February 8, 1900.

The LORD LISTER, F.R.C.S., D.C.L., President, in the Chair.

A List of the Presents received was laid on the table, and thanks ordered for them.

The following Papers were read:—

I. "The Spectrum of α Aquilæ." By Sir NORMAN LOCKYER, K.C.B., F.R.S., and A. FOWLER.

II. "On the Production of Artificial Colour-blindness by Moonlight." By G. J. BURCH. Communicated by Professor GOTCH, F.R.S.

III. "On the Relation of Artificial Colour-blindness to Successive Contrast." By G. J. BURCH. Communicated by Professor GOTCH, F.R.S.

IV. "On Electrical Effects due to Evaporation of Sodium in Air and other Gases." By W. CRAIG HENDERSON. Communicated by LORD KELVIN, F.R.S.

V. "On Electric *Touch* and the Molecular Changes produced in Matter by Electric Waves." By Professor J. CHUNDER BOSE. Communicated by LORD RAYLEIGH, F.R.S.

"On Electrical Effects due to Evaporation of Sodium in Air and other Gases." By W. CRAIG HENDERSON, M.A., B.Sc., late 1851 Exhibition Science Scholar. Communicated by LORD KELVIN, F.R.S. Received November 30, 1899,—Read February 8, 1900.

The experiments described below form part of a research which I began in the summer of 1897 in the Cavendish Laboratory, Cambridge, but was unable to complete before leaving Cambridge that same year. The object of this part of the research, which was suggested by Professor J. J. Thomson, was to determine whether evaporation of an unelectrified liquid produces any electrification or not.

The liquid used was fused sodium and the arrangement of apparatus is shown in the accompanying drawing.

The sodium to be fused was held in a vertical iron cylinder, A,

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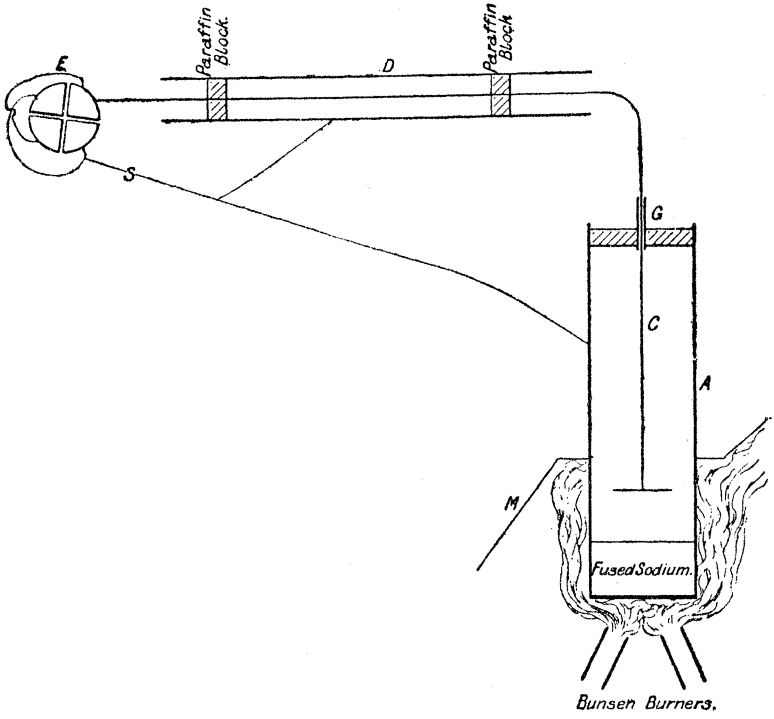
closed at the bottom and having a tightly fitting asbestos plug at the mouth. Through a small hole in the asbestos plug there passed a tightly fitting glass tube, G, only a little longer than the thickness of the plug. A stout bare copper wire, C, passed through this tube G without touching the sides, and had a copper disc at the end inside



the iron cylinder. Outside the cylinder, this wire passed direct to the insulated quadrants of an electrometer E, and was surrounded throughout this portion of its length by a metal guard-tube D, which screened it from outside electrostatic influences. Besides the fastening to the electrometer, the sole supports of the wire C were two paraffin plugs fixed into the ends of this tube D. The iron cylinder A, the tube D, and the uninsulated quadrants of the electrometer E, were connected by a wire with one another and with the sheath of the electrometer, denoted by S in the diagram.

