On the internal discharges of electrical condensers

E. Villari

To cite this article: E. Villari (1881) On the internal discharges of electrical condensers, Philosophical Magazine Series 5, 11:71, 541-543, DOI: [10.1080/14786448108627058](https://doi.org/10.1080/14786448108627058)

To link to this article: <http://dx.doi.org/10.1080/14786448108627058>

Published online: 08 Jun 2010.

Submit your article to this journal [↗](#)

Article views: 2

View related articles [↗](#)

Citing articles: 1 View citing articles [↗](#)

Lyelli also occurs at this level. Above the greensands come 6 feet of chloritic marl:—the upper $3\frac{1}{2}$ feet fossiliferous, with a base of hard phosphatic nodules containing crushed specimens of *Pecten asper*; the lower $2\frac{1}{2}$ feet compact, with darker grains and few fossils. The author compared the sections of this series given by Capt. Ibbetson and Dr. Barrois; his own views closely correspond with those of the latter writer.

2. "On the Flow of an Ice-sheet, and its Connexion with Glacial Phenomena." By Clement Reid, Esq., F.G.S.

The author considers that the Boulder-clays have been formed beneath an ice-sheet, and consequently there must have been formerly a huge mass of ice, which would have to flow 500 miles on a nearly level surface, and then to ascend a gentle slope for nearly another 100 miles. He does not think a great piling up of the ice at the north pole can be assumed to account for this motion. This he explains by the gradual passage of the earth's heat through the mass of ice raising the temperature of the whole instead of liquefying the surface-layer. As the heat passes upwards it raises the temperature of a particular layer, causes it to expand, and so to put a strain upon the layer above, and then to rupture it. The broken part spreads out, reunites by regelation, and then, receiving the heat from the layer below, again expands, and ruptures the layer next above. Thus the movement is from the base upwards, rather than from the surface downwards.

The author estimates that the ice-sheet in Norfolk was only about 400 feet thick, because Boulder-clay does not appear above that level, but only coarse Boulder-gravel; in North Yorkshire it extends up to about 900 feet. The author considers that the shell-beds of Moel Tryfaen were not deposited under water, but thrust up hill by this advancing ice-sheet.

3. "Soil-cap Motion." By R. W. Coppinger, Esq.

The author described numerous cases in Patagonia where the stumps &c. of trees are to be seen in the marginal waters of the sea and of lakes. These, together with stones and rocks, sometimes simulating perched blocks, he considers to have been brought down by the motion of the soil-cap—a thick spongy mass resting upon rock often worn smooth by the action of ice, and so sliding down the more easily under the influence of vegetation. The appearances are not unlike those due to subsidence; but he points out that all the evidence is in favour of recent upheaval, instead of subsidence.

LXXIII. *Intelligence and Miscellaneous Articles.*

ON THE INTERNAL DISCHARGES OF ELECTRICAL CONDENSERS.

BY E. VILLARI*.

WHEN a strongly charged battery is discharged, a characteristic rumbling noise is produced in its interior; the glass of the jars becomes brightly luminous at the edges of the coatings; and

* *Atti dell' Acc. della Soc. di Bologna*, 11 Nov. 1880, ser. 4, vol. ii. 1881. *Phil. Mag.* S. 5. No. 71. *Suppl.* Vol. 11.

heat is evolved, as I have ascertained by introducing one of the jars into an air-thermometer suitably arranged.

Therefore, besides the *ordinary* external discharge of the jar, there is another in its interior, which I will call *internal*, to distinguish it from the former. It takes place along the sides of the condenser where they are destitute of coating; and it is appreciable by the light and heat which accompany it. On measuring the internal discharge by the thermometric dilatations which it produces, we arrive at the following conclusions:—

1. The heat evolved by the internal discharge can be neglected with feeble discharges; beyond certain limits, however, it manifests itself, and increases very rapidly with the discharges themselves; thus a principal means for augmenting this internal heat is to employ jars charged to a very high potential.

