juices, gum, sugar, starch, acid, gluten, albumen, (the last two being the nutritive principle of wheat, corn, &c.) yet they are of no more use than certain other substances, which are of equal necessity to the animal, and are always present in productive soils, and in a form, state, or condition capable of being taken up by the plant. These essential elements are

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INORGANIC OR MINERAL MATTERS.

Silica, Silicious Earth, or Sand—Which is the oyxd of silicon, exists abundantly in all soils. Though having none of the sensible properties of an acid, it nevertheless belongs to this class of bodies, and combines with bases to form salts. It very rarely exists in a pure form in the earth, being almost always in union with some other substance, and forming a class of bodies called *silicates*. With alumina and peroxyd of iron, it forms our red and yellow clays; it most generally is associated with lime, magnesia, potash, or soda. The "grains of sand" in soils, are frequentlycomposed of pure sand (silicic acid) in combination with some of the above substances. In pure water, these combinations are quite insoluble; but water charged with carbonic acid dissolves them in a sensible degree. When first set free from its combinations, water dissolves it very readily.

Besides its determining, to a great extent, the mechanical properties of soils, and when in a very fine state of division, acting as a substitute for iron and clay in their absorbent capacity; it has a direct and independent use, that of forming the stalk and stem of plants, and the husk or outward envelope of the grain. In combination with potash, soda, lime and magnesia, but more particularly with potash, it gives hardness and firmness to the stalk of grasses, Indian corn, wheat, rye, oats, &c. It gives strength to the stalk to support the weight of the blades and ear; forms channels for the circulation of the sap, and for the transmission from the root, of whatever nutriment the other parts of the plant may require. Without the presence of this substance, and that too in a suitable state to be taken up by the roots, whatever quantity of the other constituents of plants might be present in the soil, vegetation could not arrive at any perfection. If the materials for the grain or ear existed, still there would be no stalk to support them.

The soils which, in common parlance, are called "sandy soils," frequently contain no more sand than those which are called "white oak soils, or pipe clay soil."

The difference in their texture is due to the size of the individual grains of sand, and not to the quantity which actually exists. Other things being equal, the finer the grains of sand the better