

PROCEEDINGS
OF
THE ROYAL SOCIETY.

1831-1832.

No. 10.

May 3, 1832. (Continued.)

JOHN BOSTOCK, M.D. Vice President, in the Chair.

A Paper was read, entitled, "An Account of certain new Facts and Observations on the Production of Steam," by Jacob Perkins, Esq. Communicated by Ralph Watson, Esq. F.R.S.

Having observed that water on the surface of melted iron was very slowly affected by the heat, although it exploded violently when the same fused metal was dropped into it, the author made a series of experiments on the time required for the evaporation of the same quantity of water successively poured into a massive iron cup, at first raised to a white heat, and then gradually cooled by the addition and evaporation of the water. The first measures of water were longer in being evaporated than those subsequently added, in consequence of the reduction in the temperature of the iron, until this temperature reached what the author calls the *evaporating point*, when the water was suddenly thrown off in a dense cloud of steam. Below this temperature, the time required for the complete evaporation of the same measure of water became longer in proportion as the iron was cooler, until it fell below the boiling point. The author accounts for these results from the circumstance that when the metal is at the higher temperatures, the water placed on its surface is removed from contact with it by a stratum of interposed steam. From these and other experiments, he is led to infer the necessity of keeping water in close and constant contact with the heated metal in which it is contained, in order to obtain from it, in the shortest time, the greatest quantity of steam.

The reading of a Paper, entitled, "On certain Irregularities in the Magnetic Needle, produced by partial warmth, and the relations which appear to subsist between terrestrial Magnetism and the geological Structure and thermo-electrical Currents of the Earth," by Robert Were Fox, Esq. Communicated by Davies Gilbert, Esq. V.P.R.S.—was commenced.

May 10, 1832.

JOHN WILLIAM LUBBOCK, Esq. M.A., V.P. and Treasurer,
in the Chair.

The reading of Mr. Fox's Paper was resumed and concluded.

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The author begins by an account of some experiments which he instituted with a view to discover the cause of the irregularities in the indications of the intensity of terrestrial magnetism given by the vibrating magnetic needle. By inclosing the needle in a box surrounded with water at different temperatures, the number of the vibrations did not appear to be affected by these differences of temperature when the heat was applied equally on all sides ; but when partially applied, irregular oscillations took place, apparently from the currents of air set in motion by the inequalities of its temperature. Hence the author recommends that for delicate experiments the magnetic needle should be contained in a box of wood, or other imperfect conductor of heat ; or, for still greater security, that it should be adjusted in a glass vessel exhausted of air. For experiments on magnetic intensity at sea, he recommends placing two magnets at some distance from the needle, in the line of its magnetic meridian, and surrounded with water, in order to preserve a uniformity of temperature. For increasing the action of terrestrial magnetism, he suggests the employment of a bar or cylinder of wrought iron, placed perpendicularly, or in the line of the dip, at right angles to the meridian, so as to repel the north pole of the needle : and also surrounded with water.

The experiments made with an apparatus of this kind in some of the deep mines in Cornwall, did not lead to the conclusion that there is any increase of magnetic intensity at the depth of 1000 or 1200 feet below the level of the sea ; but if any thing, rather the reverse ; but, on the whole, the discrepancy in the results was so great, that no dependence can be placed on them as establishing a general fact of this importance.

It appeared also to the author that the direction of electrical currents under the earth's surface is greatly diversified ; although, when taken collectively, the probability is that the tendency of the positive currents is from east to west.

The author then proceeds to state the results of his experiments on the thermo-electricity of rocks. He found that compact slate was an excellent conductor of electricity ; and that the heated end gave indications of positive electricity. Granite, on the contrary, at a bright red heat, was almost incapable of conducting electricity, but when vitrified became nearly a perfect conductor, owing probably to the destruction of its crystalline structure. In general the end most heated was negative, and the same was the case with porphyritic feldspar. Greenstone and serpentine, which also occur in frequent alternations in Cornwall, in like manner differ in their electrical properties ; the former giving out positive, and the latter negative electricity at their most heated parts. Many anomalies, however, occurred in these properties, the results being frequently reversed without any obvious cause.

On the hypothesis of the existence of a very elevated temperature in the interior of the globe, it would necessarily follow from the preceding experiments that electrical currents would be produced from this cause, taking frequently different, and even opposite di-

rections, and exerting an important influence on all the phenomena of terrestrial magnetism, both such as are general, and also such as appear to be local anomalies. The later researches of the author have satisfied him that the directions of these currents are probably much influenced by the geological structure of the globe; which would in most cases tend to give them more or less obliquity to the parallels of latitude. The author ascribes the diurnal changes in the direction and intensity of terrestrial magnetism to the successive action of the sun on the different portions of the surface of the globe. With reference to the causes that have determined the juxtaposition and arrangement of rocks in the interior of the earth, the author examines their comparative expansibility by heat. Granite, porphyritic feldspar, and clay-slate expanded from one-50th to one-77th by a red heat; while the expansion of serpentine, by the same heat, could not be rendered sensible. He concludes by calling in question the theory which ascribes the spheroidal form of the earth to its having been once a mass of plastic matter in igneous fusion or in aqueous solution.

May 17, 1832.

The Rev. WILLIAM BUCKLAND, D.D. Vice President,
in the Chair.

The reading of a Paper, entitled, "On Harriot's Astronomical Observations contained in his unpublished Manuscripts belonging to the Earl of Egremont," by Stephen Peter Rigaud, Esq. M.A. F.R.S. Savilian Professor of Astronomy in the University of Oxford,—was commenced.

May 24, 1832.

DAVIES GILBERT, Esq. D.C.L. Vice President, in the Chair.

The reading of Professor Rigaud's Paper was resumed and concluded.

In the Memoirs of the Royal and Imperial Academy of Brussels, for the year 1788, the Baron de Zach published a paper on the planet Uranus, in a note to which he states that, in the summer of 1784, he found in the library of Lord Egremont at Petworth, some old manuscripts of the celebrated Thomas Harriot, which he alleges afforded proofs that he had observed the solar spots, and the satellites of Jupiter before Galileo. In the Berlin Ephemeris for 1788, Baron Zach gave a full account of his alleged discovery, drawn up from Harriot's papers; an English translation of which was circulated in this country, and has been perpetuated by its being inserted in Dr. Hutton's Mathematical Dictionary. The author, having been entrusted by Lord Egremont with Harriot's original papers, has examined them with every attention he could apply to the subject, and gives in the present memoir the result of his inquiry.

The observations of Harriot on the spots on the sun, fill seventy-four half-sheets of foolscap, the first being dated December 8, 1610.