2. The internal discharge increases sensibly if the external spark is produced between two balls from 10 to 30 millim. in diameter; it is diminished, on the contrary, by almost the half, if the spark is called forth between a point and one of the balls. It is the reverse for the heat produced by the external exciting spark.

3. The internal discharge increases, for a given charge, if the internal coating of the jar be diminished; it diminishes if we augment the coating until it meets the outer coating. From this point it remains almost independent of the extent of the coating within the limits in which I have operated. The reason of these phenomena is complex: they depend in part on the variation undergone by the potential of the discharge with the extension of the coating, and partly on the influence exercised by the different extents of the two coatings upon the number and size of the sparks.

4. The internal discharge is the same with an ordinary as with a spark-discharging jar.

5. The internal discharge falls to zero when the resistance of the external circuit is much increased.

6. The internal discharge appears, *cæteris paribus*, a little stronger with an internal coating of mercury. With this exception, the jar behaves like an ordinary phial with a coating of tinfoil.

The foregoing conclusions, deduced from the thermometric dilatations, are completely confirmed by the luminous phenomena exhibited in the jars, since the brightness and size of the internal sparks constantly correspond almost exactly with the extent of the thermometric dilatations.

7. The internal discharges depend, in my opinion, on this—that each coating induces or excites in the insulating slip a zone charged with opposite electricity to its own, the zones induced by the two coatings being separated by another zone of glass in the natural state. At the moment of the discharge a part of the electricity of the coating and of the electrified zone neutralize each other with production of sparks and heat; hence the internal discharge.

8. The existence of these electrified zones can be demonstrated by the electric figures obtained on projecting upon a Franklin's square of varnished glass, or, better, of ebonite, or on a charged

Leyden jar, the well-known mixture of sulphur and minium. After the discharge of the condensers those figures can no longer be distinguished; for the electrified zones more or less completely destroy one another at the very instant.

9. When the Franklin's square has its coatings unequal, the neutral zone on the side of the smaller coating, as well as the electrified zone, increases in extent at the moment of the discharge, at least in certain cases.

10. In studying by this method some squares of glass with unequal coatings, or, better of ebonite, with coatings unequal or equal, I have observed that after they had been discharged as usual, the coatings were found to be charged with the opposite electricity to that which they had originally.

Perhaps this method of investigation, modified and extended, may in the future offer us useful indications respecting the inversion of discharges, the influence of the insulators and varnishes made use of in condensers, and the different ways in which the two electricities spread over the insulators—questions to all of which I hope, some day, to return.—*Comptes Rendus de l'Académie des Sciences*, April 4, 1881, t. xcii. pp. 872–874.

THE SECULAR INEQUALITIES IN TERRESTRIAL CLIMATES DEPENDING ON THE PERIHELION LONGITUDE AND ECCENTRICITY OF THE EARTH'S ORBIT.

A paper on this subject, by the Rev. Dr. Haughton, of Trinity College, Dublin, was read before the Royal Society on February 24 last. Dr. Haughton shows that the two inequalities in question depend upon terrestrial radiation only, and in no way upon sun-heat.

Having noticed that the hottest and coldest time of day follows noon and midnight by an interval often considerable, and in like manner that the hottest and coldest days in the year follow midsummer and midwinter* by an interval often of many days, Dr. Haughton saw in these facts a close analogy with the diurnal tides, which follow the sun or moon's meridian passage by an interval of some hours.

Dr. Haughton was thus led to solve the differential equation on which the problem depends, by assuming an expression similar to those so well known and so long employed in the mathematical discussion of the tides of the ocean.

The result fully justified the assumption of expressions similar to diurnal tidal expressions; for when the differential equation is integrated for a day and summed for a year, all the periodic terms disappear, and nothing is left but terms depending on the perihelion longitude and eccentricity, which represent the exact mathematical expression of the two inequalities first noticed by Adhémar and Croll.

* In the British Islands January 15 is reckoned the time of maximum cold, which is twenty-four days after midwinter.