form other products, at the same time usually giving out carbonic acid as a result of the plant's assimilation. The processes of oxidation and deoxidation are carried on by them; and it is a question whether, in the particular cases mentioned on the preceding pages, the changes are not dependent on the presence of microbes. They set sulphur free from sulphates (genus *Beggiatoa*); make ammonia and nitrates (*Micrococcus nitrificans*), deoxidize nitrates and other salts; aid plants in taking up nitrogen through the roots; probably aid animals in their digestive processes, besides causing some of their diseases; they are the basis of all processes of fermentation, and are concerned fundamentally in animal putrefaction and vegetable decay. Tyndall proved that flesh would not decay if shut away from Bacteria — the strong affinities of its elements being unable to take a start without help from these minutest of plants. The Bacteria are the smallest of workers and among the largest of producers.

In garden earth which is free from compost, as T. Leone found, the nitrification process converts the nitrous acid into nitrate; while, on adding compost, the nitrate is deoxidized, and ammonia is given out; or in gelatine or other proteid substance and water, the organic substance is rapidly oxidized, attended by denitrification and the production of ammonia. Bacteria liquify muscle and coagulated gelatine, and, according to Brunton and Macfadyen, by producing a peptone-like solvent; and the same kinds produce fermentation in starch and similar non-nitrogenous carbo-hydrogen materials.

This organic source of nitrates explains their occurrence in the earth of caverns, or beneath sheds, and in other covered places; also of the loosening of the sands of sandstones in such places — an agency that may in time cause a vast amount of degradation and removal.

The native nitrate is usually either sodium or calcium nitrate, but sometimes potassium nitrate. The latter, which is salt-peter of the shops, is usually made from the others. In Kentucky caves the calcium nitrate occurs, the caves being in limestone. Sodium nitrate exists in the district of Tarapaca, northern Chile, over a great extent of surface, 3300 feet above the sea, in beds several feet thick, which have a covering of earth and a layer of gypsum, and contain some common salt. Moreover, underneath the bed occur common salt, glauber salt, gypsum, magnesia alum, and large quantities of borates; all of which indicate deposits from hot springs or evaporated sea water. But the source of the nitrate remains unexplained. This Tarapaca region of western South America is much like the Great Basin of North America in position, dryness, and saline deposits.

Mechanical Work of Chemical Products.

In oxidation and other processes yielding solid products, particles of the new material, when formed among the grains of the surface portion of a rock, or in its rifts, act like growing wedges in loosening and detaching the grains, and opening and extending rifts. The following figure represents a piece of quartzyte from Canaan, Conn., divided up, or *septated*, by the oxidation process. It looks like breccia, in which limonite is the cement; and specimens from the region were long so considered. But it was produced by the formation and infiltration of limonite. The rifts were thus widened into