



## Philosophical Magazine Series 1

ISSN: 1941-5796 (Print) 1941-580X (Online) Journal homepage: <http://www.tandfonline.com/loi/tphm12>

# XLIII. Experiments and remarks on galvanism

To cite this article: (1801) XLIII. Experiments and remarks on galvanism , Philosophical Magazine Series 1, 9:36, 352-355, DOI: [10.1080/14786440108562709](https://doi.org/10.1080/14786440108562709)

To link to this article: <http://dx.doi.org/10.1080/14786440108562709>



Published online: 25 Jan 2010.



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the lime would, no doubt, become much more sensible if the ammoniacal gas were received in a strong solution of the muriat of lime.

If the ammonia produces a precipitate with salts having a base of alumine, it is because this earth has less solubility than lime, even when it is combined with the portion of the acid which it retains while it is precipitated.

[To be continued.]

*XLIII. Experiments and Remarks on Galvanism. A Letter from a Correspondent to the Editor.*

SIR,

**H**AVING read, with much pleasure, in your very valuable monthly publication, the several opinions and experiments respecting the influence excited in the pile of Volta, I take the liberty of submitting to you some observations on the same subject.

It has been said by some very ingenious experimentalists that the oxydation of one side of the plates, or the difference of oxydation in the two metals, or between one metal and different fluids, is the cause of the production of the galvanic influence. I find that the acids increase the power of my pile, and I also find, when the papers or cards are moistened with the pure alkalies, and particularly with a solution of pure ammonia, that the effect is much greater than by any other substance. This fact is, I believe, sufficient to prove that the oxydation of the metals is not the cause of the phænomenon.

It is very convenient to use the alkalies in this manner, as it does not require so much trouble to clean the metals, or to keep the pile in order.

I took ten saucers, and placed in each a plate of silver and a plate of zinc; I connected these metals in the several saucers together, by means of slips of tin-foil, and completed the circuit by means of wires in water. I first filled these saucers with salt and water, and found that the wires in the water produced a trifling effect: some few air-bubbles escaped, which proved that the influence was excited. I then re-  
moved

moved the salt and water, and substituted in its stead an aqueous solution of pure potash in water: a much greater effect was produced in the liquid through which the circuit was made. On the addition of water of pure ammonia, the effect was very strong.

You will observe that in these experiments I employed the decomposition of water (as it is called), by means of platina wires, as a galvanometer.

As I found that the water of pure ammonia succeeded so well in the saucers, I built up my pile, interposing pieces of blotting-paper moistened with this alkali: I was astonished at the increase of power; with fifty or sixty pieces of silver it was much too strong to be agreeable. A person above six feet high, and very strong, started several paces on receiving the shock, although he knew he was to receive one; and this after the pile had been constructed five hours. I mention these facts thus particularly, because I wish to show that the fluid excited in the pile does not arise from the action of acids, or from any combination of oxygen with the metals.

The next subject to which I wish to draw your attention is, the effect which this new agent will have on the prevailing theory of chemistry. The advocates for the Lavoisierian hypothesis say that it decomposes water. The facts which are already before the public, completely, in my opinion, unsettle that doctrine. In your last Number, Dr. Moyes mentions that the influence will not continue to decompose the water after it has been acted on to a certain point. I have kept my two platina wires in the same small quantity of water for months, and I find that, when connected with my pile, the gases are produced as rapidly as when they were first used.

Indeed, now that I use the water of pure ammonia, they pour forth very large quantities. If a syphon be made to connect two glasses of water, and in each be placed a wire, one connected with the zinc and the other with the silver, the gases are produced. If a particle of water is composed of a particle of oxygen and a particle of hydrogen, what rapid currents must there be of those two substances! Where the oxygen is produced, the hydrogen must first descend to the bottom of the leg of the syphon, pass through it, and appear

at the wire in the other glass, and *vice versa* with the oxygen; for, where each appears, there is not the slightest trace of its former concomitant in the particle of water.

The visionary hypothesis\* of oxygen and hydrogen being the bases of certain gases, the one a principle of acidity and the other the generator of water, in their combinations also with another substance, azot, forming atmospheric air, nitrous acid, gaseous oxyd, &c.; with carbon also forming all the substances of the animal and vegetable kingdoms, must now, in concurrence with the hitherto invariable opinions of some of our most learned philosophers, be entirely abandoned.

From the experiments with the pile, it appears that the difference between vital and inflammable air does not arise from any difference between their ponderable parts, those being in both instances water. A question arises respecting the minus side of the pile. How is it that, by abstracting electricity (which must be the case if the negative side be only deficient in quantity) from the water, that water is changed into an highly elastic aëriform fluid, into oxygen air, which of all airs, according to M. Lavoisier, has the greatest capacity for containing caloric? Surely the abstraction of fire, though it should be in the form of electricity, could not change water into so highly an elastic substance as oxygen air.

The following conclusions appear to me to result from what I have read and seen respecting the pile of Volta :

The oxydation or rusting of the metals in the pile does not appear to be the cause, but the consequence, of the influence. As the rusting of the metals diminishes and destroys the power of the pile, I conceive the pure alkalies to act by reaching the pure metals.

Water is not decomposed when forming part of the cir-

\* The admitted facts in philosophy had been so well canvassed by the adherents of the new and the old systems of chemistry before we commenced our work, as to enable us to steer pretty clear of all controversy in conducting it. New facts, however they may operate, demand the attention of philosophers; and those connected with galvanism, in particular, may serve to clear up some parts of a theory, which, if not perfect, deserves, at any rate, a more respectful epithet than that of being a *visionary hypothesis*.—EDIT.

cuit. Oxygen and hydrogen airs have the same basis, water. Oxygen and hydrogen, as solid bases, are, consequently, non-entities. Positive and negative electricity are distinct fluids.

As these two electricities change water into two airs, and as those airs can from water be obtained in any proportion, and as those airs can be united, and again form water and fire; I consider those electricities as the principles of fire.

I consider, therefore, that the influence is excited by the decomposition of heat, caloric, or fire; as the tourmalin decomposes it by merely heating it.

The elastic state of æriform bodies does not depend so much on the quantity of what is termed *latent heat*, as on the nature of one of the principles of heat which it contains. The solid oxygen, according to the Lavoisierian hypothesis, in nitre, contains as much latent heat as in the state of gas.

Put a piece of red-hot iron on an electrometer, and drop a little water on it, does not hydrogen air escape? Now, as positive electricity and water form hydrogen air, does not the electrometer show signs of negative electricity?

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*XLIV. On the Manufacture and constituent Parts of Gunpowder. Read before the Askejian Society May 1801. By Mr. R. COLEMAN, of the Royal Mills, Waltham Abbey; a corresponding Member of the Society.*

THE process of manufacturing gunpowder is so inaccurately described in every author which I have seen, and in many instances so extremely absurd an account is given, that I am induced to hope that a true account thereof will not be unacceptable; and more particularly as I apprehend nothing can tend more to establishing a true theory of the combustion of gunpowder, than a knowledge of the ingredients it is composed of, and the manner of their combination: with this view I have drawn up the following account of the process, &c. in manufacturing that article, and added some facts on the explosive force thereof, which I now beg to lay before the Society.