4. *Gypseous marls.*—More than 50 feet of thinly laminated gypseous marls, exactly resembling those in the hill of Montmartre, at Paris, are worked for gypsum at St. Romain, on the right bank of the Allier. They rest on a series of green cypridiferous marls which alternate with grit, the united thickness of this inferior group being seen, in a vertical section on the banks of the river, to exceed 250 feet.

General arrangement, origin, and age of the freshwater formations of Auvergne.—The relations of the different groups above described cannot be learnt by the study of any one section; and the geologist who sets out with the expectation of finding a fixed order of succession may perhaps complain that the different parts of the basin give contradictory results. The arenaceous division, the marls, and the limestone, may all be seen in some places to alternate with each other; yet it can by no means be affirmed that there is no order of arrangement. The sands, sandstone, and conglomerate constitute in general a littoral group; the foliated white and green marls, a contemporaneous central deposit; and the limestone is for the most part subordinate to the newer portions of both. The uppermost marls and sands are more calcareous than the lower; and we never meet with calcareous rocks covered by a considerable thickness of quartzose sand or green marl. From the resemblance of the limestones to the Italian travertins, we may conclude that they were derived from the waters of mineral springs,—such springs as even now exist in Auvergne, and which may be seen rising up through the granite, and precipitating travertin. They are sometimes thermal, but this character is by no means constant.

It seems that, when the ancient lake of the Limagne first began to be filled with sediment, no volcanic action had yet produced lava and scoriæ on any part of the surface of Auvergne. No pebbles, therefore, of lava were transported into the lake,—no fragments of volcanic rocks imbedded in the conglomerate. But at a later period, when a considerable thickness of sandstone and marl had accumulated, eruptions broke out, and lava and tuff were deposited, at some spots, alternately with the lacustrine strata. It is not improbable that cold and thermal springs, holding different mineral ingredients in solution, became more numerous during the successive convulsions attending this development of volcanic agency, and thus deposits of carbonate and sulphate of lime, silex, and other minerals were produced. Hence these minerals predominate in the uppermost strata. The subterranean movements may then have continued, until they altered the relative levels of the country, and caused the waters of the lakes to be drained off, and the farther accumulation of regular freshwater strata to cease.

We may easily conceive a similar series of events to give rise to analogous results in any modern basin, such as that of Lake Superior, for example, where numerous rivers and torrents are carrying down the detritus of a chain of mountains into the lake. The transported materials must be arranged according to their size and weight, the coarser near the shore, the finer at a greater distance from land; but in the