A Section of Carboniferous Rocks in Cumberland County, Nova Scotia: (1) Detailed Section of Rocks from West Ragged Reef to the Joggins Mines and Minudie, by Sir William E. Logan, (republished); and (2) from Shulie to Spicer Cove, by Hugh Fletcher, B. A., of the Geological Survey of Canada.

Introduction.

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The continuous exposure of Carboniferous rocks along the Cumberland County shore of the Bay of Fundy, Nova Scotia, early attracted the notice of observers, and in 1843 it was measured in detail by the late Sir William Logan. His section of 14,570 feet of strata was published in 1845 as an appendix to the Reports on a Geological Survey of the Province of Canada.* Copies of this section, however, cannot now be obtained. Students ask for them and so do others who are attracted to the locali y by the present boom in the coal trade and the possibilities of the field whose rocks are so well exposed in the so-called Joggins section.

To meet this demand, the council of the Nova Scotian Institute of Science has decided to republish Logan's section *verbatim et literatim.* Following the reprint of this section is given, with the sanction of Dr. R. Bell, the Acting Director of the Geological Survey of Canada, a hitherto unpublished detailed section of the rocks from Shulie to Spicer Cove, by Mr. Hugh Fletcher, who has made a life's study of the geology of

* Message from His Excellency the Governor General, with Reports on a Geological Survey of the Province of Canada, presented to the House on 27th January, 1845. Montreal, 1845.

Nova Scotia. That gentleman has also taken great trouble to prepare the accompanying map. *

The base of the section is occupied by rocks of the Carboniferous Limestone series. They form an anticline from the shore of the Bay of Fundy opposite Shepody Mountain across the country to Pugwash on the Straits of Northumberland. Resting on them, with a southerly dip towards the Cobequid range, approximately parallel to the anticline, lies the series of strata detailed in this section. Going southward, in ascending order, the highest members are reached at Shulie, and there Logan's section ended. Mr. Fletcher continued his examination, over the repeated measures to the flank of the hills, where at Spicer's Cove a continuous bed of conglomerate, the waste of the igneous rocks of the axis of the range, terminates the area under review.

The best exposure of the base of the Joggins series is on the west side of Maringouin peninsula where at the Pink Rocks the gypsum deposits are closely overlaid by marine fossiliferous limestones and marls dipping southerly. Then succeeds the series of the Middle Carboniferous, of red sandstone, shales and marly beds, in turn overlaid by the unbroken grey beds with which are associated some bituminous shales and dark fireclays with small seams of coal from Ferris Cove to the Squaw's Cap, a repetition of the measures of the Joggins section north of Boss Point on the other side of Cumberland Basin.

The portion of the series remaining on the point of the peninsula, can be traced across Shepody Bay through Grindstone Island and Mary Point, where the strata are deflected to skirt the New Brunswick coast to Cape Enragé.

A visitor to the Pink Rocks on Maringouin will find a partial repetition to the northward, and structural features well

* The Nova Scotian Institute of Science takes this opportunity to acknowledge on behalf of the practical and scientific interests of the province, the public appreciation of the work performed by Mr. Fletcher, and of the zeal he has brought to bear on the study of our much complicated rock structure and the compilation of details relating to Nova Scotia.

worthy of examination. There is at Hard Ledge an exceptionally well exposed syncline with its axis inclined 15° towards Shepody Mountain, and an unconformity with members of the so-called Permian series. When in the neighborhood one should not fail to see The Rocks of Demoiselle Cape below Hopewell; conglomerate cliffs, caved by the sea, and on a grand scale carved into pinnacles and buttressed.

Mill Cove, the base of Logan's measurements, lies opposite Minudie, and between them, it is said, gypsum beds occur agreeing with the horizon of the Pink Rocks of Maringouin.

Section of the Nova Scotia Coal Measures, as developed at the Joggins, on the Bay of Fundy, in descending order, from the neighbourhood of the West Ragged Reef to Minudie, reduced to vertical thickness.

[Made by SIR WILLIAM E. LOGAN, in 1843 and published as an appendix in the first Report of Progress of the Geological Survey, for 1843, beginning at page 92, and extending to page 156, with figures on pages 157 to 159.]

1.

	Ft.	In.
Greenish gray or drab coloured sandstone or grit, with some conglomerate beds, of which the matrix is sandstone and the pebbles consist of white and of red veined quartz. These are generally as large as peas; some are of the size of pigeons' eggs, and a few as large as hens eggs,	30	0
Drab sandstone of a fine grit, but rather too hard for grindstones,	2	0
Red or chocolate coloured argillaceous shale, with small layers of sandstone of the same colour and quality as above,	15	0

	Ft.	In.
Drab sandstone, with small layers of chocolate coloured shale,	20	0
Dark red argillaceous shale, with some green spots,	10	0
Drab sandstone in two to three beds,	8	0
Drab sandstone of a coarse grit; the bed has an uneven bottom,	20	0
Dark red or chocolate coloured argillaceous shale, with a few bands of sandstone,	20	0
Dark red argillaceous shale,	10	0
Drab sandstone,	7	0
Dark red shale and drab sandstone in irregular beds,	20	0
Drab or greenish gray sandstone,	3	0
Red argillaceous shale,	9	0
Greenish gray or drab coloured sandstone in several layers, separated by bands of dark red or chocolate coloured argillo-arenaceous shale	20	0
Greenish gray or darb coloured sandstone of a fine grit,	4	0
Soft measures, concealed, probably dark red shale,	20	0
Coarse greenish gray sandstone, or rather a conglomerate with a fine matrix of sand and with fragments of plants, converted into coal,	30	0
Measures not well seen,	15	0
Greenish gray sandstone, with conglomerate beds and plants converted into coal,	60	0
Dark red shale,	15	0
Greenish gray sandstone, with conglomerate beds,	10	0
Dark red shale,	5	0
Greenish gray or darb coloured sandstone, with conglomerate beds,	15	0
Dark red shale,	10	0
Greenish gray sandstone, with conglomerate beds,	52	0
Dark red shale, with bands of red sandstone,	14	0
Greenish gray sandstone, with conglomerate beds,	25	0
Dark red shale,	10	0

	Ft.	In.
Greenish gray sandstone, with plants converted into coal,	30	0
Dark red shale, with thin beds of sandstone,	10	0
Greenish gray sandstone, with thin conglomerate layers,	3	0
Dark red shale,	6	0
Greenish gray sandstone, with beds of conglomerate,	55	0
Dark red or chocolate coloured shale,	1	0
Greenish gray sandstone, with much conglomerate and fragments of drift plants coated with coal,	50	0
Dark red or chocolate coloured shale,	9	0
Greenish gray sandstone, with conglomerate beds and carbonized drift plants,	14	0
Dark red shale,	5	0
Dark red shale, with beds of sandstone,	15	0
Greenish gray sandstone, with conglomerate beds,	20	0
Greenish gray sandstone, with bands of red shale,	21	0
Greenish gray sandstone, with conglomerate beds and carbonized drift plants of large diameter, say one foot, and wholly converted into coal. In many cases the action of the surf against the base of the perpendicular cliff has worn deep holes or caverns, where the stems lie prostrate in the reck. The plants are *sigillariæ*, so are nearly the whole of those already mentioned as met with in the grits or conglomerates. Fragments of *calamites* are occasionally seen,	30	0
Red or chocolate coloured shale,	10	0
Greenish gray sandstone of a conglomerate character, with many carbonized drift plants imbedded in it. Some beds of grit in this, towards the bottom, have been found fit for grindstones,	20	0
Dark red or chocolate coloured argillaceous shale,	60	0
Greenish gray sandstone inclining to yellow, chiefly of a coarse grit and free texture; some of it must be called conglomerate, the pebbles of which, consisting of quartz of various colours—white, yellow, and red,		

	Ft.	In.
with black chert and lydian stone,—are some of them as large as hens' eggs, a great many as large as almonds, and the majority as big as peas. Some of the beds have been found fit for grindstones. This sandstone constitutes the point of *West Ragged Reef*,*	30	0
Measures concealed,	42	0
Measures concealed, with sandstone at the bottom,	23	0
Greenish gray or drab coloured sandstone of a coarse grit,	12	0
Dark red shale with green bands,	30	0
Greenish gray sandstone of a coarse grit, some of which is fit for grindstones, but some parts are conglomerate, with red and white quartz pebbles, generally as large as peas, some of the size of pigeons' eggs, and a few as large as hens' eggs; some parts exhibit large spherical concretions rather harder than the surrounding material,	30	0
Dark red shale, with green bands,	6	0
Greenish gray or drab coloured sandstone of a coarse grit,	6	0
Dark red and light green shale, with some bands of drab sandstone,	50	0
Greenish gray sandstone of a coarse grit,	30	0
Dark red shale,	30	0
Greenish gray sandstone of a coarse grit, with some carbonized drift plants,	3	0
Greenish and red shale. This is on the west side of *South Brook, Two Rivers*,	3	0
Measures not well seen, being occupied by the brook, but consisting chiefly of greenish gray sandstone,	42	0
Greenish gray sandstone, with bands of greenish arenaceous shale and red arenaceous shale,	10	0
Red argillaceous shale,	1	0
Greenish gray sandstone,	7	0
Red arenaceous shale,	4	0

*In this reprint, place names are printed in a more prominent type than in the original, in order to facilitate reference to the section.—*Editor.*

	Ft.	In.
Red argillaceous shale,....	6	0
Red argillo-arenaceous shale,....	17	0
Greenish gray sandstone,....	2	0
Red argillo-arenaceous shale,....	2	0
Greenish gray sandstone,....	1	0
Red argillo-arenaceous shale,....	18	0
Greenish gray sandstone,....	7	0
Red argillo-arenaceous shale,....	6	0
Greenish gray sandstone,....	1	0
Red argillo-arenaceous shale, with green bands,....	8	0
Greenish gray sandstone of a coarse grit,....	19	0
Measures concealed. This is where the *North Branch of the Two Rivers* occurs,....	16	0
Greenish gray sandstone of a coarse grit, with some beds of conglomerate, having red and white quartz pebbles, the largest of which would weigh about two ounces, .	20	0
Red argillaceous shale,....	12	0
Greenish gray sandstone of a coarse grit, some parts of which are fit for large grindstones, commonly called *water-stones* by the quarrymen,....	76	0
Greenish gray sandstone, with divisional layers of arenaceous shale,....	4	0
Red argillaceous shale,....	19	0
Red argillaceous shale, with greenish gray arenaceous shale at the top,....	19	0
Greenish gray sandstone,....	1	0
Red argillaceous shale,....	4	0
Greenish gray sandstone,....	2	0
Red argillaceous shale,....	6	0
Greenish gray sandstone,....	5	0
Red argillaceous shale and green arenaceous shale, with a few bands of greenish gray sandstone. This deposit is chiefly red shale,....	32	0
Greenish gray sandstone,....	24	0

	Ft.	In.
Red argillaceous shale with green bands,	10	0
Greenish gray sandstone in four beds, separated by bands of red argillaceous shale of one to two feet thick,	27	0
Red argillaceous shale,	11	0
Greenish gray sandstone, with one foot of shale towards the bottom,	5	0
Red argillaceous shale,	8	0
Greenish gray sandstone in three small beds separated by red shale; occasionally the sandstone occupies the whole of the thickness	5	0
Red argillo-arenaceous shale, with green bands,	27	0
	1617	0

Recapitulation.

Greenish gray or drab coloured sandstones, with conglomerate beds and large carbonized drift plants,	947	0
Dark red or chocolate coloured argillaceous and argillo-arenaceous shales,	670	0
	1617	0

2.

Gray arenaceous shale,	5	0
Greenish gray sandstone. This is an unequal band, and there are doubtful indications of the leaves of *stigmariæ ficoides* at the top,	8	0
Reddish and greenish gray argillaceous shale, with some bands of arenaceous shale,	28	0
Greenish gray sandstone of a coarse grit fit for waterstones,	7	0
Red argillaceous shale, with some bands of arenaceous shale.	5	0
Measures concealed,	26	0
Greenish gray sandstone,	3	0

	Ft.	In.
Measures only partially seen, and containing some arenaceous shale,...	13	0
Reddish yellow sandstone,....	2	0
Measures concealed, but shown by the shape of the surface to be soft,..	4	0
Reddish yellow sandstone of a coarse grit, fit for water-stones,....	15	0
Red argillaceous shale, ...	7	0
Reddish yellow sandstone of a coarse grit, fit for water-stones,....	12	0
Red argillaceous shale, with greenish gray arenaceous shale in three beds,....	47	0
Greenish gray sandstones,....	7	0
Red argillaceous shale,....	3	0
Greenish gray sandstone, ...	14	0
Dark green shale,....	1	0
Gray sandstone,....	25	0
Red argillo-arenaceous shale, with greenish gray arenaceous shale, and some few layers of sandstone,.....	42	0
Greenish gray sandstone,....	9	0
Greenish gray arenaceous shale and sandstone, with red and gray argillaceous shale,....	24	0
Red argillaceous shale, with green arenaceous shale,....	26	0
Gray sandstone fit for grindstones,....	21	0
Red and green shale,....	11	0
Greenish gray sandstone,....	4	0
Red argillaceous and arenaceous shale,....	5	0
Greenish gray sandstone of various qualities, chiefly of coarse grit, fit for large grindstones or water-stones; much of it, however, is fine enough for small stones; both are made from the Reef,....	97	0
Red argillaceous and greenish gray arenaceous shale,...	13	0
Gray sandstone fit for grindstones, the bottom part of a coarse grit. This constitutes *Ragged Reef Point*,....	35	0
Red argillaceous shale,....	15	0

	Ft.	In.
Greenish gray sandstone, fit for grindstones,	10	0
Red argillaceous shale, with one foot of greenish gray sandstone,	9	0
Greenish gray sandstone fit for grindstones; the top of the bed is uneven,	20	0
Red argillaceous shale, gray arenaceous shale, and a few bands of greenish gray sandstone,	15	0
Red argillaceous shale,	4	0
Greenish gray sandstone,	2	0
Red argillaceous shale, with green bands,	13	0
Greenish gray shaly sandstone, or perhaps arenaceous shale,	7	0
Greenish gray sandstone fit for grindstones, with a few *calamites* nearly at right angles to the plane of the beds, as if in situ, but forced over at the top,	36	0
	650	0

Recapitulation.

Drab coloured sandstones without conglomerate beds,	219	0		
Gray sandstones,	81	0		
Reddish yellow sandstones,	28	0		
			328	0
Red, green and greenish gray argillaceous and arenaceous shales,			322	0
			650	0

(Indications of *stigmariæ ficoides* exist near the top, and of upright *calamities* at the bottom.)

3.

	F.	In.
Black carbonaceous shale	2	0
Greenish gray sandstone, with *stigmariæ ficoides*, (this would be called *understone* by the Welsh miners)	3	0
Gray argillaceous shale, with impressions of *ferns* and other plants, (*topstone*).	2	0
1. COAL of inferior quality—a regular seam	0	1
Greenish gray argillaceous shale, with *stigmariæ ficoides* (*understone*)	1	0
Greenish gray argillaceous shale, with *stigmariæ ficoides* and *ironstone* balls (*understone*)	1	0
Greenish gray sandstone	1	0
Red or chocolate coloured shale	6	0
Greenish gray sandstone, fit for grindstones, with a bed of red shale in the middle	23	0
Red shale, with a layer of sandstone	12	0
Red shale, in three beds	5	0
Greenish gray sandstone, in four beds	6	0
Red argillaceous shale	7	0
Gray sandstone, in small layers	7	0
Reddish gray sandstone	3	0
Greenish gray sandstone, in small layers	7	0
Reddish and green sandstone	13	0
Reddish and green shale	1	0
Reddish sandstone—soft	1	0
Red argillo-arenaceous shale, with balls of *ironstone*	3	0
Red and green sandstone	12	0
Measures concealed, but supposed to be soft	52	0
Red and green shale, with balls of *ironstone*	7	0
Gray sandstone and shale	3	0
Greenish grav sandstone	8	0
Greenish gray sandstone and red shale	5	0
Greenish gray or drab coloured sandstone, fit for grindstones	50	0

	Ft.	In.
Red shale	8	0
Greenish gray or drab sandstone, fit for grindstones; the top is uneven, and the whole is rather of a coarse grit. This constitutes *South Ragged Reef*	20	0
Red shale	7	0
Reddish gray sandstone	9	0
Red argillaceous shale	3	6
2. Coal 0 1		
Dark gray carbonaceous shale 0 4		
Coal 0 1		
	0	6
Red shale; the upper part is of a tough quality, and has *stigmariæ ficoides* in it (*understone*)	13	0
Greenish gray or drab coloured sandstone, occasionally separated into two beds. This sandstone appears to thin out within the distance of 100 yards on the strike	33	0
Red shale	2	9
Greenish gray or drab coloured sandstone	5	0
3. Coal	0	1
Greenish gray sandstone and reddish shale, with *stigmariæ ficoides* (*understone*)	5	0
Reddish green argillaceous shale	1	0
4. Coal	0	2
Reddish and green argillaceous and arenaceous shale, the green colour prevailing, with *stigmariæ ficoides* (*understone*)	5	0
Reddish and green argillaceous and arenaceous shale, the red prevailing	6	0
Red shale, separated by thin bands of sandstone; the top is of the tough crumbly quality of underclay, but no *stigmariæ* are visible	20	0
Gray sandstone and shale, the sandstone of soft quality.	11	0
Dark red shale	0	6

	Ft.	In
Tough arenaceous shale, with *stigmariæ ficoides* in the upper part in two layers, a hard and a soft one (*understone*)	12	0
Red and green crumbly tough shale of the quality of underclay, but no *stigmariæ* visible	11	0
Greenish gray sandstone, in four thinly laminated divisions, separated by red and green shale	30	0
Gray sandstone and red shale in thin beds	10	0
Red and green shale	9	0
Greenish gray sandstone, with red and green shale	4	0
Greenish gray sandstone, in regular beds of three feet and upwards	17	0
Red shale, varying from two to seven feet thick	5	0
Greenish gray sandstone	4	0
Greenish shale	1	0
Gray sandstone and shale	4	0
Dark greenish red shale	2	0
Greenish gray sandstone	1	0
Dark green and red shale	1	0
Greenish gray or drab coloured sandstone, fit for grindstones, forming a reef	25	0
Reddish shale	8	0
Greenish gray sandstone, in three beds, and gray shale in beds of one foot each	20	0
Gray shale, with two beds of greenish gray sandstone of one foot each	20	0
(Into the above penetrate two upright stems (*calamites*), two inches in diameter; and replaced by sandstone with a coating of coal; they start from the top of the succeeding bed.)		
Dark gray argillaceous shale	8	0
5. Coal	0	2
Gray argillo-arenaceous shale (*fire clay?*) with *stigmariæ ficoides* (*understone*)	1	6

	Ft.	In.
Gray argillo-arenaceous shale	10	0
Gray sandstone	1	0
Gray arenaceous shale, in two equal beds	7	0
6. Coal	0	3
Gray argillo-arenaceous shale, with *stigmariæ ficoides*	2	0
Greenish gray sandstone	2	0
Gray argillaceous shale	1	0
Gray argillaceous sandstone, with *stigmariæ ficoides* (*understone*)	2	0
Gray argillaceous shale	3	0
Reddish gray sandstone	1	0
Gray argillaceous shale	1	6
(In this shale, and running into the sandstone above, is visible a *calamite* at an angle of 45° to the plane of the deposit. It appears to start from the coal below.)		
7. Coal	0	1
Gray argillaceous shale, with *stigmariæ ficoides* (*underclay*)	1	6
Coal	0	2
Gray argillaceous shale, with *stigmariæ* (*underclay*)	0	4
Coal	0	1
	2	2
Gray argillaceous shale, with *stigmariæ* (*underclay*)	2	0
Greenish gray crumbly sandstone, with *stigmariæ* at the top	8	0
Red shale	12	0
Greenish gray sandstone	3	0
Red shale, with some few beds of sandstone	20	0
Red shale and reddish gray sandstone, in beds of one to three feet	12	0
Reddish gray sandstone, in thin layers, alternating with red shale	12	0
Red and green arenaceous shale	4	0

	Ft.	In.
8. Coal	0	1
Gray argillaceous shale, with *stigmariæ ficoides* (*understone*)	3	0
Gray argillaceous sandstone, with *stigmariæ ficoides* (*understone*)	2	0
Hard argillo-arenaceous shale, with *stigmariæ ficoides* (*understone*)	5	0
Red shale	20	0
Greenish gray or drab coloured sandstone, forming a reef	20	0
Red shale	23	0
Reddish gray sandstone	5	0
Red shale and greenish gray sandstone; not much sandstone	30	0
Red argillaceous shale and greenish gray sandstone, more sandstone than before	30	0
Red argillaceous shale	1	0
Reddish gray sandstone	1	0
Red argillaceous shale	3	0
Reddish gray sandstone	2	0
Red argillaceous shale	12	0
Greenish gray sandstone	15	0
Red argillaceous shale	20	0
Reddish sandstone	2	0
Red and green shale	8	0
Reddish gray sandstone	6	0
Red shale	2	0
Greenish gray sandstone	2	0
Red argillaceous shale	3	0
Greenish gray sandstone	3	0
Greenish gray sandstone, fit for grindstones, which are now quarried from it. This constitutes *North Ragged Reef*	12	0

	Ft.	In.
Reddish gray sandstone, in beds of one to three or four feet, separated by beds of reddish shale of one to two feet	60	0
Red shale	4	0
Reddish sandstone	2	0
Red argillaceous shale	20	0
Greenish gray sandstone, in beds of two to three feet, with beds of red shale of one to two feet	30	0
Red argillaceous shale	6	0
Reddish sandstone, separated at the top into moderate layers by red shale	49	0
Red shale	2	0
Reddish sandstone	1	0
Red argillaceous shale	35	0
Gray sandstone and red argillaceous shale, in alternating beds; the sandstone has a reddish tinge towards the top	30	0
Gray sandstone	1	0
Reddish argillaceous shale	5	0
Gray sandstone	1	0
Reddish argillaceous shale	5	0
Gray sandstone	2	0
Reddish and gray shale	1	0
Gray sandstone	2	0
Reddish argillaceous shale, with *ironstone* balls	3	0
Gray sandstone	1	0
Green and red argillaceous shale	2	0
Hard argillo-arenaceous shale	1	0
Gray argillaceous shale, with *ironstone* balls. This bed has something the appearance of underclay, but the *stigmariæ* are not distinct	7	0
9. Coal	0	3
Gray arenaceous shale, with *ironstone* balls, and *stigmariæ ficoides* (*underclay*)	5	0

	Ft.	In.
Reddish gray argillaceous shale	1	0
10. Coal and *carbonaceous shale* 0 8		
Gray argillaceous shale, with *ironstone* balls and *stigmariæ ficoides* (*underclay*) 2 0		
Coal 0 2		
	2	10
Gray argillaceous sandstone, with *stigmariæ ficoides* (*underclay*)	2	0
Reddish and green argillo-arenaceous shale, *ironstone* balls. This has much the character of underclay, but the *stigmariæ* are not well marked	12	0
Gray sandstone	1	0
Gray argillaceous shale, with *ironstone* balls	3	0
Greenish gray sandstone	4	0
Gray argillaceous shale	1	0
(From the succeding layer of coal there springs up an erect *sigillaria*. It is 1 ft. 6 in. in diameter, and penetrates the shale and sandstone above it, five feet of the plant being visible.)		
11. Coal	0	3
Gray sandstone, with *stigmariæ ficoides* (*underclay*)	2	0
Gray argillaceous shale, with *ironstone* balls and *stigmariæ ficoides* (*underclay*)	5	0
12. *Black carbonaceous shale* 0 9		
Coal 0 2		
	0	11
Gray argillaceous shale, with *ironstone* balls and *stigmariæ ficoides* (*underclay*)	1	6
Greenish gray sandstone	1	6
Gray argillaceous shale	9	0
13. Coal	0	7
Gray argillaceous shale, with *ironstone* balls and *stigmaria ficoides* (*underclay*)	2	0
Gray argillaceous shale	5	0

