VI. New outlines of chemical philosophy

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Independent of this circumstance, it is amusing to find an individual so confident of the infallibility of his own observations, as to consider them sufficient to subvert the experience of Canton, Franklin, Wilke, Æpinus, Cavallo, Stanhope, and Robison; although the observations of the most experienced electricians of the present time are opposed to the inference he has drawn.

London, Jan. 10, 1814.

G. J. SINGER.

To Messrs. Nicholson and Tilloch.

VI. *New Outlines of Chemical Philosophy.* By EZ. WALKER, Esq. of Lynn, Norfolk.

[Continued from p. 371, vol. xlii.]

MUCH confusion in chemical philosophy seems to arise from want of precision in chemical language. Oxygen and hydrogen are terms that are used in a very vague manner, no distinction being made between oxygen and oxygen gas, nor between hydrogen and hydrogen gas. Positive and negative are words that have no definite meanings in chemical science; and yet we have positive and negative electricity, positive and negative galvanism; and even the laws of chemical affinity are now explained by the terms positive and negative. We have also fixed fire, phlogiston, and other words that express things rather more imaginary than real. All this confusion might be avoided by adopting two new terms to express the two elements, which produce effects that are real objects of our senses, and by which those elements may be known in all their various combinations with matter.

"Mr. Davy," now Sir Humphry Davy, "exhibited the powers of the Voltaic instrument by brilliant experiments; metals were fused upon the surface of water and of oil of turpentine, and burnt in contact with them. He stated that the maximum of heat was at the positive electrical surface; and he exhibited an experiment in which, though the most brilliant light was at the negative surface, yet the ignition was infinitely greater at the positive*."

From these properties of the two elements above mentioned, that element which produces the maximum of heat, at the positive electrical surface, may be called the generator of heat, or *thermogen*; and that element which appears at the negative surface, and exhibits the most brilliant light, may be called the generator of light, or *photogen*. The choice of these terms seems to be sanctioned by the words *thermometer* and *photometer* now in common use. By the term *photogen* is to be understood the imponderable element of all combustibles, whether it

* Phil. Mag. vol. xxxix. p. 137.

exists combined or uncombined with matter ; by *thermogen* is to be understood the imponderable element of all supporters of combustion, whether it exists combined with matter, or in a free and uncombined state.

Thermogen and Photogen.

When a Leyden jar is receiving a charge from an electric machine, one side receives *thermogen* from the atmosphere, and the other side receives *photogen* from the earth. When a communication is made between the inside and the outside of the jar, by some conductor of these elements, the element from the inside attracting the element from the outside, a spark is produced, consisting of a double current exhibiting both light and heat, and the equilibrium which was destroyed by the action of the machine is restored. But it cannot be supposed that these elements are annihilated by their union : such a supposition would be absurd : they only enter into new combinations, and return again into those receptacles from whence they were withdrawn. For while the element of one side of the jar goes to the earth, the element of the other side is communicated to the air.

When two portions of the same element are nearly equal they repel each other, but when they are very unequal they attract each other. This is known from an infinite number of experiments : consequently, the immense attraction of the photogen in the earth attracts any small portion of the same element, which may be disengaged from its base, with an infinite force ; and the thermogen in the atmosphere attracts every small portion of the same element the instant that it is disengaged from matter.

But why does not the thermogen in the atmosphere unite with the photogen of the earth, as they have a very strong attraction for each other ? This question will be easily solved as soon as it is understood that they are kept asunder by their bases. Oxygen and hydrogen gases mixed together in a proper vessel, would remain for ages without producing any effect upon one another ; but let their elements be brought into contact, either by pressure or increase of temperature, and combustion will instantly take place.

If the attraction between these elements of combustion and their bases were not proportioned to a mathematical exactness, the whole œconomy of our globe would be deranged. For, if this attraction were greater than it is at present, we should have perpetual frost ; and if this attraction were much less than it is, all combustibles would be reduced to ashes in a moment : but, in the present state of things, it is impossible that either of these events should happen.

It is not to be understood that photogen is light, or that

thermogen is heat; they are the generators of light and heat, light and heat being the effects which they produce on matter. The thermogen on the inside of a charged jar cannot be felt, nor does it produce any effect upon the most delicate thermometer, nor is any light perceptible on the outside of the jar. But let the jar be discharged through a piece of iron wire, and both light and heat are produced. When the metal becomes red hot by this means, it loses its photogen, attracts oxygen gas from the air, and becomes oxidized. If this oxide be mixed with some matter containing photogen, and heat applied, oxygen gas will be reproduced, and the metal will receive photogen, and again become malleable.

The application of these elements, to elucidate some of the most interesting phenomena in nature, will be more fully treated of hereafter.

Composition of Water.

Some philosophers maintain that water is a simple body, and the only ponderable basis of oxygen and hydrogen gases, and other aerial fluids; but others suppose that water is a compound of oxygen and hydrogen, and this opinion is now generally adopted by writers on chemistry. But all the experiments made to separate the component parts of water, tend to prove that it is a body simple and undecomposed. What has led men to conclude that water is a compound body, seems to have arisen from their supposing that the electric spark is a simple fluid; but as it is now well known that it consists of two elements possessing different properties, both *chemical* and *mechanical**, the passing of these elements through water is no proof of its being a compound substance, notwithstanding oxygen and hydrogen gases are produced by this means.

