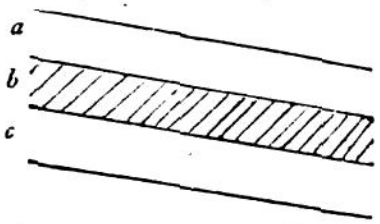
that case one single stratum would have covered the planes of a medium elevation throughout extensive districts (if not the whole globe), and we could have been acquainted with those above it only by the structure of mountains rising above that level, and with those beneath it only by the natural excavations of the vallies, or artificial ones of wells and mines; but by the actual arrangement, the beds which in one point lie at an impenetrable depth, are in others brought up to the surface, and thus become subject to our examination, and (which is much more important) yield us those various mineral products which are often essential to the most necessary of human arts.

§ 4. When, however, the observer commences his attempt to trace more in the detail the succession of these mineral beds and masses, he will at first find himself perplexed by their almost infinite numbers; but he will soon discover that these individual strata are arranged together, in such a manner as to afford natural and easy grounds for classing them in a limited number of series, each series comprehending numerous indi-

Beds of rock are occasionally subject, from their mechanical structure, to split into smaller laminæ not parallel to the plane of stratification; thus



This structure is called the cleavage of the bed. Where only part of a bed is exposed, it is often difficult to distinguish the lines of cleavage from the true planes of stratification, but the doubt may be cleared by observing the upper and under surface of the bed at the line of its junction with its superstratum and substratum, especially if these be of a different substance; for instance, if the bed exhibiting the cleavage *b* be calcareous, and the beds above and below it *a* and *c* argillaceous; for then there can be no question but that these dissimilar beds are the true strata, and that the lines not parallel to them are merely lines of cleavage.

The law of stratification, as above stated, extends to all the rocks and mineral masses forming the Earth's surface, excepting perhaps the rocks of the granitic class (which generally form the lowest rocks with which we are acquainted), and those of the trap family, which are irregularly interposed throughout all the other formations; but these are points upon which it would be premature now to enlarge.

Although all the rock-masses occur forming strata, yet many of the minerals employed in the arts of life do not constitute the entire substance of such beds, but are disposed in lines irregularly traversing them; such lines are called veins, and have the appearance of having originally been open cracks or fissures ranging across the beds, subsequently filled up by the mineral substances they contain. *Most metals are found in veins of this kind*; if the direction of the vein approaches to a vertical plane it is called a *rake* vein, if to the horizontal a *pipe* or *flat* vein; its angle of inclination is called the *hade* of the vein.