vacuum-tube inserted about 2 inches apart, I obtained a stratified discharge similar to that from an induction coil.

The experiment was repeated with 400 series of Grove's nitric acid battery. In this case distinct sparks between two copper discs were obtained, and the luminous layers were shown in a peculiar and striking manner, thus proving that the induction coil is not necessary for the production of the striæ, as in most of the experiments the only interruption of the battery circuit was through the vacuum-tube.

I had another tube prepared, substituting for metallic points balls of gas-carbon. At first the stratified discharge was obtained as before, while little or no chemical action took place in the battery; on heating the potassa, the character of the stratifications gradually changed, and suddenly a remarkably brilliant white discharge, *also stratified*, was observed; intense chemical action was at the same time perceptibly taking place in the battery, and on breaking the circuit, the usual vivid electrical flame-discharge was developed at the point of disruption.

The continuation of these experiments will necessarily occupy much time, involving, as they do, the charging of so extended a series of the nitric acid battery, and with the requisite care necessary for the proper insulation of each cell; other phenomena were observed which require further verification, but I hope that after the recess the result which I hope to obtain may be of sufficient interest to form the subject of a future communication.

VII. "Note on the Transmission of Radiant Heat through Gaseous Bodies." By JOHN TYNDALL, Ph.D., F.R.S. &c. Received May 26, 1859.

Before the Royal Society terminates its present session, I am anxious to state the nature and some of the results of an investigation in which I am now engaged.

With the exception of the celebrated memoir of M. Pouillet on Solar Radiation through the atmosphere, nothing, so far as I am aware, has been published on the transmission of radiant heat through gaseous bodies. We know nothing of the effect even of air upon heat radiated from terrestrial sources.

The law of inverse squares has been proved by Melloni to be true for radiant heat passing through air, whence that eminent experimenter inferred that the absorption of such heat by the atmosphere, in a distance of 18 or 20 feet, is totally inappreciable. With regard to the action of other gases upon heat, we are not, so far as I am aware, possessed of a single experiment.

Wishing to add to our knowledge in this important particular, I had a tube constructed, 4 feet long and 3 inches in diameter, and by means of brass terminations and suitable washers, I closed perfectly the ends of the tube by polished plates of rock-salt. Near to one of its extremities, a T-piece is attached to the tube, one of whose branches can be screwed to the plate of an air-pump, so as to permit the tube to be exhausted; while the gas to be operated on is admitted through the other branch of the T-piece. Such a tube can be made the channel of calorific rays of every quality, as the rock-salt transmits all such rays with the same facility.

I first permitted the obscure heat emanating from a source placed at one end of the tube, to pass through the latter, and fall upon a thermo-electric pile placed at its other end. The tube contained ordinary air. When the needle of a galvanometer connected with the pile had come to rest, the tube was exhausted, but no change in the position of the needle was observed. A similar negative result was obtained when hydrogen gas and a vacuum were compared.

Here I saw, however, that when a copious radiation was employed, and the needle pointed to the high degrees of the galvanometer, to cause it to move through a sensible space, a comparatively large diminution of the current would be necessary; far larger, indeed, than the absorption of the air, if any, could produce: while if I used a feeble source, and permitted the needle to point to the lower degrees of the galvanometer, the total quantity of heat in action was so small, that the fraction of it absorbed, if any, might well be insensible.

My object then was to use powerful currents, and still keep the needle in a sensitive position; this was effected in the following manner:—The galvanometer made use of possessed two wires coiled side by side round the needle; and the two extremities of each wire were connected with a separate thermo-electric pile, in such a manner that the currents excited by heat falling upon the faces of the two piles passed in opposite directions round the galvanometer. A source of

heat of considerable intensity was permitted to send its rays through the tube to the pile at its opposite extremity; the deflection of the needle was very energetic. The second pile was now caused to approach the source of heat until its current exactly neutralized that of the other pile, and the needle descended to zero.

Here then we had two powerful forces in perfect equilibrium; and inasmuch as the quantity of heat in action was very considerable, the absorption of a small fraction of it might be expected to produce a sensible effect upon the galvanometer-needle in its present position. When the tube was exhausted, the balance between the equal forces was destroyed, and the current from the pile placed at the end of the tube predominated. Hence the removal of the air had permitted a greater amount of heat to pass. On readmitting the air, the needle again descended to zero, indicating that a portion of the radiant heat was intercepted. Very large effects were thus obtained.

I have applied the same mode of experiment to several gases and vapours, and have, in all cases, obtained abundant proof of calorific absorption. Gases vary considerably in their absorptive power—probably as much as liquids and solids. Some of them allow the heat to pass through them with comparative facility, while other gases bear the same relation to the latter that alum does to other diathermanous bodies.

Different gases are thus shown to intercept radiant heat in different degrees. I have made other experiments, which prove that the self-same gas exercises a different action upon different qualities of radiant heat. The investigation of the subject referred to in this Note is now in progress, and I hope at some future day to lay a full description of it before the Royal Society.

VIII. "Photochemical Researches."—Part IV. By Robert W. Bunsen, For. Memb. R.S., and Henry Enfield Roscoe, Ph.D., Professor of Chemistry in Owens College, Manchester. Received May 26, 1859.

(Abstract.)

In the three communications* which they have already made to the Royal Society upon the subject of photochemistry, the authors showed

* Phil. Trans. 1857, pp. 355, 381 and 601.