The ratio of the flow-times obtained at 20° C. with and without air at atmospheric pressure in the viscometers was found to be 1·00125 ± 0·00009 at a 95 per cent confidence-level. To obtain the corresponding ratio of kinematic viscosities, this figure must be reduced by 4 parts in 100,000 for the effect of the pressure difference on the dimensions of the viscometers, and by a factor of 1·00119 for the effect of the buoyancy of the water with respect to the water-saturated air. The resulting viscosity ratio does not differ significantly from unity. More specifically, the effect of air at atmospheric pressure on the kinematic viscosity of water does not exceed 13 parts in 100,000 at the 95 per cent confidence-level. This statement relates to the combined effects of the dissolved air and the pressure; but it can be shown independently, by extrapolating data available for higher pressures, that the direct effect of a pressure of one atmosphere is to change the viscosity by no more than a few parts in 100,000.

Likewise, at 25° C. and 30° C. no significant effect was found.

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[1] U.S. Nat. Bur. Stand., *Tech. News Bull.*, **37**, 100 (1953).
[2] Swindells, J. F., Coe, J. R., and Godfrey, T. B., *J. Res. Nat. Bur. Stand.*, **48**, 1 (1952).
[3] Roscoe, R., and Bainbridge, W., *Proc. Phys. Soc.*, **72**, 585 (1958).
[4] U.S. Nat. Bur. Stand., *Ann. Rep. for 1959*, 31, *Misc. Pub.* No. 229.

A Phenomenon in *n*-Hexane prior to its Electric Breakdown

A preliminary photographic study has been made using a schlieren optical system in which a 1-microsecond flash-light source was arranged to flash five times in synchronism with a single-step function voltage applied to electrodes immersed in highly purified *n*-hexane. The events were recorded with a rotating-mirror camera.

In the examples shown in Fig. 1, the first photograph in each series shows the undisturbed state of the liquid prior to the application of the voltage. Each second photograph, taken 7 μsec. after the application of the voltage, shows that the refractive index in a localized region at the pointed cathode has become different from that in the surrounding liquid. The extent of the localized region was observed to be greater with higher voltages under otherwise similar conditions.

The phenomenon at the cathode can disappear (Fig. 1*A*) without breakdown ensuing, even with the voltage maintained. On the other hand, Fig. 1*B* shows a spark breakdown, which is self-luminous and therefore recorded, about 20 μsec. after the application of the voltage. The later photographs record the bubble originating from the spark. Fig. 1*C* shows similar phenomena in a point-plane gap with the breakdown about 10 μsec. after the application of the voltage.

All these phenomena are detectable with a shadowgraph technique, which is less sensitive than the schlieren technique; thus the refractive index of the region at the cathode must be greatly different from that of the surrounding liquid, but it is not known whether it is higher or lower.

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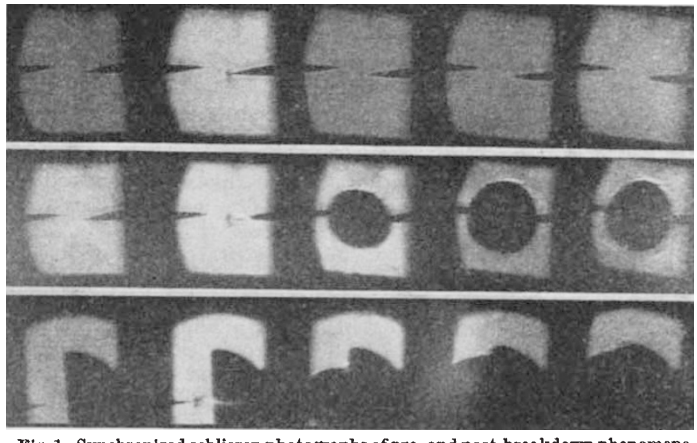

Fig. 1. Synchronized schlieren photographs of pre- and post-breakdown phenomena in *n*-hexane. In each series the first photograph was taken 70 μsec. before the application of a step function voltage, and the remaining photographs were taken, respectively, 7, 80, 150 and 220 μsec. after the application of the voltage. Ratio voltage/gap-length: *A*, 325 kV./cm.; *B*, 335 kV./cm.; *C*, 330 kV./cm.

Emission of Soft Electromagnetic Radiation from Metals by the Impact of High-Energy Protons and Positive Ions

It is known that the impact of fast protons[1] and α-particles[2] on metals results in the emission of their characteristic X-radiation. It has not been reported, however, whether ultra-violet and visible radiation are also emitted from metals when high-energy protons and positive ions strike them. Sir J. J. Thomson[3] predicted as early as 1914 that the impact of positive ions on metals may result in the emission of soft electromagnetic radiations. Evidence supporting this view has been given in recent experiments, where it is shown that ultra-violet and visible radiation is emitted when positive ions and protons of moderate energies strike a nickel surface[4]. These experiments have now been extended to protons and positive ions of energies of 400–700 keV.

A proton beam was obtained from an Oliphant ion source[5] of our 1·2-MeV. Cockcroft–Walton generator, supplied by Messrs. Philips Electrical Co. of Eindhoven, Holland, and described earlier by one of us[6]. It was analysed with a 15° permanent magnetic analyser using an adjustable magnetic shunt. The voltage for the ion source was obtained from a 0–50-keV. transformer energized by a remote controlled 0–220-V. a.c. generator driven by a large insulating belt, both installed in the top of the accelerator along with the Oliphant discharge tube and the gas reservoir.