Observations have also been made by Hartley* and by Ramage† on the Bunsen and the oxy-hydrogen flame spectra of some nineteen of the elements. With mercury no characteristic lines were observed with either of these flames. With zinc, cadmium, and magnesium, spectra consisting of a number of lines came out with the oxy-hydrogen flame, but no characteristic spectra were obtained when the Bunsen flame was used. With calcium, strontium, and barium, however, the single spectral line whose frequency is given by $\nu=(1{\cdot}5, S)-(2, P)$, *i.e.* the fundamental frequency, came out strongly with the Bunsen flame, while the same line and several others in addition came out when the oxy-hydrogen flame was used. In the experiments of Hartley and of Ramage, the vapours of the pure metals as well as of the salts of these metals were used in studying the flame spectra. De Watteville‡ reports that he was unable to detect any characteristic line of the mercury spectrum in photographs taken of the spectrum of the flame of a Bunsen burner into which there was blown the spray from solutions of metallic mercury in nitric acid.

The only investigators who appear to have observed the line $\lambda = 4571{\cdot}38$ Å.U.—frequency $\nu = (1{\cdot}5, S)-(2, p_2)$—in the flame spectrum of magnesium are Liveing and Dewar,§ and Eder and Valenta.‖ The former found in the spectrum of the light from magnesium burning in air a number of lines, among which those of the wave-lengths $\lambda = 4571{\cdot}38$ Å.U. and $\lambda = 2852{\cdot}22$ Å.U. came out with relatively strong intensity. The first-mentioned line they state was always narrow and sharply defined. Eder and Valenta in their experiments found that a Bunsen flame fed with magnesium emitted a spectrum consisting of the l[illegible] 5183·79, 5172·87, 5164·49, 4571·38, 3336·82, 3332·33, 3330·04, [illegible] 93·09, 3091·11, and 2852·22 Å.U., together with other lines wh[illegible]tributed to magnesium oxide and to impurities in the magnesium. [illegible] Atlas of typical spectra,¶ however, they give a spectrum of the flame from a magnesium-fed Bunsen burner which shows but the single line $\lambda = 4571{\cdot}38$ Å.U. of the magnesium spectrum.

As the Bunsen flame would appear to be the simplest possible means of exciting the fundamental frequencies in the atoms of easily volatilised metals the failure of Hartley, Ramage, and de Watteville to bring out these

* Hartley, 'Phil. Trans.,' A, vol. 185, p. 161 (1894); and 'Trans. Dublin Soc.,' N.S., vol. 7, Part XII, p. 341 (1901).

† Ramage, 'Roy. Soc. Proc.,' No. 459, vol. 70, p. 1 (1901).

‡ De Watteville, *loc. cit.*

§ Liveing and Dewar, 'Roy. Soc. Proc.,' vol. 32, p. 189 (1881).

‖ Eder and Valenta, 'Atlas Typischer Spektren,' and 'Beiträge zur Photochemie und Spektral-Analyse,' S. 411, 1904.

¶ Eder and Valenta, 'Atlas Typischer Spektren,' Tafel III, No. 1.