ments determined by harmonics of any even degree (n), the "coefficient of stability" for the displacement symmetrical about the axis is the *last* to change sign, it is clear that hardly any less general constraint would suffice to produce such a result.

VI. "A Determination of "v," the Ratio of the Electromagnetic Unit of Electricity to the Electrostatic Unit." By J. J. Thomson, M.A., F.R.S., Cavendish Professor of Experimental Physics, Cambridge, and G. F. C. Searle, B.A., Peterhouse, Demonstrator in the Cavendish Laboratory, Cambridge. Received March 12, 1890.

(Abstract.)

The experiments made by one of us in 1883 having given a value for "v" considerably smaller than those found in several recent researches on this subject, it was thought desirable to repeat the experiments. The method used in 1883 was to find both the electrostatic and the electromagnetic measures of the capacity of a condenser, the electrostatic measure being calculated from the dimensions of the condenser, and the electromagnetic measure by determining a resistance which would produce the same effect as that produced by repeated charging of the condenser when placed in one arm of a Wheatstone's bridge. In the experiments in 1883 the condenser used in determining the electromagnetic measure was not the same as that for which the electrostatic capacity had been calculated, but one without a guard ring, the equality of the capacity of this condenser and the guard ring condenser being tested by the method given in Maxwell's 'Electricity and Magnetism,' vol. 1, p. 324.

In repeating the experiments we adopted at first the same method as before, using, however, a key of different design for testing the equality of the condensers by Maxwell's method. We got very consistent results, practically identical with those obtained in 1883. We may mention here, since it has been suggested that the capacity of the leads might explain the low value of "v" obtained previously, that the leads are allowed for by the way the comparison between the two condensers is made, for the same leads are used in the determination of the electromagnetic measure of the capacity of the auxiliary condenser and in the comparison of the capacity of this condenser with the one with the guard ring, and the capacity of the auxiliary condenser is adjusted until its capacity, plus that of the leads, equals the capacity of the guard ring condenser; and in the electromagnetic measurements it is the capacity of the auxiliary condenser, plus that of its leads, which is found.

As the use of the auxiliary condenser introduces additional sources of error, we endeavoured to determine the electromagnetic measure of the capacity of the guard ring directly, using a complicated commutator, which worked both the guard ring and condenser. The first commutator we used was one where the contacts were made by platinum styles attached to a tuning fork; the results obtained with this were not so regular as we desired, so we replaced the tuning fork commutator by a rotating one driven by a water motor. A stroboscopic arrangement was attached to the commutator, which enabled its speed to be measured and kept constant. With this arrangement, which worked perfectly, we got values for the electromagnetic measure of the capacity of the condenser distinctly less than those obtained by the old method. We then endeavoured to find out the reason for this difference, and after a good deal of trouble discovered that in the experiments by which the equality of the capacities of the guard ring and auxiliary condensers were tested the guard ring did not produce its full effect. When the guard ring of the standard condenser was removed and the capacity of the auxiliary condenser made the same, the two methods gave identical results, but the effect produced by adding the guard ring was less in the old method than in the new. We found by calculation that the effect produced by the addition of the guard ring in the old method was distinctly too small, while in the new the observed and calculated effects agreed well together. As the new method was working perfectly satisfactorily, and as it possesses great advantages over the old one, inasmuch as we get rid entirely of the auxiliary condenser, and, since the commutator is a rotating one, its speed can be altered with much greater ease and accuracy than can be done with a tuning fork, we discarded the old method and adopted the new one.

The following are the results obtained by this method:—

Electrostatic measure of the capacity, 397·991.

Electromagnetic Measure.

First Set of Experiments.

Number of times the condenser is charged per second.	Capacity $\times 10^{21}$.
64	443·427
32	443·571
48	443·523
80	443·459
64	443·298
55	443·478
42	443·443

Mean, 443·457.

Second Set.

64	443·043
48	443·097
32	443·378
80	442·950
64	443·686
55	443·766
48	443·378
32	443 646
16	443·672
80	443·163

Mean, 443 377.

Third Set.

64	443·369
32	443·257
48	433·770
80	443·530
55	443·835
64	443·401

Mean, 443·527.

The mean of all the observations = $443{\cdot}454 \times 10^{-21}$.

The means of the observations for different speeds are given in the following table:—

Number of times the condenser is charged per second.	Capacity $\times 10^{21}$.
80	443·275
64	443·370
55	443·693
48	443·442
42	443·443
32	443·463
16	443·672

These agree very well together, the greatest difference being about one part in 1,000.

Taking $443{\cdot}454 \times 10^{-21}$ as the electromagnetic measure of the capacity, the value of "v" is 299·58.