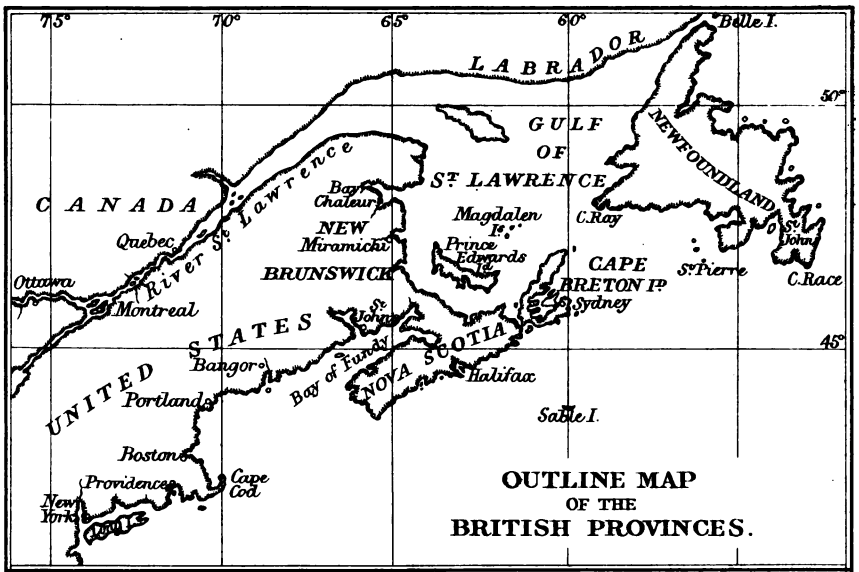

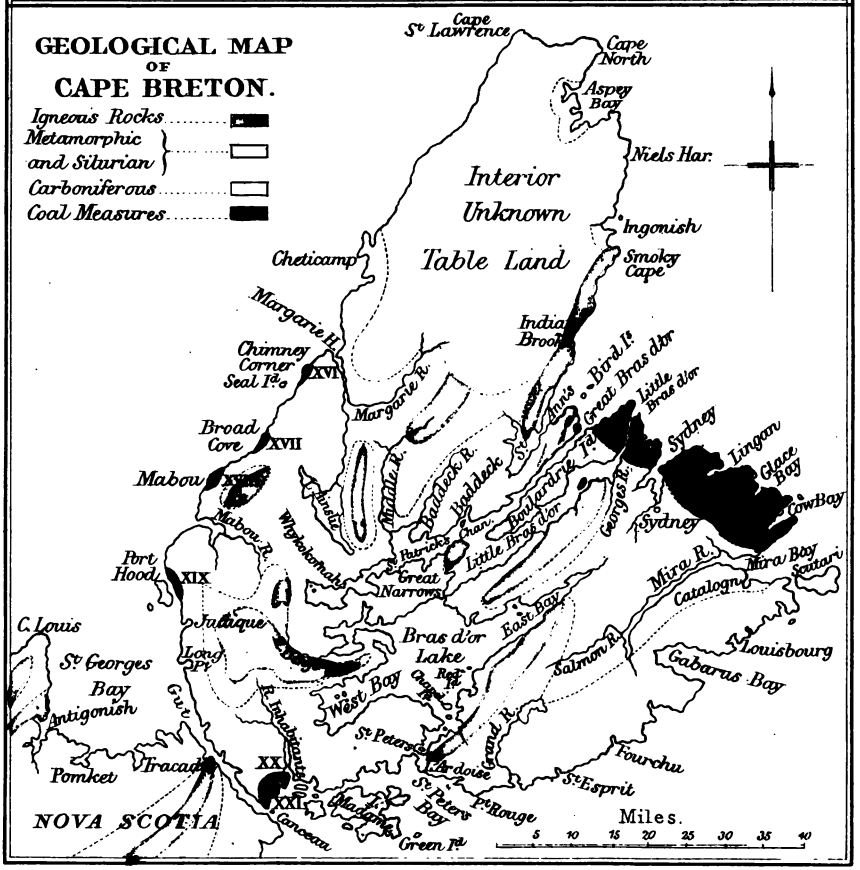

E. Weller, lith.

THE

COAL FIELDS AND COAL TRADE

OF THE ISLAND OF

CAPE BRETON

By RICHARD BROWN, F.G.S. &c.

