Hence

$$\int_{-\infty} \frac{\varepsilon^{-nu^2+xu}\,du}{a^2+u^2} = c\cos ax\,;$$

$\therefore$ putting $x=0$,

$$c = \int_{-\infty}^{\infty} \frac{\epsilon^{-nu^2}du}{a^2+u^2}\,;$$

$$\therefore\ \frac{dc}{dn} - a^2 c = \int_{-\infty}^{\infty} \epsilon^{-nu^2}du = -\frac{\sqrt{\pi}}{\sqrt{n}}.$$

Integrating this equation, and choosing the arbitrary constant so that c may vanish when n is infinite,

$$c = \sqrt{\pi}\,\epsilon^{a^2n} \int_{n}^{\infty} \frac{dn}{\sqrt{n}}\,\epsilon^{-a^2n}.$$

Hence we shall have

$$\int_{-\infty}^{\infty} \frac{\epsilon^{-nu^2+xu}\,du}{a^2+u^2} = 2\sqrt{\pi}\cos ax\,\epsilon^{a^2n} \int_{\sqrt{n}}^{\infty} d\mu\,\epsilon^{-a^2\mu^2},$$

which last integral is exceedingly well known. It is manifest that we can reduce the integral $\int_{-\infty}^{\infty} \frac{\epsilon^{-nu^2+xu}du}{a^{2r}+u^{2r}}$ to this by the method of partial fractions.

In concluding this paper, I desire to express the obligations I am under to Spitzer's 'Studien.'

II. "Measurements of Specific Inductive Capacity of Dielectrics, in the Physical Laboratory of the University of Glasgow." By John C. Gibson, M.A., and Thomas Barclay, M.A. Communicated by Sir William Thomson. Received November 23, 1870.

(Abstract.)

This paper describes the instruments and processes employed in a series of experiments on the specific inductive capacity of paraffine, and the effect upon it of variations of temperature. The instruments described are the platymeter and the sliding condenser. The former of these was, in a rudimentary form, shown to the Mathematical and Physical Section of the British Association at its Glasgow Meeting in 1855, by W. Thomson. It consists of two equal and similar condensers employed for the comparison of electrostatic capacities. The sliding condenser is a condenser the capacity of which may be varied by known quantities by altering the effective area of the opposed surfaces. By means of these two instruments, along with the quadrant electrometer, the capacity of a condenser may be determined by equalizing the sliding condenser to it. The method of working, and the electrical actions upon which it depends, are described in detail. In

order to determine the capacity of the sliding condenser at the lower extremity of its range, a spherical condenser, so constructed that its capacity could be accurately determined in absolute measure, was employed. An apparent discrepancy in the results obtained, arising from an inequality in the condensers forming the platymeter, is then considered, and the method of deducing the true result investigated. A series of experiments is then described which gave 1·975 as the specific inductive capacity of paraffine, that of air being taken as unity, but failed to show whether this alters with variations of temperature. An improved form of condenser, composed of concentric brass cylinders with paraffine for the dielectric, and the results obtained from it, are then described. The measurements made at different temperatures show no variation of specific inductive capacity. In order to allow to the paraffine freedom of expansion with temperature, another form of condenser was employed, and the same results obtained. A series of experiments was then made on the expansion of paraffine with temperature, in order to estimate the effect of this upon the capacity of paraffine condensers. As a mean of the results, it was found that the linear expansion of paraffine at 9° C. is ·000237 per degree. Some further measurements of the cylindrical condenser were made with the same result as before. Thus all the measurements of this condenser made at temperatures ranging from —12°·15 to 24·35 C. show no variation of specific inductive capacity of paraffine with temperature. This was found to be 1·977, that of air being taken as unity.

In a note added to the paper a description is given of an improved form of sliding condenser.

III. "On the Uniform Flow of a Liquid." By Henry Moseley, M.A., D.C.L., Canon of Bristol, F.R.S., and Corresponding Member of the Institute of France. Received December 1, 1870.

(Abstract.)

The resistance of every molecule of a liquid at rest which a solid (by moving through it) disturbs, contributes its share to the resistance which the solid experiences; so that the inertia of each molecule so disturbed and its shear must be taken into account in the aggregate, which represents the resistance the liquid offers to the motion of the solid. The motions communicated to the molecules of a liquid by a solid passing through it, and the resistances opposed to them, however, are so various, and so difficult to be represented mathematically, that in the present state of our knowledge of hydrodynamics the problem of the resistance of a liquid at rest to a solid in motion is perhaps to be considered insoluble. As it regards the opposite problem of the resistance of a solid at rest to a liquid in motion (as in the case of a liquid conveyed through a pipe), there are in like manner to be taken into account the disturbances created by that re-