were absent, and from the fact that the mixed product (for only a portion of the 14 mgrms. was clear diamond) contains nitrogen, I am inclined to believe that it is by the decomposition of a nitrogenous body, and not the hydrocarbon, that the diamond is formed in this reaction. The experiments are, however, too few, and the evidence too vague, to draw any conclusions, as there are even very few negative experiments from which anything can be learned, most of the results being lost by explosion. I intend, when my other work—which I laid aside for the diamond experiments—is finished, to begin a series of experiments on the decompositions of carbon compounds by metals, to find whether a more easily controlled reaction may not be discovered.

VII. "Further Note on the Spectrum of Carbon." By J. Norman Lockyer, F.R.S. Received May 11, 1880.

The preliminary discussion of a considerable number of photographs of the spectra of various carbon compounds has brought to light a relationship which I think may be worthy of notice in the Proceedings; it was noticed orally in connexion with the paper read before the Society on April 29th.

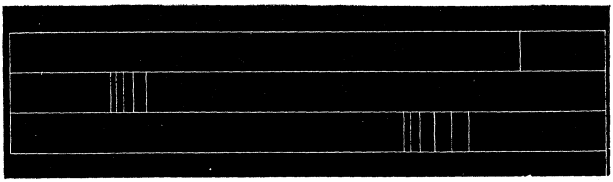
A comparison of the photographs of the various carbon compounds observed under various conditions enabled us to isolate the lines in the blue and ultra-violet portions of the spectrum (wave-lengths 4300–3800).

In this manner the constant lines seen in the photographs of the spectra of CCl_4, $C_{10}H_8$, CN, CHI_3, CS_2, CO_2, CO, &c., have been mapped, and the coincident lines and flutings thus marked.

The phenomena thus seen with more or less constancy are a blue line, with a wave-length of 4266; a set of blue flutings, extending from 4215 to 4151; and another set of ultra-violet flutings, which extend from 3885 to 3843 (all approximate numbers).

Fig. 1.

Action of three different temperatures on a hypothetical substance, assuming three stages of complete dissociation.



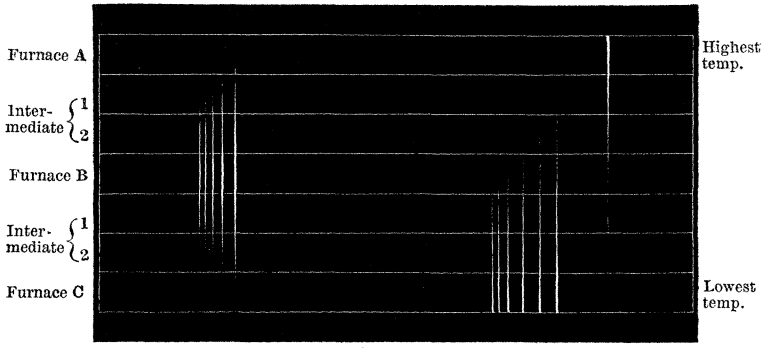
In a photograph of the spectrum of the electric arc (with a weak

battery) from carbon poles in an atmosphere of chlorine, the blue flutings alone are visible, while, when the spark is similarly photographed, the ultra-violet flutings and the blue line (4266) are also visible, while the blue flutings become fainter.

From this we may assume, in accordance with the working hypothesis of a series of different temperature furnaces, as set forth in the paper of December, 1878 (see fig. 1), that the different flutings and the line correspond to different temperature spectra, the blue flutings to the lowest and the blue line to the highest temperature, while the ultra-violet flutings occupy an intermediate position.

FIG. 2.

Spectra of the hypothetical substance in intermediate furnaces, assuming that the vapours are not completely dissociated.



According to this working hypothesis, there should be a series of heat-levels forming a perfect gradation between the spectrum which contains the blue line alone and that which contains the blue flutings alone (fig. 2).

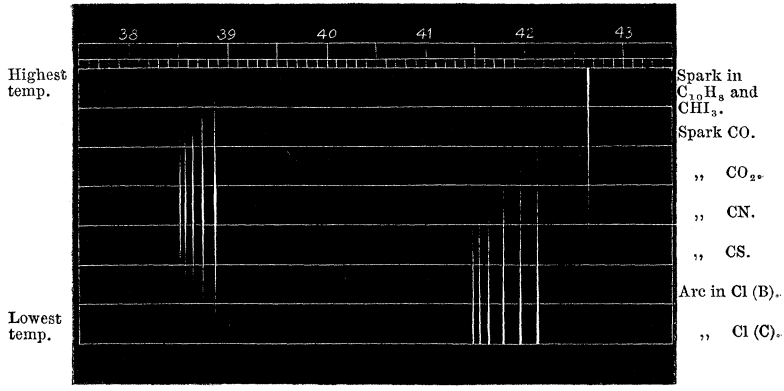
In comparing the spectra of carbon under different conditions, I find this to be true. *The blue line never appears in conjunction with the blue flutings, unless the ultra-violet flutings are also present.* In other words, the highest and the lowest hypothetical temperature spectra are never visible together without the spectrum of the intermediate hypothetical temperature.