AUTHOR OF

'A HISTORY OF THE ISLAND OF CAPE BRETON'

WITH MAPS AND ILLUSTRATIONS

LONDON

SAMPSON LOW, MARSTON, LOW, & SEARLE

CROWN BUILDINGS, 188 FLEET STREET

1871

LONDON: PRINTED BY
SPOTTISWOODE AND CO., NEW-STREET SQUARE
AND PARLIAMENT STREET

PREFACE.

THE EXISTENCE of valuable deposits of Coal in the Island of Cape Breton has been long known, but I am not aware that any account of them has hitherto been published, except in certain scientific works, which are read only by persons interested in the subjects they treat of. The want of a reliable description of the Coal Fields, the capabilities of the mines now in operation, and a history of the rise and progress of the Coal Trade, in a popular form, must often have been experienced by those who have invested their money in the Cape Breton mines, especially by the shareholders of the General Mining Association, few of whom can possibly possess more than an imperfect knowledge of the great extent and value of their mining property. Having had the advantage of consulting the works above referred to, and having also been employed many years in the management of the largest collieries in the Island, I hope the information derived from those sources and my own personal knowledge, submitted in the following pages, will be received with confidence by all who are interested in the Cape Breton mines.

I trust also that shipowners and commercial men generally will be glad to learn from these pages that Cape Breton, which, from its geographical position has

been aptly styled 'The Long Wharf of America,' possesses abundant supplies of excellent steam fuel, commodious harbours, and, in fact, every necessary qualification for becoming the great coaling station of the innumerable steamers which are rapidly superseding sailing vessels in the navigation of the Atlantic.

Being the last practical point of departure for steamers from America to Europe, Cape Breton is, in every respect, the most suitable place for the eastern terminus of the projected line of railway from the Atlantic to the Pacific, through British territory, an undertaking which is now deservedly receiving much attention in the Canadian Dominion. It is a remarkable fact, as has been pointed out in a recent able work,[1] that Cape Breton and Vancouver's Islands—the proposed termini of the line—are the only places on the seaboard which can furnish cheap and excellent coal to the steamers that will be employed on the Atlantic and Pacific Oceans in maintaining the communication, in connexion with the railway, between Europe and China.

It now only remains for me to say that, in compiling the account of the Coal Fields, I have availed myself of Dr. Dawson's admirable work on 'Acadian Geology,' and a valuable article in the 'Transactions of the North of England Institute of Mining Engineers,' by John Rutherford, Esq., the Government Inspector of Mines in Nova Scotia. My acknowledgments are also specially due to J. B. Foord, Esq., the Secretary of the General Mining Association, for the use of several important documents in his office; to Henry S. Poole, Esq., of the Caledonia

[1] *The Canadian Dominion*, by Charles Marshall: London, 1871.

Colliery, Glace Bay, for ample accounts of the new mines in the eastern portion of the Sydney Coal Field; and to Richard H. Brown, Esq., the manager of the Sydney and Lingan mines, for much statistical information, and the views of the northern shores of Sydney and Lingan Harbours.

Conscious of many defects, I nevertheless hope this little work will prove acceptable to the shareholders of the General Mining Association, and of the other companies, both English and foreign, engaged in coal mining in Cape Breton, and will convince them that they possess, in their present establishments, ample means for carrying on a large and prosperous business when the restrictions now imposed upon their trade with the United States have been removed—a consummation, there is every reason to believe, not far distant.

R. B.

LONDON: *October*, 1871.

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OF

CAPE BRETON.

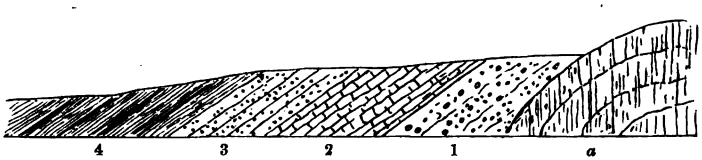
CHAPTER I.

THE CARBONIFEROUS SYSTEM OF CAPE BRETON.

