VII. ON ELECTRIC EQUILIBRIUM BETWEEN URANIUM AND AN INSULATED METAL IN ITS NEIGHBOURHOOD [1]).

(Philosophical Magazine Vol. 45, 1898; pp. 277—279).

The wonderful fact that uranium held in the neighbourhood of an electrified body diselectrifies it was first discovered by H. Becquerel. Through the kindness of M. Moissan we have had a disk of this metal, about 5 cm. in diameter and $^1/_2$ cm. in thickness, placed at our disposal.

We made a few preliminary observations on its diselectrifying property. We observed first the rate of discharge when a body was charged to different potentials. We found the quantity lost per half-minute was very far from increasing in simple proportion to the voltage, from 5 volts up to 2100 volts; the electrified body being at a distance of about 2 cm. from the uranium disk. (Added March 9. We have to day seen Prof. Becquerel's paper in Comptes Rendus for March 1. It gives us great pleasure to find that the results we have obtained on discharge by uranium at different voltage have been obtained in another way by the discoverer of the effect. A very interesting account will be found in the paper above cited, which was read to the French Academy of Sciences on the same evening, curiously enough, as our was read before the Royal Society of Edinburgh).

These first experiments were made with no screen placed between the uranium and the charged body. We afterwards found that there was also a discharging effect, though much slover, when the uranium was wrapped in tinfoil. The effect was still observable, when an aluminium screen was placed between the uranium wrapped in tinfoil and the charged body.

[1]) [En collaboration avec Lord Kelvin et J. C. Beattie; Ed.].

To make experiments on the electric equilibrium between uranium and a metal in its neighbourhood, we connected an insulated horizontal metal disk to the insulated pair of quadrants of an electrometer. We placed the uranium opposite this disk and connected it and the other pair of quadrants of the electrometer to the sheaths. The surface of the uranium was parallel to the insulated metal disk, and at a distance of about 1 cm. from it. It was so arranged as to allow of its easy removal.

With a polished aluminium disk as the insulated metal and with a similar piece of aluminium placed opposite it in place of the uranium, no deviation from the metallic zero was found when the pairs of quadrants were insulated from one another. With the uranium opposite the insulated polished aluminium a deviation of ·84 scale-divisions from the metallic zero was found in about half a minute. (Sensibility of electrometer 140 divisions per volt). After that, the electrometer-reading remained steady at this point, which we may call the uranium-rays-zero for the two metals separated by air which was traversed by uranium rays. If instead of having the uranium opposite to the aluminium, with only air between them, the uranium was wrapped in a piece taken from the same aluminium sheet, and then placed opposite to the insulated polished aluminium disk, no deviation was produced. Thus in this case the rays-zero agreed with the metallic zero.

With polished copper as the insulated metal, and the uranium separated only by air from this copper, there was a deviation of about + 10 scale divisions. With the uranium wrapped in thin sheet aluminium and placed in position opposite the insulated copper disk, a deviation from the metallic zero of + 43 scale divisions was produced in two minutes, and at the end of that time a steady state had not been reached

With oxydized copper as the insulated metal, opposed to the uranium with only air between them, a deviation from the metallic zero of about + 25 scale divisions was produced.

When the uranium, instead of being placed at a distance of 1 cm. from the insulated metal disk, was placed at a distance of 2 or 3 mm., the deviation from the metallic zero was the same.

These experiments show that two polished metallic surfaces connected to the sheath and the insulated electrode of an electrometer, when the air between them is influenced by the uranium rays, give a deflection from the metallic zero, the same in direction, and of about the same amount, as when the two metals are connected by a drop of water.

VIII. ÜBER WÄRMELEITUNG IN VERDÜNNTEN GASEN.

(Annalen der Physik und Chemie, Band 64, 1898; pp. 101–130).

I. Einleitung.

Strömt eine Flüssigkeit längs einer festen Wand, so ist die an der Wand geltende Grenzbedingung:

$$\zeta \frac{\partial v}{\partial n} = v - v',$$

worin v und v' die Geschwindigkeiten der Flüssigkeit und der Wand, n die von der Grenzfläche ins Innere der Flüssigkeit gezogene Normale bedeuten, und ζ eine Konstante ist, nämlich eine Länge, die nach Helmholtz[1]) als Gleitungskoëffizient bezeichnet wird.

Ist derselbe Null, so ist die Geschwindigkeit der Flüssigkeit gleich jener der Wand, es findet keine Gleitung statt. Dies ist das Verhalten, welches bei früheren Versuchen immer[2]) beobachtet wurde, bis Kundt und Warburg[3]) zeigten, daß in Gasen bei größerer Verdünnung eine meßbare Gleitung stattfindet.

Aus ihren Versuchen sowie aus der späteren Arbeit Prof. Warburg's[4]) ergab sich für den Gleitungskoëffizienten die Beziehung

$$\zeta = k\lambda,$$

wo λ die mittlere Weglänge der Gasmoleküle und k eine Konstante bezeichnet, die nach den Versuchen zwischen den Werten

[1]) Helmholtz, Sitzungsber. d. k. k. Gesellsch. der Wissensch. zu Wien, **40**, p. 607, 1860.

[2]) Mit Ausnahme von Helmholtz und Piotrowski l. c.

[3]) Kundt u. Warburg, Pogg. Ann. **155**, p. 337, 1875.

[4]) Warburg, Pogg. Ann. **159**, p. 399, 1876.