



XXXVIII. New outlines of chemical philosophy

Ez. Walker Esq.

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before your readers in its present imperfect state, and to take the liberty of suggesting the following hints for its further prosecution.—Three jars of equal electrical capacity with one another might be taken, and a hole full a quarter of an inch in diameter be drilled in each. One of them should have the hole near the top of its coating; the second in its middle; and the third near its bottom. The holes being of this size and the glass tolerably thick, the explosions would pass through them from coating to coating without injury to the jars. If, however, stronger charges should be required than might with safety to the jars be employed in this manner, the coating round the holes might be removed to a greater distance, and two wires having a small ball on one extremity of each might be connected with the opposite coatings of the jars; the opposing balls being placed at a small distance from each other and opposite the centre of the holes: the explosions might then be made to pass through them from ball to ball without acting on the glass, and the experiments might be repeated as often as necessary without fear of damaging the jars. Cuthbertson's balance electrometer would likewise be useful for regulating with accuracy the strength of the charges.—A series of experiments made with each jar separately, and another series with the jars combined, under every variety of circumstance which might influence the results, would, it is probable, add something more to our knowledge of the laws which regulate the action of the electric fluid.

Should any of your ingenious and able correspondents be induced by this communication to investigate the subject of it, I shall have obtained by making it the only object I had in view.

I am, sir,

Your obliged servant,

Hereford, Sept 14, 1815.

THOMAS HOWLDY.

XXXVIII. *New Outlines of Chemical Philosophy.*

By EZ. WALKER, Esq. of Lynn, Norfolk.

[Continued from vol. xlv. p. 432.]

THE phenomena of electricity are investigated in a much more satisfactory manner by low degrees of excitement, than by more powerful artificial means. For when very large electrical machines are used, all the air contained in a room soon becomes electrified, which puts a total stop to all investigations upon its natural properties; nay, even a single candle burning in a room soon alters the state of the air which it contains*.

* "The repellency between the cork-ball and the shot (the prime conductor which the Doctor made use of) is destroyed by candle-light, even though the candle be at a foot distance."—Franklin's Works, vol. i. p. 172.

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The apparatus that I make use of for excitation is a barometer tube only 3-10ths of an inch in diameter, and a silk handkerchief; but these low electrical states require a very perfect mode of insulation. The material generally used for this purpose is glass; but this is known to be a conductor in some degree, and to remove this inconvenience, varnish and sealing-wax have been used. But as these do not render glass a perfect non-conductor, some more perfect mode of insulation is necessary when low degrees of electricity are the objects of investigation.

I have frequently made use of thermometer tubes, because they contain less surface than the glass rods generally used; but these only lessen the inconvenience, without removing it.

White flint glass contains much lead; whence I supposed that green-bottle glass might be better for this purpose, because it contains no metal, and a hint to this effect is given in these *Outlines**. How far my supposition was well founded will appear from the following experiments:

Exp. 9.—1. Having fixed two slips of Dutch gold-leaf to the end of a thermometer tube ten inches long, I suspended it in the axis of an open-necked bell-glass, by means of sealing-wax; one-half of the tube being within the glass, and the other half above it.—2. A solid stick of green-bottle glass, seven inches long, and about the same thickness as the thermometer tube mentioned above, was fitted up in the same manner.

The excited barometer tube being held over the top of the stick of bottle glass, at the distance of an inch, the leaves diverged to an angle of about 30 degrees; but the effect was transient, the leaves soon collapsed.

The barometer tube, without receiving any further excitement, was then held over the top of the thermometer tube of flint glass, at the same distance as before; the leaves gradually diverged to an angle of more than 100 degrees, and continued electrified for 30 hours.

From these experiments we may infer, that green-bottle glass is greatly preferable to flint glass for insulation, and may be substituted for it in many parts of an electrical apparatus.

A thermometer tube seven inches long, having its surface uniformly covered with black sealing-wax to the thickness of 1-10th of an inch, is still a conductor; and when compared with a solid stick of green-bottle glass of the same dimensions, their conducting powers appear nearly equal,—but with this difference, the green glass conducts electricity much slower than the other†.

* *Phil. Mag.* vol. xlv. p. 425.

† “The smallest wire will be a sufficient conductor, covered a foot thick with sealing-wax.”—*Ency. Brit. Sup.* vol. ii. p. 615.

