

A solid formed of such shells and the action of outer shells upon inner ones, or *vice versâ*.

40. Case of a solid shell of small finite thickness.

41. Of statical distribution of electricity on a conductor as produced by variation of magnetic field.

42. Of non-self-inductive systems.

II. "On the Relations of the Diurnal Barometric Maxima to certain critical Conditions of Temperature, Cloud, and Rainfall." By HENRY F. BLANFORD, F.R.S. Received March 30, 1888.

(Abstract.)

The author refers to an observation of Lamont's that the diurnal barometric variation appears to be compounded of two distinct elements, viz., a wave of diurnal period, which is very variable in different places, and which appears to depend on the horizontal and vertical movements of the atmosphere and changes in the distribution of its mass, and a semi-diurnal element which is remarkably constant and seems to depend more immediately on the action of the sun. Then, referring to the theory of the semi-diurnal variation, originally put forward by Espy, and subsequently by Davies and Kreil, the author points out that the morning maximum of pressure approximately coincides with the instant when the temperature is rising most rapidly. This is almost exactly true at Prague, Yarkand, both in winter and summer, and in the winter months at Melbourne. At the tropical stations, Bombay, Calcutta, and Batavia, and at Melbourne in the summer, the barometric maximum follows the instant of most rapid heating by a shorter or longer interval; and the author remarks that this may probably be attributed to the action of convection, which must accelerate the time of most rapid heating near the ground surface; while the barometric effect, if real, must be determined by the condition of the atmosphere up to a great height. With reference to Lamont's demonstration of the failure of Espy's theory, a condition is pointed out which alters the data of the problem, viz., the resistance that must be offered to the passage of the pressure-wave through the extremely cold and highly attenuated atmospheric strata, whose existence is proved by the phenomena of luminous meteors.

With respect to the evening maximum of pressure, it is pointed out that very generally, and especially in India, and also at Melbourne, there is a strongly-marked minimum in the diurnal variation of cloud between sunset and midnight, which, on an average, as at Allahabad

and Melbourne, coincides with the evening maximum of the barometer. A similar coincident minimum, even more strongly marked, characterises the diurnal variation of the rainfall at Calcutta and Batavia in their respective rainy seasons. In the author's opinion these facts seem to point to a compression and dynamic heating of the cloud-forming strata, and he points to the existence of a small irregularity in the diurnal temperature curves of Prague, Calcutta, and Batavia, which may possibly be due to such action. It is further remarked that the evening maximum about coincides with the time when the evening fall of temperature, after a rapid reduction between 6 or 7 and 10 P.M., becomes nearly uniform in rate, and it is suggested that the former may possibly be determined by the check of the rate of collapse of the cooling atmosphere. But it is observed that both the morning and evening waves of pressure probably involve other elements than the forced waves, and are in part rhythmic repetitions of previous waves.

III. "Effect of Chlorine on the Electromotive Force of a Voltaic Couple." By G. GORE, F.R.S. Received April 7, 1888.

If the electromotive force of a small voltaic couple of unamalgamated magnesium and platinum in distilled water, is balanced through the coil of a moderately sensitive galvanometer of about 100 ohms resistance, by means of that of a small Daniell's cell plus that of a sufficient number of couples of iron and German silver of a suitable thermoelectric pile (see 'Proceedings of the Birmingham Philosophical Society,' vol. 4, p. 130), the degree of potential being noted; and sufficiently minute quantities of very dilute chlorine-water are then added in succession to the distilled water, the degree of electromotive force of the couple is not affected until a certain definite proportion of chlorine has been added; the potential then suddenly commences to increase, and continues to do so with each further addition within a certain limit. Instead of making the experiment by adding chlorine-water, it may be made by gradually diluting a very weak aqueous solution of chlorine.

The minimum proportion of chlorine necessary to cause this sudden change of electromotive force is extremely small; in my experiments it has been 1 part in 17,000 million parts of water,* or less than a 7000th part of that required to yield a barely perceptible opacity in ten times the bulk of a solution of sal-ammoniac by means of nitrate of silver. The quantity of liquid necessary for acting upon the couple

* As 1 part of chlorine in 17,612 million parts of water had no visible effect, and 1 in 17,000 millions had a distinct effect, the influence of the difference, or of 1 part in 500,000 millions, has been detected.