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On the experiments of Hertz

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by illumination, in this find an explanation.—Wiedemann's *Annalen*, xl. p. 647 (1890).

ON THE EXPERIMENTS OF HERTZ. BY L. BOLTZMANN.

I have successfully demonstrated to a large audience the sparks which pass between a knob and a point in Hertz's experiments on rays of electrical force, by connecting the knob with a very sensitive electroscope, and the point with the pole of a suitable galvanic battery, the other pole of which was put to earth. As long as there were no minute sparks or *scintille* (Fünkchen*) the electroscope remained uncharged; but when these were formed they established a connexion between the knob and the point and caused the leaves to diverge. In this manner I was able to show with certainty the scintilla produced by a single primary spark when the primary and secondary inductors were at a distance of 36·8 metres apart, the greatest distance available.

At a distance of 8·7 metres all the Hertz experiments could be most conveniently demonstrated before an audience of about 200, so as to be visible to every one; only three or four primary sparks were required for each experiment, by which the electrodes could be kept brightly polished. Dust, cracks in the metal, or an impure greasy condition of the surface appeared more injurious than the layer of oxide: cleaning with dilute sulphuric acid, distilled water, and then dry rubbing was found to be best; a thicker layer of oxide is removed by polishing with French chalk (moistened with spirit), in which case dry rubbing is sufficient. I was not able to perceive any advantage in a current of air as recommended by Dr. Classen.

The length of the secondary spark produced at the great distance of 36·8 metres I estimated at $\frac{1}{50000}$ millim. as the maximum. As the dry pile which served to charge the electroscope had a potential of 200 volts, the knob and the point were adjusted at a distance which exceeded by about $\frac{1}{50000}$ the striking distance of the dry pile, the discharge of which was then set up by the addition of Hertz's waves to the tension of the dry pile. By using a much more feebly charged battery instead of the dry pile, and a much more delicate galvanoscope, Hankel's for example, the rays might be perceived at still greater distances. In the latter case it might not be impossible to measure the deflexion with a view to quantitative determinations. The regulation of the distance between the knob and the point must then be made so much the finer.

I also made experiments on interference by reflecting the waves from the primary parabolic mirror through two plane mirrors, which, like those of Fresnel, formed an obtuse angle, and whose planes were at a distance of fourfold a half wave-length. This method

* It may be convenient to use the word *scintilla*, spark, or little spark, to denote the very minute spark produced in the secondary circuit in Hertz's experiments.—E. ATKINSON.

seems well suited for accurate measurements of the wave-length and of the decrement of the vibrations.—Wiedemann's *Annalen*, xl. p. 399 (1890).

LECTURE-EXPERIMENT TO DEMONSTRATE THE EXCITATION OF
ELECTRICITY BY LIGHT. BY WILHELM HALLWACHS.

In the first experiments on the excitation of electricity by light, only very feeble positive charges were obtained of the magnitude of a volt. MM. Bichat and Blondlot then found a method of increasing the charges by directing a current of air against the irradiated plate by which they obtained increases of potential up to 30 volts. This method of increasing the excitation afforded at the same time an insight into the connexion between the excitation of electricity by light and the discharge of electricity by light, which latter was increased by the electrostatic power of the negative charges imparted to the plates, just as by a current of air. This connexion was made clear by the experiments of Prof. Righi, who demonstrated the proportionality between the potential produced by radiation and the electrostatic forces which occur at the surface. In repeating the experiments of Bichat and Blondlot, I have obtained charges up to 100 volts by blowing against the bottom of a brass vessel suspended in a sheath.

In order to show in a lecture the excitation of electricity by light we take advantage of the current of air; for then, if the field of observation is sufficient and the lamp does not burn too long, we may dispense with the troublesome screens against induction. By means of the following arrangement I have been able to show the phenomenon to a large circle of hearers. In the luminous cone of the electric light, after removing any glass lenses in the lantern, a freshly polished zinc plate fixed to a shellac support is introduced laterally. The rays of light which pass by on the side strike a lens at some distance, which concentrates them on the gold leaf of a Hankel's electrometer. After removing the eyepiece, the object-glass of the microscope of the electrometer projects an image of the gold leaves on a screen, on which a scale is affixed to observe the displacement of the gold leaves. When the electrometer was charged with 20 chromic-acid elements and when the plates of the electrometer were tolerably near, the desired sensitiveness was obtained. In order to measure the latter a rigid wire was placed on the electrometer-battery, a few elements removed from the point put to earth, and connected by the conductor with the gold leaf.

In order to make the experiment, the gold leaf and the zinc plate are connected with each other, a disk of mica is introduced in the path of the rays coming from the lamp, the zinc plate is put to earth for a moment, and after removing the mica disk no perceptible change is observed in the adjustment of the gold leaves if the sensitiveness of the electrometer is not exceptionally great. If