

stones, and pebbles, at points where it departs most widely from verticality. Hence at places, such as *a*, fig. 717, the miner complains that the ores are "nipped," or greatly reduced in quantity, the space for their free deposition having been interfered with in consequence of the pre-occupancy of the lode by earthy materials. When lodes are many fathoms wide, they are usually filled for the most part with earthy matter, and fragments of rock, through which the ores are much disseminated. The metallic substances frequently coat or encircle detached pieces of rock, which our miners call "horses" or "riders." That we should find some mineral veins which split into branches is also natural, for we observe the same in regard to open fissures.

Fig. 717.



Chemical deposits in veins.—If we now turn from the mechanical to the chemical agencies which have been instrumental in the production of mineral veins, it may be remarked that those parts of fissures which were not choked up with the ruins of fractured rocks must always have been filled with water; and almost every vein has probably been the channel by which hot springs, so common in countries of volcanos and earthquakes, have made their way to the surface. For we know that the rents in which ores abound extend downwards to vast depths, where the temperature of the interior of the earth is more elevated. We also know that mineral veins are most metalliferous near the contact of plutonic and stratified formations, especially where the former sends veins into the latter, a circumstance which indicates an original proximity of veins at their inferior extremity to igneous and heated rocks. It is moreover acknowledged that even those mineral and thermal springs, which, in the present state of the globe, are far from volcanos, are nevertheless observed to burst out along great lines of upheaval and dislocation of rocks.* It is also ascertained that all the substances with which hot springs are impregnated agree with those discharged in a gaseous form from volcanos. Many of these bodies occur as veinstones; such as silex, carbonate of lime, sulphur, fluor-spar, sulphate of barytes, magnesia, oxide of iron, and others. I may add that, if veins have been filled with gaseous emanations from masses of melted matter, slowly cooling in the subterranean regions, the contraction of such masses as they pass from a plastic to a solid state would, according to the experiments of Deville on granite (a rock which may be taken as a standard), produce a reduction in volume amounting to 10 per cent. The slow crystallization, therefore, of such plutonic rocks supplies us with a force not only capable of rending open the incumbent rocks by causing a failure of support, but also of giving rise to faults whenever one portion of the earth's crust subsides slowly while another contiguous to it happens to rest on a different foundation, so as to remain unmoved.

Although we are led to infer, from the foregoing reasoning, that there

* See Dr. Daubeny's Volcanos.