

ducing these convulsions have operated at successive periods, not blindly and at random, but with a direction to beneficial ends, we see at once the proofs of an overruling Intelligence continuing to superintend, direct, modify, and control the operations of the agents, which he originally ordained.*

* “ Examples of this kind are perhaps nowhere more strikingly afforded than in the instance of those fractures or disturbances called *faults*, which occur in the alternating beds of coal, slaty clay, and sandstone, which are usually associated under the name of Coal-measures.

“ The occurrence of such *faults*, and the *inclined position* in which the strata composing the coal-measures are usually laid out, are facts of the highest importance as connected with the accessibility of their mineral contents. From their *inclined position* the thin strata of coal are worked with greater facility than if they had been horizontal; but as this inclination has a tendency to plunge their lower extremities to a depth that would be inaccessible, a series of faults, or traps, is interposed, by which the component portions of the same formation are arranged in a series of successive tables, or stages, rising one behind another, and elevated continually upwards towards the surface from their lowest points of depression. A similar effect is often produced by undulations of the strata, which give the united advantage of inclined position and of keeping them near the surface. The basin-shaped structure, which so frequently occurs in coal-fields, has a similar tendency to produce the same beneficial effect.

“ But a still more important benefit results from the occurrence of *faults* or *fractures*, without which the contents of no deep coal-mine would be accessible. Had the strata of shale and grit-stone that alternate with the beds of coal been continuously united without fracture, the quantity of water that would have penetrated from the surrounding country into any considerable excavations that might have been made in the porous grit beds, would have been insuperable by the powers of the most improved machinery: whereas by the simple arrangement of a system of faults, the water is admitted only in such quantities as are within control. Thus the component strata of a coal-field are divided into numberless insulated masses or sheets of rock of irregular form and area, not one of which is continuous in the same plane over any very large district, but each is separated from its next adjacent mass, or sheet, by a dam of clay impenetrable to water, and filling the narrow cavity produced by the fracture which caused the fault.

“ If we suppose a thick sheet of ice to be broken into fragments of irregular area, and these fragments again united after receiving a slight degree of irregular inclination to the plane of the original sheet, the united fragments of ice will represent the appearance of the component portions of the broken masses, or sheets, of coal-measures we are describing, whilst those intervening portions of more recent ice by which they are held together, represent the clay and rubbish that fill the faults, and form the partition walls that insulate these adjacent portions of strata, which were originally formed like the sheet of ice in one continuous plane. Thus each sheet or inclined table of coal-measures is inclosed by a system of more or less vertical walls of broken clay, derivative from its argillaceous shale beds at the moment in which the fracture and dislocation took place: and hence have resulted those joints and separations, which, though they occasionally interrupt at inconvenient positions, and cut off suddenly the progress of the collier, and often shatter those portions of the strata that are