On High Permeability in Iron

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At the meeting of the Society held on Friday, May 28, 1915, at University of London, King's College, the following demonstrations and exhibitions were given :—

Two Experiments Illustrating Novel Properties of the Electron Currents from Hot Metals were shown by Prof. O. W. RICHARDSON, M.A., D.Sc., F.R.S.

THE first experiment demonstrates the cooling of a tungsten filament when an electron current is allowed to flow from its surface. This effect is analogous to the cooling due to latent heat when a liquid evaporates, or to the similar phenomenon due to the heat of reaction when a gas is emitted by chemical decomposition of a solid.

An experimental lamp containing a fine filament of double tungsten is placed in one arm of a balanced Wheatstones bridge actuated by the current which heats the wire. When the electron current is allowed to flow, by completing a side circuit from an electrode inside the lamp to a point in the adjacent arm of the bridge, the galvanometer is deflected in a direction which corresponds to a reduction of the resistance (and temperature) of the hot filament. The precautions necessary fully to eliminate disturbances due to various subsidiary phenomena are considered in the following Papers by H. L. Cooke and the writer ("Phil. Mag.," Vol. XXV., p. 624, 1913, and *ibid.* Vol. XXVI., p. 472, 1913).

The second experiment, in which a similar experimental lamp is used, demonstrates the flow of electron currents from a hot filament to a surrounding cylinder *against* various opposing potential differences up to about 1 volt. On account of the large currents from tungsten this effect can easily be shown on a galvanometer. The data can be used to find the velocities of the emitted electrons (cf. "Phil. Mag.," Vol. XVI., p. 353 ; Vol. XVII., p. 890 ; Vol. XVIII., p. 681).

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PROF. E. WILSON gave a short account of the experiments, and exhibited the apparatus, which he had recently described in Papers read before the Royal Society. In these was dis-

cussed the increase of permeability of silicon iron produced by heat treatment with application of magnetic fields during cooling, and by demagnetisation while screened from the earth's magnetic field.

An Experiment Showing the Difference in Width of the Spectrum Lines of Neon and Hydrogen was shown by Mr. T. R. MERTON.

FOR accurate measurements of the widths of spectrum lines an interference method must be employed, in which the optical difference of path between the interfering beams can be varied, the widths being calculated from the limiting difference of path at which interference fringes can be seen. By "crossing" a Fabry & Perot etalon with a single prism spectroscope it is possible to discriminate between lines arising from different elements, by the "visibility of the fringes." In the experiment shown a vacuum tube containing neon and hydrogen is examined in this way. The neon lines being narrow, show sharp interference fringes, but for the hydrogen lines, which are broader, the limiting order at which interference can be seen is too low for fringes to be visible.