

elements by which they may be formed. All animal and vegetable bodies, by their putrefaction, give rise to volatile compounds, containing sulphur and phosphorus, and under conditions which we know to exist, these compounds are changed into phosphoric and sulphuric acid, which, with bases, will form phosphates and sulphates. Although these two substances have not, as yet, been *detected* in atmospheric air, yet we know that they must exist there, and will be brought down by dew, rain, and snow, to the surface of the earth.

CHLORINE.

Chlorine is another of the necessary constituents of a fertile soil. In its pure state it "is a yellowish-green colored gas, which has an astringent taste, and a disagreeable odor." When breathed, it excites violent spasm of some of the upper parts of the wind-pipe, and has a very irritant effect on the organs of respiration, even when very much diluted with air. In the soil it is almost always united to soda, and *very* rarely to lime, magnesia, or potash. United to any of the bases, it loses its poisonous properties. With soda, it forms the different kinds of common table salt. It is believed to add to the weight of the grain. The quantity necessary to constitute a fertile soil, all other things being present, is very small. I have not been able to determine, with any degree of certainty, the smallest quantity necessary in a soil, as the atmosphere from the contiguity of salt water in the localities which I have examined, always contained a varying proportion of this substance.

The above compose all of the substances necessary to constitute a fertile soil. In some soils manganese is found, which is the oxide or rust of a metal called manganese. This, though occasionally found in fertile soils, and in the ashes of plants growing on them, yet is not essential, since its presence does not increase, nor its absence decrease, the productiveness of a soil.

The air, in common with the vegetable matter in a soil, furnishes to plants carbonic acid, out of which they form woody fibre, and all substances in them which contain charcoal.

Besides this, it is common with many manures, affords ammonia, a substance which supplies a great share of the nutritious parts of plants, and constitutes by its elements a large part of the mass of the bodies of the vegetable and animal creation.

Water is supplied, in this country at least, wholly from the atmosphere, in the form of dew or rain.

To recapitulate, then, we have as food for plants furnished by the soil alone:—

Silica or sand,
 Alumina or clay,
 Iron,
 Lime,
 Magnesia,
 Potash,