The heat to fuse the sodium was supplied by two Bunsen burners placed below the cylinder A; and in order to protect the insulated wire from the hot gases rising from the burners, a metal screen M was fixed on the cylinder and bent up on the side remote from the electrometer to serve as a funnel.

With these arrangements it was found that very soon after heat was applied to the sodium, a negative electrification of 2 to 3 volts was indicated by the electrometer. This electrification persisted for a considerable time, but eventually the insulation broke down, owing to the sodium vapour condensing in the glass tube G at the mouth of the cylinder, sufficiently to cause a solid connection between the tube and wire.

When the same experiment was repeated *without* the sodium, no electrification was indicated by the electrometer.

These results were confirmed by repeated experiments, and the question then arose whether this negative electrification is due to the evaporation of the sodium, or to oxidation of the sodium going on in the iron cylinder.

The latter seemed probable, as the electrometer showed electrification almost from the moment when heat was applied to the sodium, whereas sodium does not fuse till at temperature of 96° C. and boils at about 400° C.

To determine this point, the same experiment was repeated with this difference, that the air in the cylinder was replaced by an atmosphere in which the sodium could not oxidise. Carbonic acid gas was first tried, being kept flowing into the cylinder after passing through a drying apparatus; but in this gas the sodium became coated with a white encrustation, and showed no signs of evaporation or of boiling even at a red heat.

Coal gas was next tried, and no difficulty was found in boiling the sodium in this gas. To prevent accident by explosion, the apparatus was set up in the fire-place, so that the escaping coal gas might pass up the chimney, and not mix with the air of the room. Great care was taken to ensure the complete removal of air from the iron cylinder before heat was applied. With this atmosphere of coal gas no electrification was obtained while heat was applied to the tube for over an hour. The insulation was tested from time to time during this period by giving a charge to the wire from an electrified vulcanite rod, watching the rate of leak indicated on the electrometer scale, and then discharging. It was found to be excellent; but eventually, as before, it broke down when some of the sodium vapour condensed in the mouth of the cylinder between the wire and the glass tube. Repetition of this experiment confirmed this result.

This problem of the possible generation of electricity by evaporation of a liquid, has been recently investigated for the case of water by Pellat,* who found no trace of electrification. A similar result was found in the earlier experiments of Blake,† who used water and solutions

* Pellat, 'Séances de la Société Française de Physique, 1899,' 1er Fascicule, p. 21.

† Blake, 'Wiedemann's Annalen,' vol. 19, 1883, p. 518.

of copper sulphate and of sodium chloride, but found no electrification. The present experiments lead to the conclusion that evaporation of fused sodium does not give electrification, such as could be detected by the method used, unless oxidation is going on.

February 15, 1900.

The LORD LISTER, F.R.C.S., D.C.L., President, in the Chair.

A List of the Presents received was laid on the table, and thanks ordered for them.

The following Papers were read:—

I. "The Genesis and Development of the Wall and Connecting Threads in the Plant Cell. Preliminary Communication." By WALTER GARDINER, F.R.S.

II. "Photography of Sound-waves and the Kinematographic Demonstration of the Evolutions of Reflected Wave-fronts." By R. W. WOOD. Communicated by C. V. BOYS, F.R.S.

"The Genesis and Development of the Wall and Connecting Threads in the Plant Cell. Preliminary Communication." By WALTER GARDINER, M.A., F.R.S., Fellow and Bursar of Clare College, Cambridge. Received February 1,—Read February 15, 1900.

In the course of my investigations in connection with the forthcoming paper on "The Histology of the Cell Wall with special Reference to the Mode of Connection of Cells,"* certain observations and conclusions concerning the origin and development of the wall-threads and cell-wall have come to light which seem to be of sufficient interest to warrant my bringing them to the notice of the Society without delay.

1. *Origin and Development of the "Wall Connecting Threads."*

The "connecting threads" are found to arise from the median nodes of the fibres of the achromatic spindle. The nodes are either (*a*) all continued as connecting threads, *e.g.*, the endosperm cells of *Tamus*

* 'Roy. Soc. Proc.,' vol. 62, 1897. (Preliminary Communication.)