

his observations, examining in detail every one of eighty-one Coal Groups, as I have called them, each consisting of at least one bed of coal, large or small, with its accompaniments, and in many cases of several small seams with intervening clays or shales.¹ In nearly every case the *Stigmaria* "underclay" is distinctly recognisable, and often in a single coal group there are several small seams separated by underclays with roots and rootlets. These underclays are veritable fossil soils; sometimes bleached clays or sands, like the subsoils of modern swamps; sometimes loamy or sandy, or of the nature of hardened vegetable mould. They rarely contain any remains of aquatic animals, or of animals of any kind, but are filled with *stigmaria* roots and rootlets, and sometimes hold a few prostrate stems of trees.² While the underclay is thus a fossil soil, the roof or bed above the coal, usually of a shaly character, is full of remains of leaves and stems and fruits, and often holds erect stumps, the remains of the last trees that grew in the swamp before it was finally covered up.

Some of the thinnest coals, and some beds so thin and impure that they can scarcely be called coals at all, are the most instructive. Witness the following from my section of the South Joggins.

Coal Group 1, of Division 3, is the highest of the series. Its section is as follows:—

“Grey argillaceous shale.

Coal, 1 inch.

Grey argillaceous underclay, *Stigmaria*.

“The roof holds abundance of fern leaves (*Alethopteris*

¹ For details see *Journal Geol. Society of London*, 1865; and “*Acadian Geology*,” last edition, 1891.

² At the South Joggins, in two or three cases, beds of bituminous shale full of *Naiadites* and *Cyprids* have by elevation and drying become fit for the growth of trees with *stigmaria* roots; but this is quite exceptional, no doubt arising from the accidental draining of lakes or lagoons on their elevation above the sea level.