Each of the above values for the q's, except that for tin, was determined by Wertheim by a statical method; in the case of tin the value of q was determined from transverse vibrations.

In the paper referred to Wertheim gives results for Young's modulus for the various metals by methods involving (1) direct elongation, (2) transverse vibrations, and (3) longitudinal vibrations. The agreement between the values obtained for the same metal by direct elongation and by vibration differ in some cases by as much as 20%. Regarding these results Lord Kelvin wrote:—"It will be seen that Young's moduli obtained by Wertheim by vibrations, longitudinal or transverse, are generally in excess of those which he found by static extension; but the differences are enormously greater than those due to heating and cooling effects of elongation and contraction and are certainly to be reckoned as errors of observation. It is probable that his modulus determinations by static elongation are minutely accurate; the discrepancies of those found by vibrations are probably due to imperfection of the arrangements for carrying out the vibrational method." [3]

A glance at the published tables of the elastic constants of various substances would suffice to show the utter uselessness of trying to test the formula showing the relation between q and q′ for any substance by any method except finding directly q and q′ for the same specimen of a given material. The purpose of the experiment described below was to find these two Young's moduli for a given specimen by direct methods in order to get the value of the ratio q : q′. The adiabatic Young's modulus was found by determining the velocity of sound in a brass rod by means of Kundt's well known dust-tube method and applying the formula:—$V = \sqrt{\frac{q'}{d}}$. The static method used was that based on the observation of the bending produced in the rod when it was supported on two knife-edges and a weight was applied to the middle of the bar.

1. *Determination of the Adiabatic Young's Modulus.*

The Kundt method is so well known as to need no description here. The air and powder in the closed tube were carefully dried by blowing a slow current of air through a tube containing phosphorus pentoxide and afterwards through the dust tube. The distances between the 1st and 7th, 2nd and 8th, etc., dust heaps were measured by means of a microscope which was placed so as to view also a standard yard placed just below the tube. The microscope was provided with a scale and

[3] *Loc. cit.*