It will be seen, by a glance at the geological map facing the title-page, that the rocks of the carboniferous system cover about one half of the whole area of the island; the other half being, so far as now known, occupied by igneous, metamorphic, and silurian rocks. The prevailing igneous rock is a red syenite which occurs in long narrow ridges of considerable elevation, running in a north-east and south-west direction. Granite, porphyry, and trap are sometimes met with, but only in patches of small extent. Stratified gneiss, mica slate, clay slate, and upper silurian rocks, often highly metamorphosed and disturbed, succeed the igneous rocks, and are in turn overlaid by the conglomerate which generally forms the basis of the carboniferous system. In some instances, however, the conglomerate is wanting, and the carboniferous limestone rests upon silurian or metamorphic

rocks, and occasionally even upon those of igneous origin.[1] The map, above referred to, is given merely for the purpose of showing the situation and extent of the coal-fields relatively to the older rocks. For an accurate account of the geological structure of the island, the reader is referred to Doctor Dawson's excellent and well-known work on Acadian Geology,[2] the object of the present work being confined to a description of the coal formation, and the history of the rise and progress of the coal trade of the island.

The carboniferous system of Cape Breton, coloured blue upon the geological map, comprises four distinct formations, each of great but variable thickness: namely, the conglomerate (1), the carboniferous limestone (2), the millstone grit (3), and the productive coal-measures (4). Their relative position is shown in the annexed diagram :—



1 Conglomerate. 3 Millstone Grit.
2 Carboniferous Limestone. 4 Coal-measures.
a Silurian or Metamorphic, and sometimes Igneous, rocks.

The Conglomerate, the basis of the carboniferous system—analogous in mineralogical character and position to the old red sandstone of Great Britain—is composed of waterworn pebbles and angular fragments, derived from the neighbouring hills, of metamorphic and igneous

[1] A well-defined example occurs on the north side of the entrance of the Great Bras d'Or, where the limestone lies upon syenite at the northern, and upon quartzite at the southern end of the district—localities only two miles apart.

[2] *Acadian Geology.* By J. W. Dawson, LL.D., &c. Second edition. Macmillan & Co., London. 1868.

rocks, which appear to have accumulated under cliffs bordering on the shores of an ancient sea—a process still going on in the formation of shingle beaches by the wasting of adjacent hills and precipices. The pebbles consist of pieces of syenite, gneiss, mica slate, quartzite, flinty slate, hard sandstone, and occasionally a dark-gray limestone, cemented together by a red ferruginous paste.[1] The conglomerate is very irregular in thickness, sometimes forming hills five to eight hundred feet in height, at others, beds merely a few feet in thickness, and in some instances being altogether wanting. At McMillan's Point, in the Gut of Canceau, a well-defined anticlinal axis occurs in the conglomerate, the strata on one side dipping northerly towards Port Hood, on the other southerly under the Richmond coal-field. In the Isle Madame it rests upon the upper silurian rocks of Arichat and underlies the limestone and gypsum of Lennox's Passage. It is seen cropping out at various places on the north-west or Gulf shore between Mabou and Cheticamp, rising to a considerable height on the flanks of the syenitic hills. Between Margarie and Whykokomagh it constitutes a lofty range of hills, which form striking objects in the wild and picturesque gorge traversed by the road between those two settlements; and at Baddeck, the Great Narrows, and many other places, the rugged hills of conglomerate form the most conspicuous features in the beautiful scenery of the Bras d'Or Lakes. In connection with the Sydney coal-field it is found only in thin beds at

[1] A remarkable instance of quite a recent date may be seen on the shore of Sydney Harbour, near the old mines wharf, where rounded pebbles and small boulders of old rocks brought from a distance by field ice, and fragments of sandstone and shale from the adjacent cliff, cemented together by water highly charged with iron flowing from an old level, form a conglomerate which it is difficult to distinguish from the rocks of the old formation underlying the carboniferous limestone.

Kelly's Cove, George's River, the head of the north-west arm of Sydney Harbour, and on the south shore of Mira Bay. It does not furnish any materials adapted for industrial purposes. No fossils have been found in the conglomerate except a few *fish scales* and fragments of *Calamites* in some thin slaty sandstones interstratified with it, on the north shore of St. Anne's Harbour.

