soil to contain as little as (.05) five one hundreths of one per cent, and fifteen bushels of wheat to be produced where only (.008,) or the eighth one thousandth part of one per cent existed.

SODA.

Soda, the oxide or rust of a metal called sodium, is another of the necessary constituents of a fertile soil. It has nearly the same uses as potash, and may be substituted for it to a certain extent. It exists in various proportions in soil, but a very small quantity seems to be all that is necessary. I have not been able to make very satisfactory examinations in relation to this substance, as the section of the State where I conducted them was supplied, to some extent, by air from the salt water which surrounded it on every side. The quantity in the soil, therefore, could not be taken as proof of the quantity necessary to supply the crop.

On salt water, land produces wheat with bright strong straw, whilst land remote from it with an equal quantity of inorganic matter, will not do this, because it is not supplied with soda from the atmosphere.

PHOSPHORIC ACID.

Is also one of the necessary constituents of a fertile soil. With lime and magnesia it forms about fifty per cent of the bones of animals. Its elements are also found in the blood and brain, and in combination with different bases, it forms a very large proportion of all grains that are used for food. It exists in the soil, in combination with lime, magnesia, potash, soda, iron and alumina. With those substances, and others of this class, it form salts, which are called phosphates. Unless there be this substance present in a soil in sufficient abundance, and in proper *form* for use, no matter how rank or strong the crop of straw may be, there will be no corresponding yield of grain. Hence, in soils famous for large crops of straw, with a small quantity of grain, the farmer may increase it by the application of manures containing this substance, which are principally bone dust and guano.

SULPHURIC ACID.

Sulphuric, acid, (commonly called oil of vitriol,) is also a necessary constituent of fertile soils. It most generally exists in combination with lime, forming, with two equivalents of water, what is generally known as gypsum. Its elements exist in all plants, and in the blood of all animals.

The quantity necessary to constitute a fertile soil, is very small. This has been shown by numerous practical experiments, as well as by many analyses. Sulphates, as such, will not act on a soil which contains as little as (.005) the five one thousandth part of one per cent of sulphuric acid.

Besides the soil, the air undoubtedly supplies the plants some portion of the two substances named above, or rather supplies the