			Ft.	In.
14. Coal	0	4		
Gray argillo-arenaceous shale, with *ironstone* balls and *stigmariæ ficoides* (*underclay*)	1	6		
Coal	0	2		
			2	0
Gray argillaceous shale, with *ironstone* balls and *stigmariæ ficoides* (*underclay*)			7	0
Gray argillo-arenaceous shale, with *ironstone* balls and *stigmariæ ficoides* (*underclay*)			1	0
Greenish gray sandstone			1	0
Greenish gray sandstone and red and gray argillo-arenaceous shale. The sandstone is not in thick beds. *Ironstone* balls and *stigmariæ ficoides* are found through the whole deposit			40	0
Greenish gray argillaceous shale			3	0
15. *Carbonaceous shale*	0	2		
Gray argillaceous shale, with *ironstone* balls and *stigmariæ ficoides* (*underclay*)	1	0		
Coal	0	1		
			1	3
Gray argillaceous shale, with *ironstone* balls and *stigmariæ ficoides* (*underclay*)			3	0
Greenish gray sandstone, with three bands of red and gray shale, loaded with *ironstone* balls			12	0
Gray argillaceous shale			1	0
16. Coal and *carbonaceous shale*			0	2
Red argillaceous shale, with *ironstone* balls and *stigmariæ ficoides* (*underclay*)			7	0
Greenish gray sandstone			10	0
Red and green shale			2	0
Rough gray argillaceous sandstone			2	0
Red and green shale			2	0
Rough greenish gray argillaceous sandstone			1	6
Red and green shale			2	0

					Ft.	In.
Greenish gray sandstone					5	0
Red and green argillaceous shale					7	0
17. Coal			0	1		
Gray argillo-arenaceous shale, with *stigmariæ ficoides* (*underclay*)			4	0		
Coal	0	4				
Carbonaceous shale	0	4				
Coal	0	1	0	9		
					4	10
Gray sandstone, with 3 inches of soft gray argillaceous shale at the top, and penetrated by *stigmariæ ficoides* (*understone*)					1	3
Gray argillo-arenaceous shale					1	0
18. Coal					0	3
Gray arenaceous shale, with *stigmariæ* (*underclay*)					2	0
Gray arenaceous sandstone, with *stigmariæ* (*underclay*)					2	0
Red and green shale					3	0
Greenish gray sandstone, in several layers					6	0
Red and green argillaceous shale					7	0
Gray sandstone, with *stigmariæ* (*understone*)					2	0
Red and green argillo-arenaceous shale					4	0
19. Coal					0	1
Red argillaceous shale, with *stigmariæ* (*underclay*)					4	0
Greenish gray sandstone and red shale alternating, the sandstone in 7 beds of 2 to 8 feet, the shale in 5 beds of ½ to 3 feet					60	0
Red and gray argillaceous shale					13	0
Greenish gray sandstone					2	0
Greenish gray shale and sandstone					2	0
Greenish gray sandstone					2	0
Greenish gray shale					2	0
Greenish gray sandstone					2	0
Measures concealed					41	0

	Ft.	In.
Greenish gray sandstone	1	0
Measures concealed	1	0
Greenish gray sandstone	2	0
Measures concealed. Here occurs DENNIS RIVER*	9	0
Greenish gray sandstone	3	0
Measures concealed, but supposed to be shale	4	0
Greenish gray or drab coloured sandstone, fit for grindstones. There are quarries in it on the SOUTH REEF, DENNIS RIVER	25	0
Red argillo-arenaceous shale	9	0
Greenish gray or drab coloured sandstone, fit for grindstones. Some are quarried from the bed on the NORTH REEF, DENNIS RIVER	18	0
Measures concealed, but supposed to be argillaceous shale	4	0
Greenish gray or drab sandstone, almost fit for grindstones	14	0
Greenish gray argillaceous shale	1	0
Greenish gray sandstone	2	0
Dark gray argillaceous shale	1	0
20. COAL	0	1
Red and green shale, with *stigmariæ ficoïdes* (*underclay*)	1	0
Greenish gray sandstone	1	0
Red and greenish gray argillaceous shale, with *ironstone* balls	6	0
Carbonaceous shale	0	3
Gray crumbly argillo-arenaceous shale, with *stigmariæ ficoïdes* (*underclay*)	2	0
Greenish gray sandstone	1	0
Reddish shale, with *ironstone* balls	1	0
Greenish gray sandstone	4	0
Red argillaceous shale, with *ironstone* balls	23	0

* Now McCarren's Brook.—*Editor.*

	Ft.	In
Greenish gray sandstone, with red and green shale studded with *ironstone* balls	4	0
Red and greenish gray argillaceous and arenaceous shale, in beds of five feet, with greenish gray sandstone, in beds of one to three feet	30	0
Reddish and greenish gray argillaceous shale, with *ironstone* balls	15	0
Greenish gray sandstone, soft, with bands of red arenaceous shale	21	0
Red argillaceous shale	2	0
21. Coal	0	2
Greenish gray argillo-arenaceous shale, with *stigmariæ* (*underclay*)	2	0
Measures concealed	35	0
Greenish gray sandstone of good grit	4	0
Measures concealed	7	0
Greenish gray sandstone of good grit	1	0
Measures concealed	15	0
Greenish gray arenaceous shale	1	0
Measures concealed	43	0
Measures concealed, but probably sandstone	7	0
Measures not perfectly seen, but consisting in part of greenish gray sandstone	13	0
Greenish gray sandstone, with impressions and casts of *calamites*. This layer is almost fit for grindstones, but not sufficiently regular to be worked profitably.	13	0
Measures not well seen, supposed to be red shale	22	0
Red and greenish gray argillo-arenaceous shale, the red prevailing, with some bands of greenish gray sandstone of six to twelve inches	40	0
Reddish and greenish gray sandstone, in beds of three to ten feet, separated by layers of red and greenish gray arenaceous shale of one to two feet. This forms Dennis River Point	31	0

	Ft.	In.
Greenish gray sandstone, soft and ragged, in aggregated beds of one to ten feet; the aggregations separated by beds of dark red and green argillaceous and arenaceous shale of one to two feet, having *ironstone* balls; impressions of plants, among them *sigillariæ* and *calamites,* prevail in the sandstone	60	0
Dark red and green argillaceous shale, with six beds of red and greenish gray sandstone; the shale is loaded with *ironstone* balls	40	0
22. Coal *and carbonaceous shale*	0	2
Gray argillo-arenaceous shale of a tough quality, with *stigmariæ* (*underclay*)	4	0
Dark red and green argillaceous shale, with a band of sandstone	16	0
Gray argillaceous and arenaceous shale, with *ironstone* nodules and some thin beds of sandstone	10	0
Gray sandstone, with *stigmariæ* (*understone*)	2	0
Dark gray shale, with *ironstone* nodules	22	0
Gray sandstone	1	0
Gray argillaceous shale	2	0
Gray sandstone	1	0
Greenish gray arenaceous shale	6	0
Gray sandstone, in layers of four inches each	4	0
	2,134	1

RECAPITULATION.

Coal, in 22 seams	5	5	
Carbonaceous shale associated with the coal seams, and in one instance without coal	3	10	
			9 3

Underclay or understone, being beds of various material, immediately subjacent to the seams of Coal and Carbonaceous shale, and universally penetrated by the branches and radiating leaves of the stigmariæ

			Ft.	In
ficoides. Every one of the Coal and Carbonaceous seams rests upon a bed of this description, and in two cases stigmariæ beds exist without superincumbent coal. The material constituting the stigmariæ beds is as follows:				
Sandstone—Gray	23	3		
Drab	43	0		
			66	3
Argillaceous and arenaceous shale, having often the character of fireclay—				
Gray	58	4		
Greenish gray	7	0		
Red and occasionally green	42	0		
			107	4
			173	7
Sandstone—Gray	82	0		
Greenish gray, chiefly fit for grindstones	657	0		
Reddish, of various shades	204	0		
			943	0
Shale—Gray-Argillaceous	92	6		
Arenaceous	44	0		
			136	6
Red and green—				
Argillaceous	564	0		
Arenaceous	104	9		
			668	9
			805	3
Measures concealed, supposed to be chiefly shale			203	0
			2,134	1

(Among the organic remains visible are one oblique and two upright calamites, and one upright sigillaria. One topstone bed of shale contains impressions of ferns.)

4

	Ft.	In.
1. *Bituminous limestone,* with *shells* and *fish scales* 4 0		
Coal 1 0		
	5	0
Greenish gray argillo-arenaceous shale, with *stigmariæ ficoides* (*underclay*)	4	0
Gray sandstone, in courses of six and nine inches, with *ironstone* balls and *stigmariæ ficoides* (*understone*).	2	6
Gray argillaceous shale	1	0
Gray sandstone	6	0
Gray argillaceous shale	1	0
Gray sandstone of a rough texture	1	0
(From the succeeding bed springs an upright stem (*sigillaria*). It widens towards the bottom, and penetrates into the sandstone above.)		
Gray argillaceous shale, with *ironstone* balls	6	0
Gray sandstone and arenaceous shale	5	0
Gray arenaceous shale	2	0
Hard gray arenaceous shale, with *stigmariæ ficoides* (*underclay*)	1	6
Gray argillaceous shale	20	0
2. Coal and *Carbonaceous shale*	1	0
Soft gray argillo-arenaceous shale, with *stigmariæ ficoides* (*underclay*)	1	0
Hard gray arenaceous shale, with *stigmariæ ficoides* (*underclay*)	2	0
Gray argillaceous shale	1	0
3. Coal and *Carbonaceous shale*	0	3
Hard argillo-arenaceous shale, with *stigmariæ ficoides* (*underclay*)	2	0
Gray argillaceous shale	4	0

			Ft.	In.
4. Coal	0	9		
Carbonaceous shale	0	6		
Coal	0	1		
Carbonaceous shale	0	4		
Coal	0	1		
Carbonaceous shale	0	8		
Coal	0	2		
			2	7
Gray argillaceous shale, no *stigmariæ* visible, but across the bed appear two parallel regular cracks, about ¼ of an inch wide each, and about 18 inches apart, filled with coal, the fibre of which is at right angles to the cracks. This may be the section of an upright stem	1	7		
Coal	0	8		
			4	10
Hard gray argillo-arenaceous shale with *stigmariæ ficoides* (*underclay*)			4	0
Greenish argillaceous shale, with *ironstone* balls			12	0
Gray sandstone in several layers			1	0
Red and green argillaceous shale, with *ironstone* balls			20	0
Gray sandstone and green shale in alternating layers			24	0
Red or chocolate coloured argillaceous shale			3	6
(From the succeeding bed rises an upright *sigillaria* one foot in diameter; two feet of it are seen penetrating the bed above.)				
Gray argillaceous shale			1	6
Gray sandstone in thin beds			8	0
Gray argillaceous shale			8	0
5. *Bituminous limestone,* with *shells*	2	0		
Coal	0	0½		
Gray argillo-arenaceous shale, with *ironstone* balls and *stigmariæ ficoides* (*underclay*)	0	6		
Carbonaceous shale	0	0½		

	Ft.	In.
Gray argillo-arenaceous shale, with *ironstone* balls and *stigmariæ ficoides* (*underclay*).. 1 6		
Carbonaceous shale 0 1		
Gray argillo-arenaceous shale, with *ironstone* balls and *stigmariæ ficoides* (*underclay*) 2 6		
Coal 0 6		
	7	2
Gray argillo-arenaceous shale, with *stigmariæ* leaves (*underclay*)	2	0
Gray arenaceous shale, with *stigmariæ* leaves (*underclay*)	6	0
Gray arenaceous shale and rough argillaceous sandstone	9	0
Greenish gray arenaceous shale	5	0
Gray sandstone	3	0
Red and green argillaceous shale, with *ironstone* balls..	7	0
Gray rough sandstone	17	0
Red argillaceous shale, with *ironstone* balls; thin beds of arenaceous shale and sandstone in the middle.....	10	0
Red sandstone	1	0
Red argillaceous shale, with *ironstone* balls.....	1	0
Red sandstone	1	0
Red and green shale, with *ironstone* balls and some arenaceous beds	18	0
Gray sandstone	2	0
Gray arenaceous shale	4	0
Green and red shale	3	0
Gray sandstone	3	0
(From the upper part of the succeeding bed there arises an upright *sigillaria*.)		
Gray argillaceous shale	17	0
Gray argillaceous shale, with a layer of sandstone....	3	0
Gray sandstone	0	6
Greenish gray argillaceous shale	17	0
Gray sandstone	1	0

			Ft.	In.
Gray argillaceous shale, with *ironstone* balls and a few bands of arenaceous shale			17	0
6. *Carbonaceous shale*	1	0		
Bituminous limestone, with *shells*	0	10		
Coal	0	4		
			2	2
Gray argillo-arenaceous shale, with *stigmariæ* (*underclay*)			2	0
Rough gray argillaceous sandstone, with the branches and leaves of *stigmariæ ficoides* (*underclay*)			7	0
(An upright stem penetrating the above bed springs from the one below.)				
Gray argillaceous shale, with *ironstone* nodules			1	0
Gray sandstone			1	0
Gray argillaceous shale, with *ironstone* nodules			2	0
Gray arenaceous shale			10	0
Gray sandstone			3	0
Gray argillaceous shale			3	0
Gray sandstone			2	0
7. Coal	0	10		
Carbonaceous shale	0	2		
Coal	0	10		
Carbonaceous shale	0	2		
Coal	2	0		
Coal and *Carbonaceous shale*	0	6		
			*4	6
Gray argillaceous shale, with *stigmariæ* (*underclay*)			6	0
Gray argillaceous shale, loaded with a multitude of *ironstone* balls			10	0
Gray argillaceous shale in beds of 1 to 3 feet, with sandstone and arenaceous shale in beds of 1 foot; *ironstone* nodules are very numerous in the whole			20	0
Gray argillaceous shale, with *ironstone* nodules			9	0

* Joggins "Main Seam."—*Editor.*

	Ft.	In.
Gray sandstone	3	0
Gray argillaceous shale, with *ironstone nodules*	10	0
Gray sandstone	1	0
Gray argillaceous shale	2	0
(From the succeeding bed springs an upright *sigillaria* of 1 foot in diameter; the lower part commences to spread.)		
Gray argillaceous shale, with *ironstone* balls and some sandstone	2	0
Gray argillaceous shale, with *ironstone* balls	5	0
8. Coal	0 2	
Gray argillaceous shale	0 4	
Coal	0 3	
Carbonaceous shale and *Coal*	1 3	
Coal	0 1	
Gray argillaceous shale, with *ironstone* balls and *stigmariæ* (*underclay*)	4 0	
Coal	1 0	
	7	1
Gray argillo-arenaceous shale, with *ironstone* balls in abundance and *stigmariæ ficoides* (*underclay*)	6	0
Gray rough crumbly sandstone	9	0
Dark gray shale, with *ironstone* balls	1	0
Gray arenaceous shale	3	0
Gray sandstone	3	0
Red argillaceous shale (chocolate coloured)	10	0
Gray sandstone	1	0
Red argillaceous shale as before	10	0
Gray rough sandstone	3	0
Red argillaceous shale, as before, in beds of 1 to 4 feet, with *ironstone* balls, and separated by beds of gray sandstone of 1 foot	20	0
Gray rough sandstone, in beds of 1 to 2 feet, alternating with beds of red or chocolate coloured shale of 1 foot	15	0

	Ft.	In.
Gray soft sandstone	1	0
Red shale	1	0
Gray rough sandstone	1	6
Gray arenaceous shale, with *stigmariæ* (*underclay*)	2	0
Gray crumbly arenaceous shale, with *ironstone* balls	6	0
Gray arenaceous shale	2	0
Gray crumbly sandstone	1	0
Gray argillaceous shale	0	10
Gray sandstone, with *stigmariæ* and upright *calamites* (*understone*)	1	6
Gray argillaceous shale, with *ironstone* balls	1	10
Gray rough crumbly sandstone	0	10
Gray argillaceous shale, with *ironstone* balls and *stigmariæ ficoides* (*underclay*)	10	0
9. Coal and *Carbonaceous shale*	1	3
Greenish gray argillaceous shale, with *stigmariæ ficoides* (*underclay*)	12	0
Gray rough sandstone, with *stigmariæ* (*underclay*)	3	0
Red argillaceous shale, with *ironstone* balls	2	0
Reddish sandstone	2	0
Red or chocolate coloured argillaceous shale, with *ironstone* balls	5	0
Gray argillo-arenaceous shale, with *stigmariæ* (*underclay*)	1	6
Red argillaceous shale and gray arenaceous shale	3	0
10. Coal and *Carbonaceous shale* 0 2		
Carbonaceous shale 0 6		
Coal 0 4		
	1	0
Argillo-arenaceous shale, with *stigmariæ ficoides* (*underclay*)	1	0
Measures concealed, probably underclay. Here occurs Bell's Brook	5	0
Red and green shale as before	9	0

	Ft.	In.
Gray sandstone	1	0
Red argillaceous shale and gray arenaceous shale	3	0
Red and green shale, as before	3	0
Gray arenaceous shale	2	0
Red and green shale, as before	7	0
Gray sandstone	3	0
Red and green shale, as before	3	0
Gray sandstone	1	0
Red or chocolate coloured argillaceous shale	2	0
Gray sandstone	1	0
Red and green shale, as before	5	0
Red or chocolate coloured argillaceous shale	1	0
Gray arenaceous shale	14	0
Gray sandstone, rough and uneven	12	0
(From the top of the succeeding bed spring several upright *calamites*, 3 of them in the distance of 2 feet, and 8 more—the whole 11, in the distance of 20 feet.)		
Gray crumbly argillaceous shale, like *underclay* but no *stigmariæ* visible	2	0
Greenish sandstone	0	6
Red or chocolate coloured argillaceous shale	3	0
11. Coal and *carbonaceous shale*	0	8
Gray argillaceous shale, with *stigmariæ ficoides* (*underclay*)	7	0
Gray rough sandstone and arenaceous shale, in alternate layers	12	0
Greenish gray sandstone	1	0
Gray argillaceous shale	1	0
Gray arenaceous shale	6	0
Strong gray arenaceous shale and rough sandstone	4	0
Gray argillaceous shale	6	0
12. Coal and *carbonaceous shale*	1	0
Gray argillaceous shale, witht *stigmariæ ficoides* and *ironstone* balls (*underclay*)	2	0

	Ft.	In.
Gray argillaceous sandstone, with *stigmariæ* (*understone*)	3	0
Dark gray argillaceous shale	8	0
13. Coal and *carbonaceous shale*	0	6
Gray argillaceous shale, witth *stigmariæ* and *ironstone* balls (*underclay*)	2	0
Gray argillaceous sandstone, with *stigmariæ* (*underclay*)	2	0
Red and green shale, as before	7	0
Gray argillaceous sandstone, with *stigmariæ* (*understone*)	1	0
Red and green argillaceous shale, with *stigmariæ ficoides* (*underclay*)	7	0
Gray sandstone and shale	1	0
Red or chocolate coloured and green argillaceous shale	3	0
Gray soft shaly sandstone	1	0
Measures concealed, but supposed to be soft	7	0
Greenish gray soft sandstone	4	0
Measures concealed, but supposed to be soft	2	0
Gray sandstone	4	0
Measures concealed, but supposed to be soft	3	0
Reddish green sandstone	3	0
Gray sandstone and shale	1	0
Red argillaceous shale	1	0
Green arenaceous shale	1	0
Gray sandstone	1	0
Gray argillaceous shale	6	0
Green and red shale	3	0
Gray sandstone, with a bed of argillaceous shale	2	0
Greenish gray argillaceous shale, with *ironstone* balls	17	0
Reddish green sandstone	1	0
(In this are upright *calamites*—3 of them in the space of 1 foot.)		
Gray argillaceous shale	2	0

					Ft.	In.
Gray rough sandstone					1	0
Gray argillaceous shale					2	0
Greenish gray or drab coloured sandstone; grindstones have been quarried from this, but they are too hard for the best quality. This constitutes Coal Mine Point					30	0
Gray argillaceous shale, with balls of *ironstone*					3	0
Greenish gray sandstone					1	0
Gray argillaceous shale, with balls of *ironstone*					8	0
14. Coal		0	3			
Carbonaceous shale		0	2			
Coal		0	3			
				0	8	
Gray argillo-arenaceous shale, with *stigmariæ ficoides* (*underclay*)				6	0	
Carbonaceous shale		0	4			
Gray argillo-arenaceous shale, with *stigmariæ* (*underclay*)		1	0			
Carbonaceous shale		0	8			
Coal		0	2			
				2	2	8 10
Gray argillo-arenaceous shale, with *stigmariæ ficoides* (*underclay*)					2	6
Greenish gray sandstone					2	0
Gray argillo-arenaceous shale, with bands of sandstone (From the succeeding bed there spring up erect *calamites*, penetrating the above bed 2 feet; 2 of them are within 2 feet of one another, and there are 7 more in the space of 8 feet.)					2	0
15. *Carbonaceous shale*				1	0	
Coal				0	4	
					1	4
Gray crumbly sandstone and shale, with *stigmariæ* (*underclay*)					2	0

	Ft.	In.
Gray crumbly sandstone, very like *underclay*, but no *stigmariæ* visible	12	0
Gray argillo-arenaceous shale, with *stigmariæ* (*underclay*)	5	0
Greenish gray sandstone	2	0
Dark red shale, with *ironstone* balls	4	0
Greenish gray sandstone	5	0
Dark red shale	1	0
Greenish gray sandstone	3	0
Dark red or chocolate coloured argillaceous shale	6	0
Greenish gray sandstone, and red or chocolate coloured shale of an argillo-arenaceous character	12	0
Gray argillo-arenaceous shale, with *stigmariæ* and some beds of sandstone with *stigmariæ* leaves crossing them(*underclay*)	12	0
Gray crumbly sandstone, with beds of argillaceous shale, and *ironstone* balls, very like *underclay*, but no *stigmariæ* visible	25	0
16. Coal and *carbonaceous shale*	0	6
Gray argillo-arenaceous shale, witth *stigmariæ* (*underclay*)	3	0
Greenish gray sandstone	10	0
Gray argillaceous shale	1	0
Gray soft sandstone	1	0
Gray argillaceous shale	0	6
Gray argillo-arenaceous shale, with *stigmariæ* (*underclay*)	4	0
Gray argillaceous shale	6	0
17. Coal and *carbonaceous shale*	0	3
Gray argillo-arenaceous shale, witht *stigmariæ* (*underclay*)	2	0
Gray argillaceous sandstone	18	0
Gray argillaceous shale	11	0
18. Coal	0	8

	Ft.	In.
Gray argillo-arenaceous shale, with *stigmariæ* (*underclay*)	1	6
Gray soft flaggy sandstone	3	6
Gray argillaceous shale, with *stigmariæ*(*underclay*)	3	0
Gray arenaceous shale, with *stigmariæ* (*underclay*)	3	0
Gray argillo-arenaceous shale, witth *stigmariæ* (*underclay*)	4	0
Gray soft flaggy sandstone, with *stigmariæ* at the top (*understone*)	3	0
Fine gray argillo-arenaceous shale	4	0
Greenish gray sandstone	1	0
Dark gray argillaceous shale	6	0
19. *Carbonaceous shale* 4 0		
Bituminous limestone, with *shells* and *fish scales* 2 6		
Coal 0 1		
———	6	7
Gray argillo-arenaceous shale, with *stigmariæ* (*underclay*)	2	6
Greenish gray sandstone	6	0
Gray argillaceous shale	12	0
20. *Black bituminous shale* 1 0		
Black bituminous limestone, with *shells*..... 1 6		
Coal 0 6		
———	3	0
Gray argillo-arenaceous shale, with *stigmariæ ficoides* (*underclay*)	2	6
Greenish gray sandstone	4	0
Gray argillaceous shale	1	6
(From the top of the succeeding bed springs an upright *sigillaria* 10 inches in diameter; 2 feet, 6 inches of it are visible.)		
21. Coal and *carbonaceous shale* 0 3		
Gray argillaceous shale, with *stigmariæ* (*underclay*) 1 6		

			Ft.	In
Gray argillaceous sandstone, with *stigmariæ* (*underclay*)	7	0		
Gray argillaceous shale	4	0		
Coal	0	8		
			13	5
Gray argillaceous shale, witth *stigmariæ* (*underclay*).			2	0
Gray argillaceous sandstone, with *stigmariæ* (*underclay*)			3	0
Gray argillaceous shale			9	0
Greenish gray crumbly sandstone			1	0
Gray argillaceous shale			5	0
22. Coal and *carbonaceous shale*			0	2
Gray argillaceous shale, with *stigmariæ* (*underclay*).			1	0
Greenish gray agillaceous sandstone, with *stigmariæ* (*underclay*)			2	0
Greenish gray sandstone			3	0
(From the succeeding bed springs an upright *sigillaria* 4 inches in diameter; of it 5 feet are seen. On the beach there was a transverse slice of a *sigillaria* 1 foot 6 inches in diameter, with fragments of plants on the divisional surfaces.)				
Argillaceous shale			2	0
23. Carbonaceous shale, with some layers of argillaceous shale	4	0		
Coal and *carbonaceous shale*	0	4		
Bituminous limestone, with minute *shells* and *stigmariæ ficoides*	0	4		
Coal and *carbonaceous shale*	0	4		
			5	8
Gray argillo-arenaceous shale, witht *stigmariæ* (*underclay*)			1	0
Gray crumbly argillo-arenaceous shale, very like *underclay* in quality, but no *stigmariæ* visible			5	0

	Ft.	In.
Gray argillo-arenaceous shale, with *stigmariæ* (*under-*		
Gray sandstone	3	0
Gray crumbly argillo-arenaceous shale, or sandstone, with *stigmariæ* (*underclay*)	6	0

(From the top of the succeeding bed springs an upright *sigillaria*. Its roots spread out into the shale. It is coated with coal, and the material of the interior cast is not of uniform quality, being partly sandstone and partly shale. The shale occupies a transverse portion about 6 inches thick, and is rather less than half way up the stem, of which about 6 feet are visible, running into the underclay above. From the root of the plant, as if it had wound round or been pushed aside by the root, proceeds a *stigmaria* branch. It runs horizontally a short distance, and the turns up vertically. The leaves proceeding from the vertical portion, are not at right angles to the branch, but in part at least assume a vertical direction, and run parallel with it; those emanating from the groved side (in ordinary cases the under part or belly of the branch) taking a downward, and those from the back an upward course. The leaves issuing from the sides may be at right angles to the branch, and run horizontally into the bed, but being thus concealed they could not be traced. At first sight the stigmariæ branch had much the appearance of being a continuation of the root of the sigillaria, but close inspection shewed that the two, although touching, were distinct. The former rested on the latter nearly one-eighth of a circle, but being then suddenly cut off, it may when entire have wound much farther round, and the carbonaceous envelopes of the two plants were clearly discernible. See fig. 5 [of the original cuts.])