When thermogen and photogen pass through water in contrary directions, thermogen and water form oxygen gas; photogen and water form hydrogen gas. These gases being mixed together in a close glass vessel, and their temperature increased to a certain degree, combustion takes place, light and heat escape through the glass, and the product is pure water.

That thermogen and photogen are capable of producing combustion, before they entered the water, is unquestionable, nor can it be supposed that they are annihilated by passing through it; for they appear again in the two gases, producing the same phenomena of light and heat as before. Hence it appears that the two elements which compose the electric spark are the indispensable elements of the two gases, and that water is their common base. Oxygen and hydrogen gases thrown upon fire pro-

* Phil. Mag. vol. xlii. p. 161.

duce the most intense heat ; but water being thrown upon fire extinguishes it : water, therefore, is neither a combustible nor a supporter of combustion, and consequently it contains neither oxygen nor hydrogen.

Another experiment, which has been made to prove that water is a compound of oxygen and hydrogen, consists of passing steam through a red hot iron tube containing turnings of iron, by which means hydrogen gas is produced, and the iron turnings become oxidized ; whence it is concluded, that water is a compound of oxygen and hydrogen. But let the experiment be tried with a red hot glass tube containing pieces of broken glass, and no hydrogen gas will appear : hence it is evident, that one of the component parts of the hydrogen gas, in the former experiment, came from the metal.

Now when the turnings of iron become red hot, the photogen they contain and water produce hydrogen gas : but in this process thermogen must be present, for no combustion nor increase of temperature can be *generated* unless thermogen and photogen be united. The most condensed rays of the sun do not excite combustion in vacuo, nor in any gas deprived of oxygen, even when the most inflammable substance is employed*. Consequently, the thermogen and water produce oxygen gas, which the iron, after being deprived of its photogen, attracts, and becomes an oxide of that metal.

This experiment may be illustrated by the burning of iron wire in oxygen gas. In this beautiful exhibition the most brilliant light and the most intense heat are generated, by the union of the photogen of the metal and the thermogen of the oxygen gas. The metal, having lost its photogen, attracts oxygen gas, and becomes an oxide of iron intensely heated.

The photogen or generator of light in the metal cannot be hydrogen, for “no combinations of iron with hydrogen or azote are known †.” If this assertion be correct, we have combustion without hydrogen.

Sir H. Davy observes, that “the nature of water may be shown synthetically as well as analytically.”

“When ten grains of the metal called potassium are added to about two grains of water in a glass tube, there is a violent action, much hydrogen is disengaged, and by heating the results the operation is completed. The same effect is produced upon the potassium, as would be produced by heating it strongly in contact with a small quantity of oxygen ; it becomes united to oxygen, and its increase of weight is in proportion to the weight of the hydrogen as 15 to 2 ‡.”

* See Phil. Mag. vol. xlii. p. 370.

† Davy's Elements, p. 388.

‡ Davy's Elements, p. 217.

But the composition of water *cannot* be shown by a *compound test*. "Potassium inflames when gently heated, and throws off fumes which are alkaline *." Consequently potassium is a compound of an inflammable element and a metal, and therefore it may be used as a test to prove that water is a *simple body*, and not a compound. For the inflammable element and water will form hydrogen gas, and the metal when strongly heated will attract oxygen gas in the same manner as other metals.

"It may be remarked, that oxygen is *mild* when in the proportion of 22 per cent. in atmospheric air, and highly *corrosive* in the proportion of 70 per cent. in nitric acid; or even of that of 40 per cent. in sulphuric acid. How is it, then, that it is found in the ratio of 85 per cent. in water, and that this compound, compared with the others, should be perfectly mild and innocent?" The answer given to this question is, "*because its oxygen is so forcibly retained by the hydrogen* †."

Now, as the theory of the compound nature of water does not rest upon common experience, nor upon any known truth, but upon a bare assertion without any proof whatever; therefore, it seems to be nothing more than a fanciful conjecture.

Lynn, Jan. 7, 1814.

EZ. WALKER.

To Messrs. Nicholson and Tillock.

[To be continued.]

VII. Observations on a Fiery Meteor. By T. FORSTER, Esq.

I COMMUNICATE to you the following account of a fiery meteor, which was seen by a friend of mine on Monday evening, the 8th of November last, about eight o'clock. He was walking between Woodford and Hackney; the weather being fine, and the moon shining bright; and was suddenly surrounded by a light blueish flame: it lasted two or three seconds, so as to give him time to turn himself round and view it on all sides. He felt at the time a warmth like that of a very hot damp day. When it subsided, he perceived the moon much dimmer, on account of the bright light which had just affected the organs of vision. These are all the particulars I have of it, and I communicate them just as they were given me. In hopes that some other persons more distant, who may have seen this curious phenomenon, which is certainly of the *ignis fatuus* kind, may give further particulars, I send this for insertion in your Magazine.

Yours, &c.

Clapton, Jan. 10, 1814.

THOMAS FORSTER.

P. S. There were many meteors called falling stars on the evening of the aforesaid 8th of November.

To Messrs. Nicholson and Tillock.

* Davy's Elements, p. 322.

† Parkes's Chem. Cat. p. 252.