

eighth of an inch thick corresponds to an inch, at least, of the accumulating vegetable remains; and hence the regularity and delicacy of the structure are not surprising. Alternations are a consequence of (1) the periodicity in the growth of plants and the shedding of leaves; (2) the periodicity of the seasons, the alternations of the season of floods with the season of low waters or comparative dryness; (3) the occurrence, at intervals of several years, of excessive floods. Floods may bring in more or less detritus, besides influencing the fall and distribution of the vegetation. There may have been great variations in the length of time before the peat-like vegetation after its formation was put under the pressure of beds of clay or sand; and the precise quality of the coal would be varied thereby, the decomposition of the vegetation depending on the amount of water, the composition of that water, and the length of time exposed.

In some parts of the marshes there were pools or lakes where the vegetation was long steeping and so becoming reduced to a pulp, to the obliteration of all bedding; and in such places, according to Newberry, cannel coal was often formed; for it usually constitutes locally the lower parts of a coal-bed, though sometimes making the whole thickness. And, as such ponds or lakes were likely to have their living species, so a bed of cannel coal often contains remains of fossil Fishes, Eurypterids, Crustaceans, and other species. The Eurypterus in its bed of Ferns figured on page 677 was obtained from a locality of cannel coal.

In conclusion, the Coal period was a time of unceasing change, — eras of verdure alternating with others of wide-spread waters, destructive of all the vegetation and of other terrestrial life except that which covered regions beyond the Coal-measure limits. Yet it was an era in which the changes went forward for the most part with such extreme slowness, and with such prevailing quiet, that, if man had been living then, he would not have suspected their progress.

In Europe the conditions were similar, in the main, to those of America. The succession of Carboniferous rocks and coal in the British Isles exceeds much in thickness that in any part of Europe, very much as that of Nova Scotia exceeds that of Pennsylvania and the states west. The greater thickness of the formations (if not of the coal-beds), supposing the peat-making conditions to exist, has probably depended in each region on the extent of the slowly progressing subsidence or geosyncline. The longer continued and deeper subsidence in Nova Scotia favored greater thickness than in Pennsylvania; and the amount of subsidence in Pennsylvania determined greater thickness in that state than in Illinois. So it was also in the British Isles as compared with Europe. Far west of the Mississippi in North America the general submergence of the surface put a Carboniferous limestone over the region instead of profitable Coal-measures; and far east in Europe, Russia has her barren coal-strata of vast extent, on both sides of the Urals.

For the making of extensive Coal-measures a nice balancing of the land surface between submergences and emergences was a requisite. With a very