Gray argillaceous shale	10	0

	Ft.	In.
24. *Bituminous limestone,* with *shells* and *cone in cone* 1 0		
Coal and *carbonaceous shale* 0 1		
	1	1
Gray argillo-arenaceous shale, with *stigmariæ ficoides* (*underclay*)	2	0
Gray argillaceous shale	3	0
25. Coal and *carbonaceous shale*	0	8
Gray argillaceous shale, with *stigmariæ* (*underclay*).	2	0
Greenish gray sandstone, with *stigmariæ* leaves (*underclay*)	6	0
Greenish gray sandstone	9	0
Greenish gray sandstone and shale	4	0
Gray argillaceous shale, with *ironstone* balls.....	2	0
Greenish gray sandstone, with some beds of arenaceous shale	20	0
Gray argillaceous shale	2	0
Greenish gray sandstone	35	0
Gray argillaceous shale	10	0
Gray sandstone	7	0
(From the succeeding bed springs an upright *sigillaria* 1 foot 6 inches in diameter; it penetrates through the sandstone.)		
Gray argillaceous shale	2	0
Greenish gray sandstone	10	0
Gray argillaceous shale	2	0
26. *Carbonaceous shale*	0	4
Gray argillaceous shale, with *stigmariæ* (*underclay*)..	3	0
Gray crumbly sandstone, being probably argillaceous; it contains *stigmariæ* leaves (*underclay*).....	8	0
Gray argillaceous shale	2	0
27. Coal	0	3
Gray argillo-arenaceous shale, with *stigmariæ* leaves (*underclay*)	5	0

	Ft.	In.
Greenish gray sandstone, with shale dividing the beds; in the lower part is an upright *calamite* which springs from the succeeding bed	4	0
Gray argillaceous and arenaceous shale, witht *ironstone* balls and a few beds of sandstone	14	0
Greenish gray sandstone in 3 beds, divided by argillo-arenaceous shale	12	0
Gray argillaceous shale	3	0
Gray argillaceous shale, with *ironstone* balls and one course of sandstone	13	0
Greenish gray sasdstone	4	0
Gray argillaceous shale, with *ironstone* nodules	3	0
28. *Bituminous limestone* and *carbonaceous shale* in alternate layers of 1 to 3 inches, with *plants, shells* and *fish scales* — 6 0		
Coal and *carbonaceous shale* — not much coal — 3 0		
Coal and *carbonaceous shale*—a good deal of coal — 4 0		
— 7 0		
Gray argillo-arenaceous shale, with *stigmariæ* (*underclay*) — 4 0		
Carbonaceous shale — 1 0		
Coal — 0 6		
— 1 6		
—	18	6
Gray rough sandstone, with *stigmariæ* leaves (*underclay*)	3	0
Greenish gray argillaceous shale, with *ironstone* balls.	6	0
Gray sandstone	6	0
Greenish gray argillaceous shale with nodules of *ironstone* disseminated through it	7	0
Gray argillo-arenaceous shale, with *ironstone* balls and small seams of *coal*	7	0

			Ft.	In.
(From the succeeding bed rises an upright *sigillaria*; the roots spread on the top of it; the diameter of the plant is a foot; only 1 foot of the length is visible.)				
29. Coal and *carbonaceous shale*; the coal being a small seam on the top of the carbonaceous shale			2	0
Gray argillo-arenaceous shale, with *stigmariæ* and *ironstone* balls disseminated through it (*underclay*)			2	0
Coal	1	8		
Carbonaceous shale	0	3		
Coal	0	11		
Carbonaceous shale	0	4		
Coal	0	10		
			4	0
Gray argillo-arenaceous shale, with *stigmariæ* leaves crossing the bed (*underclay*)			8	0
Carbonaceous shale, gray argillo-arenaceous shale, with *stigmariæ* and small seams of *coal*			6	0
Coal and *carbonaceous shale*	0	6		
Gray argillaceous shale	0	6		
Coal	0	6		
			1	6
Gray argillaceous shale (*underclay?*)			0	10
Bituminous limestone, with *plants, shells* and *fish scales*			0	3
			24	7
Gray argillo-arenaceous shale, witth *ironstone* nodules and *stigmariæ* leaves (*underclay*)			7	0
Gray arenaceous shale and sandstone; the sandstone exhibits some *stigmariæ* leaves crossing it, and in the shale are *ironstone* nodules (*underclay*)			20	0
(From the succeeding bed rises an upright fluted stem (*sigillaria*) 10 inches in diameter, of which 12 feet are visible; and 2 upright *calamites*.)				

			Ft.	In.
Gray argillaceous shale with *ironstone* balls			6	0
30. Coal		0 4		
Dark gray argillaceous shale (*underclay?*)		2 0		
Coal and *carbonaceous shale*		0 2		
Coal		0 3		
Carbonaceous shale		0 6		
Coal		0 1		
			3	4
Gray soft clay (*underclay*)			2	0
Gray argillo-arenaceous shale and sandstone; the shale contains balls of *ironstone* at the bottom; there are *stigmariæ* leaves visible towards the top; towards the lower part of the bed of sandstone there is an upright *calamite* of 2 inches diameter, of which 18 inches are visible			15	0
Gray sandstone, with impressions of prostrate *sigillariæ* underneath			2	0
31. Coal and *carbonaceous shale*		1 0		
Gray argillo-arenaceous shale, with *stigmariæ* (*underclay*)		1 0		
Gray argillaceous shale with streaks *coal*	0 6			
Coal	0 2			
		0 8		
			2	8
Gray argillaceous shale, with *ironstone* balls and *stigmariæ* leaves (*underclay*)		9 0		
Bituminous limestone, with *stigmariæ, shells* and *fish scales*		0 2		
			9	2
Gray sandstone			1	0
Gray argillaceous shale, with *ironstone* balls			7	0
Gray sandstone			2	0
Gray argillaceous shale, with *ironstone* balls			4	0

	Ft.	In.
Gray sandstone	6	6
Gray argillaceous shale	4	0
32. Coal 0 8		
Carbonaceous shale 0 1		
Coal 0 8		
Carbonaceous shale 0 1		
Coal 0 4		
Carbonaceous shale 0 3		
Coal 0 1		
Carbonaceous shale 0 1		
Coal 0 1		
	2	4
Gray argillo-arenaceous shale, with *stigmariæ* (*underclay*)	4	0
Greenish gray argillo-arenaceous sandstone, with *stigmariæ ficoides* (*underclay*)	1	0
Greenish gray argillo-arenaceuos shale, with *stigmariæ* (*underclay*)	4	0
Greenish gray sandstone, with *stigmariæ* (*underclay*)	4	0
Greenish argillaceous shale	6	0
Reddish sandstone, with dividing bands of red shale of 3 inches to 1 foot	20	0
Reddish sandstone. The bed is of irregular thickness, the bottom swelling out suddenly in many places. The bed holds carbonized plants	2	0
(From the top of the succeeding bed there springs an upright *sigillaria*. Two feet of the length is seen, but it is cut clean off at the top and at the bottom by the measures, which pass both without disturbance. See fig. 6 [of original cuts.])		
Red argillaceous shale	5	0
Reddish arenaceous shale, with thin bands of sandstone	3	0
Reddish and greenish sandstone	4	0
Red and green arenaceous shale with *ironstone balls*, some bands of sandstone	25	0

	Ft.	In.
Red and green sandstone	12	0
Reddish and greenish argillaceous shale, loaded with *ironstone* balls, and having bands of sandstone	10	0
Reddish and greenish sandstone	10	0
Red and green argillaceous shale, loaded with *ironstone* nodules	10	0
Red and green sandstone	5	0
Greenish gray argillaceous shale	15	0
Greenish gray sandstone	2	0
(From the succeeding bed there starts an upright *sigillaria* 4 inches in diameter; it is planted 2 feet in it, penetrates the sandstone above, being 4 feet in length altogether.)		
Greenish gray argillaceous shale	6	0
33. *Carbonaceous shale* 1 0		
Coal 0 1		
	1	1
Grenish gray argillaceous shale, with *stigmariæ* leaves (*underclay*)	4	0
Red and gray sandstone, with arenacous shale	7	0
Red argillaceous shale, with a band of sandstone	4	0
Red sandstone, with bands of red arenaceous shale	10	0
Red and green argillaceous shale	20	0
Reddish sandstone	1	0
Red and green argillaceous shale	3	0
Reddish sandstone in uneven layers, with reddish bands of arenaceous shale	18	0
Red and green argillaceous shale	18	0
Reddish sandstone	2	0
Red arenaceous shale	3	0
Red and green argillaceous shale	4	0
Reddish sandstone	1	0
Red and green arenaceous shale	4	0
Reddish sandstone	1	0

	Ft.	In.
Red and green arenaceous shale	7	0
Reddish sandstone	1	0
Red argillaceous shale	3	0
Red and green argillaceous shale, with bands of sandstone	25	0
Red sandstone	1	0
Red and green shale, with bands of sandstone	12	0
Red and green sandstone	4	0
Red and green argillaceous shale, with bands of reddish sandstone	15	0
Red and green sandstone and shale	3	0
Red or chocolate coloured shale, with large balls of red argillaceous *ironstone*	12	0
Red and green sandstone, separated by bands of red and green argillaceous shale of about 1 foot each	30	0
Red or chocolate coloured argillaceous shale, with some balls of red argillaceous *ironstone*	12	0
Reddish sandstone	4	0
Red argillaceous shale	1	6
Red sandstone	2	0
Red argillaceous shale	2	0
Reddish sandstone	1	0
Red argillaceous shale, with a band of sandstone	12	0
Gray sandstone with *ironstone* nodules and *stigmariæ* leaves (*underclay*)	10	0
(From the succeeding bed rises 2 upright *sigillariæ*. The roots of one of them spread out just on the top of the bed, and 2 feet of the plant are visible. The roots of the other spread out likewise, but they sink deeper into the shale by 2 feet, and the plant penetrates further into the superincumbent sandstone. See fig. 7 [of the original cuts.])		
Red and gray variegated shale, with small balls of *ironstone* and *stigmariæ* (*underclay*)	28	0

	Ft.	In.
Gray sandstone	2	0
Greenish shale, with *ironstone* balls and *stigmariæ ficoides* (*underclay*)	4	0
34. *Carbonaceous shale* and *coal*	0	2
Greenish gray argillaceous shale, with *ironstone* balls and *stigmariæ* branches and leaves; one of the branches replaced by ironstone, is 8 feet long	4	0
Carbonaceous shale	0	2
	4	4
Gray argillo-arenaceous shale, with black streaks and *stigmariæ* (*underclay*)	3	0
Gray sandstone, with *stigmariæ* (*understone*)	0	10
Red and green argillaceous shale, with *stigmariæ* (*underclay*)	4	0
Gray crumbly sandstone	3	0
Gray argillo-arenaceous shale, with *stigmariæ* (*underclay*)	3	0
35. *Carbonaceous shale*	0	3
Red and green argillaceous shale, with *stigmariæ* leaves at the top (*underclay*)	6	0
Argillaceous *ironstone* in a bed	0	6
Red and green argillaceous shale	1	0
Gray sandstone, with *stigmariæ* leaves (*underclay*)	1	0
Greenish gray argillaceous shale, with dark bands; argillaceous iron ore nodules abound, and towards the top *stigmariæ* branches and leaves are visible (*underclay*)	28	0
Greenish gray crumbly sandstone	8	0
Gray argillaceous shale, with *ironstone* balls. In this there is visible an upright stem (*sigillaria*), 1 foot in diameter; the top only is visible, and it is at the top of the bed	12	0

			Ft.	In.
36. *Black bituminous limestone,* with branches and leaves of *stigmariæ* well marked and very minute *shells*	1	3		
Carbonaceous shale and streaks of *coal*	0	3		
			1	6
Red argillaceous shale, with *ironstone* (*underclay?*)			4	0
Gray argillo-arenaceous shale, with *stigmariæ* and *ironstone* balls (*underclay*)			6	0
Gray argillaceous shale, with *ironstone* balls			5	0
Gray arenaceous shale			2	0
Gray argillaceous shale			5	0
37. *Dark bituminous limestone,* with shells replaced by pyrites	0	3		
Coal and *carbonaceous shale*	0	10		
Gray argillaceous shale, *stigmariæ* (*underclay*)	1	6		
Coal	0	6		
Gray argillaceous shale, with *stigmariæ* (*underclay*)	1	0		
Dark bituminous limestone, with *stigmariæ* branches and leaves, and also *shells*	0	3		
Gray argillaceous shale	0	3		
Coal	1	0		
			5	7
Gray argillaceous shale of a crumbly character, with *ironstone* balls and *stigmariæ* (*underclay*)			6	0
Greenish gray rough sandstone			4	0
Dark gray argillaceous shale, with *ironstone* balls			7	0
Greenish gray sandstone			1	0
Red argillaceous shale			4	0
Greenish gray sandstone			2	0
Red argillaceous shale, with *ironstone* balls			8	0
Red and green sandstone, with bands of red argillaceous shale under 8 inches thick			6	0

	Ft.	In.
Red argillaceous shale, with bands of sandstone under 8 inches thick	20	0
Reddish sandstone, hard	1	0
Red argillaceous shale, with balls of *ironstone*	4	0
Reddish sandstone, hard	0	3
Green argillaceous shale	0	6
Greenish gray sandstone, with carbonized fragments of drift plants	1	0
Dark gray argillaceous shale, with a red band near the top	10	0
38. Coal 0 1		
Black bituminous limestone, with *shells* and *plants, stigmariæ* branches and leaves.... 0 6		
Coal 0 2		
	0	9
Red argillaceous shale, studded with *ironstone* balls; *stigmariæ* not visible (*underclay?*)	10	0
Reddish sandstone	2	0
Green arenaceous shale, with red argillaceous bands	15	0
Red and green sandstone	2	0
Red argillaceous shale	1	0
Green arenaceous shale	1	0
Red argillaceous shale	3	0
Green arenaceous shale	1	0
Red argillaceous shale	5	0
Gray bituminous limestone, with *minute shells*	0	6
Red argillaceous shale, with *ironstone* balls	11	0
Green and dark gray argillaceous shale, with *ironstone* balls	14	0
Red and green argillaceous shale, with *ironstone* balls; in this are some dark bands of shale	25	0
Greenish gray sandstone, with a confused mass of carbonized drift plants	10	0
Greenish gray sandstone	2	6
Red argillaceous shale, with a band of sandstone	2	0

			Ft.	In.
Gray and black shale			3	0
Carbonaceous shale			1	0
Red and green argillaceous shale, studded with *ironstone* balls; no *stigmariæ* visible (*underclay?*)			15	0
39. Coal	0	0½		
Gray argillaceous shale, with *stigmariæ*	0	6		
Dark gray limestone, with *stigmariæ* branches and leaves, and minute shells	0	4		
			0	10½
Red and green argillaceous shale, with *stigmariæ* leaves (*underclay*)			1	6
Red and green sandstone			1	0
Red argillaceous shale, with some green and gray bands; the whole containing thin bands of sandstone			18	0
Greenish gray sandstone			8	0
Dark red and green argillaceous shale, studded with *ironstone* balls			15	0
Gray hard argillaceous sandstone			1	0
Dark gray argillaceous shale, with *ironstone* balls in considerable number, with some red argillaceous beds			20	0
40. *Black bituminous limestone,* with *shells.*	0	1½		
Carbonaceous shale	0	0½		
Black bituminous limestone, with *shells*	0	1		
Gray argillaceous shale	0	2		
Black bituminous limestone, with *shells*	0	2		
Gray argillaceous shale, with *ironstone* balls (*underclay?*)	1	0		
Coal	0	1		
Carbonaceous shale, with thin seams of *coal*	0	3		
Gray argillo-arenaceous shale, with *stigmariæ ficoides* (*underclay*)	1	0		
Black bituminous limestone, with *shells* and *stigmariæ*	0	6		
Carbonaceous shale and thin *laminæ* of *coal*	0	2		
			3	7

			Ft.	In.
Green argillaceous shale, with many coarse nodules of clay *ironstone*, all small, and impressions of *stigmariæ* leaves crossing the bed (*underclay*)			5	0
41. *Black calcareo-bituminous shale* with *shells*	0	8		
Black calcareo-bituminous shale, more calcareous, with *shells*	0	2		
Black calcareo-bituminous shale, less calcareous, with *shells*	1	0		
Carbonaceous shale, with *laminæ* of *coal*	1	6		
Gray argillaceous shale, with *stigmariæ* (*underclay*)	3	0		
Carbonaceous shale	0	1		
			6	5
Gray argillaceous shale, with *stigmariæ* (*underclay*)			2	0
Greenish gray argillo-arenaceous shale, in alternate hard and soft layers, with *stigmariæ* leaves (*underclay*)			2	6
Greenish gray sandstone			2	0
Dark gray argillaceous shale, studded with *ironstone* nodules			4	0
42. *Carbonaceous shale*	0	7		
Black bituminous limestone, with *shells* replaced by pyrites	0	2		
Coal	0	3		
Carbonaceous shale	1	0		
Coal	1	0		
Gray argillaceous shale, with *stigmariæ* (*underclay*)	1	0		
Coal	0	2		
			4	2
Dark gray argillaceous shale, with *stigmariæ* (*underclay*)			5	0
Red argillaceous shale, with some green bands, and studded with *ironstone* balls			25	0
Reddish sandstone			1	0

			Ft.	In
Red argillaceous shale, with *stigmariæ* (*underclay*)			4	0
43. *Carbonaceous shale*			0	1
Red shale, with *stigmariæ* (*underclay*)	0	3		
Gray sandstone, very hard, (*ganister,* as the Lancashire miners call it), with *stigmariæ*	0	8		
Red argillaceous shale, with *stigmariæ* (*underclay*)	3	0		
Gray sandstone, very hard, with *stigmariæ* (*ganister* or *understone*)	0	10		
Gray argillaceous shale, with *stigmariæ* (*underclay*)	0	10		
Gray sandstone, very hard, with *stigmariæ* (*understone*)	1	0		
Gray sandstone, very hard, with *stigmariæ* leaves running across the bed, (*ganister* or *understone*)	2	0		
			8	7
Red argillaceous shale, green at the bottom			15	0
Gray arenaceous and argillaceous shale, with greenish gray sandstone containing prostrate carbonized plants			12	0
(Into this bed penetrate several upright *calamites* which start from the one subjacent, on the top of which one 3 inches in diameter is seen to spread its roots, and 21 more are visible along the face of the bank in the space of 20 yards; their diameters vary from ½ inch to 4 inches.)				
Dark gray argillaceous shale			2	0
Gray sandstone			1	0
Dark gray argillaceous shale			15	0
Gray sandstone			0	4
Dark gray argillaceous shale, with *ironstone* balls and bands of sandstone			4	0
Dark gray argillaceous shale, with *ironstone* balls			5	0

			Ft	In.
44. *Carbonaceous shale*	1	6		
Dark gray argillaceous shale	2	0		
Carbonaceous shale, with *ironstone* balls	0	4		
Dark gray argillaceous shale, with *ironstone* balls	6	0		
Black bituminous limestone, with *shells*	0	1½		
Dark green argillaceous shale	0	1½		
Coal	0	0½		
Black bituminous limestone with plants and minute *shells*	0	0½		
Coal	0	5		
Black bituminous limestone, with *stigmariæ* and other plants	0	2		
Coal	0	1		
Black bituminous limestone, with *stigmariæ* branches and leaves, and fragments of other plants	0	2		
Coal	0	0½		
			11	0½
Gray crumbly argillo-arenaceous shale, with indistinct *stigmariæ leaves* (*underclay*)			3	0
Red and green crumbly argillaceous shale (*underclay*)			10	0
Red and green sandstone			5	0
Red or chocolate coloured argillaceous shale			1	6
Reddish sandstone			1	0
Red or chocolate coloured argillaceous shale			1	0
Greenish gray sandstone			9	0
Red argillaceous shale, with thin green beds and some patches of sandstone			40	0
Red shale, with a considerable number of small beds of sandstone			6	0
Greenish gray sandstone, with upright *calamites* about 2 inches in diameter; some of them are traceable for 4 feet in the upper part of the bed; 6 of them are visible; the top of the bed is reddish in colour			10	0

			Ft.	In.
Red argillaceous shale, studded with *ironstone* balls..			10	0
Gray hard argillo-arenaceous shale, with *stigmariæ* (*underclay*)			1	0
Red argillaceous shale			1	0
45. *Carbonaceous shale*	0	10		
Coaly matter	0	0½		
Gray hard argillo-arenaceous stone, with *stigmariæ* (*underclay*)	2	0		
Coaly matter	0	0½		
Green argillaceous shale, with *stigmariæ* (*underclay*)	7	0		
Coal	0	3		
			10	2
Greenish gray arenaceous shale with *stigmariæ* (*underclay*)	3	0		
Red arenaceous and argillaceous shale, with sandstone	2	0		
Red sandstone of a soft quality	0	6		
	2539	1		

RECAPITULATION.

Coal in 45 seams	37	9½		
Carbonaceous shale associated with the above coal seams, and in one instance without coal	36	4		
Gray argillaceous shale interstratified with the coal seams in 8 cases, in two of which the shale is 1 foot and upwards thick without exhibiting any remains of stigmariæ	4	4½		
Black and grey bituminous limestone touching the coal and carbonaceous shale, often interstratified and containing the remains of fishes, shells and occasionally stigmariæ. In one instance the limestone has no coal with it; in 16 cases it is associted with the coal seams	23	3		
			101	9

			Ft.	In.
Underclay or understone, being beds of various materials, immediately subjacent to the seams of coal and carbonaceous shale and bituminous limestone, and invariably penetrated by the recumbent branches or radiating leaves of the stigmariæ ficoides. Every one of the seams of coal and carbonaceous shale rests upon a stigmaria bed, with the exception of one instance, where 4 feet of gray argillaceous shale, destitute of the plant, is interposed between the stigmariæ bed and the coal, and one instance where the stigmariæ are doubtful. There are twelve instances of stigmariæ beds without superincumbent coal. The material constituting the stigmariæ beds is as follows:				
Ganister, a hard silicious stone			4	6
Sandstone—				
Gray and crumbly, sometimes a doubtful fireclay	72	10		
Greenish gray	4	0		
			76	10
Arenaceous shale, fit for fire clay—				
Gray	189	0		
Greenish gray	25	6		
Red	6	0		
			220	6
Argillaceous shale, sometimes fit for fireclay—				
Gray	99	4		
Greenish gray	28	0		
Green	12	10		
Red and green	45	0		
Red	17	3		
	202	5		
			504	3

	Ft.	In.		
Sandstone—				
Gray in colour, and much of it of a crumbly nature, resembling the quality in which the remains of stigmariæ are found	259	2		
Greenish	4	6		
Greenish gray or drab coloured, some of it fit for grindstones, and patches of it containing carbonized drift plants	232	6		
Red and green, less durable in quality than the drab coloured stone.	69	0		
Reddish, similar to the preceding in durability	67	3		
Red or chocolate coloured, easily yielding to the influence of weather	15	6		
			647	11
Shale—Arenaceous—				
Gray	91	0		
Gray, with ironstone balls	13	0		
			104	0
Greenish gray	5	0		
Green	18	6		
Reddish	15	8		
Red and green	42	0		
Red and green, with iron stone balls	4	0		
			46	0
			189	2
Shale—Argillaceous—				
Gray	224	8		
Gray, with ironstone balls	199	4		
			424	0

	Ft.	In.
Greenish gray 32 0		
Greenish gray, with ironstone balls 17 0		
——— 49 0		
Green 38 6		
Red and green.....153 6		
Red and green, with ironstone balls 118 6		
———272 0		
Red or chocolate coloured ..230 6		
Red or chocolate coloured, ironstone balls 82 0		
———312 6		
———1096 0		
———2539	1	

(Among the organic remains visible, are to be enumerated 15 upright sigillariæ and 56 upright calamites.)

