

ye! it is not inexhaustible. One man consumes by respiration 25 cubic feet of oxygen in 24 hours; 10 cwt. of charcoal consume 32,066 cubic feet of oxygen during its combustion; and a small town like Giessen (with about 7000 inhabitants) extracts yearly from the air, by the wood employed as fuel, more than 551 millions of cubic feet of this gas.

When we consider facts such as these, our former statement, that the quantity of oxygen in the atmosphere does not diminish in the course of ages—that the air at the present day, for example, does not contain less oxygen than that found in jars buried for 1800 years in Pompeii—appears quite incomprehensible, unless some sources exists whence the oxygen abstracted is replaced. How does it happen, then, that the proportion of oxygen in the atmosphere is thus invariable?

The answer to this question depends upon another; namely, what becomes of the carbonic acid, which is produced during the respiration of animals, and by the process of combustion? A cubic foot of oxygen gas, by uniting with carbon so as to form carbonic acid, does not change its volume. The billions of cubic feet of oxygen extracted from the atmosphere, produce the same number of billions of cubic feet of carbonic acid, which immediately supply its place.

The most exact and most recent experiments of De Saussure, made in every season for a space of three years, have shown, that the air contains on an average 0.009415 of its own volume of carbonic acid gas; so that, allowing for the inaccuracies of the experiments, which must diminish the quantity obtained, the proportion of carbonic acid in the atmosphere may be regarded as nearly equal to 1.1050 part of its weight. The quantity varies according to the seasons; but the yearly average remains continually the same.

We have no reason to believe that this proportion was less in past ages; and nevertheless, the immense masses of carbonic acid which annually flow into the atmosphere from so many causes, ought perceptibly to increase its quantity from year to year. But we find that all earlier observers describe its volume as from one-half to ten times greater than that which it has at the present time; so that we can hence at most conclude that it has diminished.

It is quite evident that the quantities of carbonic acid and oxygen in the atmosphere, which remain unchanged by lapse of time, must stand in some fixed relation to one another; a cause must exist which prevents the increase of carbonic acid by removing that which is constantly forming; and there must be some means of replacing the oxygen, which is removed from the air by the processes of combustion and putrefaction, as well as by the respiration of animals.

Both these causes are united in the process of vegetable life.

The facts which we have stated in the preceding pages prove that the carbon of plants must be derived exclusively from the atmosphere. Now, carbon exists in the atmosphere only in the form of carbonic acid, and therefore in a state of combination with oxygen.

It has been already mentioned likewise, that carbon and the elements of water form the principal constituents of vegetables; the quantity of the substances which do not possess this composition being in a very small proportion. Now, the relative quantity of oxygen in the whole mass is less than in carbonic acid; for the latter contains two equivalents of oxygen, whilst one only is required to unite with hydrogen in the proportion to form water. The vegetable products which contain oxygen in larger proportion than this, are, comparatively, few in number; and indeed in many the hydrogen is in great excess. It is obvious, that when the hydrogen of water is assimilated by a plant, the oxygen in combination with it must be liberated, and will afford a quantity of this element sufficient for the wants of the plant. If thus be the case, the oxygen contained in the carbonic acid is quite unnecessary in the process of vegetable nutrition, and it will consequently escape into the atmosphere in a gaseous form. It is therefore certain, that plants must possess the power of decomposing carbonic acid, since they appropriate its carbon for their own use. The formation of their principal component substances must necessarily be attended with the separation of the carbon of the carbonic acid from the oxygen, which must be returned to the atmosphere, whilst the carbon enters into combination with water or its elements. The atmosphere must thus receive a volume of oxygen for every volume of carbonic acid which has been decomposed.

This remarkable property of plants has been demonstrated in the most certain manner, and it is in the power of every person to

convince himself of its existence. The leaves and other green parts of a plant absorb carbonic acid, and emit an equal volume of oxygen. They possess this property quite independently of the plant; for if, after being separated from the stem, they are placed in water containing carbonic acid, and exposed in that condition to the sun's light, the carbonic acid is, after a time, found to have disappeared entirely from the water. If the experiment is conducted under a glass receiver filled with water, the oxygen emitted from the plant may be collected and examined. When no more oxygen gas is evolved, it is a sign that all the dissolved carbonic acid is decomposed; but the operation recommences if a new portion of it is added.

Plants do not emit gas when placed in water which either is free from carbonic acid, or contains an alkali that protects it from assimilation.

These observations were first made by Priestley and Senneber. The excellent experiments of De Saussure have further shown, that plants increase in weight during the decomposition of carbonic acid and separation of oxygen. This increase in weight is greater than can be accounted for by the quantity of carbon assimilated; a fact which confirms the view, that the elements of water are assimilated at the same time.

The life of plants is closely connected with that of animals, in a most simple manner, and for a wise and sublime purpose.

The presence of a rich and luxuriant vegetation may be conceived without the concurrence of animal life, but the existence of animals is undoubtedly dependent upon the life and development of plants.

Plants not only afford the means of nutrition for the growth and continuance of animal organization, but they likewise furnish that which is essential for the support of the important vital process of respiration; for besides separating all noxious matters from the atmosphere, they are an inexhaustible source of pure oxygen, which supplies the loss which the air is constantly sustaining. Animals on the other hand expire carbon, which plants inspire; and thus the composition of the medium in which both exist, namely, the atmosphere, is maintained constantly unchanged.

(To be Continued.)

## NEWS.

Great excitement has been occasioned in Britain by the discovery that the letters of certain foreigners were opened, examined, and carefully re-sealed prior to delivery, by the Post Office department, in obedience to the orders of the Home Secretary, Sir James Graham, who refuses explanation, stating generally that the power is confided to him by Act of Parliament. This Act, it is urged on the other hand, only contemplated cases of imminent danger to the state from treason at home, and not the serving of foreign despots by prying into the correspondence of refugees. The abuse to which such a secret system may be carried is also pointed out, and paragraphs, caricatures, and lampoons are rife on the subject. A letter which has been opened before reaching the owner is now said to be *Grahamed*.

A war has broken out between France and Morocco. It has been attended as usual with a waste of human life, and scarcely any other result. After learning that his troops had been defeated, the Emperor of Morocco disowned their acts.

Dr. Grant, the celebrated American missionary to the Nestorians, died at Mosul of Typhus fever, in April last.

A Bill legalizing the possession by Unitarians of certain endowments originally intended to support a Puritan ministry has been passed by large majorities in both Houses of Parliament, notwithstanding an unusual amount of opposition from without.

The steamer *Manchester*, with all on board, has been lost between Hull and Hamburg.

The torch of the incendiary still blazes in the agricultural counties of Norfolk and Suffolk, and the most horrid depravity and appalling destitution exists among the peasantry.

The coal fields of Great Britain are calculated to cover 4,900,000 acres, those of France only 692,000.

THE GREAT BRITAIN.—This vessel was advertised to sail on the 11th July. As, however, she still remains in dock at Bristol, and the attempt to obtain her liberation cannot be immediately made, the day of her sailing for New York is indefinitely postponed.