

## On a Method of Comparing very unequal Capacities

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that convenient coincidences were not always to be trusted, and that the specific heat of air depended on the pressure to which it was subjected.

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## XII. *On a Method of Comparing very unequal Capacities.*

*By Mr. H. FISON, D.Sc.\**

(Abstract.)

ONE coating of each condenser is joined to earth and to one end A of a high resistance (20,000 or 30,000 ohms) through which a current is flowing. The small condenser is charged to the P.D. existing between the ends A, B of the resistance and discharged into the large one. This is repeated a great number of times. If C be a point between A and B, the resistance between A and C may be varied until the P.D. between them is equal to that between the coatings of the condensers after  $n$  operations. If the insulated coatings be now joined to C through a galvanometer no deflexion will result. The relation between the capacities  $C_1$  and  $C_2$  of the large and small condensers is given by

$$\left(1 + \frac{C_2}{C_1}\right)^n = \frac{R_{AB}}{R_{BC}},$$

where  $R_{AB}$ ,  $R_{BC}$  are the resistances between AB and BC respectively.

Since time is required to prepare the operations the instantaneous capacities cannot be compared, and accordingly the measurements are taken after a definite time of electrification. A special rotating key was shown for performing ten operations per revolution, in which a trigger arrangement was provided for stopping the rotation after a predetermined integral number of revolutions. The method has been used for comparing a small air-condenser with a microfarad. The capacity of the former was also calculated electrostatically (correction being made for the edges), and that of the latter measured electro-magnetically by a ballistic galvanometer.

\* Read June 9, 1888.

The results give a value for  $v$  equal to  $2.965 \times 10^{10}$ . In these experiments the capacity of the rotating key was allowed for. Under favourable conditions, capacities in the ratio of 1 to 1000 or 1 to 10,000 can be compared with an accuracy of  $\frac{1}{4}$  per cent.

Prof. Ayrton thought the novelty of the arrangement was in the rotating key, as the method of comparing unequal capacities by charging the smaller and discharging it into the larger a considerable number of times had been described and used by himself and Prof. Perry in their experiments on the Specific Inductive Capacity of Gases.

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XIII. *On the Divergence of Electromotive Forces from Thermochemical Data.* By E. F. HERROUN, *Professor of Natural Philosophy in Queen's College, and Demonstrator in King's College, London* \*.

THE fact that with many voltaic cells the electromotive forces observed experimentally do not accord with values calculated from the thermochemical equations representing the reactions occurring within the cells, has been the subject of remark by several investigators, including Favre, Julius Thomsen, Braun, Helmholtz, Willard Gibbs, Wright and Thompson, and others. But although, at the present time, we are in possession of a knowledge of the actual and computed values of the electromotive forces of a large number of voltaic cells, anything approaching a complete explanation of the reason why certain cells should give electromotive forces in excess, others in defect, others again according almost exactly with the calculable values, is still wanting.

It was in the hope of deciding certain questions and of going some way on the road to a final solution of the problem that the present research was undertaken.

Certain cells, like the 'Grove' or 'Bunsen,' in which nitric acid is reduced by the evolved hydrogen, are said to furnish, with nitric acid of certain degrees of concentration, electromotive forces somewhat in excess of the values calculated from the thermal effects accompanying the chemical changes;

\* Read January 26, 1889.