5

Red argillaceous shale, with *ironstone* balls	6	0
Red arenaceous shale	2	0
Red argillaceous shale, with beds of arenaceous shale..	16	0
Red sandstone	1	0
Red argillaceous shale	22	0
Red sandstone	1	0
Red argillaceous shale	7	0
Red argillaceous shale, with a bed of sandstone	38	0
Red sandstone	1	0
Red argillaceous shale, with a bed of red sandstone....	50	0
Measures concealed, but supposed to be red shale and sandstone	19	0
Red sandstone	1	0

	Ft.	In.
Measures concealed, (red shale and sandstone?)	33	0
Greenish gray soft sandstone, with fragments of plants carbonized	3	0
Measures concealed	32	0
Measures concealed, (red shale and sandstone?), a bed of sandstone at the top	39	0
Greenish gray sandstone	3	0
Measures concealed, (red shale and sandstone?)	19	0
Measures concealed, (red shale and sandstone?) a bed of red sandstone at the top	50	0
Red sandstone	30	0
Measures concealed, (red shale?)	3	0
Red sandstone	1	0
Measures concealed, (red shale and sandstone?)	40	0
Red shale, with some red sandstone	33	0
Measures concealed, (red shale and sandstone?)	30	0
Reddish gray sandstone	5	0
Measures concealed	3	0
Red and gray sandstone of a soft quality	32	0
Red arenaceous shale and sandstone	6	0
Reddish gray sandstone of a soft quality	6	0
Red argillaceous and arenaceous shale	20	0
Red sandstone	2	0
Red argillaceous shale	25	0
Red sandstone	2	0
Red argillaceous and arenaceous shale	12	0
Red sandstone and shale	8	0
Red shale and sandstone	54	0
Measures concealed, (red shale?)	12	0
Measures concealed, (red sandstone and shale?)	3	0
Measures concealed, (red shale?)	28	0
Red shale and sandstone	11	0
Red sandstone	2	0
Measures concealed, but supposed to be red shale	6	0

	Ft.	In.
Measures concealed, but supposed to be red sandstone.	12	0
Measures concealed, but supposed to be red shale.....	138	0
Red arenaceous shale, with some beds of red sandstone.	12	0
Red arenaceous shale, with some beds of red sandstone.	43	0
Red sandstone	17	0
Red arenaceous shale	14	0
Measures concealed	30	0
Red sandstone	6	0
Measures concealed, but supposed to be red shale and sandstone	6	0
Reddish gray sandstone	9	0
Measures concealed, but supposed to be red shale and sandstone	5	0
Red sandstone	2	0
Measures concealed, but supposed to be red sandstone.	44	0
Red shale and sandstone	12	0
Measures concealed, but supposed to be red shale and sandstone	33	0
Red argillaceous and arenaceous shale, with some beds of red sandstone	132	0
Red sandstone	3	0
Red arenaceous shale and sandstone	17	0
Greenish gray sandstone, with patches of concretionary limestone	13	0
Red argillaceous and arenaceous shale	51	0
Reddish sandstone	17	0
Measures concealed	37	0
Reddish green sandstone	24	0
Measures concealed	17	0
Reddish gray sandstone	18	0
Measures concealed	19	0
Reddish sandstone	5	0
Measures concealed, probably red shale	73	0
Reddish gray sandstone, soft, with fragments of plants carbonized	22	0

	Ft.	In.
Measures concealed, but supposed to be red shale	37	0
Red and green sandstone, with probably some patches of concretionary limestone	37	0
Red argillaceous and arenaceous shale, with bands of sandstone	38	0
Red sandstone	2	0
Red argillaceous and arenaceous shale, with bands of sandstone	18	0
Red sandstone	3	0
Red argillaceous shale	1	0
Greenish gray sandstone	9	0
Green argillaceous shale	2	0
Greenish gray sandstone	5	0
Red argillaceous and arenaceous shale, with some beds of red sandstone	50	0
Greenish gray sandstone	7	0
Greenish gray sandstone, with concretions of limestone giving it much the appearance of a conglomerate ...	1	0
Red argillaceous shale	1	0
Red and green sandstone	6	0
Green shale	2	0
Greenish gray sandstone	1	0
Grenish gray sandstone, with many calcareous concretions, giving it much the appearance of a conglomerate	6	0
Red arenaceous and argillaceous shale, with some beds of sandstone	17	0
Red argillaceous shale and sandstone	16	0
Red arenaceous and argillaceous shale, with some sandstone	8	0
Red argillaceous shale	6	0
Red arenaceous shale, with some bands of sandstone..	6	0
Red sandstone	12	0
Red argillaceous shale	1	0
Red sandstone	1	0

	Ft.	In.
Red argillaceous and arenaceous shale, with a two feet bed of sandstone	29	0
Red sandstone, thinning off and replaced by red shale.	5	0
Red argillaceous shale	5	0
Red sandstone	2	0
Red argillaceous shale	3	0
Red arenaceous shale	1	0
Red argillaceous shale	3	0
Red arenaceous shale and sandstone	3	0
Red argillaceous shale	22	0
Reddish sandstone	7	0
Reddish sandstone with a one foot bed, having calcareous concretionary nodules, and resembling a conglomerate, with carbonized plants on the top	16	0
Red argillaceous and arenaceous shale	20	0
Red sandstone	8	0
Red arenaceous shale and argillaceous shale	12	0
Red sandstone and shale, half of each	12	0
Red argillaceous shale	5	0
Red arenaceous shale	1	0
Red sandstone	5	0
Red arenaceous shale	7	0
Red sandstone	3	0
Red arenaceous shale	3	0
Red sandstone	2	0
Red argillaceous shale	8	0
Red sandstone	1	0
Red arenaceous shale	5	0
Red sandstone	1	0
Red argillaceous shale	6	0
Red sandstone	1	0
Red argillaceous shale	28	0
Red arenaceous shale	2	0
Red argillaceous shale	15	0
	2082	0

RECAPITULATION.

			Ft.	In.
Sandstone—				
Greenish gray, with occasional drift plants carbonized	28	0		
Greenish gray, with concretionary limestone, having the aspect of conglomerate	20	0		
		48	0	
Reddish gray, with occasional drift plants carbonized	104	0		
Reddish gray, with concretionary limestone	16	0		
		120	0	
Shale—				
Red argillaceous	640	0		
Red arenaceous	230	0		
		870	0	
Green argillaceous	4	0		
		874	0	
Measures not well exposed, but probably composed of red shale and sandstone	740	0		
			2082	0

6

Greenish gray or drab coloured sandstone, fit for grindstones of good quality, which are extensively quarried from it. This is called the SOUTH REEF.	50	0
Red argillaceous shale	14	0
Red sandstone	20	0
Measures concealed, probably red shale	2	0
Red sandstone	3	0
Red sandstone, with probably red shale on the top	7	0

	Ft.	In.
Measures concealed, but said to be red argillaceous and arenaceous shale, with occasional beds of red sandstone	103	0
Dark gray argillaceous shale, with a small quantity of fine grit in it. This would be called a fine *bluestone* in some parts of South Wales. At the Joggins, there is usually a bed of it above a good grindstone reef..	4	0
Greenish gray or drab coloured sandstone, fit for grindstones of the very best quality. The whole reef has been quarried away up to the bank	36	0
Greenish gray sandstone, fit for grindstones of good quality. This has been much quarried	17	0
Greenish gray sandstone, fit for grindstones. This has been very much quarried	7	0
Greenish gray sandstone, fit for grindstones. This and the preceding greenish gray sandstones constitute what is called the NORTH REEF	9	0
Red and green argillaceous shale	18	0
Red sandstone of a soft quality	6	0
Red argillaceous shale	14	0
Red argillaceous and arenaceous shale, with 6 bands of red sandstone	27	0
Greenish gray sandstone	7	0
Red argillaceous shale	6	0
Red sandstone	4	0
Red arenaceous shale	4	0
Red argillaceous and arenaceous shale	10	0
Red argillaceous and arenaceous shale and red sandstone, in alternating beds	12	0
Red argillaceous shale, with 2 small beds of red sandstone	21	0
Red sandstone, with bands of red argillaceous shale...	9	0
Red arenaceous shale, with bands of red sandstone....	6	0
Red sandstone	1	0

	Ft.	In.
Red argillo-arenaceous shale, with thin bands of red arenaceous shale and red sandstone	30	0
Black calcareous bed, no shells visible	0	1
Red and green variegated argillaceous shale	6	0
Green arenaceous shale	1	0
Red arenaceous and argillaceous shale, in alternating beds	4	0
Red argillaceous shale	6	0
Reddish gray sandstone	6	0
Red argillaceous and arenaceous shale	10	0
Red and green variegated shale and sandstone	15	0
Red and green argillaceous shale	4	0
Red and green variegated sandstone	2	0
Red argillaceous shale	12	0
Red and green calcareous band	0	6
Green arenaceous shale, mixed in patches with red arenaceous shale	9	0
Red arenaceous shale of a crumbly character	12	0
Dark gray argillaceous shale, with *ironstone* balls	5	0
1. *Calcareous* shale 1 0		
Dark gray argillaceous shale 3 0		
Coaly clay 0 2		
	4	2
Reddish and dark gray argillaceous and arenaceous shale, crossed by *stigmariæ* leaves (*underclay*)	6	0
Gray argillaceous shale	2	0
Dark gray argillo-arenaceous shale, of a fine smooth quality (*bluestone*)	7	0
Greenish gray or drab coloured sandstone, fit for grindstones	10	0
Gray arenaceous shale of a fine quality, in even beds	8	0
Dark gray argillo-arenaceous shale, of a fine smooth quality, such as usually covers grindstone beds	3	0

	Ft.	In.
Greenish gray sandstone, fit for grindstones. The top part contains large spherical concretions of harder sandstone, with a rusty exterior, and concentric variations of colour. This constitutes BACON LEDGE	54	0
Greenish gray sandstone, with a vast number of drift plants with a coating of coal. It holds also patches of limestone concretions, which have much the aspect of a conglomerate	10	0
Dirty green calcareous concretionary bed. This has so much the appearance of a conglomerate bed with limestone pebbles, that there is some doubt whether it be not so. It is a very irregular bed and holds carbonized plants	4	0
Reddish green argillo-arenaceous shale	1	0
Greenish arenaceous shale of a hard quality, probably fireclay, crossed by *stigmariæ* leaves (*underclay*) ...	8	0
Red and green variegated argillaceous shale, with 2 feet of sandstone	8	0
Red arenaceous shale with green spots	5	0
Green arenaceous shale	1	0
Red arenaceous shale	1	0
Green arenaceous shale	1	0
Red argillaceous shale	2	0
Red and green arenaceous shale	2	0
Red argillaceous shale	1	0
Greenish gray arenaceous shale	3	0
Red and green arenaceous shale	2	0
Red argillaceous shale	3	0
Greenish gray arenaceous shale	4	0
Green clay	0	1
Red argillaceous shale	6	0
Reddish sandstone	1	0
Red argillaceous shale	5	0
Gray argillaceous shale	2	0

	Ft.	In.
2. Coaly clay, probably coal further in the bank	0	1
Red and green argillo-arenaceous shale of a soft quality, crossed by *stigmariæ* leaves (*underclay*)	3	0
Red and green crumbly argillo-arenaceous shale, rather harder than the preceding, crossed by *stigmariæ* leaves (*underclay*)	6	0
Reddish sandstone, no *stigmariæ* visible	0	6
Red crumbly argillo-arenaceous shale, with *stigmariæ* (*underclay*)	2	0
Red argillo-arenaceous shale of a tough crumbly nature, with *stigmariæ* strongly marked (*underclay*)	2	0
Red argillaceous shale, with thin green bands and nodules of *ironstone*, a tough, crumbly mass	6	0
3. *Carbonaceous shale* 0 1		
Greenish argillaceous shale 0 6		
Carbonaceous shale 0 1		
Greenish argillaceous shale 2 6		
Carbonaceous shale 0 3		
Greenish argillaceous shale in thin leaves .. 0 1		
Coaly matter and *carbonaceous shale* 0 3		
	3	9
Green argillo-arenaceous shale of a soft quality, crossed by *stigmariæ* leaves (*underclay*)	3	0
Gray argillo-arenaceous shale, rather harder than the preceding, with *stigmariæ* leaves and many nodules of *ironstone* at the top where the bed is more arenaceous (*underclay*)	4	0
Gray sandstone, with *stigmariæ* leaves (*underclay*)..	1	0
Green argillo-arenaceous shale of a rather soft quality, with *stigmariæ* leaves (*underclay*)	4	0
4. Coal and *carbonaceous shale*	0	3
Green argillo-arenaceous shale, with *stigmariæ* leaves (*underclay*)	2	0
Red and green tough crumbly arenaceous shale, with *stigmariæ* branches and leaves (*underclay*)	2	0

	Ft.	In.
Red and green tough crumbly claystone, with balls of *argillaceous iron ore, stigmariæ* leaves crossing the bed (*underclay*)	2	0
Gray rough sandstone and tough crumbly red and green arenaceous shale; one *stigmariæ* branch visible without leaves, but leaves exist in other parts of the bed (*underclay*)	4	0
Red and green tough crumbly clay, some very like *underclay,* but no *stigmariæ* leaves visible	2	0
Dark gray argillaceous shale, no *stigmariæ* visible, but the mass tough and crumbly	1	0
Reddish argillo-arenaceous shale, with *stigmariæ* branches and leaves (*underclay*)	2	0
Red sandstone with green spots	3	0
Red and green variegated sandstone, the green in spots	3	0
Gray argillaceous shale	3	0
5. Coaly matter	0	0⅛
Greenish arenaceous shale, with *stigmariæ* branches and leaves, the recumbent branches crossing one another and running in all directions (*underclay*)	8	0
Green sandstone	2	0
(From the succeeding bed there starts an upright *sigillaria* about 1 foot in diameter, only 2 feet of the length are visible.)		
6. *Carbonaceous shale*	0	3
Gray argillo-arenaceous shale, with *stigmariæ* leaves (*underclay*)	6	0
Greenish gray sandstone, with *stigmaræ* leaves (*underclay*)	4	0
Greenish gray sandstone, with *stigmariæ* branches and leaves (*underclay*)	2	0
Red argillo-arenaceous shale, with *stigmariæ* leaves (*underclay*)	3	0

	Ft	In.
(In these 15 feet of underclay there is a beautiful exhibition of stigmariæ. They are not very abundant, that is to say, in such profuse confusion as usual, but each plant is very distinct. One branch floats along just beneath the surface of the 2 feet bed mentioned, and 24 feet of its length are finely exposed without interruption. The leaves radiate from it distinctly, and individual leaves can be followed down 5 feet, crossing both the hard and the soft parts of the deposit continuously, and others can be traced 2 feet upwards. Where the branch enters a projecting part of the bed, its measurement is 2 inches vertically by 3 inches horizontally, and where the other extremity is lost beneath the beach the measurement is about the same, so that I could not come to any conclusion as to the direction in which the branch issues from the stem, if it has one. See fig. 8 [of the original cuts.])		
Greenish gray or drab sandstone in irregular beds ...	70	0
Greenish gray sandstone, with a vast quantity of drift plants lying in confusion and coated with coal. In one of the beds there appears a bundle of no less 10 plants squeezed together side by side, as represented in fig. 8 [of the original cuts.] Each has a core of sandstone surrounded by a good thick coating of crystallized coal. They run through and through a projecting ledge of 10 feet (see fig. 9 [of the original cuts]), and lie rather oblique to the plane of the bed, but conformably with its elementary layers....	30	0
Greenish gray sandstone, with some spherical concretions of a harder quality, with a rusty exterior	50	0
Greenish gray sandstone	22	0
Dark gray argillaceous shale	0	6

	Ft.	In.
Greenish gray arenaceous shale, with some fibrous impressions like *stigmariæ* leaves crossing the bed (*underclay*)	2	0
Red argillaceous shale	0	6
Greenish gray arenaceous shale	0	6
Red argillaceous shale	2	0
Green arenaceous shale	2	0
Greenish gray sandstone, with spherical concretions	4	0
Greenish gray sandstone and shale	5	0
Greenish gray sandstone	1	0
Gray argillaceous shale	0	10
Gray rough crumbly sandstone	5	0
Gray calcareous sandstone	0	6
7. *Bituminous limestone* 0 3		
Gray argillaceous shale 3 0		
Gray calcareous bed 0 2		
Carbonaceous shale 0 6		
Bituminous limestone, with *shells* and *fish scales; fish jaws* occur 0 3		
Carbonaceous shale, being a mass of platted plants, apparently grasses 1 0		
Coal 0 1		
	5	3
Gray argillo- arenaceous shale, with *stigmariæ* (*underclay*)	5	0
Gray arenaceous shale	5	0
Greenish gray sandstone	7	0
Gray arenaceous shale	2	0
Greenish gray sandstone	1	0
Gray arenaceous shale	2	6
Greenish gray sandstone	0	6
Gray soft arenaceous shale	4	0
Greenish gray soft flaggy sandstone, with ripple mark.	10	0
Greenish gray soft flaggy sandstone	4	0

	Ft	In.
Gray arenaceous shale	4	0
Greenish gray sandstone	4	0
Greenish gray soft flaggy sandstone, scarcely standing the weather	14	0
Greenish gray sandstone, in regular beds	27	0
Measures concealed, but no doubt soft, probably argillaceous shale, with a mixture of arenaceous	100	0
Gray arenaceous shale	8	0
Gray argillaceous shale	6	0
Greenish gray sandstone, fit for grindstones. This has been quarried to a considerable extent, and worked deep into the bank. It is the best quarry of this reef, but the stone is rather too hard	10	0
Greenish gray sandstone of grindstone quality	6	0
Greenish gray sandstone. This has been worked for grindstones, but the quality is rather hard	14	0
Greenish gray sandstone fit for grindstones, but rather too hard. This bed exhibits spherical concretions in some parts, some of which are 6 to 8 inches in diameter. These grindstone beds constitute what is called the UPPER COVE REEF	18	0
Greenish gray sandstone	34	0
Greenish gray sandstone in flaggy beds	49	0
Greenish gray sandstone of a stronger quality	8	0
Greenish gray sandstone in flaggy beds	15	0
Greenish gray sandstone	34	0
Greenish gray argillaceous shale	9	0
Greenish gray sandstone. This constitutes BOSS POINT	42	0
Greenish gray sandstone	6	0
Greenish gray sandstone, with drift plants coated with coal	12	0
Greenish gray sandstone in regular beds	28	0
Greenish gray sandstone, with carbonized drift plants	7	0

	Ft.	In.
Greenish gray sandstone in more regular beds	9	0
Greenish gray sandstone, with drift carbonized plants.	9	0
Greenish gray sandstone, pervaded by a tangled mass of carbonized drift plants	6	0
Greenish gray sandstone	12	0
Gray argillaceous shale	1	0
8. Coal occurring in patches	0	0½
Gray argillo-arenaceous shale, with the aspect of fire-clay, with *stigmariæ* branches and leaves very distinctly exhibited (*underclay*)	7	0
Gray arenaceous shale	3	0
Greenish gray argillaceous shale, with nodules of *clay ironstone* disseminated in considerable quantity	5	0
Gray argillaceous shale	10	0
Greenish gray sandstone	18	0
Greenish gray sandstone, with carbonized drift plants in confusion	7	0
Greenish gray sandstone	10	0
Greenish gray sandstone, with carbonized drift plants in confusion	4	0
Greenish gray sandstone	7	0
Greenish gray sandstone, with carbonized drift plants in confusion	3	0
Greenish gray sandstone	15	0
Greenish gray sandstone, with spherical concretions of a harder qualit y	7	0
Greenish gray sandstone, with a few carbonized drift plants	18	0
Gray arenaceous shale	2	0
Greenish gray sandstone	12	0
Greenish gray sandstone, with a confused multitude of carbonized drift plants	4	0
Greenish gray sandstone, with a few carbonized drift plants	21	0

	Ft.	In.
Greenish sandstone, with calcareous concretionary nodules, having much the aspect of a conglomerate, with limestone pebbles. The bed is very uneven ...	1	0
Greenish gray sandstone, with carbonized drift plants	13	0
Greenish gray sandstone, in even beds	12	0
Greenish gray sandstone, with carbonized drift plants	10	0
Greenish gray sandstone	51	0
Gray argillaceous and red argillaceous shale	23	0
Greenish gray sandstone, fit for grindstones, but rather hard. This constitutes Boss QUARRY	10	0
Greenish gray sandstone	25	0
Greenish gray sandstone, with carbonized drift plants.	6	0
Greenish gray sandstone	24	0
Greenish gray sandstone, with nodules of *clay iron-stone,* casts of *calamites* and other plants.....	1	0
Gray arenaceous shale	4	0
Red argillaceous shale	6	0
Greenish gray arenaceous shale	3	0
Gray argillaceous shale	12	0
Gray arenaceous shale	3	0
Yellow sandstone, very soft and yielding to the weather	4	0
Gray argillaceous shale	7	0
Yellow sandstone, very soft and yielding to the weather	21	0
Greenish gray sandstone in even beds	4	0
Gray arenaceous shale	4	0
Greenish gray sandstone, fit for grindstones	18	0
Gray arenaceous shale	4	0
Greenish gray sandstone	7	0
Greenish gray sandstone, with carbonized drift plants	9	0
Greenish gray sandstone in regular beds	21	0
Gray arenaceous shale and sandstone.....	1	0
Greenish gray sandstone	13	0
Gray argillaceous shale	1	0
Greenish gray sandstone	27	0

	Ft.	In
Gray argillaceous shale	6	0
Greenish gray sandstone	30	0
Greenish bed with concretions of limestone very much resembling a calcareous conglomerate	5	0
Gray argillaceous shale	5	0
Greenish bed of calcareous concretions, very much resembling a calcareous conglomerate	9	0
Gray arenaceous shale, with some bands of sandstone	23	0
Greenish gray sandstone	64	0
Greenish gray sandstone	27	0
(Here there appears to be a small fault. It does not disturb the strike, but the dislocation, if there is any, is not ascertained. I do not think it can be many yards.)		
Greenish gray sandstone	34	0
Greenish gray sandstone, with many carbonized drift plants	14	0
Greenish gray sandstone, more regular in the beds	16	0
Greenish gray sandstone, with some carbonized drift plants	18	0
Greenish gray sandstone, with many carbonized drift plants in great confusion	9	0
Greenish bed, with calcareous concretions, having much the aspect of a calcareous conglomerate	1	0
Greenish gray sandstone, with many prostrate carbonized drift plants	9	0
Greenish gray sandstone, a solid mass without divisions	21	0
Greenish gray sandstone, with a vast and confused collection of carbonized drift plants, one lying prostrate measured 25 feet in length and about 1 foot in diameter, at the small end	19	0
Greenish gray sandstone more regular	117	0
Greenish gray sandstone with carbonized drift plants, and holding small patches of concretionary nodulous limestone very like conglomerate	39	0

	Ft.	In.
Gray arenaceous shale, with small *clay ironstone* balls desseminated. This has something of the character of underclay, but the *stigmariæ* are not distinct....	4	0
Gray arenaceous shale	1	0
Gray argillaceous shale	3	0
Gray arenaceous shale	3	0
Gray argillaceous shale, with some balls of *clay ironstone*	5	0
Gray arenaceous shale	1	0
Gray argillaceous shale with 2 beds of arenaceous shale	8	0
Greenish gray sandstone in regular beds	61	0
Greenish gray sandstone, with cabonized drift plants, and occasional patches of concretionary nodulous limestone, very like conglomerate	63	0
Greenish gray sandstone with carbonized drift plants..	1	0
Greenish gray sandstone fit for grindstones	20	0
Gray concretionary limestone, very like a conglomerate with calcareous pebbles	4	0
Greenish gray sandstone	25	0
Lead gray concretionary limestone with carbonized drift plants, and mixed up with calcareous sandstone	8	0
Gray argillaceous shale	10	0
Red or chocolate coloured argillaceous shale	40	0
Dark gray coarse limestone, no organic remains visible	1	0
Gray argillaceous shale	1	0
9. Coaly matter and *carbonaceous shale*	0	2
Gray argillo- arenaceous shale, resembling fireclay, with the leaves and branches of *stigmariæ ficoides* strongly marked, the branches recumbent, and near the top of the bed *ironstone* balls are disseminated through the deposit (*underclay*)	5	0
Gray argillaceous shale and greenish gray sandstone..	2	0
Gray argillaceous shale	2	0
Red argillaceous shale	5	0

	Ft.	In.
Greenish argillaceous shale	7	0
Greenish gray sandstone	96	0
Greenish concretionary limestone	2	0
Greenish gray hard sandstone with a number of large spherical masses still harder. Some of them are 1 foot in diameter, and in section exhibit beautiful deep black and bright red concentric circles towards the exterior. These spheres are said to be occasionally 4 feet in diameter. This constitutes DOGFISH REEF	20	0
Greenish concretionary limestone, the calcareous concretions are lodged in an argillaceous matrix	1	0
Gray argillaceous shale	12	0
Greenish gray sandstone	6	0
Measures concealed, but supposed to be soft	3	0
Dark gray argillaceous shale with disseminated *clay ironstone* balls	10	0
Dark gray argillaceous shale with a course of *clay ironstone* balls at the bottom, some of them 6 inches in diameter	5	0
Black carbonaceous shale, with *shells* in some parts	4	0
Dark gray argillaceous shale	0	10
Dark gray argillaceous shale with a course of poor *ironstone* balls at the top, making about ½ inch	8	0
Greenish gray sandstone fit for grindstones	17	0
Greenish concretionary limestone, having much the appearance of a calcareous conglomerate	3	0
Greenish gray sandstone	5	0
Greenish gray sandstone with carbonized drift plants, *calamites* and others squeezed flat	3	0
Brown argillaceous shale	1	0
Greenish gray sandstone	1	0
Reddish gray shale	1	0
Measures concealed, probably shale	77	0

	Ft.	In.
Red or chocolate coloured sandstone	3	0
Red or chocolate coloured arenaceous shale	7	0
Red or chocolate coloured sandstone and shale	21	0
Red sandstone	1	0
Red shale	1	0
Red sandstone	6	0
Red shale	1	0
Red sandstone	2	0
Red arenaceous shale	1	0
Red sandstone	10	0
Red shale	2	0
Red sandstone	0	6
Red shale	0	8
Dark green limestone	0	4
Red shale	3	0
Red sandstone	2	0
Red argillaceous shale	6	0
Greenish argillaceous shale	0	3
Red or chocolate coloured shale	1	0
Red or chocolate coloured sandstone	1	0
Red or chocolate coloured shale	8	0
Black bituminous limestone	0	3
Red or chocolate coloured shale	1	0
Black bituminous limestone	0	6
Red or chocolate coloured argillaceous shale	1	6
Black bituminous limestone, with *fish scales*	0	6
Brownish red soft shale	52	0
Red or chocolate coloured shale	18	0
Greenish gray sandstone	9	0
Red shale	37	0
Black bituminous limestone, with *fish scales*	0	6
	3240	9

RECAPITULATION.