The Carboniferous Limestone, including its associated beds of *Shale*, *Marl*, and *Gypsum*, spreads over nearly one-seventh of the whole surface of the island, and probably extends under the great area occupied by the waters of the Bras d'Or Lakes. This formation consists of thick beds of red and gray shale, red marl, sandstone, limestone, and gypsum. The beds of gypsum—a distinctive feature in the series—in some places have a thickness of more than 200 feet, forming lofty precipices in the interior, and continuous cliffs of great extent on the shores of the Bras d'Or Lakes and St. Anne's Harbour. On the sea-coast it is largely developed in Lennox's Passage, the Gut of Canceau, on the Gulf shore, and at Aspey Bay near Cape North. The limestone beds, both laminated and concretionary, contain marine fossils characteristic of the same formation in Europe, chiefly of the genera *Productus*, *Terebratula*, *Spirifer*, *Modiola*, *Crinoidea*, *Euomphalus*, *Conularia*, &c. In some localities the thickness of the formation probably exceeds 2,000 feet; but in many places it is much less, as, for instance, at Cape Dauphin, where it occurs in a highly inclined position resting upon syenite, its thickness, in a very clear section, is only 850 feet.[1] The limestones of this

[1] A detailed section of the carboniferous limestone, with its associated beds of gypsum and marl, at this locality, will be found in a paper by the writer in the *Quarterly Journal of the Geological Society*, vol. iii. p. 257. Dr. Dawson says, 'This section did good service in confirming the new and

formation are well adapted for agricultural and building purposes, and in some places, in the vicinity of igneous rocks, furnish white, gray, and variegated marble, of good quality, in great abundance. Gypsum occurs in many situations convenient for shipment to the United States, where it is in great demand for agricultural purposes; but very little is exported from Cape Breton, the extensive quarries on the Bay of Fundy[1] being able to supply all that is required at a much lower rate of freight. Brine springs issue from the lower beds of the carboniferous limestone at Baddeck, St. Patrick's Channel, and Whykokomagh, which at some future day will supply the fisheries with common salt, and provide a market for the small coal now unsaleable at some of the mines. Petroleum springs also are said to have been recently discovered on the shores of Lake Ainslie, in the shales of the carboniferous limestone formation.

The Millstone Grit. The great sandstone formation resting upon the carboniferous limestone, which, for the sake of brevity, we may designate the Millstone Grit—the name given to its equivalent in the English coal-fields—consists of a series of coarse and fine-grained sandstone beds, with a few layers of shale at wide intervals, and, in one or two instances, thin seams of coal. Fragments of fossil plants of the genera *Sigillaria*, *Lepidodendron* and *Calamites*, occur in some of the beds, in tangled masses, apparently collected together by currents or eddies. Its thickness is very irregular. On the shores of Sydney Harbour it probably exceeds 1,800 feet; but at Cape Dauphin, the western extremity of the coal-field, its

more accurate views of the structure of the carboniferous rocks in Nova Scotia, *promulgated by Sir Charles Lyell in* 1842.

[1] The export of gypsum from Windsor, Nova Scotia, to the United States, exceeds 120,000 tons annually.

thickness is only 200 feet. In the county of Richmond it attains also a considerable thickness, covering a large tract of country between the river inhabitants and St. Peters. Between Port Hood and Margarie, on the Gulf shore, the millstone grit is confined within narrow limits, occupying a belt of country running parallel to, and overlying, the carboniferous limestone. In the Sydney district it can be traced, almost without interruption, from Mira Bay to Cape Dauphin, varying from one to three miles in width. The Bird Islands, each about three-quarters of a mile in length—outliers of this formation—were evidently once connected with the millstone grit of Cape Dauphin. As the limits of the coal-measures can always be determined by the outcrop of the higher beds of the millstone grit, it is fortunate that its existence, though concealed by the soil, may almost everywhere be detected by the presence of large angular weather-worn blocks of sandstone, thickly spread over the surface of the country. These blocks, which are sometimes of great size, are identical in mineralogical character with the beds of millstone grit upon which they lie, and seem to have been detached by means of frost or ice. They clearly have not been brought from a distance as they are in no instances rounded or boulder-shaped, but, on the contrary, rhomboidal or tabular, their sharp corners only being worn off by long exposure to atmospheric influences. Neither can they have been, in geological time, old occupants of their present position, as they would have been crushed or carried away by the icebergs or glaciers which have left evident marks of their former presence in the grooves, and scratches on the outcropping sandstones of the coal-measures in their immediate vicinity. By the aid of these blocks, the southern limit of the coal-measures may be traced from the Great

