

rains should again fall. The manner in which droughts exercise their beneficial influence is as follows: During dry weather a continual evaporation of water takes place from the surface of the earth, which is not supplied by any from the clouds. The evaporation from the surface creates a vacuum, (so far as water is concerned,) which is at once filled by the water rising up from the sub-soil of the land; the water from the sub-soil is replaced from the next stratum below, and in this manner the circulation of water in the earth is the reverse to that which takes place in wet weather. This progress of the water in the earth to the surface manifests itself strikingly in the drying up of springs, and of rivers and streams which are supported by springs. It is not, however, only the water which is brought to the surface of the earth, but also all that which the water holds in solution. These substances are salts of lime, and magnesia of potash and soda, and indeed whatever the sub-soil or deep strata of the earth may contain. The water on reaching the surface of the soil is evaporated and leaves behind the mineral salts, which I will here enumerate, viz: Lime, as air-slacked lime; magnesia, as air-slacked magnesia; phosphate of lime, or bone earth; sulphate of lime, or plaster of Paris; carbonate of potash, and soda, with silicate of potash and soda, and also chloride of sodium, or common salt. All these are indispensable to the growth and production of plants which are used for food. Pure rain water *as it falls* would dissolve but a *very* small proportion of some of these substances, but when it becomes soaked into the earth it there becomes strongly imbued with carbonic acid from the decomposition of vegetable matter in the soil, and thus acquires the property of readily dissolving minerals on which before it could have very little influence.

I was first led to the consideration of the above subjects by finding, on the re-examination of a soil which I analyzed three or four years ago, a larger quantity of a particular mineral substance than I at first found; as none had been applied in the meantime, the thing was difficult of explanation until I remembered the late long and protracted drought. I then also remembered that in Zacatecas and several other provinces in South America, soda was obtained from the bottom of ponds, which were dried in the dry, and again filled up in the rainy season. As the above explanation depended on the principles of natural philosophy, I at once instituted several experiments to prove its truth.

Into a glass cylinder was placed a small quantity of chloride of barium, in solution; this was then filled with a dry soil, and for a long time exposed to the direct rays of the sun on the surface. The soil on the surface of the cylinder was now treated with sulphuric acid, and gave a copious precipitate of sulphate of baryta.