	Ft.	In.	Ft.	In.
Coal in 9 seams	0	10		
Carbonaceous shale associated with the coal, and in one instance without coal, and then containing remains of shells	7	4		
Bituminous limestone with remains of fish, and calcareous beds, associated with the coal and carbonaceous shale seams in one instance, and in six instances independent	4	10		
Greenish and gray argillaceous shale, associated in some instances with the coal and carbonaceous seams.....	9	1		
			22	1
Underclay or understone, being beds of various material, immediately subjacent to the seams of coal and carbonaceous shale, and invariably penetrated by the recumbent branches and radiating leaves of the stigmaria ficoides. Every one of the coal seams rests upon a stigmaria bed, and there is one instance of the stigmaria bed without superincumbent coal. The material of which the stigmaria beds consists, is as follows:				
Sandstone of a gray colour and crumbly quality	5	0		
Shale—				
Gray argillo-arenaceous, frequently fit for fireclay	50	0		
Green argillo-arenaceous..	21	0		
Red and green argillo-arenaceous	17	0.		
			88	0
			93	0

			Ft.	In.
Sandstone—				
Greenish gray or drab coloured, of which much is fit for the purpose of good grindstones, and it is in it that the chief quarries of the Joggins exist. Of this mass 350 feet in various parts are filled with vast collections of drift plants, coated with crystalline coal. The plants are in general confusion, and are in general prostrate. Spherical concretions, some 4 feet in diameter with a rusty black exterior, occur in 51 feet of it.....	1886	6		
Greenish	2	0		
Yellow of a finer but less durable quality than the drab	25	0		
Reddish gray (and gray 5).....	19	6		
Red and green	15	0		
Red and chocolate coloured	95	6		
			2043	6
Limestone of a concretionary character very much resembling conglomerate generally of a greenish colour and in very irregular layers			43	0
Shale—				
Greenish gray arenaceous and argillaceous	136	0		
Gray arenaceous and argillaceous with a few small beds containing ironstone balls	234	0		
Red and green variegated	77	0		
Red and chocolate coloured	592	2		
			1039	2
			3240	9

(Among the organic remains is to be remarked one upright sigillaria.)

7

	Ft.	In.
Measures concealed	19	0
Red arenaceous shale	1	0
Measures concealed	37	0
Red arenaceous shale	1	0
Measures concealed, probably red shale	139	0
(Here is said to occur a bed of gypsum. I am informed that it has been occasionally seen when the beach was washed clean by the tide. A fragmentary mass of gypsum about half a hundred weight lay on the beach.)		
Measures concealed, probably red shale	85	0
Red sandstone conglomerate with white, red, yellow and black silicious pebbles. The black is lydian stone, the others are quartz. The pebbles vary in size from that of a pea to that of a hen's egg	105	0
Red sandstone conglomerate of a coarser quality. The pebbles are of the same colour, but some of them would weigh two pounds	3	0
Red sandstone conglomerate, not quite so coarse	16	0
Red arenaceous shale with several bands of sandstone	21	0
Red sandstone	5	0
Red shale	3	0
Red sandstone	6	0
Red shale	3	0
Red sandstone conglomerate with white, gray and black silicious pebbles as before	16	0
Red sandstone	22	0
Red and green spotty variegated sandstone	11	0
Red sandstone of soft quality	3	0
Red and green spotty variegated sandstone. The green colour constitutes the spots which are circular with a black speck in the centre. The bed appears to be partly calcareous	9	0

	Ft.	In.
Red sandstone of a soft quality and red arenaceous shale	11	0
Red arenaceous shale	24	0
Red sandstone conglomerate with white, red and yellow quartz, and black lydian stone pebbles, varying in size from that of a pea to that of an egg	17	0
Red sandstone of a very coarse grit, with streaks of white parallel with the bedding	16	0
Red sandstone conglomerate with quartz and limestone pebbles. The matrix is coarse	4	0
Red sandstone with thin white streaks deposited in it..	35	0
(This bed is cut by a regular vein of sulphate of barytes 3 inches wide. Its colour is tinged with red. The course of the vein is N. & S. The underlie E. $< 82°$.)		
Red sandstone conglomerate. The bed is very uneven and contains calcareous material	3	0
Greenish concretionary limestone, looking very like a conglomerate with limestone pebbles	8	0
Greenish gray sandstone	1	0
Greenish concretionary limestone as before	3	0
Reddish sandstone	7	0
Greenish concretionary limestone as before	5	0
Red or chocolate coloured shale	8	0
Red sandstone	2	0
Red or chocolate coloured shale	1	0
	650	0

RECAPITULATION.

Sandstone—				
Greenish gray	1	0		
Reddish	7	0		
Red and green	20	0		
Red	65	0		
			93	0
Red with white streaks	51	0		
			144	0

	Ft.	In.
Conglomerate, with red, white, gray and yellow quartz and black lydian stone pebbles, in a matrix of red sandstone 148	0	
Limestone in concretionary nodules placed in a matrix of greenish sandstone and shale, occasionally associated with carbonized fragments of plants 16	0	
Shale—		
Deep red and chocolate red arenaceous. 62	0	
Measures concealed, but supposed to be of the same quality 280	0	
——— 342	0	
——— 650	0	

8

Greenish gray sandstone, red towards the top	12	0
Greenish gray arenaceous limestone, with a band of concretionary limestone, resembling conglomerate...	6	0
Greenish concretionary limestone and coarse sandstone, with carbonized drift plants.....	1	0
Greenish gray sandstone	11	0
Greenish gray sandstone, with two bands of concretionary limestone	12	0
Reddish black and reddish brown shale, with beds containing calcareous septariæ	9	0
Dark gray sandstone, with nodules of concretionary limestone	2	0
Reddish black argillaceous shale, with nodules of ferruginous limestone	9	0
Greenish gray sandstone	30	0
Greenish concretionary limestone	1	0
Greenish gray sandstone	21	0

	Ft.	In.
Greenish concretionary limestone, with carbonized drift plants	3	0
Greenish gray sandstone	17	0
Greenish concretionary limestone	1	0
Greenish gray or drab coloured sandstone	4	0
Red shale	8	0
Red sandstone	12	0
Red shale, with some bands of soft red sandstone	37	0
Red sandstone of a soft quality	6	0
Red shale, with bands of red sandstone	40	0
Greenish gray sandstone	30	0
Greenish concretionary limestone	1	0
Greenish gray sandstone, 10 feet; greenish concretionary limestone, 2 feet	12	0
Greenish gray sandstone, at the bottom of which there is a layer of carbonized drift plants, occasionally replaced by *gray sulphuret of copper* invested with a thin pellicle of the *green carbonate*	8	0
Red shale	8	0
Red sandstone	17	0
Red shale	3	0
Greenish gray sandstone, at the bottom which is a layer of drift plants converted into coal, and occasionally replaced by *gray sulphuret of copper* invested with the *green carbonate*	6	0
Red shale	9	0
Red shale and red sandstone	10	0
Red shale	10	0
Red sandstone	7	0
Red shale	8	0
Red and greenish gray sandstone	19	0
Greenish gray sandstone, with drift plants converted into coal, and occasionally replaced by *gray sulphuret of copper* with *green carbonate*	1	0

	Ft.	In.
Red arenaceous shale	37	0
Red sandstone of a soft quality	16	0
Greenish gray sandstone	6	0
Red hard arenaceous shale	25	0
Reddish sandstone	13	0
Red shale	2	0
Greenish gray sandstone, with carbonized remains of plants	6	0
Greenish concretionary limestone, 2 feet; red shale, 1 foot	3	0
Greenish gray sandstone, with concretionary limestone and carbonized remains of plants at the bottom	11	0
Greenish gray sandstone, with one foot of red shale on top	3	0
Red shale	16	0
Red sandstone, with some of a drab colour at the bottom, with carbonized remains of plants and balls of argillaceous shale	12	0
Red arenaceous shale	3	0
Red sandstone	3	0
Red arenaceous shale	60	0
Red sandstone of a coarse quality	14	0
Greenish gray sandstone, coloured red in parts	10	0
Red arenaceous shale	4	0
Greenish gray sandstone, with remains of plants converted into coal	6	0
Red arenaceous shale	30	0
Red sandstone, fit for first quality flagging	15	0
Greenish gray sandstone, with many remains of plants converted into coal, and occasionally replaced by *gray sulphuret of copper* with a pellicle of *green carbonate* around it	6	0
Red arenaceous shale	14	0
Red sandstone fit for flagging	16	0

	Ft.	In.
Red arenaceous shale	16	0
Red sanstone fit for inferior flagging	3	0
Red arenaceous shale	100	0
Red sandstone fit for flagging	4	0
Red arenaceous shale	29	0
Red sandstone fit for flagging	6	0
Red arenaceous shale	39	0
Red sandstone fit for flagging	30	0
Red arenaceous shale, with two bands of red sandstone	19	0
Red sandstone fit for flagging	22	0
Red arenaceous shale	119	0
(Here is said to occur gypsum of a red colour, in small quantities, but the bank being rather obscured by debris it was not visible.)		
Red arenaceous shale	108	0
Red arenaceous shale, with bands of red sandstone	3	0
Red arenaceous shale	79	0
Red arenaceous shale, with bands of red sandstone	3	0
Red arenaceous shale	43	0
Red arenaceous shale, with green veins crossing it	19	0
Red sandstone	1	0
Red arenaceous shale	2	0
Red sandstone	1	0
Red arenaceous shale	39	0
Red sandstone, partly greenish gray	4	0
Red arenaceous shale	1	0
Red sandstone of a soft quality	3	0
Red arenaceous shale	12	0
Red sandstone	1	0
Red arenaceous shale	14	0
Red arenaceous shale of a hard quality, with a band of red sandstone above	9	0
Red sandstone of a soft quality	1	0
Measures concealed, probably red shale	4	0

	Ft.	In.
Red arenaceous shale, with a band of greenish gray sandstone above	14	0
Red arenaceous shale	10	0
Measures not well seen, but probably red arenaceous shale	27	0
Red arenaceous shale, with a band of red sandstone above	7	0
Red hard arenaceous shale	1	0
Measures concealed, but probably arenaceous shale	15	0
Red arenaceous shale	53	0
Measures concealed, but probably red arenaceous shale of the same quality as before. Here occurs SEAMAN'S BROOK, MILL COVE	75	0
	1658	0

(In the exact strike of the lower gypsum above mentioned, in its course to Hebert River, there is a sink-hole about half way, in which gypsum has been found by excavation; and where the strike would come upon the Hebert, a mass of the mineral, apparently in situ, is seen in the bank, with red shale on both sides of it. At such a distance to the north of this mass as gives a vertical thickness of 300 feet of subjacent red shale, there is exposed a deposit of limestone, which, with some associated strata, appears to be about 100 feet thick; and this may, therefore, be considered as terminating the foregoing section. The limestone contains organic remains, among which there is, in some abundance, a bivalve shell, which I recognize as identical with the *Producta Lyelli* of Windsor, in Nova Scotia.)

RECAPITULATION.

	Ft	In.	Ft	In.	Ft	In.
Sandstone—						
Greenish gray, occasionally holding carbonized remains of plants, and in four instances the plants (underlying the sandstone) are replaced by gray sulphuret and green carbonate of copper	206	0				
Reddish	13	0				
Deep red	213	0				
			432	0		
Concretionary limestone associated with the greenish gray sandstone. The concretions are held in an argillo-arenaceous matrix. In one instance the whole of the bed is calcareous, and there occur 9 beds altogether			20	0		
Shale—						
Red arenaceous, sometimes more and sometimes less argillaceous.	1186	0				
Reddish black and gray, with calcareous septaria and nodules...	20	0				
			1206	0		
					1658	0

TOTAL THICKNESS.

	Ft	In.
No. 1	1617	0
" 2	650	0
" 3	2134	1
" 4	2539	1
" 5	2082	0
" 6	3240	9
" 7	650	0
" 8	1658	0
	14570	11

Section of Rocks from Shulie to Spicer Cove, Cumberland Co., N. S., in descending order.—By Hugh Fletcher, B. A., of the Geological Survey of Canada.

Section I.

ROCKS FROM SHULIE TO SAND COVE,

In descending order.

The section begins at a cove where the highest rocks come on top of the cliff. From this cove a school-house on the opposite side of Shulie river lies S. 22° E., and a little wharf near a point is N. 48½° E., the extreme tip of the point being N. 46° E.*

	Ft.	In.
1. Greenish gray and gray fine sandstone with irregular layers of conglomerate. Dip N. 68½° E.< 2°, but becomes southerly immediately down Shulie River	25	0
2. Red argillaceous shale	10	0
3. Gray fine sandstone in thick layers nearly massive, passing on the strike into conglomerate	8	0
4. Red marl	5	9
5. Red and olive-green marl, finely banded, passing on the strike into sandstone	5	3
6. Gray, very fine-grained, irregularly-bedded sandstone, passing into arenaceous shale. Cuts out all the shales; contains at one point a lenticular layer of coal, two feet long and two inches to half an inch in thickness and with these there are patches of yellowish underclay; passing in places into conglomerate with pebbles chiefly of pre-Carboniferous rocks	5	5
7. Red marl with layers of greenish calcareous flag; with very irregular interchanges	17	0

*All bearings in Mr. Fletcher's sections are magnetic. The sections were measured from 9th to 18th November, 1896.—*Ed.*

	Ft.	In.
8. Greenish gray sandstone, passing into conglomerate, more than half being in places conglomerate....	5	0
9. Greenish gray sandstone and conglomerate, irregularly mixed; in places nearly all conglomerate; many large fragments of carbonized plants. One band at the point nearest the wharf opposite is very fine and wavy.....	25	0
10. Red marl with layers of harder shale	8	6
11. Reddish-gray, very fine, shaly sandstone	7	11
12. Red marl	8	0
13. Red flaggy sandstone in layers four inches thick and downward	3	0
14. Red marl	8	0
15. Red, somewhat massive sandstone in irregular blocks, passing into red flags. The top of the bank at the entrance of Shulie River	7	0
16. Red marl, with olive green blotches	2	6
17. Red shale, with greenish, harder, calcareous bands	2	0
18. Red marl	2	0
19. Red and gray, very fine, glistening sandstone in flaggy layers	5	0
20. Red marl of somewhat irregular thickness, from one foot four inches to four feet	2	8
21. Very fine gray sandstone in beds from four feet downward	10	0
22. Red and gray shale, lenticular, replaced by gray sandstone	1	3
23. Gray, very fine, massive sandstone with coal pipes.	10	0
24. Red marl with greenish and gray streaks; very irregular, sometimes all red	5	0
25. Gray sandstone with blackish stripes, interbedded with red marl; all more or less lenticular	6	0
26. Greenish-gray, very fine calcareous sandstone; lenticular	2	4
27. Red marl	1	4

	Ft.	In.
28. Reddish-gray, very fine sandstone in flaggy layers.	4	0
29. Light-gray fine sandstone with comminuted plants	16	4
30. Greenish argillaceous shale	3	0
31. Rusty-gray, fine sandstone, massive, passing in places into conglomerate, and in other places altogether into greenish argillaceous shale	5	0
32. Gray, very coarse, pebbly sandstone, full of prostrate trees, with veins of bright coal half an inch thick	10	0
33. Greenish, very fine sandstone, replaced by coarser sandstone	1	0
34. Greenish and reddish rusty-weathering marl, replaced by sandstone	1	0
35. Greenish and reddish, very fine, argillaceous sandstone, replaced by greenish-gray, pebbly sandstone	3	0
36. Red marl with layers of jointed sandstone and shale.	7	0
37. Very fine, coherent, calcareous sandstone, in two or three layers	0	9
38. Red marl	4	7
39. Gray flags, very fine and sandy, replaced on the strike by gray sandstone	6	9
40. Gray massive sandstone. Much thicker in places, but replaced by the lower band of red marl	3	0
41. Greenish crumbly marl	0	3
42. Red marl with a layer of harder rock	6	0
43. Reddish and greenish, mottled, flaggy, rubbly rock; replaced by greenish sandstone	2	6
44. Greenish-gray very fine sandstone, passing into gray pebbly sandstone	6	6
45. Gray and rusty pebbly sandstone, with very irregular surfaces. The rocks are unfit for grindstone; many of the layers show broken leaves and fruit of fossil plants, with sometimes large		

	Ft.	In.
46. Red marly rock, seen for a great distance on the strike with various replacements	2	0
47. Gray, fine, massive, rusty-weathering sandstone all replaced by red marl, and again by sandstone	5	0
48. Red marl	4	6
49. Reddish sandy flags	3	0
50. Greenish-gray sandstone	2	1
51. Greenish argillaceous shale with a blackish streak at the top	2	0
52. Reddish and gray, very fine, flaggy sandstone	4	1
53. Red marl, replaced by sandstone. The bottom of this bed is at water-level at a little brook	7	0
54. Greenish-gray sandstone. An eight inch fault with up-throw on the south side	1	8
55. Red marl	7	6
56. Greenish-gray calcareous rock in two layers	0	10
57. Red marl. Another little fault with upthrow on the south side	5	6
58. Gray very coherent sandstone	1	2
59. Red argillaceous shale with greenish blotches	2	6
60. Reddish-gray sandstone	2	10
61. Red argillaceous shale	4	0
62. Light-gray, very coherent, knobby sandstone	0	8
63. Gray and greenish-gray very fine sandstone	5	0
64. Red sandstone and argillaceous shale	5	10
65. Reddish argillaceous shale with three layers of gray fine sandstone	9	0
66. Red marl and sandstone, replaced by the gray sandstone of No. 67	7	6
67. Gray sandstone at water level at the mouth of a tiny brook	2	0
68. Red marl	5	6
69. Gray fine sandstone in three layers, much thicker in places	2	6

	Ft	In.
70. Red marl	4	0
71. Greenish-gray sandstone with lenticular layers of red marl; blackish pebbly patches	4	4
72. Greenish and red argillaceous shale	1	6
73. Greenish argillaceous shale and flaggy sandstone. Dip S. 76°—52° E.< 4°	5	0
74. Red marl and gray sandstone in layers. Dip S. 80° E.< 4°	6	10
75. Light gray very fine sandstone, passing into red marl at the top and into arenaceous shale	8	0
76. Gray, coarse and fine, pebbly sandstone at the mouth of Fitzgibbon Brook	4	6
77. Greenish-gray conglomerate, with pebbles often larger than a hen's egg. Forms the base of the island on the south side of the brook. The lowest three feet is finer in places	24	6
78. Red marl	6	0
79. Reddish, rubbly, argillaceous sandstone with irregular thin layers of red marl	11	4
80. Red marl with layers of rubbly argillaceous sandstone	11	6
81. Reddish-gray, very fine, flaggy sandstone	4	0
82. Red jointed marl	2	6
83. Greenish and reddish mottled sandstone and arenaceous shale in alternate layers	21	0
84. Reddish-gray sandstone, a few inches on top passing into gray fine and coarse sandstone	6	0
85. Measures concealed in a cove at the mouth of a little brook	10	5
86. Light gray, fine, micaceous sandstone, blackened in places by minute plants; rusty spots, with coal pipes and greenish shale. Thickens in places by encroaching upon No. 87	10	0
87. Reddish and greenish argillaceous shale	4	6

		Ft.	In.
88.	Gray fine sandstone in irregular layers	10	0
89.	Greenish-gray argillaceous shale with harder layers of sandstone	3	6
90.	Gray sandstone as before with lenticular layers of red shale	10	0
91.	Red marl and sandstone	6	6
92.	Greenish arenaceous shale	1	6
93.	Gray pebbly sandstone, irregularly bedded	7	6
94.	Greenish, soft, argillaceous underclay	0	3
95.	Red marl	3	6
96.	Gray sandy flags, not well seen	1	9
97.	Measures concealed	2	9
98.	Red marl and sandy flags	2	1
99.	Gray pebbly sandstone at the mouth of a little brook	15	0
100.	Red marl	2	6
101.	Measures concealed at Cranberry Head to a little pond or marsh. Dip S. 23° E.< 4°	41	9
102.	Light gray flaggy sandstone	5	6
103.	Gray coarse pebbly sandstone with patches of conglomerate	5	6
104.	Greenish and gray, reddish and rusty conglomerate with pebbles as large as a hen's egg; of irregular thickness	4	0
105.	Gray coarse sandstone	9	0
106.	Greenish argillaceous shale	0	3
107.	Red shale	4	0
108.	Reddish-gray sandstone, passing into gray fine sandstone	12	0
109.	Greenish and gray and reddish argillaceous shale	3	6
110.	Greenish and gray, rusty and reddish flaggy sandstone, and arenaceous shale with three patches of greenish coarse shale and coal-pipes; lenticular beds of conglomerate also	23	0

	Ft.	In.
111. Greenish argillaceous shale	0	5
112. Red argillaceous shale	1	0
113. Greenish-gray and gray sandstone, passing into red marl and flaggy sandstone	9	0
114. Red marl	6	6
115. Greenish-gray argillaceous shale	1	0
116. Gray, coarse, pebbly sandstone in thick layers	10	6
117. Greenish arenaceous and argillaceous shale	1	7
118. Red argillaceous shale and sandstone	6	6
119. Greenish and gray very fine sandstone and arenaceous shale	6	11
120. Greenish and reddish, mottled, nearly compact sandstone, passing into gray sandstone	5	0
121. Gray and rusty sandstone in part pebbly and with patches of conglomerate	6	7
122. Reddish-gray argillaceous shale	1	4
123. Reddish, rubbly, argillaceous sandstone	4	0
124. Red shale	4	6
125. Red marl and sandstone in alternate layers	9	0
126. Light gray arenaceous shale with a tinge of red on top, passing into gray flaggy sandstone; lenticular patches of greenish argillaceous shale and red marl, sometimes ten feet thick	23	0
127. Greenish-gray argillaceous shale	5	0
128. Light-gray fine flaggy sandstone	2	0
129. Gray, coarse, pebbly sandstone with patches of conglomerate and a finer rock; in part very rusty with many streaks of coal and prostrate trees	29	0
130. Measures concealed at the mouths of five little brooks, Clam Cove. Dip N. 66° E. $<12°$. The change of dip from S. E. to E. and then back to S. E. requires further examination. That it extends across this concealed interval is doubtful.	493	0