Entrance across the island of Boulardrie to the Little Entrance of the Bras d'Or, and thence to the western shore of Sydney Harbour. Crossing the harbour, they may be traced from the South Bar, where the millstone grit presents an escarpment of considerable elevation, to Hardwood Hill, behind the town of Sydney. They appear again at the mouth of Mira River, but have not been observed between that river and the last-named locality. Although the sandstones of the millstone grit are generally coarse and pebbly, and often false bedded, quarries of excellent building-stone are worked in many localities; and, in the vicinity of the Sydney mines and also near the South Bar, there are quarries of superior flags and grindstones.

At Stubbert's Point, on the north side of Sydney Harbour, where the coal-measures rest conformably upon the millstone grit, the latter dips to the north-east at an angle of six degrees; but at McPhee's Ferry, on the south side of the harbour, it dips due north at an angle of thirty degrees near its junction with the coal-measures; and south-easterly at the South Bar, two miles further up the harbour. These great disturbances are due, probably, in the first case, to a fault running up the harbour; and in the second, to an anticlinal fault running from the north shore of Lingan Bay (which will be described in a future page) to the South Bar, and thence to Point Edward, where the upper beds of the carboniferous limestone are disturbed in the same manner.

The Coal-measures—the most important member of the carboniferous system, resting upon the millstone grit—consist of a great accumulation of sedimentary strata of *shale*, *sandstone*, and *fireclay*, containing valuable seams of bituminous coal. The *shales*, which were once fine mud, constitute, in thickness, nearly two-thirds of

the whole formation. They are generally argillaceous and arenaceous, but in some cases carbonaceous and bituminous. The first are of a gray or bluish-gray colour but occasionally tinged red by the peroxide of iron. They are the great depositaries of the *fossil plants* peculiar to the coal formations of Great Britain and other countries. The great abundance and variety of fossil plants in the Sydney coal-field are very striking, one section of 1,860 feet in thickness having afforded more than a hundred characteristic species, nine-tenths of which were collected from the bed of shale forming the roof of the main coal-seam. In addition to these, twenty-one new species have been discovered by the writer in the same locality.[1] Erect trees, some of large size, occur at eighteen different levels in the same section, belonging to the genera *Sigillaria*, *Lepidodendron*, and *Calamites*.[2] Roots and rootlets of *Stigmaria* occur in great abundance in the beds of fireclay, or underclay, which form the floors of all the coal-seams; frequently also in beds of shale, overlying coal-seams, attached to the stumps of erect trees.[3] *Ripple marks*, *sun cracks*, and *worm tracks* are of frequent occurrence in the shales, and, occasionally, impressions of *rain drops*; a specimen of the last, found by the writer, is said by Dr. Dawson 'to have afforded

[1] The reader is referred to Dr. Dawson's *Acadian Geology* for a list of the Sydney coal-plants, and descriptions of the new species.

[2] For descriptions of these see papers by the writer in the *Quarterly Journal of the Geological Society*, vol. ii. p. 393; vol. iv. p. 96; and vol. v. p. 354.

[3] A fine specimen of a compressed Sigillaria stump, the '*dome-shaped fossil*,' which so long puzzled fossil botanists, from the Sydney coal-measures, may be seen in the Museum of Geology, Jermyn Street.—'Mr. Brown's various papers on these fossils gave to the geological world the first really satisfactory information respecting the true nature and growth of *Stigmaria*. Mr. Binney can claim priority in date of publication, but his specimens were much less perfect in details of structure, and therefore less satisfactory than those described by Mr. Brown.'—*Acadian Geology*, p. 406.

the finest example yet known of carboniferous rain marks.'[1]

