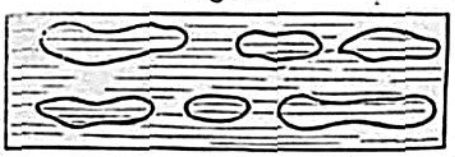
are often traced in the concretions, remaining parallel to those of the surrounding unconsolidated rock. (See fig. 55.) Such nodules of limestone have often a shell or other foreign body in the centre.*

Fig. 55.



Calcareous nodules in Lias.

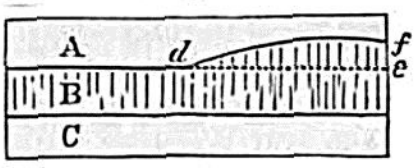
Among the most remarkable examples of concretionary structure are those described by Professor Sedgwick as abounding in the magnesian limestone of the north of England. The spherical balls are of various sizes, from that of a pea to a diameter of several feet, and they have both a concentric and radiated structure, while at the same time the laminæ of original deposition pass uninterruptedly through them. In some cliffs this limestone resembles a great irregular pile of cannon balls. Some of the globular masses have their centre in one stratum, while a portion of their exterior passes through to the stratum above or below. Thus the larger spheroid in the annexed section (fig. 56) passes from the stratum *b* upwards into *a*. In this instance we must suppose the deposition of a series of minor layers, first forming the stratum *b*, and afterwards the incumbent stratum *a*; then a movement of the particles took place, and the carbonates of lime and magnesia separated from the more impure and mixed matter, forming the still unconsolidated parts of the stratum. Crystallization, beginning at the centre, must have gone on forming concentric coats, around the original nucleus without interfering with the laminated structure of the rock.

Fig. 56.

Spheroidal concretions in magnesian limestone.

When the particles of rocks have been thus rearranged by chemical forces, it is sometimes difficult or impossible to ascertain whether certain lines of division are due to original deposition or to the subsequent aggregation of similar particles. Thus suppose three strata of grit, A, B, C, are charged unequally with calcareous matter, and that B is the most calcareous. If consolidation takes place in B, the concretionary action may spread upwards into a part of A, where the carbonate of lime is more abundant than in the rest; so that a mass *d*, *e*, *f*, forming a portion of the superior stratum, becomes united with B into one solid mass of stone. The original line of division *d*, *e*, being thus effaced, the line *d*, *f*, would generally be considered as the surface of the bed B, though not strictly a true plane of stratification.

Fig. 57.



Pressure and heat.—When sand and mud sink to the bottom of a deep sea, the particles are not pressed down by the enormous weight of the incumbent ocean; for the water, which becomes mingled with the sand and mud, resists pressure with a force equal to that of the column

* De la Beche, Geol. Researches, p. 95, and Geol. Observer (1851), p. 686.