	Ft.	In.
131. Gray and rusty sandstone irregularly bedded; patches of fine conglomerate in lenticular masses sometimes six feet thick	15	6
132. Red argillaceous shale and sandstone. Dip N. 66° E. < 12°	16	0
133. Light gray and greenish flaggy sandstone	6	0
134. Light greenish and bluish gray argillaceous and arenaceous shale	3	6
135. Red marl	2	0
136. Dark gray argillaceous shale	0	5
137. Red and greenish, more or less concretionary rubbly shale	5	0
138. Red and greenish mottled argillaceous flag	4	0
139. Red and greenish argillaceous shale	5	6
140. Reddish and greenish coherent sandstone, very fine and argillaceous	1	0
141. Red marl with dark-greenish blotches and shaly layers	9	0
142. Greenish and gray very fine wavy sandstone and shale	1	0
143. Greenish and light gray very fine sandstone, full of carbonized plants	6	0
144. Gray, coarse, pebbly sandstone and conglomerate	26	0
145. Red marl with harder layers	17	6
146. Greenish fine argillaceous sandstone in flaggy and shaly layers	4	6
147. Light gray and rusty jointed sandstone of fine texture with broken plants, wavy, with lenticular patches of coal	17	0
148. A lenticular layer of coal and pyrite in bands; from four to two inches thick	0	3
149. Gray, rusty-weathering, irregularly bedded sandstone, with patches of conglomerate and wedges of coal. Many of the sandstones are false-bedded and hard to measure	20	0

		Ft.	In.
150.	Red and green argillaceous shale	0	6
151.	Gray fine sandstone, passing at the bottom into pebbly, coarse sandstone with pebbles as large as a hen's egg	10	0
152.	Greenish coarse nut-and-egg conglomerate	14	0
153.	Greenish argillaceous shale, passing into rusty coarse twisted sandstone with coal-pipes	1	9
154.	Rusty sandstone and fire-clay, light gray at the top	6	0
155.	Alternate layers of sandstone and conglomerate, replaced in part by greenish argillaceous shale	11	6
156.	Arenaceous shale replaced by argillaceous shale	2	0
157.	Gray massive sandstone, broken by irregular joints, with lenticular replacements of greenish and reddish shale	17	0
158.	Greenish-gray argillaceous shale	0	9
159.	Gray, rusty-weathering, fine sandstone with pebbly patches	10	0
160.	Greenish-gray argillaceous shale; in places replaced by sandstone	1	2
161.	Gray and greenish-gray flaggy sandstone, passing at the bottom into pebbly coarse sandstone	19	0
162.	Dark gray argillaceous shale, more or less lenticular	0	2
163.	Gray broken and jointed sandstone. All the sandstones contain comminuted carbonized plants	10	0
164.	Greenish flaggy sandstone with thin layers of red argillaceous shale. A three-feet fault with upthrow on the west side	9	0
165.	Red argillaceous shale, with thin band of greenish-gray coherent sandstone	9	6
166.	Gray rusty-weathering sandstone in somewhat flaggy layers, with small wedges of argillaceous shale. Another fault of nine feet five inches with upthrow on the west. Dip of fault N. 42° E. $< 67°$	12	6

		Ft.	In.
167.	Red argillaceous shale and greenish-gray argillaceous flags with wavy arenaceous shale in alternate bands, in part replaced by greenish sandstone	18	6
168.	Greenish-gray fine flaggy sandstone, becoming coarse at the bottom. A downthrow fault dips S. 60° W. < 85°. Another dips S. 28° W. < 85°, the amount of downthrow to the south being nine feet. The sandstone contains coal-pipes, and wedges of argillaceous shale. Here the bottom of No. 167 shows two inches of black coaly shale and the upper surface of the sandstone becomes rusty underclay. A little further south is a twenty-two feet upthrow on the south side, the dip being N. 43° E.< 28°. The faults are easily traced by the coaly shale	20	6
169.	Greenish-gray argillaceous shale	1	0
170.	Reddish and greenish sandstone in alternate layers thrown up a few feet on the south side. On the strike these beds pass at the bottom into dark argillaceous shale	11	6
171.	Gray arenaceous shale	4	6
172.	Greenish-gray and rusty conglomerate, jointed and with small lenticular layers of red and greenish argillaceous shale. In the joints are veins of barytes a quarter of an inch thick	6	6
173.	Greenish-gray and gray fine sandstone divided into two by a foot of greenish argillaceous shale. An upthrow-fault of perhaps twenty-five feet, not well seen, separates No. 172 from this sandstone	25	0
174.	Reddish argillaceous shale with blotches of greenish shale; passes in places into greenish shale	2	0
175.	Reddish, rubbly, argillaceous sandstone and shale in alternate layers, passing into sandstone with coal-pipes. No. 67 of Section II (See page 514).	12	0

	Ft.	In.
176. Gray jointed pebbly sandstone. At the water level on the point of Sand Cove and following for some distance to the southward, while still further south the sandstone of No. 173 comes to the water level	10	0
177. Greenish-gray conglomerate with layers of finer grit and of arenaceous shale	10	0
178. Greenish-gray and gray fine sandstone with a little coal, seen only on the reefs. The dip now turns to S. 12° W.< 18°. (All the bearings in these sections are magnetic). A number of small faults, not well seen now obscure the section which is repeated in ascending order towards the large brook that flows into Sand Cove, as in Section II.	27	0
Total thickness of section	1769	4

From the top of the 25 feet sandstone (No. 173 of Section I.) south along the shore at about 60 yards the dip changes to S.< 50°. At 155 yards, sandstone and conglomerate dip S. 20° W.< 25°. At 260 yards, a 3-inch band of black shale underlaid by fine sandstone dips S. 35° W.< 33°. At 365 yards, sandstone dips S. 84° W.< 31°, but seems at 475 yards to dip northerly at a very high angle. There is here every indication of a fault with a downthrow to the north. The dip at one point is overturned to S 1° E.< 69°; the red marl, sandstone and conglomerate to the northward are greatly altered, then for 17 yards farther the dip is westerly, while for the next 100 yards the shore follows the strike, the dip being towards the sea.

Few rocks are then seen to 560 yards where the dip is perhaps N. 45° E.< 20°, beyond which for 526 yards to the mouth of Sand Brook a sand beach conceals the rocks.

From the outermost reef a section was measured as follows:

Section II.

NORTH OF SAND COVE.

In descending order.

	Ft.	In.
1. Rusty conglomerate with bands of gray sandstone. Dip S. 81° W.< 50°	35	6
2. Rusty and light-gray fine sandstone in thick beds, seen at intervals on the reefs	60	0
3. Rusty and greenish-gray pebbly sandstone and conglomerate	11	6
4. Rusty and greenish-gray pea-and-nut conglomerate with many larger pebbles. Extends to the fault.	10	0
5. Light-gray argillaceous shale with a layer of blackish coaly matter on the top	1	6
6. Red argillaceous shale with layers of flaggy sandstone	10	0
7. Greenish-gray and rusty nut-and-egg conglomerate. Little downthrows on the east side	10	0
8. Reddish argillaceous shale with greenish layers and blotches	1	0
9. Greenish-gray argillaceous shale with red bands	2	0
10. Gray and greenish-gray, pebbly sandstone with irregular layers of conglomerate	7	0
11. Greenish argillaceous shale and flags with reddish layers	12	6
12. Greenish arenaceous shale with red spots and blotches	2	0
13. Light-gray fine sandstone with coal-pipes and a few patches of conglomerate	12	0
14. Rusty and gray pea-and-nut conglomerate	7	0
15. Light greenish-gray fine sandstone with plants and patches of argillaceous shale	5	0

	Ft.	In.
16. Red and green argillaceous shale. A band of black shale and coal 3 inches on top (p. 510)	1	0
17. Light gray very fine sandstone with an underclay at the top	3	0
18. Red argillaceous shale	1	3
19. Greenish argillaceous shale	0	8
20. Bright-red conglomerate, passing into red sandstone	1	0
21. Light-gray fine sandstone with coal-pipes	7	0
22. Greenish and gray pea-and-nut conglomerate	9	0
23. Greenish argillaceous shale, passing into harder flags	1	2
24. Greenish coherent flag	0	5
25. Red argillaceous shale and sandstone or arenaceous shale and flags, faulted	14	0
26. Light bluish-gray very fine sandstone	4	0
27. Red flags with greenish layers and blotches	6	0
28. Gray very fine sandstone with a reddish tinge	2	0
29. Red argillaceous shale with layers of greenish sandstone	10	0
30. Gray, coarse, pebbly sandstone	2	0
31. Red argillaceous shale with bands of greenish, fine coherent, flaggy sandstone	12	0
32. Light gray, ripple-marked sandstone with the footprints of some land animal	5	0
33. Red argillaceous shale	0	6
34. Light-gray and rusty very fine sandstone with small patches of conglomerate	12	0
35. Red argillaceous shale and sandstone, not well exposed	10	0
36. Greenish-gray very fine sandstone	1	6
37. Red argillaceous shale, not well exposed but apparently not faulted	20	0
38. Light-gray, fine, flaggy sandstone, with patches of conglomerate	10	0
39. Greenish-gray and rusty sandstone and conglomerate mixed	5	0

		Ft.	In.
40.	Red and green mottled argillaceous shale	1	0
41.	Reddish sandstone with green spots	7	0
42.	Red argillaceous shale with a layer of white clay near the top	10	0
43.	Rusty-gray sandstone with a lenticular layer of greenish and reddish argillaceous shale	4	0
44.	Red and green argillaceous shale	1	0
45.	Greenish-gray and rusty, flaggy sandstone, with thin layers of red argillaceous shale	4	0
46.	Red argillaceous sandstone, flag and shale	2	0
47.	Greenish and gray, fine, flaggy sandstone with carbonized plants and argillaceous streaks	5	0
48.	Greenish and gray, coarse, pebbly sandstone and conglomerate, with lenticular layers of greenish argillaceous shale	10	0
49.	Red argillaceous shale with greenish flags	15	0
50.	Greenish, fine, flaggy sandstone	15	0
51.	Greenish-gray and red argillaceous shale	3	0
52.	Greenish-gray, fine, flaggy sandstone, lenticular	2	0
53.	Red arenaceous shale	2	0
54.	Red argillaceous shale with bands of red and greenish sandstone	30	0
55.	Measures concealed	30	0
56.	Gray, fine, flaggy and shaly sandstone	2	0
57.	Rusty-gray fine sandstone, with pebbly patches	7	0
58.	Measures concealed, probably soft	10	0
59.	Gray and rusty, pebbly, coarse sandstone	7	0
60.	Measures concealed	15	0
61.	Rusty and gray, crumbly, pebbly sandstone with coal-pipes	15	0
62.	Red argillaceous shale, not well exposed	18	0
63.	Greenish and gray and rusty, pebbly sandstone, with plants and coal-pipes. The dip changes to easterly	25	0
64.	Greenish-gray arenaceous and argillaceous shale	5	0

	Ft.	In.
65. Red argillaceous sandstone with greenish patches, rubbly and in irregular beds	8	0
66. Red argillaceous shale with a light greenish clay-parting at the top. Thinner in places	9	0
67. Reddish arenaceous shale with greenish blotches and layers	2	6
68 Greenish and gray arenaceous shale; passes into fine sandstone	2	6
69. Rusty-gray, fine sandstone with streaks of argillaceous shale. To the water-level at the point of Sand Cove. No. 176 of Section I.	5	0
Total thickness	597	0

There is probably no break in this section which repeats the measures of Section I. as far as the fault.

Across Sand Brook, at 344 yards farther south, gray pebbly sandstone in a cliff dips N. 75° E.< 19°. Including all the rocks to the top of this and the succeeding cliffs, the section is as follows:

Section III.

SOUTHWEST OF SAND COVE,

In descending order.

1. Gray sandstone	20	0
2. Red argillaceous shale and sandstone	40	0
3. Gray sandstone with pebbly patches	20	0
4. Red argillaceous shale with harder layers of reddish anud greenish sandstone. Some layers of reddish sandstone are of coarse texture	55	0
5. Gray fine sandstone in broken layers. Thin bands of greenish argillaceous shale and beds of arenaceous shale; coal streaks; very thin patches of pebbly rock	66	0
Total thickness	201	0

The first cliffs include only Nos. 4, 5 and ten ft. of 3. Then a downthrow fault on the south side brings red rock against the gray sandstone the whole height of the cliff, the displacement being probably sixty feet nearly vertical in a southeasterly direction. Further along, at another downthrow, a bed, perhaps 3. is seen to be twenty feet thick, while overlying come 2 and 1 as given in the section.

Outside on the point, a band of sixty feet of fine gray sandstone is overlaid by red rocks and gray sandstone at another fault.

Again a thick sandstone, perhaps 5, comes on the shore and is faulted. This is nearly all of fine texture, whereas further along the shore there are bands of coarser material. It seems possible that for all this distance the same sandstone (5) runs along on the strike, broken by many little faults.

Then comes a thickness of seventy-five feet of red rocks with conglomerate bands nearly horizontal. Then a heavy gray sandstone with a band of conglomerate twenty feet thick, greenish and reddish and gray, underlaid by pebbly sandstone.

Towards Sand River the section is in ascending order, red shale, sandstone of coarser texture with more conglomerate being abundant as far as a clean cliff of sandstone, nearly all fine, about 100 feet high. The highest beds at Sand River show thin layers of shale. A descending section is as follows:

Section IV.

FROM SAND RIVER EASTWARD,

In descending order.

	Ft.	In
1. Red marl with green layers, broken in the bank, beneath the first house behind the Post Office at Sand River. Dip S. 19° W. < 20° to 44°. Thickness undefined	5	0

	Ft.	In.
2. Gray and greenish, fine, wavy sandstone and arenaceous shale, with rusty spots and small streak of coal	15	0
3. Red marl with flaggy layers and greenish blotches and bands	6	6
4. Reddish, somewhat massive, fine sandstone and argillaceous shale	3	0
5. Red marl with irregular bands of harder flags. Dip S. 11° W.< 27°	13	0
6. Red, very fine sandstone, in two wedge-shaped layers	1	6
7. Red marl	2	0
8. Red sandstone with greenish blotches	1	6
9. Red marl with light green blotches	3	6
10. Red argillaceous sandstone and flag with green patches	1	6
11. Red marl or argillaceous shale with thin harder layers	10	8
12. Greenish, coherent, argillaceous flag	0	4
13. Red marl with two thin layers of sandy flag	4	6
14. Red argillaceous sandstone with green blotches; passes into argillaceous shale	2	0
15. Red argillaceous shale with green pipes and blotches	7	6
16. Gray or rusty fine grit	1	6
17. Red argillaceous shale	2	0
18. Greenish and rusty gray very fine sandstone with a few pebbles, rusty spots and coaly blotches	7	0
19. Greenish or bluish-gray argillaceous shale	6	0
20. Greenish-gray arenaceous shale and flaggy sandstone	1	4
21. Greenish and bluish-gray argillaceous shale; passes into sandy flags	2	0
22. Greenish-gray flaggy arenaceous shale and sandstone	5	0
23. Reddish argillaceous shale with greenish thin layers and blotches	12	0
24. Reddish flaggy sandstone	1	6

	Ft.	In.
25. Red argillaceous shale with a layer of rubbly fine sandstone	13	0
26. Reddish sandstone with green patches	2	6
27. Red crumbly argillaceous shale with four layers, sometimes lenticular, of arenaceous flag	22	0
28. Greenish-gray and rusty fine arenaceous shale and sandstone, blackened with comminuted carbonized plants; rusty and coaly spots; small lenticular basins of greenish argillaceous shale; has in places an Indian-red tint. The water-level of the base of the sand bar is at 31 feet, the rest of the measurement being on the outer shore. The layers are usually thick, very irregular, and in the lower part occur a few pebbles as large as a hen's egg. Dip at the bar S. 5° E.< 25°	75	0
29. Red argillaceous shale	10	0
30. Greenish-gray, gray and rusty, coarse sandstone with patches of pea-and-nut conglomerate; pipes and gash-veins of coal from one inch downward	12	0
31. Greenish-gray argillaceous shale	5	0
32. Gray and greenish, flaggy, fine sandstone	12	0
33. Red argillaceous shale	8	0
34. Greenish-gray shaly sandstone or arenaceous shale.	12	0
35. Rusty-gray thick-bedded sandstone, with a few small pebbles	15	0
36. Red argillaceous shale	7	0
37. Greenish-gray arenaceous shale, passing into sandstone	13	0
38. Rusty gray fine sandstone, jointed into rectangular blocks, with pebbly patches	8	0
39. Greenish and bluish-gray argillaceous shale, of irregular thickness	2	0
40. Greenish-gray arenaceous flag	4	0

	Ft.	In.
41. Light-gray and greenish-gray, false-bedded, rusty-weathering sandstone, of somewhat loose texture; coal-pipes and pebbly patches	25	0
42. Rusty-gray and greenish pea-and-nut conglomerate with larger pebbles	5	0
43. Greenish-gray and rusty, very coarse, pebbly sandstone in irregular beds, for the most part thick-bedded	67	0
44. Greenish and rusty nut-and-egg conglomerate with finer bands	8	0
45. Reddish argillaceous shale with greenish and dark layers and blotches, probably No. 5 of next section	5	0
46. Greenish-gray arenaceous shale	1	6
47. Reddish-gray argillaceous shale and flags	4	0
48. Reddish-gray sandstone in bands	4	0
49. Red argillaceous shale	8	0
50. Greenish arenaceous shale and flaggy sandstone	2	0
51. Rusty, thick-bedded, fine sandstone	7	0
52. Red argillaceous shale with greenish bands and blotches. Dip S. 5° E.<18°	2	0
53. Red and green argillaceous shale with harder flags	5	6
54. Reddish argillaceous shale with fewer green blotches	2	0
55. Greenish and reddish arenaceous shale	1	0
56. Gray and rusty fine sandstone, false-bedded and in thick layers	11	0
57. Gray sandstone of the same texture, but pebbly	3	0
58. Greenish pea-and-nut conglomerate, in irregular bedding	1	6
59. Rusty and grav pebbly sandstone. Dip S. 21° E. to S. 14° E. < 16° to 23°	3	0
60. Greenish-gray and rusty conglomerate and fine sandstone mixed in lenticular beds. Below No. 60 the beds do not appear in the cliff but only on reefs below high-water	7	0

	Ft.	In.
61. Greenish-gray conglomerate	5	0
62. Greenish-gray sandstone	5	0
63. Greenish and reddish, mottled argillaceous shale with harder flaggy bands	12	4
64. Greenish sandy flags and sandstone in a massive bed; conglomerate at the bottom	5	0
65. Measures concealed. Red marl and greenish argillaceous coherent flags seen on the reefs	13	0
66. Greenish-gray and gray fine sandstone	30	0
Total thickness	579	2

Here the section is broken by a fault with a downthrow of considerable amount to the east, its dip being east and hade nearly vertical. The throw could not be determined, but perhaps the following beds succeed as indicated.

Section V.

BETWEEN SAND RIVER AND SAND COVE.

1. Greenish-gray sandstone like No. 43 of Section IV. Dip S. 2° to 5° W.< 14° to 24°	75	0
2. Greenish argillaceous shale passing into sandstone.	3	0
3. Greenish-gray argillaceous shale passing into sandstone	5	0
4. Greenish-gray and gray fine sandstone with some layers of greenish argillaceous shale	20	0
5. Red argillaceous shale. Possibly No. 45 of the previous section	2	0
6. Red marly sandstone	6	0
7. Red argillaceous shale with greenish layers	2	0
8. Rusty and greenish fine sandstone, with carbonized plants and pebbly patches	10	0
9. Gray and rusty pebbly sandstone, with small patches of pea-and-nut conglomerate and veins of coal one inch thick and downward	5	0

	Ft.	In.
10. Greenish and rusty nut-and-egg conglomerate; passes partly into sandstone	10	0
11. Rusty and greenish-gray pebbly sandstone, irregularly bedded	10	0
12. Red marl or argillaceous shale not well exposed	23	0
13. Reddish-gray and gray arenaceous shale and flaggy sandstone	3	6
14. Gray fine sandstone. Possibly No. 51 of Section IV.	5	0
15. Greenish-gray arenaceous shale, passing in part into red argillaceous shale	1	0
16. Gray and rusty fine sandstone with a few small pebbly patches at the bottom	10	0
17. Greenish-gray conglomerate; passes into pebbly sandstone	3	0
18. Greenish-gray pebbly sandstone	4	0
19. Greenish-gray and reddish argillaceous shale	4	0
20. Gray fine sandstone with coal-pipes, very irregularly bedded towards the top	12	6
21. Greenish and reddish argillaceous shale in alternate layers with harder flags	6	0
22. Greenish argillaceous shale and fine sandstone	4	0
23. Rusty-gray pebbly sandstone in irregular beds; coal-pipes and lenticular layers of argillaceous shale	25	0
24. Red argillaceous shale	7	0
25. Reddish-gray argillaceous sandstone	3	6
26. Red marl with a few greenish streaks	9	0
27. Rusty-gray pebbly sandstone; many fossil plants in some layers	10	0
28. Greenish-gray argillaceous shale	1	6
29. Rusty-gray pebbly sandstone as above	11	0
30. Red argillaceous shale and flags with greenish blotches at the bottom	9	0
31. Greenish and gray argillaceous sandstone in one layer	1	0

	Ft	In.
32. Rusty-gray fine flaggy sandstone	5	0
33. Greenish and gray argillaceous flags	2	6
34. Red argillaceous shale; passes into rusty sandstone.	2	0
35. Greenish fine sandstone	17	0
36. Reddish argillaceous shale	5	0
37. Greenish-gray shaly sandstone	4	0
38. Red argillaceous shale	6	0
39. Greenish arenaceous shale and sandstone, with prostrate trees and small lenticular layers of greenish argillaceous shale	20	0
40. Red argillaceous shale and flags; passes into rusty sandstone with prostrate trees	1	6
41. Greenish, fine, evenly-bedded arenaceous flags	2	0
42. Red and greenish argillaceous shale and flags	1	6
43. Greenish argillaceous shale and flags	3	0
44. Rusty-gray, pebbly, thick-bedded sandstone with prostrate trees and patches of conglomerate	85	0
45. Red argillaceous shale with greenish bands and streaks. The debris of the bank here obscures the section so that the thickness given for 44 may be too great	20	0
46. Reddish sandstone	4	0
47. Red argillaceous shale	5	0
48. Reddish-gray fine sandstone	3	0
49. Red argillaceous shale	5	0
50. Reddish sandstone with green spots	2	0
51. Red argillaceous shale	2	0
52. Red sandstone	3	0
53. Red argillaceous shale	5	0
54. Red sandstone	2	0
55. Red argillaceous shale	2	0
56. Reddish sandstone	3	0
57. Red argillaceous shale	1	0

	Ft.	In.
58. Reddish sandstone and argillaceous shale in alternate beds	12	0
59. Greenish-gray flaggy sandstone and argillaceous shale	2	0
60. Rusty-gray, thick-bedded, very fine sandstone with a thin layer of argillaceous shale	5	0
61. Greenish-gray argillaceous shale	2	6
62. Very rusty fine and pebbly sandstone, passing into a mixture of gray conglomerate and sandstone	22	0
63. Red argillaceous shale	8	0
64. Gray pebbly sandstone with patches of conglomerate	5	0
65. Greenish-gray conglomerate with patches of fine sandstone	15	0
66. Greenish-gray, coherent, thick-bedded sandstone	15	0
67. Measures concealed with perhaps one or more breaks. Dip S. 80° W. < 16°	22	0
68. Greenish and rusty sandstone in a cliff	50	0
69. Reddish argillaceous shale and sandstone	25	0
Total thickness	310	0

Beds 68 and 69, instead of belonging to the base of the section, may be a repetition of some of those above. Several downthrows to the northeast then seem to repeat others, but are perhaps counterbalanced by faults with downthrow to the southwestward.

Ninety yards northeastward from the outcrop of 69, after two little downthrows have brought the red shale upon the beach, the gray sandstone (68) is in the cliff to a height of forty feet as before, the reefs striking apparently along the shore. About 275 yards farther east, red rock is capped in the cliff by gray and rusty sandstone, and at 140 yards still farther northeast is brought against greenish and gray sandstone by a fault. These latter are almost certainly the beds 45 to 58 of Section IV.; and the succeeding strata are those of Section III.

The direction of the line of fault is N. 53° W., with downthrow to the southwestward. At the last reefs, 225 yards west of the mouth of Sand Brook, the dip is S. 61° E. <15° to 22° near the landwash and N. 77° E. <10° farther seaward.