A stick of black sealing-wax is the best non-conductor of any substance that I have examined, but it is far from being perfect. It may, however, be used with advantage in many electrical experiments, though not in such as require perfect insulation.

As a perfect insulating stand is a valuable part of an electrical apparatus, and as all the materials just mentioned were found to be conductors, I was induced to try what effect might be produced by combining glass and sealing-wax. I took a thermometer tube nine inches long, and joined it to a glass foot, like the foot of a wine-glass, with black sealing-wax. Upon the top of this tube a stick of sealing-wax an inch and a half in length and half an inch thick is fixed, having a circular piece of plate-glass three inches in diameter fixed horizontally upon the top of it. The upper surface of this glass is gilt with gold-leaf, and upon its centre one end of a slip of Dutch leaf is fixed with gum water. This serves as an index or electroscope; for, as soon as the gilt surface of the glass cap is charged, this index stands erect, being repelled equally on every side by the charged surface of the cap.

The perfection of this stand, as a non-conductor, was proved thus:

The wire upon the top of one of my best electrometers was applied to the glass foot of the stand, and then to the thermometer tube fixed upon it, without the least effect being produced upon the Dutch leaves: but as soon as the electrometer was brought near the cap the leaves began to diverge; and on coming into contact, either with the under or upper side of it, the leaves instantly diverged to an angle of 90 degrees or more, according to the height of the charge which the cap had received.

In my fifth experiment, (Phil. Mag. vol. xliii. page 430,) which was made to prove the permeability of glass by the electrical elements, the neck of a Florence flask was closed with an animal substance communicating with the earth, by which means no electricity could enter the flask without passing through the glass.

The truth of this conclusion may be evinced by means of the following experiment.

Exp. 10.—I took the same flask mentioned in the fifth experiment, and after having removed the animal membrane from it, I dipped the top of its neck and stopper into melted sealing-wax, by which means the neck of the flask was closed *more completely* than if it had been hermetically sealed; for it has been proved in the preceding experiments, that sealing-wax is a much worse conductor than glass.

An excited barometer tube being held over the top of the neck of the flask at a short distance, no effect was produced in
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the Dutch gold-leaves within it; but the excited tube being held under the bottom of the flask, without touching it, the leaves diverged, and continued electrified for eight days.

Lynn, Aug. 4, 1815.

Ez. WALKER.

XXXIX. *An alphabetical Arrangement of the Places from whence Fossil Shells have been obtained by Mr. JAMES SOWERBY, and drawn and described in vol. i. of his "Mineral Conchology;" with the geographical and stratigraphical Situations of those Places, and a List of their several Fossil Shells, &c. By Mr. JOHN FAREY, Sen. Mineral Surveyor.*

To Mr. Tilloch.

SIR,—IN page 274, of your last volume, the attention of your Readers was called to the subject of *Fossil Shells*; since then, three events of considerable importance to the progress of British Geology have occurred, viz. the publication of Mr. William Smith's very long expected *Map of the Strata*, with a short Memoir explaining the same, the completion of Mr. Aaron Arrowsmith's very large and minute *Map of England and Wales*, (by which the localities of Places* can now, in so superior a degree be ascertained, which is of the first importance to geological observations), and the completion of vol. i. of Mr. James Sowerby's "*Mineral Conchology*," with an Index to the 57 genera, and 212 species† of fossil Shells, described therein.

I have availed myself without delay, of the facilities thus afforded me, to draw up an arranged List of Mr. Sowerby's Shells, according to the Strata to which they severally belong, and mentioning the Place or places where each shell is found; which arrangement he intends to print, as a supplementary Index to his first

* Mr. A. is now engaged on "An Index to Maps," which is to contain all the Towns, Villages, Houses, Mines, Rivers, Hills, &c. &c. which are mentioned in his great Map of England and Wales, or in any others, or that his Friends may communicate, with their exact bearings and distances from known Towns: a work greatly wanted.

† I think it far more than probable, that repeated and more minute research and examination, will extend the *species* of fossil Shells described, or partly so, in this volume, to the number of 244; because in 21 instances the localities mentioned, are found to belong to two different, and mostly to very distant Strata, in the series, and in 6 other instances, to three such strata; and it is remarkable, that, without being aware of these circumstances, Mr. Sowerby has, in far the greater number of these instances, mentioned striking differences in the Shells, so, for the present, referred by him to the same Species, although, as it now seems, belonging to different Strata.

The Species, which I conceive will require dividing, are as follows; viz.