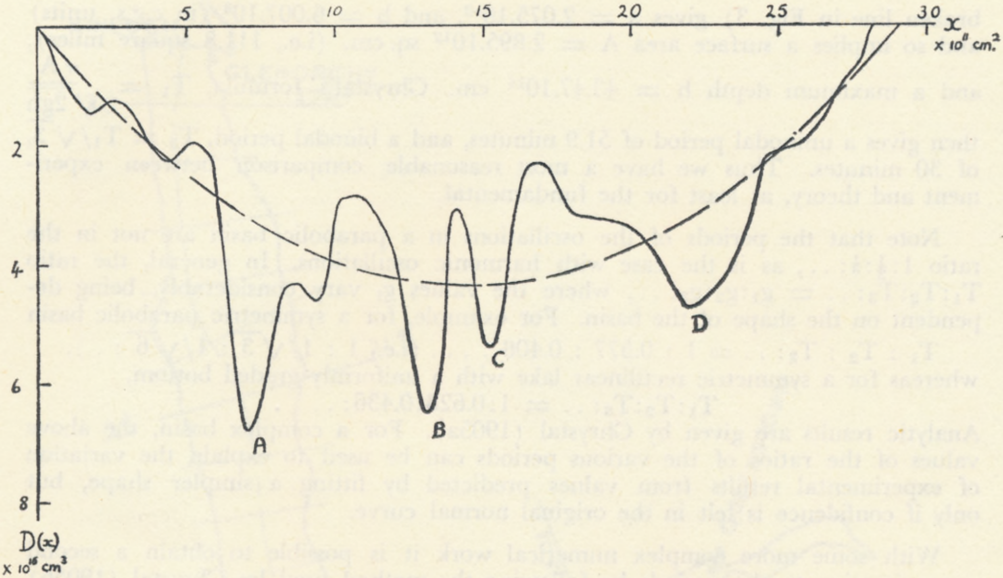


FIGURE 3.—Normal curve for Lake Wakatipu (———) and the parabola fitted by least squares (— — —).

In any theoretical treatment much depends on the accuracy of the normal curve, which in turn depends on the accuracy of the bathymetric survey. Unfortunately only one survey has been made of Lake Wakatipu; by Lucas (1904) using a sounding line. Hence the survey is by no means accurate, implying that the resulting planimeter measurements may also be somewhat approximate. A minor error in the placing of the sides of the glacial trough at any cross-section in a lake as deep as Lake Wakatipu results in a considerable error in h(x), and hence in D(x). The scale of 1 to 200,000 of Lucas's map results in further inaccuracy. Hence it is heartening to find that the above normal curve is substantially the same as that calculated by Bottomley (1956a; p. 52).

It is difficult to know how much significance should be attached to the deep valleys A, B, C and D in the curve shown in Fig. 3. Each one corresponds to a major bay (e.g., Drift Bay, Wilson's Bay) where inaccuracies in the survey are considerable, and may be in either direction. Hence it is not possible at present, or at least until a more accurate survey has been made, to attempt a sophisticated analysis, and only approximate theories have any hope of success.

Thus, as a first approximation, it is reasonable to ignore the peaks and valleys, and to fit a simple curve as closely as possible to the given data for the normal curve. The seiche periods can then be calculated by inserting numerical values in the formulae developed by Chrystal (1905a; p. 622). This should give a reasonable result for the period of the fundamental, but cannot be expected to predict the periods of higher order oscillations with any degree of accuracy, as the influence of irregularities will be much greater in these cases (see Chrystal (1905a)).

The first obvious curve to fit (by least squares) is a symmetric parabola of the form $D(x) = -ax^2 + bx$; i.e., not necessarily assuming that the parabola passes through both end points of the normal curve. This was necessary as the above normal curve implies a surface area of 108.2 square miles, whereas Lucas (1904) gives an area of 112.3 square miles. Fitting such a curve (shown by the