The *sandstone* beds, which once were loose sand, are generally of considerable thickness, mostly coarse-grained, rarely pebbly. False bedding is very frequent. Whilst the *shales*, as proved by the manner in which the most delicate and fragile ferns are preserved, were evidently deposited in quiet shallow waters; the *sandstones*, on the contrary, except in a few instances, were accumulated under conditions of an opposite character. *Sigillariæ*, *Calamites* and *Lepidodendra* are common in some of the beds of coarse sandstone, but almost always in short fragments or tangled bunches, showing that they have been drifted from a distance and deposited from troubled waters. Some of the sandstones are in thin layers and flaggy. At Lloyd's Cove, near the Sydney mines, *rill marks*, formed by receding wavelets, are abundant in a flaggy brown sandstone, which has also furnished a fine example of the *footprints* of a land animal, plainly proving that it was deposited upon a flat tidal sandy shore.[2] With the exception of these footprints, no animal remains have been found in the shales and sandstones above described; they are, however, very abundant in the bituminous shales and some thin layers of limestone, consisting of shells of *Modiola*, *Microconchus*, *Spirorbis*, *Unio*, *Cypris*, &c. *Scales*, *teeth*, *and spines of fishes* of the genera *Holoptychius*, *Megalycthis*, *Palæoniscus*, *Gyrolepis*, and *Amblypterus*, are found in the same beds, together with *Coprolites*.

It will be observed, by reference to the geological

[1] *Acadian Geology*, p. 410.

[2] These footprints are described by Dr. Dawson in the *Canadian Naturalist*, under the name of *Sauropus Sydnensis*. There is a sketch of them in his *Acadian Geology*, p. 358, and of the rill marks in the same work at p. 27.

map, that there are six separate portions of coal-measures distinguished by a dark shading, each of which, at first sight, might be supposed to represent a distinct coal-field; there are, however, only three—the Sydney, the Inverness, and the Richmond coal-fields; the four small patches of coal-measures at Port Hood, Mabou, Broad Cove, and Chimney Corner being portions of one great coal-field extending under the waters of the Gulf of St. Lawrence. A description of these coal-fields will form the subject of the following chapter.

CHAPTER II.

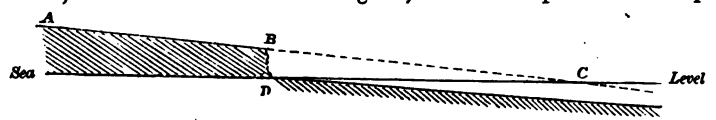
THE SYDNEY COAL-FIELD.

THE coal-field of Sydney—the most extensive, and, it may safely be asserted, the most valuable in the province of Nova Scotia—extends from Mira Bay on the east to Cape Dauphin on the west, a distance of thirty-one miles, being bounded on the north by the sea-coast, and on the south by the millstone grit formation.[1] This tract of country, occupying an area of about 200 square miles, is intersected or indented by several bays and harbours affording exposed sections of the coal-measures in the cliffs, which, with the exception of a few sand beaches, extend along the whole coast from Mira Bay to Cape Dauphin. From these cliffs, varying from twenty to one hundred feet in height, the land rises gradually towards the interior, rarely attaining a greater elevation than 150 feet at a distance of one mile from the shore. Viewed from the sea, the general aspect of the country is undulating, low valleys proceeding inland from the bays and harbours, separated by gently swelling wooded hills, terminating in headlands on the sea-coast. There can be no doubt that at no far distant day (in geological time) the coal country extended far to the north-eastward, and occupied a considerable area now covered by the sea, as the scarped rocky cliffs, composed of alternate beds of sandstone and

[1] See map of the coal-field at the end of the volume.

shale, present a feeble bulwark against the incessant attacks of the waves of the Atlantic. When the island last emerged from the sea, a low gravelly beach—not a cliff—naturally constituted its coast-line; this beach, exposed to the abrading action of the surf, soon gave place to an incipient cliff, which has been gradually, but steadily, receding inland from that time up to the present day.[1] If not arrested in its progress by artificial means, in the course of time the whole of the coal lands will become the prey of the restless ocean. In some cases, this wasting of the land must have proceeded at a more rapid rate than that mentioned in the foot-note, owing to land-slips under peculiar conditions, as for instance at Cranberry Head, where, some years ago, a mass of strata twenty yards square and fifteen yards in perpendicular height, overlying a thin seam of coal resting upon an underclay floor, slipped off at once, forming a small island, detached about twenty feet from the mainland. The effects of a similar land-slip, on a much larger scale, may still be seen between Low Point lighthouse and the Barrasois, where

