedule the hours are mean solar, the day is an arbitrary one of 25 hours, and the unit for heights is $\frac{1}{8}$ ft.

The height of the tide above its mean level: at any hour t (counted from 0 h to 24 h), on any day ν (beginning with 0), may be represented by a sum of terms of the form—

$$h_{t,\nu} = \mathrm{R}\cos(i\,t - \zeta + \nu.\,25\,i) + \mathrm{R}_y\cos(i_y t - \zeta_y + \nu.\,25\,i_y) + \ldots . (1)$$

where $\mathrm{R} = \mathrm{H}f$

$$\zeta = \kappa - (\mathrm{V} + u).$$