

basalts, affords a probability that the inner magma is in part metallic, and possibly, that vast masses of unoxidised metals exist in the central portion of the earth.

(5) Where rents or fissures form in the upper crust, the material of the lower crust is forced upward by the pressure of the less supported portions of the former, giving rise to volcanic phenomena either of an explosive or quiet character, as may be determined by contact with water. The underlying material may also be carried to the surface by the agency of heated water, producing those quiet discharges which Hunt has named crenitic. It is to be observed here that explosive volcanic phenomena, and the formation of cones, are, as Prestwich has well remarked, characteristic of an old and thickened crust; quiet ejection from fissures and hydrothermal action may have been more common in earlier periods and with a thinner over-crust. This is an important consideration with reference to those earlier ages referred to in chapter second.

(6) The contraction of the earth's interior by cooling and by the emission of material from below the over-crust, has caused this crust to press downward, and therefore laterally, and so to effect great bends, folds, and plications; and these, modified subsequently by surface denudation, and the piling of sediments on portions of the crust, constitute mountain chains and continental plateaus. As Hall long ago pointed out,¹ such lines of folding have been produced more especially where thick sediments had been laid down on the sea-bottom, and where, in consequence, internal expansion of the crust had occurred from heating below. Thus we have here another apparent paradox, namely, that the elevations of the earth's crust occur in the places where the greatest burden of de-

¹ Hall (American Association Address, 1857, subsequently republished, with additions, as "Contributions to the Geological History of the American Continent"), Mallet, Rogers, Dana, La Conte, etc.