

LETTERS TO THE EDITOR

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THE LIGHT-EFFECT UNDER ELECTRICAL DISCHARGE: THE PROBABLE TIME-LAG IN ITS PRODUCTION

DISCOVERED originally¹ as a small increase, on irradiation, of V_m the 'threshold potential' required to initiate discharge at a given gas pressure, subsequent work has shown that the above influence is of wider occurrence and of a greater order of magnitude than a 'residual phenomenon'. It was shown² that i , the discharge current, depends chiefly on $V - V_m$ where V is the applied potential. From this it follows that under conditions, e.g., irradiation which increase V_m , a diminution of current Δi , should occur. This prediction has been fulfilled in numerous cases without exception and is perhaps the simplest way of investigating the phenomenon.^{3,4,5}

It was observed from the very beginning of this work, that whilst the start of Δi the light effect is practically instantaneous, its full value is attained only after an appreciable time, as shown by a sensitive ballistic galvanometer actuated by an A.C. rectifier or a vacuo-junction which carried i the discharge current. This remark applied also to the reverse change, i.e., when i increased to its original value in dark on screening off the light. With improved knowledge of the chief determinants of this phenomenon, it has been possible to obtain Δi as high as 93 per cent.⁵ Short period, dead beat type galvanometers could, therefore, be employed despite their comparative insensitivity. This reduced markedly the hitherto appreciable interval between the act of irradiation and observation of Δi to about 1-2

seconds. It is found, however, that the inertia of the galvanometer suspension and especially the heat conductivity of the vacuo-junction set a lower limit to the time in which Δi may be observed.

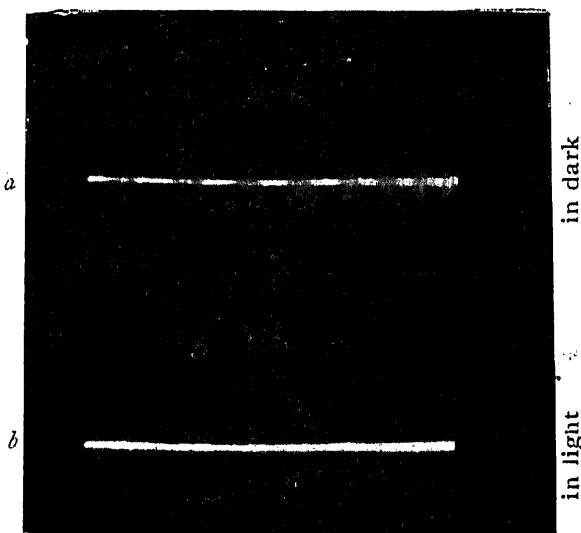


FIG. 1

Oscillograms of the discharge current

That any time-lag inherent in this effect may well be shorter than the above period was seen, when the mode of its observation was varied. The discharge current i was allowed to flow through an iron core transformer; its secondaries were connected to an amplifier and a loud-speaker. This produced a characteristic group of notes, when the chlorine tube, screened from light, was excited by