Ignoring faults, the strata west of Sand River appear to overlie those on the east side and may represent some of those between Sand Cove and Shulie. And unless there is a fault, the uppermost beds of the Pudsey Point section must be near, or repeat the lowest strata of Hetty Point. It may therefore be possible from the measurements to shew the entire section from Shulie to Spicer Cove.

On the west side of Sand River the first rocks exposed dip N. 80°-83° E.< 21°, and their section is as follows:

Section VI.

West of Sand River,

In descending order.

		Ft.	In.
1.	Gray fine sandstone with layers of dark-gray argillaceous shale; coal-pipes. Dip N. 82° E.<21°. At water-level 250 yards southwest of the end of the road to the beach	10	0
2.	Gray, coarse, pebbly grit with layers of gray sandstone, full of carbonized plants	11	0
3.	Red and green mottled argillaceous shales	0	10
4.	Light gray fine sandstone	7	0
5.	Dark bluish-gray argillaceous shale, lenticular	0	6
6.	Light-gray and greenish-gray fine sandstone, in thick irregularly jointed beds, with a few pebbly patches of grit, coarser at the bottom; for the most part very massive	49	0
7.	Greenish argillaceous shale. Dip S. 15° E. <9°	0	9

A fault, the direction of which is S. 5° W. and the dip apparently S. 85° E.<85°, seems to pro-

		Ft.	In.
	duce this change of dip from east to south. A thin band of red and greenish argillaceous shale on the east side is lost against the sandstone on the west, and the amount of the fault may be more than 20 feet, for nothing is seen of the shale on top of the bank. Usually at these faults very little of the rock is turned on edge, the course being marked only by a quantity of soft clay or "gouge"; but here a block of 10 feet seems to have been dropped off the gray sandstone on the west side. This fault shows in the cliff 150 yards southwest of the first rocks, or 400 from the end of the road to the beach on the southwest side of Sand River.		
8.	Red argillaceous shale. A two feet fault with a nearly vertical upthrow on the west side.....	19	0
9.	Gray and cream-colored, massive, fine sandstone...	9	0
10.	Greenish and gray coarse grit; cut out at one point and nearly all replaced by red argillaceous shale at a pillar-rock	22	0
11.	Greenish and reddish argillaceous shale, replaced on the strike by sandstone	2	0
12.	Reddish and greenish, mottled, argillaceous sandstone	6	0
13.	Gray, coarse, pebbly grit and conglomerate.....	16	0
14.	Red fine sandstone and argillaceous shale, replaced in part at the bottom by gray sandstone.....	10	0
15.	Gray and greenish fine and coarse sandstone in thick beds, with thin lenticular patches of pea-and-nut conglomerate; coaly streaks associated with the coarser patches and some finer bands of gray arenaceous shale are full of broken carbonized plants. The bottom of the upper ten feet of this band is at water-level at the mouth of the Mile Brook, the lower, at the next little brook quarter of		

	Ft.	In.
a mile further west. On the strike there are of course many changes. The upper part is in places fine arenaceous shale and at the mouth of this second brook patches of conglomerate contain pebbles of gray, fine, micaceous sandstone and shale almost certainly newer than Devonian. The bedding is very irregular and also the lenticular layers of conglomerate and greenish shale	77	0
16. Red argillaceous shale with greenish blotches.....	9	0
17. Greenish and reddish mottled argillaceous and arenaceous rock	5	0
18. Gray sandstone like No. 15, the upper part being in places fine wavy arenaceous shale. Nearly all the pebbles of the conglomerate are of Pre-Carboniferous rocks; the layers varying from six feet to two inches in thickness	55	0
19. Dark bluish-gray argillaceous shale, with bands of dark-reddish shale and lenticular layers of greenish very fine sandstone and shale; an upright *Calamite* with the bark converted into coal. The overlying sandstones are very rusty and full of broken carbonized plants	10	6
20. Gray and rusty fine massive sandstone, jointed at right angles to the bedding; pebbly patches and lenticular layers of dark shale	23	0
21. Rusty nut-and-egg conglomerate with pebbles up to three inches in diameter. Thicker in places, the sandstone cutting it out	4	6
22. Red argillaceous shale with bands of light gray and greenish very fine, coherent sandstone	25	0
23. Light gray very fine sandstone, with thin layers of red and gray argillaceous shale	15	0
24. Red argillaceous shale interbedded with reddish fine sandstone	13	0

	Ft.	In.
25. Red crumbly argillaceous shale	7	0
26. Dark reddish and gray argillaceous flags	4	6
27. Gray fine massive sandstone, with lenticular patches of reddish and dark shale	6	6
28. Bluish-gray rubbly argillaceous shale	2	0
29. Red argillaceous shale with greenish-gray blotches and reddish sandstone in regular layers.....	14	6
30. Gray and cream colored fine flaggy sandstone.....	5	0
31. Red argillaceous shale with blotches and thin layers of greenish and gray shale	5	0
Total thickness	424	7

The dip, S.<41°, now takes the rocks out to sea and they are repeated on the shore from the bottom of No. 29, but reversed in the following section:

Section VII.

ROCKS REPEATED ON THE SHORE SOUTHWEST OF SAND RIVER,

In descending order.

1. Coal in layers with pyrite, about fifteen feet long. It ends at a two feet fault with an upthrow on the left side, followed by a much larger fault, apparently a similar upthrow, which brings up the shale No. 3, the upper part of which is here red. No. 3 comes to the water level at a brook of some size, where the overlying sandstone contains lenticular bands of argillaceous shale. A little further west, behind a narrow point, there is another brook, at which again the dark shale is at water-level, but a short distance further it is replaced by pebbly sandstone, the whole cliff probably two hundred feet in height, being composed of pebbly sandstone dipping at a low angle	0	4

	Ft.	In.
2. Gray and greenish-gray and rusty massive sandstone with coal-pipes of large size; more or less pebbly. In some places sandstone occupies the whole height of the cliff, but in other places it shows a few inches of argillaceous shale	18	6
3. Greenish-gray and gray, rusty-weathering, somewhat rubbly argillaceous shale	10	0
4. Gray thick-bedded sandstone containing patches of conglomerate and a prostrate tree eight feet in length. The lowermost forty feet come to the water-level at the mouth of Two Mile Brook, where there are exposed overlying beds which dip S. 5° E.< 30°, and give a total thickness of 105 feet to the old dam at the head of the cove. Certain layers are coarse and pebbly, others fine and shaly, but none are fit for building stone, containing very irregular concretions. On the right bank of this brook there is a lenticular layer of greenish-gray argillaceous shale, five feet thick, overlaid by conglomerate and underlaid by fine sandstone, some of which, about eighty feet from the bottom of the mass, is of good grindstone grit. On the opposite bank some of the beds turn to red shale, but only for a few feet. There is a very persistent band of ten feet of this shale with reddish-gray sandstone. Below this horizon the rocks to the southwest change largely into conglomerate, the coast nearly following the strike of the rocks	105	0
5. Dark-gray argillaceous shale. Here occurs a downthrow on the west side, of considerable amount, at a tiny brook. None of the measurement is, however, lost	3	0
6. Red argillaceous shale and sandstone in alternate bands	25	0

	Ft.	In.
7. Greenish-gray argillaceous shale	3	0
8. Rusty-gray coarse pebbly sandstone, with finer layers and lenticular patches of conglomerate	50	0
9. Bluish-gray argillaceous flag, with concretionary arenaceous "bulls-eyes"	12	0
10. Gray and greenish and rusty pebbly sandstone; passes in part into conglomerate and contains lenticular patches of conglomerate and argillaceous shale	37	0
11. Rusty-gray nut-and-egg conglomerate. No. 21 of last section	4	6
12. Red sandstone and shale with greenish and gray layers and a lenticular layer of dark arenaceous shale	20	0
13. Greenish-gray and rusty fine sandstone. A 10-feet downthrow on the west side	10	0
14. Red sandstone and argillaceous shale in alternate layers	25	0
15. Red marl	10	0
16. Dark gray and greenish argillaceous shale	0	6
17. Reddish argillaceous sandstone	4	0
18. Gray, very fine sandstone	5	0
19. Bluish-gray argillaceous shale	1	6
20. Gray and greenish argillaceous shale, with pebbly patches	5	0
21. Red shale and light-gray and greenish fine sandstone, in alternate layers. No. 29 of previous section	14	0
Total thickness	363	4

Section VIII.

DESCENDING BELOW NO. 3 OF LAST SECTION.

1. Gray pebbly sandstone of the usual character	20	0
2. Dark-gray argillaceous shale in a lenticular band ranging from ten feet to one inch	5	0

	Ft.	In.
3. Gray sandstone, fine on top but becoming pebbly below. 38 feet of this sandstone comes to water-level at the next little brook. With so much sandstone the measurement of some parts of the section is incorrect no doubt, but the bedding is usually plain	50	0
4. Red argillaceous shale with bluish and greenish layers; replaced by gray coarse pebbly sandstone.	5	0
5. Gray pebbly sandstone. In places the layers of shale are thicker and contain bands of gray fine sandstone	7	0
6. Greenish and reddish argillaceous rubbly rock; also replaced by gray sandstone	4	0
7. Rusty-gray or cream-colored fine sandstone, passing into coarse sandstone and intermixed with pebbly layers. In places it turns nearly all into nut-and-egg conglomerate. Lenticular layers sometimes six inches thick and ten feet long, show alternate bands of impure coal and pyrite. At ninety feet there is a landing place. Here the rocks are largely conglomerate and in certain bands this assumes a reddish tint as well as in patches of the finer sandstone. Some of the pebbles are of brick-red sandstone, others, of greenish-gray and gray micaceous sandstone, like Carboniferous. The lower part is very rusty and full of veins and blotches of coal	95	0
8. Greenish-rubbly argillaceous shale with red patches and layers	4	0
9. Gray-flaggy argillaceous sandstone with a lump of coal near the top	5	0
10. Greenish-gray and cream-colored alternations of fine sandstone, pebbly sandstone, and pea-and-nut conglomerate with larger pebbles; coal streaks and pipes	22	0

	Ft	In.
11. Reddish argillaceous shale. Al these bands are lenticular	5	0
12. Greenish-gray argillaceous shale. Thickens to the westward	2	0
13. Gray and rusty sandstone and conglomerate, irregularly mixed. This is on the strike for some distance, then the overlying No. 12 comes to the water-level.. The top of No. 10 is at the water-level at the first little brook in Birch Cove. Here bands that represent Nos. 8 and 9 are, however, Indian-red, the material being still sandstone and conglomerate. Then rocks of a bright red color overlie to a height of fifty feet. Dip S. 47° W.< 20°	35	0
Total thickness	259	0

The top of 110 feet of reddish and gray sandstone and conglomerate, for the most part red, with coal-pipes, and veins of barytes in the joints, overlying No. 13, comes to the water-level at the second little brook in Birch Cove.

From this point 60 yards west, a large brook empties and a little brook comes into it. The brook turns from S. 15° W, the shore runs N. 53° W. to a headland, then trends more westerly. The top of the following descending section here comes to the water-level, probably about 13 feet below the top of the 110 feet above mentioned or 97 feet over No. 13.

Dip on the southeast side of the cove S. 8° W. < 14°.

Dip on the northwest side of the cove S. 60° E. < 12°; S. 24° to 17° E < 14° to 16° (mean dip S. 34° E. < 14°).

Section IX.

FROM BIRCH COVE WESTWARD TO HETTY POINT,

In descending order.

1. Gray and greenish-gray pebbly sandstone and conglomerate with thin lenticular layers of Indian-red conglomerate 52 0

	Ft.	In.
2. Greenish-gray, dark-bluish-gray and reddish argillaceous shale, the dark portions full of fossil plants	12	6
3. Gray and rusty fine sandstone, full of broken plants and having a one-inch lenticular layer of coal, sometimes in the bedding, sometimes in the joints	9	0
4. Greenish and bluish-gray pea-and-nut conglomerate	11	0
5. Gray and cream-colored pebbly sandstone, fin sandstone and conglomerate, a large proportion of which is conglomerate. It passes on the strike into Indian-red conglomerate, resembling that of Polly Brook and the Morang River, and soon it all turns to Indian-red. Many of the pebbles are as large as a cocoanut. Where coal-pipes are seen the rock is rusty and gray. Dip S. 21° E.< 15°..	90	0
6. Gray fine flaggy sandstone with a nine-inch lenticular layer of greenish-gray argillaceous shale..	6	6
7. Red argillaceous shale or marl. These beds are all lenticular and thin out	5	0
8. Mottled red and green argillaceous shale	2	0
9. Greenish and gray coarse grit and nut-and-egg conglomerate	45	0
10. Red argillaceous shale with greenish layers, cut out to form a fine cave behind a bluff.....	2	6
11. Red, rubbly, more coherent flag	0	11
12. Reddish sandstone with greenish blotches	0	10
13. Gray and greenish, fine, massive sandstone with broken plants	4	10
14. Gray and rusty fine sandstone, the upper surface of which is spotted with prostrate plants	3	0
15. Rusty-gray pea-and-nut conglomerate with layers of sandstone, the latter being blackened with carbonized plants. Veins of coal lie at various angles to the bedding, seldom exceeding half an inch in thickness. The gray sandstone is in very irregular		

Ft In.

wedges. Some of the pebbles are three inches in diameter; they consist chiefly of various gray Devonian rocks, but among them there are finer soft micaceous bluish-gray sandstone and shales, apparently derived from Carboniferous strata. Twenty feet to high water-level at the bluff about half a mile from Birch Cove Brook; and thirty-five feet to the bottom of the same cliff, but all cut out behind back to the band of red shale. Several fine prostrate trees occur, and on the strike some of these rocks turn again Indian or brick-red, although for the most part they are gray and rusty 12 0

The overlying band thins out, but again takes up in an attenuated form in a few places, the rocks following the coast for a great distance on the strike. The line of the red band (10 to 12) is occupied by a definite bedding-joint, into which lenticular small patches of argillaceous shale sometimes come, while above it about twenty feet and in other parts of the high cliff, there are thin layers of argillaceous shale.

Nearer McCarren Cove, the finer bands have a tinge of reddish or brown, and are nearly all pebbly. Further along, parts of the fine beds become fit for grindstone, the red bands in the cliff retaining their horizontal position, so that there is absolutely no doubt that this part of the section is on the strike. Dip not far from the cove, S. 23° E. $<15°$, S. 7° E. $<$ 4° to 18°. The section here below No. 9 is as follows:

	Ft	In.
1. Greenish-gray sandstone and argillaceous shale	2	9
2. Greenish-gray argillaceous shale with two layers of clay	1	6

	Ft.	In
3. Greenish-gray and reddish rubbly argillaceous sandstone	3	2
4. Reddish argillaceous shale with a lenticular layer of fine greenish sandstone	1	5
5. Red and green fine flags	2	6
6. Greenish and reddish very fine sandstone, in flaggy beds fit for grindstone, probably a part of No. 15 but very different in texture	2	8
7. Light gray very fine massive sandstone with pebbly patches, but no coarse layers	45	6

Beyond the bluff at which this section ends, conglomerate is again cut out in a cove, but the red band reappears on the next point, where the underlying sandstone is, however, somewhat pebbly, but only in places, for on the whole there is a distinct improvement in the texture. On the point west of Birch Cove the thickness of the sandstone was found to be forty-seven feet; on the next headland, forty-five feet six inches as above, whereas on the point near McCarren Cove, the lower part has turned into the section as continued below:

16. Red argillaceous shale	0	9
17. Greenish-gray argillaceous shale, with thin lenticular layers of greenish arenaceous rock	5	0
18. Clay parting	0	2
19. Greenish-gray arenaceous shale passing at the bottom into greenish, coarse, pebbly sandstone, with coal veins, two inches and downward, in gashes in the rock	10	0
20. Gray sandstone of fine texture almost fit for grindstone, but with pebbly patches in some of the massive layers. The lower part passes into conglomerate	15	0

		Ft.	In.
21.	Gray conglomerate with lenticular patches of fine sandstone; all very coarse, some of the pebbles being three inches in diameter. Dip S. 5° to 9° W. <7° to 8°	6	0
22.	Gray sandstone in thick layers, of fine grit but with pebbles. In texture the rocks generally resemble those of River John	12	0
23.	Greenish-gray conglomerate	1	6
24.	Gray fine sandstone of uniform texture, with very few pebbles	4	0
25.	Measures concealed. Dip S. 34° to 33° E.	6	3
26.	Gray or brownish sandstone seen only on the reefs; pebbles scattered throughout the mass and with some beds of conglomerate. Not all exposed, but seen in frequent reefs across McCarren Cove. Dip S. 34° E. <16°.	265	0
27.	Gray pebbly sandstone in thick beds. The first rock of the cliff north of McCarren Cove	15	0
28.	Rusty-gray sandstone; irregular layers of pea-and-nut conglomerate; coal-pipes and veins	31	0
29.	Reddish and greenish lenticular argillaceous shale, replaced entirely at both ends by the sandstone and containing layers of sandstone	9	0
30.	Light gray sandstone, in thick beds, with a few pebbles. Some beds have a reddish tinge and some are fit for grindstones. Other small lenticular replacements occur. A very large proportion of the lower beds on the outer shore is of fine grain and without pebbles. At the first point, a thickness of forty-five feet is exposed, then higher beds appear in a rough cove. Dip, about the middle of the point, S. 45° E. <12°; in places large regular flags break out and the bottom becomes more shaly	70	0

	Ft.	In
31. Red argillaceous shale with bands of reddish arenaceous shale; layers of greenish or whitish-gray calcareous, fine sandstone and of bluish-gray shale in a deep little cove	50	0
32. Greenish and rusty-gray fine grained arenaceous shale and sandstone, with carbonized plants; cut into long blocks by irregular joints; some pebbly patches occur towards the bottom, but the fine beds greatly predominate. Changes in the lower part into Indian-red sandstone like that of Birch Cove	68	0
33. Red argillaceous shale with greenish thin bands	15	0
34. Indian or brick-red fine sandstone with pebbly patches containing layers of arenaceous shale, precisely like the greenish and gray varieties except in color; shows the usual whitish and greenish blotches of the red rocks. At the lighthouse on Hetty Point, the red layers are underlaid by gray or brown, and these latter replace certain beds on the strike	58	0
35. Greenish-gray and rusty fine sandstone with very few pebbles, generally in thick beds, some patches very rusty; in part concertionary, with "bulls-eyes"; many of the beds have wavy lines. Certain layers at the bottom turn into red. Almost the whole thickness may be said to lie below high water on Hetty Point and to extend to the lowest point seen on the reefs	140	0
Total thickness	1038	9

The beds now rise on the right bank of Apple River. They appear to be but very little higher than the strata of the following section at Pudsey Point on the opposite side of the river, or may represent a portion of the latter.

Section X.

AT PUDSEY POINT AT THE MOUTH OF APPLE RIVER,

In descending order.

	Ft.	In.
1. Gray sandstone, with a few pebbles	5	0
2. Greenish-gray conglomerate with occasionally a tinge of red; pebbles six inches and downward, the matrix always of coarse grit; small lenticular masses of finer rock	15	0
3. Red argillaceous sandstone with greenish streaks	1	6
4. Dark-gray, fine, flaggy sandstone with layers of dark argillaceous shale, in part almost carbonaceous shale	5	0
5. Reddish fine sandstone mixed with conglomerate and in part replaced by the dark sandstone; streaks of coal at the bottom	5	0
6. Reddish conglomerate with lenticular layers of reddish shaly sandstone	10	0
7. Reddish sandstone, with lenticular layers of dark bluish-gray shale	5	0
8. Reddish somewhat finer conglomerate	6	0
9. Reddish and dark-gray and greenish argillaceous sandstone and shale, in lenticular irregular beds, all of which pass into conglomerate	8	0
10. Reddish nut-and-egg conglomerate	7	0
11. Reddish and greenish-gray, rubbly, very fine sandstone and argillaceous shale	12	0
12. Reddish and gray conglomerate	5	0
13. Greenish-gray and reddish sandstone and argillaceous flags	10	0
14. Gray, fine, flaggy sandstone	3	0
15. Reddish and gray sandstone with beds of bluish-gray argillaceous shale	2	6

	Ft.	In.
16. Reddish, coarse, thick-bedded sandstone	4	6
17. Greenish argillaceous shale	1	0
18. Reddish, coarse sandstone, with partings of argillaceous shale	7	6
19. Greenish-gray argillaceous shale	3	0
20. Greenish-gray and rusty conglomerate, replaced by No. 19 and again passing into reddish conglomerate; thin layers of reddish sandstone. The bottom is at water-level on the beach at a pillar-rock....	11	0
21. Reddish and greenish sandstone and argillaceous shale in a lenticular layer	4	6
22. Reddish conglomerate with thin layers of arenaceous shale and sandstone	7	0
23. Rusty arenaceous shale with reddish argillaceous and arenaceous shale	6	0
24. Red argillaceous shale with layers and blotches of reddish and greenish mottled sandstone	11	0
25. Reddish pea-conglomerate, with finer layers; passes into greenish conglomerate	10	0
26. Greenish and reddish flaggy argillaceous sandstone; lenticular	4	0
27. Reddish conglomerate with thin layers of reddish arenaceous shale and sandstone; passes into greenish conglomerate	7	0
28. Brick or triassic-red sandstone, of very coarse grit, in thick beds; changes into conglomerate	5	0
29. Reddish and greenish flaggy fine sandstone and argillaceous shale	5	6
30. Light gray, pebbly sandstone, changing into greenish gray arenaceous shale, spotted with plants.....	4	0
31. Measures concealed. Dip S. 31° E. $< 8°$. Reefs of greenish-gray arenaceous shale in place at intervals	21	6
32. Greenish-gray arenaceous shale and sandstone, of fine texture, seen on the reefs but not in the cliff..	10	0

	Ft.	In.
33. Gray flaggy sandstone and arenaceous shale with a few pebbles	4	6
34. Greenish-gray conglomerate	5	0
35. Greenish-gray argillaceous shale and sandstone	4	0
36. Greenish conglomerate, with pebbles more than six inches in diameter	5	0
37. Greenish and reddish argillaceous shale and sandstone	5	0
38. Greenish, pebbly sandstone in one bed; changes into conglomerate	2	0
39. Greenish conglomerate	4	0
40. Greenish and dark-gray argillaceous shale and sandstone	5	0
41. Greenish-gray fine conglomerate	4	6
42. Greenish-gray arenaceous and argillaceous shale	5	0
43. Rusty, knobby sandstone and greenish, pebbly sandstone and conglomerate, full of rusty concretions	12	0
44. Red argillaceous shale with greenish and bluish-gray layers	7	0
45. Measures concealed	5	0
46. Light gray sandstone of fine grindstone grit; some flaggy layers; has been quarried on Pudsey Point.	14	0
47. Rusty and cream-colored and gray conglomerate and sandstone in irregular beds	12	0
48. Gray shale and flaggy sandstone	6	6
49. Gray fine sandstone in part fit for grindstones, but in places of coarse grit	5	0
50. Light gray and rusty arenaceous shale, in part pebbly. Dip S. 83° to 65° E. < 8° to 11°	6	0
51. Measures concealed by a sand beach, but showing on the reefs rocks similar to the above, a reddish grit about 48 ft. 6 inches from the top, and a band of greenish-gray conglomerate immediately overlying No. 52.	74	0

	Ft	In.
52. Greenish arenaceous shale and sandstone with patches of fine grit. Dip S. 83° E.< 7°	5	0
53. Bluish-gray argillaceous shale full of plants	0	6
54. Greenish-gray argillaceous sandstone with a few plants	2	0
55. Red argillaceous shale with green spots. These shale beds change to the westward	1	6
56. Greenish-gray, very fine massive sandstone, passing into red and green argillaceous shale on the strike	1	6
57. Reddish and greenish mottled argillaceous shale	1	10
58. Greenish-gray fine sandstone with reddish spots and layers of arenaceous shale, passing into greenish conglomerate. These rocks are all regularly bedded. A fault throws them down five feet on the south side	7	0
59. Dark gray, rubbly, argillaceous shale	3	0
60. Greenish-gray sandstone with small patches of fine conglomerate; becomes finer on the strike. On the whole the beds are argillaceous	7	4
61. Dark gray argillaceous shale	1	6
62. Greenish-gray, fine, flaggy, argillaceous sandstone	6	0
63. Greenish and dark-gray argillaceous shale	2	4
64. Clay with an eighth of an inch of coal	0	6
65. Greenish argillaceous shale	3	0
66. Greenish-gray, coarse, pebbly sandstone with patches of conglomerate; replaced by lenticular argillaceous shale	10	0
67. Red argillaceous shale with layers of reddish and mottled sandstone. An upthrow of four feet six inches on the south side	15	0
68. Greenish-grav fine conglomerate and pebbly sandstone, with coarser layers at the base	10	0
69. Greenish and gray, rubbly argillaceous shale and flags	10	0

	Ft.	In.
70. Gray and rusty and greenish nut-and-egg conglomerate	8	0
71. Red argillaceous shale	3	0
72. Gray and greenish flaggy sandstone	9	0
73. Gray and greenish and rusty, pebbly sandstone and grit	5	0
74. Reddish argillaceous shale with greenish layers, but essentially red	14	0
75. Greenish sandstone in one bed, replaced on the strike by shales and flags	1	4
76. Red argillaceous shale ,with layers of reddish sandstone	17	0
77. Greenish wavy sandstone and arenaceous shale	3	6
78. Cream-colored or rusty very fine sandstone, somewhat concretionary, like certain layers seen on Pudsey Point and also on Hetty Point; irregularly jointed and all fine. A vein of coal at the bottom, one inch thick, in an irregular joint	11	0
79. Nut-and-egg conglomerate	5	0
80. Gray, pebbly sandstone	2	4
81. Measures concealed. Reefs and broken banks of gray and greenish fine sandstone occasionally seen, from which, about the middle of the gap, grindstones have been cut; dip S. 56° E.< 7°	148	0
82. Greenish arenaceous shale	5	0
83. Rusty-gray pebbly sandstone, with concretionary "bulls-eyes" at the top. Very like certain rocks of Hetty Point	12	0
84. Dark or Indian-red pebbly sandstone, like that of Hetty Point; contains small patches of conglomerate	6	0
85. Greenish-gray, wavy, arenaceous shale, blackened in the bedding by plants, sometimes of large size	6	0
86. Red argillaceous shale	5	0

	Ft.	In.
105. Reddish-gray nut-and-egg conglomerate, among the pebbles of which are some of gray sandstone, containing plants and perhaps Carboniferous, although the greater number are of red syenite, porphyritic felsite and various Devonian quartzites. Gray patches show carbonized markings of stems of plants	14	0
106. Pinkish and triassic-red, coarse sandstone, with pebbly patches; forms the great cape north of Spicer Cove. Dip S. 41° E.< 12°. The strike would apparently run the rocks against the conglomerate cliffs of the opposite side of the cove, which they appear to represent. Fine reddish sandstone and grit almost entirely replace the coarser beds on the strike. The lower 33 feet are repeated and the measures are then concealed by the beach of Spicer Cove	55	0
107. Measures concealed		
Total thickness	974	2

On the low shore northeast of the mill at Spicer Cove, several good reefs seem to indicate a continuity of low southerly dips between the cliff exposures and, consequently, an absence of faults. If there is no important fault, the measures of the following section may be a repetition of the rocks below No. 80 of Section X.