[1] That such was the fact is evident from a careful inspection of the contour of the land, which generally presents a gently sloping surface towards the sea-coast, as shown in the annexed diagram, where A B represents the slope



of the land terminating at the cliff B, and D E the present sea-bottom. The line A B, continued at the same angle of declination, strikes the sea-level at C, the situation of the ancient beach when the land was last elevated into its present position. Applying this theory to several localities on the coast where the heights of the cliffs and the slope of the adjacent land are known, it appears that a belt of land two miles in width, between the present and the ancient coast-lines, has been removed. The writer, from observations extending over a period of thirty years, having ascertained that the wearing away of the cliff at one locality averaged five inches per annum, it follows that more than 25,000 years have passed away since the coal country emerged from beneath the waters of the Atlantic.

a mass of strata half a mile in length, 200 yards in width, and twenty yards in height, resting upon a seam of coal, having a strike parallel with the coast-line, has slipped down bodily, owing to the softening of the under-clay, on one side by land-springs and rains, and on the other by the action of the surf. The debris of the fallen mass at the foot of the cliff, before this time, has probably been ground into mud and sand by the waves, but the course of the land-slip may be distinctly traced from end to end by means of the long rugged gaps and holes left on the surface of the land.

The total thickness of the Sydney coal-measures has not yet been correctly made out, but there is good reason to conclude that, from Burnt Head near Glace Bay, where the highest known bed occurs, down to the millstone grit, it is not much under 7,000 feet.[1] On this important question the reader will be better prepared to form an opinion for himself when he has perused the following account of the position and extent of the several seams in both divisions of the coal-field. As the line of separation of the coal-measures from the millstone grit has not yet been correctly ascertained between Mira Bay and Sydney Harbour, it will be better first to describe the western portion of the coal-field, where the coal-measures can be distinctly seen resting upon the millstone grit, without interruption, from Stubbert's Point to Cape Dauphin. This will give us a well-defined starting-point from the lowest

[1] In a paper published in the *Quarterly Journal of the Geological Society*, vol. vi. p. 115, the writer stated that the thickness of the *productive* coal-measures probably exceeded 10,000 feet. He has since found, upon revising his estimate, that, in placing the thickness of the Boulardrie section at 5,400 feet, the millstone grit and carboniferous limestone, together 2,800 feet in thickness, were erroneously included in this amount. Deducting this grave error, the thickness of the *productive* coal-measures will not much exceed 6,000 feet. The explorations in progress in the Glace Bay district will soon, it is hoped, accurately determine their thickness.

beds, and enable us subsequently to trace, more satisfactorily, the connection of the seams in the eastern and western divisions of the coal-field.

The Sydney Mines district, lying between Sydney Harbour and the Little Entrance of the Bras d'Or Lakes, occupies an area of about ten square miles. Partial sections of the coal-measures are visible at many places in the interior and on the borders of the district, but nowhere in such perfection as in the cliffs on the north-west shore of Sydney Harbour, which exhibit a complete section, directly at right angles to the line of strike, three miles in length and 1,860 feet in depth, extending from Cranberry Head, at the entrance of the harbour, to Stubbert's Point, where the lowest bed of the coal-measures may be seen lying conformably upon the millstone grit.[1]

The following is a section of the coal-measures from Cranberry Head to Stubbert's Point, in descending order, showing, in separate columns, the thickness of each seam and of the intervening strata of sandstone, shale, underclay, &c. in the Sydney Mines district[2]:—

	Ft.	In.	Ft.	In.
Strata	21	7	...	
Coal (Cranberry Head Upper Seam)	...		3	8
Strata	15	8	...	
Coal 0 2				
Clay 0 2 (Cranberry Head Lower Seam)	0	2	0	10
Coal 0 8				
Strata	245	8	...	
Coal 0 2				
Soft Shale 0 8	0	8	0	5
Coal 0 3				

[1] A view of the north-west shore of Sydney Harbour, taken from the opposite shore, showing the positions of the principal seams of coal in the cliffs, and the situations of the pits, buildings and wharves of the General Mining Association, will be found at the end of this volume.

[2] Compiled from a detailed section taken by the writer, published in the *Quarterly Journal of the Geological Society*, vol. vi p. 115.

