

PREFACE.

Five years have gone by since the first Section of the present work, Volume I, was published. In spite of uninterrupted and persevering labour, we have only now succeeded in making Section II ready for publication.

The observations that formed our material were however exceedingly numerous, and the questions that in the course of our work presented themselves for solution were of a somewhat multifarious nature. The limits that were originally designed for Vol. I have therefore been overstepped, and the volume has been expanded to about double the compass at first intended.

The present section begins with the discussion of magnetic observations from 15 stations of the well-known polar investigations of 1882—1883, by which my earlier results from observations from 25 stations in medium latitudes in 1902—1903, have received a most valuable complement.

As regards the conditions during the positive and negative polar storms, and particularly the diurnal motion of the respective magnetic storm-centres, we have arrived at results that seem to us so valuable, that they have fully rewarded us for the exertions and personal sacrifices that the work has cost.

In order further to make it clear whether our results from the working-up of the above-mentioned observations from the most varied parts of the world could be brought into theoretic harmony with my previous assumptions, I have carried out a long series of experimental investigations with a magnetic globe in a large vacuum-box intended for electric discharges. I have hereby been enabled to obtain a representation of the way in which cathode-rays move singly, and group themselves in crowds about a magnetic globe such as this. Special study has been made of those crowds of rays that produce magnetic effects analogous to those observed upon the earth during positive and negative polar storms.

Those who will go through the whole labyrinth that this concatenation of experiments forms, cannot but be attracted by their scientific beauty; and in the end they will see that great difficulties have resolved themselves into a surprising clearness.

I hold that I have demonstrated that the magnetic storms on the earth — the positive and negative polar storms, and the positive and negative equatorial storms — may be assumed to have as their primary cause the precipitation towards the earth of helio-cathode rays, of which the magnetic stiffness is so great that the product $H \cdot q$ for them is most usually about 3×10^6 C. G. S. units.

On account of the magnetic condition of the earth, these new solar beams which I have discovered, will especially make their way towards the earth in the polar regions in the two auroral zones, where they also certainly produce other effects which play an important part in various meteorological phenomena.

SCHUSTER, in a later work, considers that from energy and from electrostatic considerations alike, he can prove that even originally well-defined pencils of cathode-rays from the sun cannot

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