whilst the pearly cones existed in the solar atmosphere and constituted a true solar corona.

My long delay in making this communication to the scientific world will be excused, I trust, in view of the imperative demands made upon my time during the two years that have elapsed since the Eclipse of 1869. I shall be deeply interested to learn whether the phenomena seen by myself may not be repeated on some other occasion and be studied by more experienced observers.

I may add that I had hastily provided myself with a Nicol's prism in hopes of making at least some trial of the nature of the coronal light; but the rude apparatus did not work satisfactorily, and I confined myself to details of structure; indeed, in my earnest gaze upon the novel phenomena I quite forgot the polarising apparatus.

Office of the Chief Signal Officer, U.S. Army, Washington, Feb. 6, 1872

## EARTH-CURRENTS AND THE AURORA BO-REALIS OF FEBRUARY 4, 1872

I T is unfortunate that more accurate observations of the electrical phenomena accompanying auroral displays cannot be made upon the telegraph wires of this country. The truth is, public business cannot be made to suffer for scientific investigation, and at such moments the disturbance of the wires makes it more than ever imperative that delays should not occur. The whole efforts of the staff are directed to maintain the communications intact, hence the observations made on February 4 are not very numerous, though they are sufficiently interesting to deserve record.

At Portsmouth twenty-six observations were made of the direction and strength of the earth-currents on a wire extending from Portsmouth to London, vid the London and South-Western Railway—a length of 74 miles, giving a resistance of 995 ohms. These were as follows :--

Time.	Direction of	Strength.	Remarks.	Time.	Direction of Current	Strength.	Remarks.
5.54 6.8 6.11 6.13 6.15 6.17 6.19 6.21 6.23 6.25 6.27 6.29 6.31 6.33	P ,, ,, ,, ,, ,, ,, ,, ,, ,, ,	30° 20 10 30 25 40 30 15 24 20 20 0 8 13	The observations were made upon an ordinary vertical gal- vanometer, and 40° was equal to about 20 Daniell's cells.	6.41 7.35 7.42 7.56 8.6 8.8 8.15 8.22 8.28 8.30 9 0 9.40	P N "" " " " " " "		No observa- tions made between 6.41 & 7.35. No observa- tions made between 8.30 & 9.0 P.M.

P means Positive from London to Portsmouth.

The officer who made these observations writes :— "Strong deflections arising from earth currents were observed on all circuits except the local ones. The duration of the currents changed from north to south at intervals of a few minutes, and varied in strength from 1° to 68°. The strength of the current was proportionate to the length of the wire. Thus Chichester circuit (a short one) was affected less than the Guildford, and the latter less than the London circuits. The working was maintained to London with comparative ease by looping two circuits together at each end." The latter method is that usually adopted to overcome the disturbance due to earth currents, but of course it is only applicable in places where there are two wires or more. Another officer at the Waterloo Station, London, observed the deflections gradually appear on every needle circuit, of which many concentrate at that station. They commenced about 2 P.M., and from that period to 8 P.M. they had all alike been more or less disturbed. It was noticed that the needles moved over gradually, not by a continuous motion, but by jerks, resembling that of the minute hand of a large clock. This has, however, been proved to be due to the friction of the pivots, and not to any pulsations in the currents.

The currents were always most apparent, and first noticeable on the longest lines, and as the lengths of the circuits terminating at Waterloo are very variable, this gradual appearance was very interesting. Lines running south-west and west appear to have been most affected.

All the wires in the Channel Islands were also very much disturbed. In fact Jersey was broken down to England for three hours, owing to the fact of there only being one cable. The section most affected was that between England and Guernsey. It was also noted that the wires in France were very much influenced.

The records from abroad show that, as in previous c ases of storms of this character, the effect has been simultaneous all over the globe. The French Atlantic cable was seriously affected; the strength of the current was at one time equal to 90 Daniell cells. It was at times impossible to read even with condensers in circuit. The American lines were also disturbed in the East, West, and North, but not in the South:

It is much to be regretted that simultaneous observations cannot be made in various parts of the globe, detailing, in comprehensible units of measurement, the direction and strength of these currents, as well as the exact time of their appearance and disappearance. We might then arrive at some knowledge of their cause.

W. H. PREECE

## THE DARMSTADT POLYTECHNIC SCHOOL

Southampton, Feb. 24

THE following epitome of the programme of the "Grand Ducal Hessian Polytechnic School of Darmstadt" may interest the readers of NATURE as a further illustration of the facilities offered in Germany for technical training of the highest and most practical kind.

The object of the school is stated to be a thorough scientific, as well as artistic, education, for all technical pursuits, assisted by appropriate practical exercises. The institution affords special facilities for the education of architects, engineers, mechanical and chemical technicists, manufacturers, craftsmen, and agriculturists. The institution is divided into the following sections:—(I) the Lower School; (2) the School of Architecture; (3) of Engineering; (4) of Machinery; (5) of Technical Chemistry; and (6) of Agriculture.

The Lower School aims at giving a general instruction in mathematics, natural science, and design, as a foundation for the special pursuits taken up afterwards. For admission into the school it is necessary that the student shall be sixteen years of age, and have received such an education as would be afforded by the highest class of a "Realschule," or the third course of a "Gymnasium," with the exception of the dead languages. This implies a knowledge of algebra as far as equations of the second order, an acquaintance with logarithms, with plain geometry, and the elements of solid geometry, practice in German style, a knowledge of the outlines of history, and some practice in linear and free-hand drawing.

Examinations are held in the lower school at the end of each half-year, in the other divisions at the end of each year; a diploma is only given if the student gives satisfactory evidence of having completely mastered one of the branches of technical study in which special instruc-