Section XI.

at spicer cove,

In descending order.

1. Gray sandstone	7	0
2. Greenish, reddish and dark-gray argillaceous shale, not well seen	6	0
3. Bluish-gray, coherent, argillaceous shale	1	6

		Ft.	In.
87.	Reddish or pinkish sandstone like that of Hetty Point; patches of conglomerate; in thick layers, sometimes flaggy	25	0
88.	Indian-red argillaceous shale and flaggy fine sandstone	7	0
89.	Greenish-gray, wavy arenaceous shale, passing into fine sandstone	5	0
90.	Rusty or cream-colored fine, thick-bedded sandstone.	4	6
91.	Greenish-gray and dark-gray argillaceous shale, mottled with red	7	0
92.	Reddish-gray and greenish, very fine argillaceous sandstone, changing at the bottom into gray sandstone in flaggy layers and on the strike into massive sandstone	15	0
93.	Red argillaceous shale with bands of greenish and gray sandstone	15	0
94.	Dark-gray argillaceous shale with films and streaks of coal	1	0
95.	Light-gray underclay with *Stigmaria* rootlets	1	6
96.	Red argillaceous shale changing into sandstone	1	0
97.	Gray and dark-gray fine sandstone and arenaceous shale, full of plants	12	0
98.	Dark-greenish-gray argillaceous shale	4	6
99.	Red argillaceous shale changing into red sandstone.	4	6
100.	Dark-gray and greenish argillaceous shale	2	0
101.	Reddish-gray and mottled, arenaceous flags and sandstone	6	6
102.	Greenish and dark-gray argillaceous shale	1	6
103.	Red argillaceous shale with greenish layers and lenticular bands of fine sandstone	10	0
104.	Gray and pinkish, fine and coarse sandstone, in thick, irregular, jointed beds; pebbly patches, the pebbles being nearly all of syenite	25	0

		Ft.	In.
4.	Dark-bluish-gray, coaly shale	0	6
5.	Bluish, greenish and reddish argillaceous flags	6	0
6.	Dark-greenish-gray, rubbly argillaceous flags	3	0
7.	Blackish coaly shale	0	4
8.	Greenish argillaceous sandstone	1	0
9.	Greenish argillaceous shale	0	6
10.	Greenish argillaceous sandstone in flaggy layers	8	0
11.	Coal, lenticular, with an underclay. A fault with an upthrow of two feet on the south side	0	1
12.	Red and green mottled fine sandstone	1	6
13.	Reddish and greenish mottled argillaceous shale. An upthrow of five feet on the south side	0	8
14.	Greenish, fine, flaggy sandstone	8	6
15.	Dark-gray argillaceous shale and flag, almost a coal at the top	0	10
16.	Black coaly shale	0	2
17.	Greenish and reddish, mottled argillaceous shale	7	0
18.	Light gray fine sandstone	3	0
19.	Greenish argillaceous flags and shales	1	6
20.	Dark gray shale, coaly in places	1	0
21.	Black coaly shale yielding a dark streak	0	4
22.	Bluish-gray argillaceous shale	0	8
23.	Black coaly shale	0	1
24.	Dark, greenish-gray and rusty argillaceous underclay	1	0
25.	Gray and greenish, very fine sandstone, broken in the bank and perhaps faulted	1	6
26.	Reddish and greenish, mottled, somewhat coherent argillaceous rock	2	0
27.	Dark-greenish argillaceous shale with coaly layers	1	0
28.	Light gray wavy arenaceous shale and sandstone; an underclay with fine *Stigmaria*	2	0

The rocks are now obscured by a broken, faulted bank on a northeast and southwest roll

or anticline. About 60 yards to the westward there is the following section:

1. Olive-green massive sandstone	3	6
2. Dark argillaceous shale and bands of sanstone with large erect trees....	8	0
3. Dark argillaceous sandstone	5	0
4. Dark coaly shale	0	3
5. Dark-gray fine sandstone	0	6
6. Black coaly shale, in part clean coal.	0	4
7. Dark-gray argillaceous underclay....	1	4
8. Black coaly shale, passing into greenish argillaceous shale	0	6
9. Greenish arenaceous underclay passing into sandstone	2	0
10. Dark-green argillaceous shale	3	0
11. Measures concealed	1	10
12. Greenish-gray coherent arenaceous shale	3	0
Total thickness	29	3

About 55 yards to the westward and perhaps separated from the foregoing by a fault, the following beds occur:

1. Greenish and reddish argillaceous shale with layers of sandstone	14	0
2. Coaly band	0	3
3. Dark greenish shale with veins of coal.	1	6
4. Greenish coherent sandstone	0	4
5. Red argillaceous shale. Perhaps No. 26 of Section XI.	2	0
Total thickness	18	1

At 70 yards farther west these broken sections end at a great cliff of conglomerate. They are perhaps a repetition of the beds of Section XI

Ft. In.

below No. 13, and No. 28 may rest directly upon the conglomerate, in which case that section may be continued as follows:

29. Red conglomerate with veins of barite and celestite near the top; its material is for the most part of syenite, and it is associated with red, thick, fine layers. The thickness here given is taken from the boring drilled by Mr. J. A. Johnson. (See Section XII.) 811 6

30. Red syenite of Devonian age, or more generally an obscurely granular and compact felsite and quartz-felsite, hornblende being scarce except in dykes and blotches of dark diorite, seldom more than ten to fifteen feet wide. An epidote breccia occurs near the contact of the conglomerate, and the felsite is so much brecciated as to resemble the conglomerate. These rocks in great cliffs occupy the coast south past Eatonville to Cape Chignecto, as shown on Sheet No. 100 (and 101) of the Geological Survey series of maps. A line of fault at the first beds of red conglomerate is indicated by the grooves as dipping N. 45° E.< 63°. First a little piece of the conglomerate is thrown on edge; then, further inland near a little brook from the south, the dark rocks with the black shale and coaly layers of No. 28 rest upon the conglomerate at a low angle apparently conformably. The thickness of the latter as given above is much greater than the height of conglomerate in the cliffs, overlying the syenite, and thus measures the downthrow of the fault at about 500 feet.

Total thickness 878 2

The section of the boring referred to on page 545, is as follows:

Section XII.

J. A. JOHNSON'S BOREHOLE AT SPICER COVE,

In descending order.

		Ft.	In.
1.	Surface: reddish gravel and clay	8	0
2.	Light-gray fine sandstone	1	0
3.	Reddish coarse and fine rock	1	0
4.	Light greenish-grey fine compact sandstone	6	0
5.	Dark gray argillaceous shale with fossil plants	1	0
6.	Light grey and reddish mottled argillaceous shale	28	0
7.	Reddish sandstone	1	6
8.	Reddish nut-and-egg conglomerate	3	0
9.	Reddish fine micaceous sandstone	5	6
10.	Reddish conglomerate, coarse grit and sandstone	13	0
11.	Reddish micaceous sandstone	2	0
12.	Reddish conglomerate	1	0
13.	Reddish-grey argillaceous shale	0	8
14.	Black coaly shale and coal	0	8
15.	Greenish argillaceous shale with *Stigmaria* and rootlets	0	6
16.	Greenish-gray argillaceous shale	2	0
17.	Greenish-gray and reddish shale showing graphite	4	2
18.	Reddish argillacous shale with greenish blotches showing fossil plants	2	0
19.	Reddish-gray very hard sandstone	1	0
20.	Reddish conglomerate with thin bands of reddish and greenish coarse grit, fine sandstone and argillaceous shale, of gray sandstone and shale, and dark gray argillaceous shale with streaks of coal	811	6
21.	Reddish granitic rocks	50	3
	Total depth	943	9

A correlation of these sections seems to show that only about 498 feet of the base of Section IX at Hetty Point extend beyond the base of Section I (and II); that Sections IV, V and VI are wholly repeated in Section I, the general similarity of the strata of these four sections being evident.

A provisonal summary of the total thickness of strata from the uppermost Permian beds at Shulie River—the top of Logan's section—to the base at the Devonian syenite, south of Spicer Cove, may be given as follows:

	Feet.
Strata of Section I (Shulie to Sand Cove).....	1769
" Section IX (Birch Cove to Hetty Point)....	498
" Section X (Apple River to Spicer Cove)....	793
" Section XI (Spicer Cove).....	811
Total thickness exposed in coast section...	3871

This conclusion, arrived at from comparison of the columnar sections, does not contradict the evidence obtained from a study of the dips, faults, etc., as may be seen on the accompanying maps, on which the position of the various sections has been laid down; but before accepting it, further comparison of the beds supposed to be equivalent might be made.

Of the rocks of the Upper Coal Formation on the opposite side of the basin, from Shulie toward Ragged Reef, Sir J. Wm. Dawson says:* "Fossils are not abundant; but *Calamites, Stigmaria, Lepidodendra* and large petrified trunks of the pine trees of the Coal Formation still appear. The general aspect of these beds is, to a great extent, similar to that of the Millstone Grit series."

And in regard to the strata of the base of the section the same writer observes: "At Mill Brook, southeast of Apple River, there is a bed of coal one inch in thickness, and dipping to the north at a small angle. It is associated with coarse sand-

*Acadian Geology, p. 155.

stones and conglomerate, and probably belongs to the Lower Coal Measures or Millstone Grit series, the marine limestones being apparently absent. At least this is the interpretation I should be inclined to put upon the appearances in connection with the fact that along the north side of the Cobequids, the marine Lower Carboniferous is either absent or overlapped by the higher beds of the series in all the localities which I have explored."

Note.—Besides the map accompanying these sections, the reader is referred to the Geological Survey's map sheets of Nova Scotia, Nos. 100 and 101, as well as to the forthcoming Nos. 81 and 102, with the bibliographies thereon given. The reader may also consult Sir William Dawson's *Acadian Geology*, pages 150-178, which treats of Logan's section.

ERRATA.

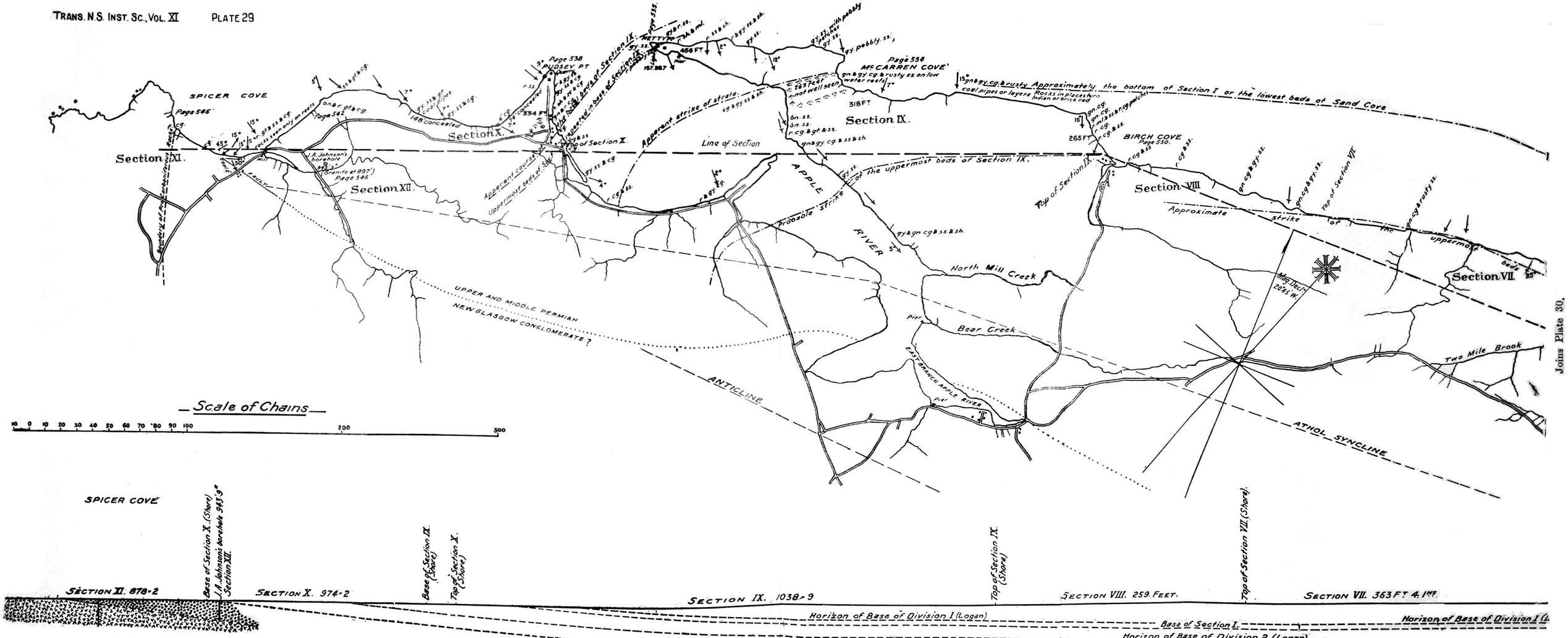
Page 420, lines 17 and 28, for ' darb " read *drab*; p. 421, l. 21, for "reck" read *rock*; p. 426, last line, for "calamities" read *calamites*; p. 427, line 30, for "grav" read *gray*; p. 441, last line, "carbonaceous shale" should be in italics; p. 451, l. 27, for "carbonaceous shale 0·4" read *Carbonaceous shale 1·0*; p. 451, l. 28, for "witht" read *with*; p. 452, omit line 1, "Gray argillo-arenaceous shale, with *stigmariæ* (under-"; p. 452, l. 15, for "the turns" read *then turns*; p. 452, l. 19, for 'groved" read *grooved*; p. 455, l. 23, indent "Gray" one "em"; p. 473, l. 23, for "grenish" read *greenish*; p. 481, l. 22, for "no less 10" read *no less than 10*; p. 487, l. 2, for "desseminated" read *disseminated*; p. 489, l. 14, "Dark green limestone" should be in italics; p. 502, last line, add to ' with sometimes large" the omitted word *trunks*, and carry out 5 ft. 6 in in column of figures; p. 505, l. 31, omit comma after "flaggy sandstone"; p. 514, l. 13, to make sense more clear, place full stop after word "section," and for "which" read *It*; p. 530, l. 1, for "al" read *all*; p. 531, l. 7, for "fin" read *fine*; p. 535, l. 22, for "concertionary" read *concretionary*; p. 543, l. 32, for "Stigmaria" read *Stigmariæ*; p. 546, l. 24, for "argillacous" read *argillaceous*.

CONTENTS.

In order to assist the reader in consulting the foregoing geological sections, there given below a list of those sections and the place-names that are mentioned therein, with the pages on which they occur.

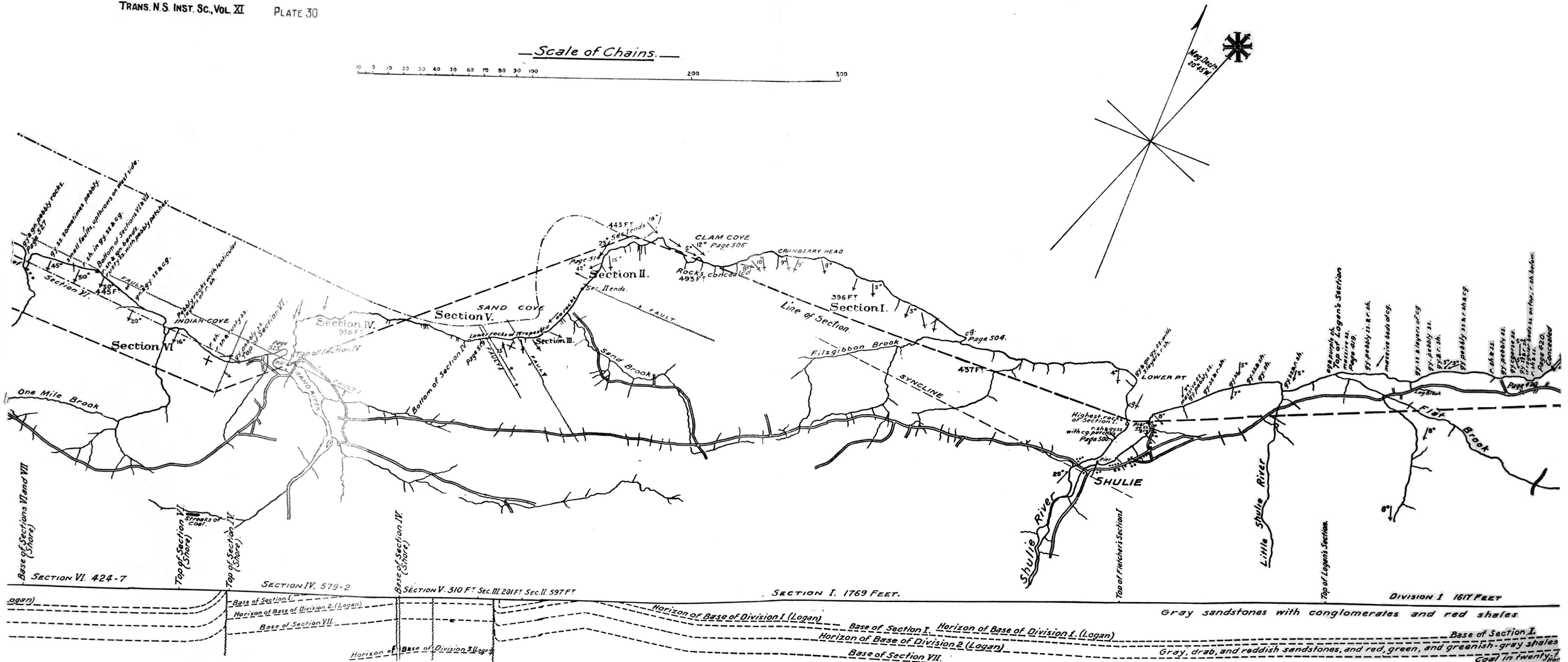
A. SECTIONS AT THE JOGGINS, FROM WEST RAGGED REEF TO MINUDIE (IN DESCENDING ORDER), BY SIR WILLIAM E. LOGAN.

B. SECTIONS FROM SHULIE TO SPICER COVE (IN DESCENDING ORDER), BY HUGH FLETCHER.



Joins Plate 30.

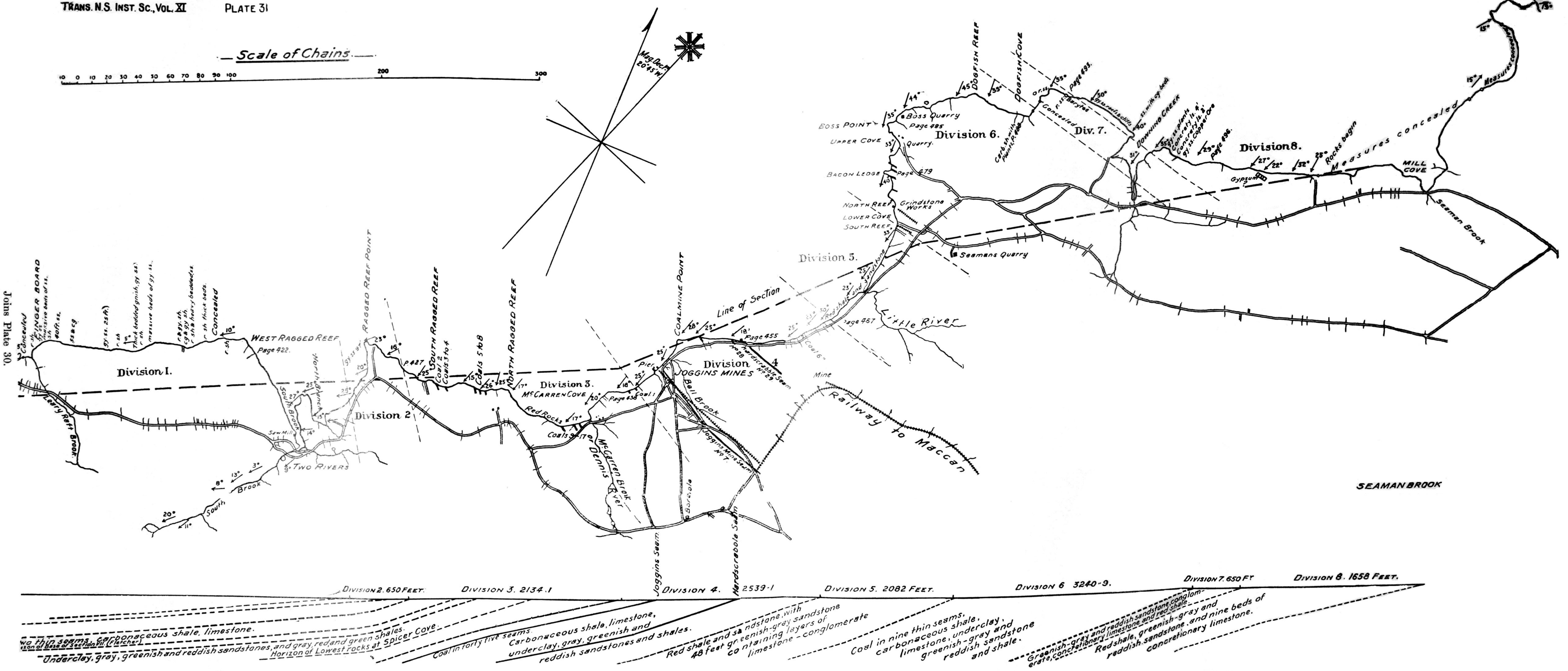
PLAN AND SECTION FROM SPICER COVE TO SEAMAN BROOK, CUMBERLAND CO., NOVA SCOTIA.—No. 1 (SPICER COVE TO TWO MILE BROOK). *(To illustrate paper by Sir William E. Logan and Hugh Fletcher on Carboniferous Rocks in Cumberland Co.)*



Joins Plate 29.

Joins Plate 31.

PLAN AND SECTION FROM SPICER COVE TO SEAMAN BROOK, CUMBERLAND CO., NOVA SCOTIA.—No. 2 (TWO MILE BROOK TO LEARY RAFT BROOK). *(To illustrate paper by Sir William E. Logan and Hugh Fletcher on Carboniferous Rocks in Cumberland County.)*



Plan and Section from Spicer Cove to Seaman Brook, Cumberland Co., Nova Scotia.—No. 3 (Leary Raft Brook to Seaman Brook)

(To illustrate paper by Sir William E. Logan and Hugh Fletcher on Carboniferous Rocks in Cumberland Co.)