

more use than certain other substances forming part of a class called inorganic bodies, which are of equal necessity to the animal, and are always ever present in productive soils, and in a form, state, or condition capable of being taken up by the plant. These essential elements are—

*Phosphorus, Sulphur, Chlorine, Silicon, Calcium, Potassium, Sodium, Magnesium, Iron and Aluminum.*

These do not exist in either animal or vegetable matter, or in soils in their pure state. Thus phosphorus is united to oxygen and becomes phosphoric acid, and then in the soil is *almost invariably* found united to iron or alumina, making a phosphate of iron or alumina, as the case may be. In plants and animals it is united to lime and magnesia forming phosphate of lime or magnesia.

Sulphur is also united in soils to oxygen, forming sulphuric acid, which united to lime forms sulphate of lime or gypsum.

Chlorine in an uncombined state does not naturally exist; when pure it is a gas, which, when inhaled, even though much diluted with air, speedily produces suffocation. It is of a yellowish green color, of an astringent taste and disagreeable smell. It speedily removes all animal and vegetable colors by its bleaching powers, and when the colors are once destroyed they cannot again be restored. It is likewise a powerful agent in destroying the contagious principle of diseases. It exists abundantly in sea-water united to sodium, forming a chloride of sodium or common salt: the bodies formed by union with chlorine are called chlorides.

Silicon united to oxygen forms silica, silex, quartz, or common flint, which constitutes, in union with lime, magnesia, potash and soda, so large a proportion of the earth.

Calcium is the metallic base of lime, which, when united to oxygen forms lime, (unslaked, or caustic lime,) this on being united to carbonic acid becomes carbonate of lime or air-slacked lime.

Potassium is a metallic base, which, when united to oxygen, becomes potash; this in union with silicic acid, or flint, becomes silicate of potash, and gives to straw and the grasses their hardness.

Sodium is also a metallic base, which, when united to oxygen, becomes soda, which in union with carbonic acid is the common soda of the shops, and with chlorine constitutes common salt.

Magnesium is a metallic base, which, when united to oxygen, becomes common calcined magnesia, and exists in combination in many limestones with carbonic acid, forming carbonate of magnesia.

Iron is a metal too well known to need any description, it very rarely is found in a state of purity in soils, but exists as an oxide or rust.