But this is not all. By placing the spectra of the substances at different heat-levels, so to speak, I am enabled to construct a diagram which not only indicates the mere presence or absence of the lines and their relative intensities, but shows that there exists a perfect gradation between the spectrum which contains the line alone and that which contains the blue flutings alone (fig. 3). I would point out that there is nothing theoretical in this diagram. All the heat-levels

depicted are copied from photographs of carbon under the conditions indicated, and theory has merely enabled me to arrange them *in order*.

FIG. 3.

The photographed spectra of some carbon compounds.



This map I submit, therefore, bears out the hypothesis of differences of temperature indicated above, for it is seen that, while the blue line gradually thins out, the ultra-violet flutings appear first and grow in intensity. As these increase, the blue flutings become visible, and further as the latter augments and the line disappears, the ultra-violet flutings gradually die out altogether.

It is philosophical to infer from these observations not only that the line and flutings in question are produced by carbon, but that the blue line (4266), since it is visible at the highest temperature, corresponds to the most simple molecular grouping we have reached in the experiments, and the flutings to others more complex.

Presents, May 13, 1880.

Transactions.

Barnsley :—Midland Institute of Mining Engineers. Transactions. Vol. VII. Part 49. 8vo. *Barnsley* 1880. The Institute.

Graz :—Naturwissenschaftlicher Verein für Steiermark. Mittheilungen. Jahrg 1879. 8vo. *Graz* 1880. Das Chemische Institut der K.-K. Universität Graz von Leopold von Pebal. 4to. *Wien* 1880. The Association.

Jena :—Medicinisch-Naturwissenschaftliche Gesellschaft. Denkschriften. Band II. Heft 4. 4to. *Jena* 1880. The Society.

FIG. 2.

Spectra of the hypothetical substance in intermediate furnaces, assuming that the vapours are not completely dissociated.

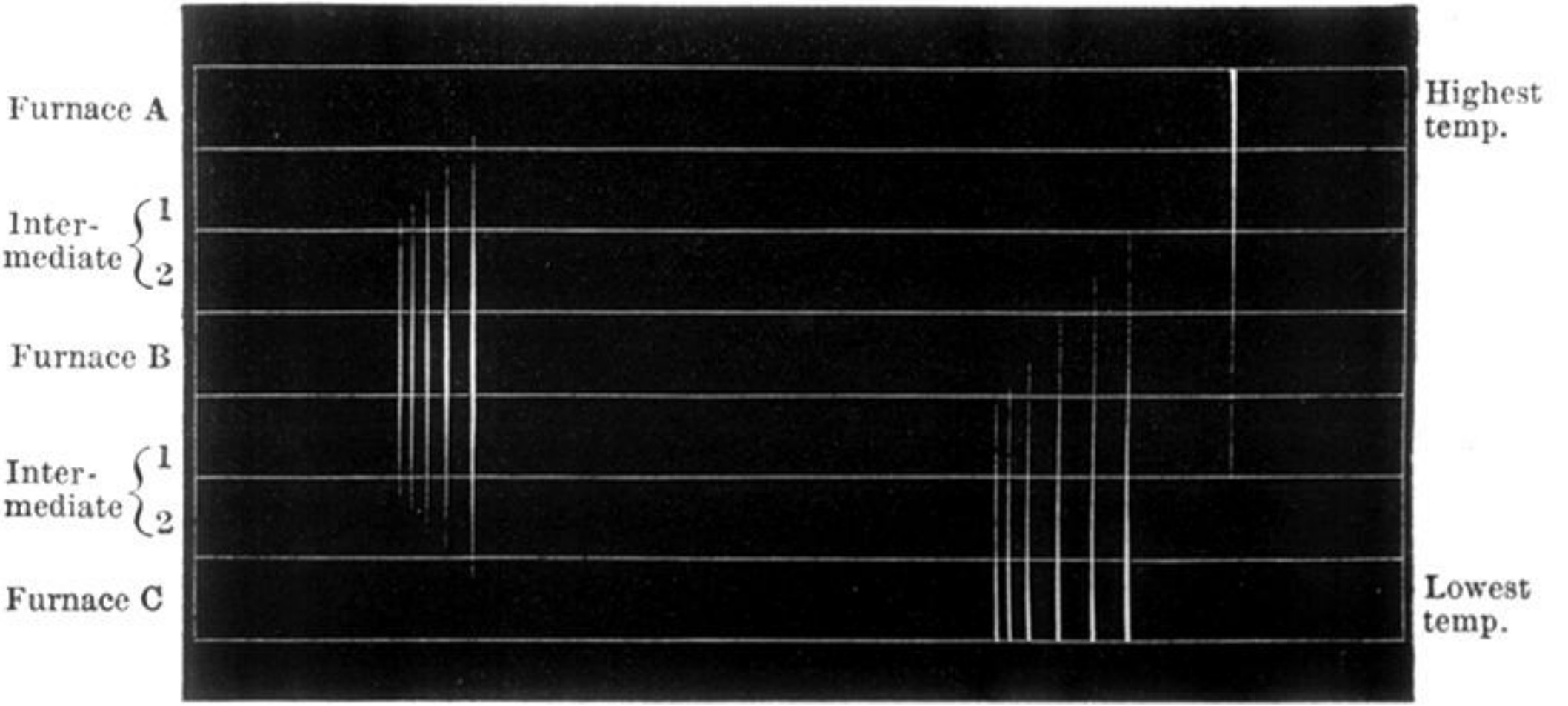


FIG. 3.

The photographed spectra of some carbon compounds.