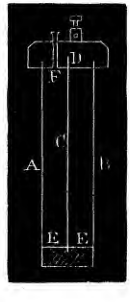
A few specimens of lead or flint glass were examined in the same way, and in this case a very marked connexion between electric conductivity and density was observed. This result was, however, no doubt due to the fact that the density of this kind of glass gives an indication of its chemical composition. In all the specimens examined it was found that the higher the density the lower the conductivity. The highest density reached, however, was that in the case of a Thomson's electrometer jar, which had a density of 3·172. On examining these specimens for chemical composition it was found that the electrometer jar contained almost exactly the proper amount of lead and potash to form a trisilicate of potash and lead. It appears likely, therefore, that the electric conductivity of glass is lowest when it is an exact chemical compound. It will be interesting to learn from future experiments if still more dense glass has a higher conductivity, and if the conductivity passes a minimum at the point where the pure silicate is reached.

The author has to express his great obligation to his colleague, Dr. Edward Diver, in whose laboratory and under whose superintendence the chemical analyses of the specimens of glass were made.

## III. "On a New Electrical Storage Battery. (Supplementary Note.)" By Henry Sutton. Communicated by The President. Received January 3, 1882.

The new cell consists of a flat copper case, of the same shape as a Grove's cell; it has a lid of paraffined wood, from which hangs a plate of lead amalgamated with mercury, the lower part of the lead plate being held in a groove in a slip of paraffined wood resting on the bottom of the copper case: through the lid a hole is bored for the introduction of the solution, which consists of a solution of cupric sulphate, to which is added one-twelfth of hydric sulphate; the presence of this free sulphuric acid improves the cell at once.

The following sectional sketch shows the arrangement:—



AB. The outer flat copper case.

C. Plate of amalgamated lead held in grooves in the cap D and the slip E.

F shows the hole in the cap through which the solution is introduced, and by the introduction of a glass tube through this hole the state of the charge is seen by observing the colour; the interior surface of the case forms the negative, and the amalgamated lead the positive electrode.

*January* 19, 1882.

THE PRESIDENT in the Chair.

The Presents received were laid on the table and thanks ordered for them.

The following Papers were read:—

## I. "On certain Definite Integrals." No. 10. By W. H. L. Russell, F.R.S. Received December 31, 1881.

Let $a_0+a_1x+a_2x^2+a_3x^3+a_4x^4=\alpha+\beta(\mu+\nu x+\rho x^2)+\gamma(\mu+\nu x+\rho x^2)^2$. Then we find the condition

$$8a_1a_4^2+a_3^3-4a_2a_3a_4=0,$$

together with the equations—

$$\gamma\rho^2=a_4, \qquad 2a_4\nu=\rho a_3, \qquad \beta\nu+2\gamma\mu\nu=a_1,$$

when there are three equations connecting the five quantities $\beta$, $\gamma$, $\mu$, $\nu$, $\rho$.

Under these conditions we shall have—

$$\int_b^a dx\epsilon^{a_0+a_1x+a_2x^2+a_3x^3+a_4x^4}=\int_{\mu+\nu b+\rho b^2}^{\mu+\nu a+\rho a^2}\frac{dz\,.\,\epsilon^{\alpha+\beta z+\gamma z^2}}{\sqrt{4\rho(z-\mu)+\nu^2}} \quad . \quad . \quad . \quad (220).$$

In the same way, if

$$a_0+a_1x+a_2x^2+a_3x^3+a_4x^4+a_5x^5+a_6x^6$$
$$=\alpha+\beta(\mu+\nu x+\rho x^2)+\gamma(\mu+\nu x+\rho x^2)^2+\delta(\mu+\nu x+\rho x^2)^3,$$

we have similarly—

$$\int_b^a dx\epsilon^{a_0+a_1x+a_2x^2+a_3x^3+a_4x^4+a_5x^5+a_6x^6}=\int_{\mu+\nu b+\rho b^2}^{\mu+\nu a+\rho a^2}\frac{dz\,.\,\epsilon^{\alpha+\beta z+\gamma z^2+\delta z^3}}{\sqrt{4\rho(z-\mu)+\nu^2}} \quad . \quad (221).$$

There will be six equations connecting the quantities $a_1$, $a_2$, $a_3$, $a_4$,