

decomposition of hornblende or mica, which contain oxide of iron in large quantity.

It is a general fact, and one not yet accounted for, that scarcely any fossil remains are preserved in stratified rocks on which this oxide of iron abounds; and when we find fossils in the New or Old Red Sandstone in England, it is in the gray, and usually calcareous beds that they occur.

The gypsum and saline matter, occasionally interstratified with such red clays and sandstones of various ages, primary, secondary, and tertiary, have been thought by some geologists to be of volcanic origin. Submarine and subaerial exhalations often occur in regions of earthquakes and volcanoes far from points of actual eruption, and charged with sulphur, sulphuric salts, and with common salt and muriate of soda. In a word, such "solfataras" are vents by which all the products which issue in a state of sublimation from the craters of active volcanoes, obtain a passage from the interior of the earth to the surface. That such gaseous emanations and mineral springs, impregnated with the ingredients before enumerated, and often intensely heated, continue to flow out unaltered in composition and temperature for ages, is well known. But before we can decide on their real instrumentality in producing in the course of ages beds of gypsum, salt, and dolomite, we require to know more respecting the chemical changes actually in progress in seas where volcanic agency is at work.

The origin of rock-salt, however, is a problem of so much interest in theoretical geology as to demand the discussion of another hypothesis advanced on the subject; namely, that which attributes the precipitation of the salt to evaporation, whether of inland lakes or of lagoons communicating with the ocean.

At Northwich, in Cheshire, two beds of salt, in great part unmixed with earthy matter, attain the extraordinary thickness of 90 and even 100 feet. The upper surface of the highest bed is very uneven, forming cones and irregular figures. Between the two masses there intervenes a bed of indurated clay, traversed with veins of salt. The highest bed thins off towards the southwest, losing 15 feet in thickness in the course of a mile.\* The horizontal extent of these particular masses in Cheshire and Lancashire is not exactly known; but the area, containing saliferous clays and sandstones, is supposed to exceed 150 miles in diameter, while the total thickness of the trias in the same region is estimated by Mr. Ormerod at more than 1700 feet. Ripple-marked sandstones, and the footprints of animals, before described, are observed at so many levels that we may safely assume the whole area to have undergone a slow and gradual depression during the formation of the Red Sandstone. The evidence of such a movement, wholly independent of the presence of salt itself, is very important in reference to the theory under consideration.

In the "Principles of Geology" (chap. 27), I published a map, fur-

\* Ormerod, Quart. Geol. Journ. 1848, vol. iv. p. 277.