proper place, of the greatest importance in the nutrition of plants.

It may, perhaps, surprise some of our readers when we state that the *diamond* is nothing more than *a pure variety of carbon.* However different it may appear in its external character or commercial value to common charcoal, yet it is essentially the same substance. This is one among the many extraordinary things which chemistry reveals to the enquiring student.

2nd. Hydrogen.—This, and the other two elements which follow, are gaseous bodies, whose presence cannot be detected by the senses. Hydrogen is the lightest of all substances, and combines with oxygen to form water. It also enters into combination with other substances but it will not support combustion or animal life. It is not our object to give instructions for preparing the gases—an operation that requires some apparatus and considerable caution; those who desire to institute experiments, will find suitable directions in any modern elementary treatise on chemistry. The readiest way of procuring hydrogen is from the decomposition of water, by pouring diluted sulphuric acid on granulated zinc, or iron filings, when a copious stream of the gas will be evolved.

3rd. Oxygen.—It is calculated that one-half of the solid materials of the earth consists of oxygen; but in that case it exists in the solid form. We meet with it as a liquid combined with hydrogen in water. In the atmosphere we find it as a gas united with nitrogen, forming about one-fifth of the bulk of the air we breathe, without which, indeed, the atmosphere could neither support combustion nor animal life. Hence, oxygen has been denominated *vital* air. It has a very strong affinity for most bodies, and consequently enters readily into numerous combinations, and performs a most important part in the economy of vegetation, and the products of the farm. It is easily procured by exposing a strong heat, the oxide of magnesia, the red oxide of mercury, or chlorate of potash; the latter, particularly, is rich in oxygen.

4th. Nitrogen.—This gas possesses properties the very opposite to those of oxygen. If a lighted taper be placed in a vessel containing nitrogen, it will be immediately extinguished, and an animal so placed would likewise cease to exist. This gas seems to possess no other remarkable property. In bulk it occupies nearly four-fifths of the atmosphere; one of its principal uses appears to consist in its tendency to weaken or dilute the oxygen, and thus adapt the air to the actual state and wants of living beings. Nitrogen as an elementary constituent of organic structures, is found more largely in animals than plants; some portions of the latter indeed, such as gum, starch, sugar and woody fibre, consist only of carbon, hydrogen and oxygen. Although their gases cannot be distinguished from each other, or from common air by the senses, yet a burning taper enables us to do so readily. Hydrogen will burn while it extinguishes the taper; nitrogen extinguishes it but will not take fire. Oxygen itself will not burn, but it will cause the taper to burn with extraordinary rapidity and brilliancy. Without, therefore, this important element in the atmosphere a candle would not burn, a fire could not be lighted, nor could an animal live!

It is well worth remembering that the organic part of all the endless varieties of animals and plants that exist upon the earth, is made up of one solid substance, carbon, and the three gases just described. These elementary principles however, are combined in very different proportions. *Carbon* usually forms about *one-half* by weight of all those vegetable productions, in a dry state, which are used as food for man or beast. *Oxygen* constitutes a little more than *a third*, *hydrogen* about *5 per cent.*; while *nitrogen* will vary from 2 to 4 per cent.

When plants are burned in the open air, that portion of their substance which is dissipated by heat and denominated their organic part, consists only of the elementary substances just enumerated, while the remainder of this substance will be reduced to ashes. These ashes consist of what is called the *inorganic* portion of plants, and they usually contain some ten or eleven different substances, which it is necessary we should consider, that our enquiry into the constitution of plants may be somewhat complete.

The ash of plants varies considerably, not only in different species, but in the same variety, particularly when produced from different soils. The following earthy substances are to be found in varying proportions, in the ash of plants, and consequently, every fertile soil must contain them, either actually or artificially:—

1st. Potash.—This substance is too well known to need description. It enters largely into the