			Ft. In.	Ft. In.
Brought forward . . .				
Strata			17 3	...
Coal	2 0			
Clay	0 2			
Coal	0 6	(Lloyd's Cove Seam)	0 3	6 0
Clay	0 1			
Coal	3 6			
Strata[1]			250 3	...
Coal	0 7			
Clay	0 5	(Chapel Point Upper Seam) . .	0 5	0 11
Coal	0 4			
Strata			106 11	...
Coal	1 4			
Clay	0 4			
Coal	0 5	(Chapel Point Lower Seam) .	2 9	2 1
Fireclay . . .	2 5			
Coal	0 4			
Strata			21 6	...
Coal			...	0 3
Strata			162 8	...
Coal			...	0 4
Strata			178 9	...
Coal (The Sydney Main Seam)			...	6 0
Strata			43 1	...
Coal			...	0 9
Strata			12 1	...
Coal			...	0 4
Strata			130 11	...
Coal	0 2			
Carboniferous Shale .	0 1			
Coal	0 3	(Quarry Seam) .	0 3	0 8
Carboniferous Shale .	0 2			
Coal	0 3			
Strata			76 9	...
Coal			...	0 4
Strata			46 0	...
Coal	0 5			
Carboniferous Shale .	0 2		0 2	0 6
Coal	0 1			

[1] About 144 feet of these beds are concealed by the sand beach of Lloyd's Cove, but can be distinctly seen on the sea-shore between Cranberry Head and Black Point on their line of strike.

			Ft. In.	Ft. In.
Brought forward . . .				
Strata			26 10	...
Coal			...	1 3
Strata			120 4	...
Coal	0 8			
Shale	0 1	(Indian Cove Seam)	0 1	4 8
Coal	4 0			
Strata			61 9	...
Coal			...	0 11
Strata			21 11	...
Coal			...	1 4
Strata			20 10	...
Coal			...	0 7
Strata			8 11	...
Coal			...	0 2
Strata			73 9	...
Coal	0 1			
Shale	0 3			
Coal	0 2			
Shale	0 2			
Coal	0 2			
Fireclay . . .	1 10			
Coal	1 2	(Stony Seam)	2 10	3 0
Carboniferous Shale	0 2			
Clay	0 2			
Coal	1 3			
Carboniferous Shale	0 3			
Coal	0 2			
Strata			1 10	...
Coal	0 2			
Shale	0 1			
Coal	0 1	(Shelly Seam)	0 7	0 5
Carboniferous Shale	0 6			
Coal	0 2			
Strata			65 2	...
Coal			...	1 0
Strata, with traces of Coal in three places			72 5	...
			1,823 9	36 3
Coal			36 3	
Total Thickness			1,860 0	

It will be seen by this table that, although there are not less than thirty-six beds and layers of coal in the section, only four are of sufficient thickness to be economically worked, namely, the Cranberry Head, the Lloyd's Cove, the Main, and the Indian Cove seams, whose aggregate thickness is twenty feet four inches.

All the principal seams of this district, except that at Cranberry Head, which runs into the sea, can be traced across the country from Sydney Harbour to the Little Entrance of the Bras d'Or Lakes. The Lloyd's Cove seam certainly is not quite continuous, as it crops out on the coast a quarter of a mile to the westward of Cranberry Head, and runs into the sea, but owing to an undulation in the measures at right angles with the strike, the seam is deflected to the west, and rising out of the sea, again appears above high-water mark near Bonar's Head, from whence it has been traced running nearly due north to Plant's Point. It maintains a tolerably uniform section until it nearly reaches Plant's Point, when, owing to a rapid increase in the thickness of the clay parting, it is split into two distinct beds, separated by fifteen feet of shale.

The two beds forming the lower seam at Chapel Point, sixteen and four inches thick, were both met with in sinking the Queen Pit three-fourths of a mile to the westward. They are visible in the cliff at Black Point, and also at Oxford Point. At the latter place the upper seam is four, and the lower two feet six inches in thickness, separated by eighteen feet of shale. They have not been traced any further to the northward.[1]

The 'Six-Foot,' or main seam, maintains its full thickness as far as the Big Pond, gradually bending round to

[1] The strike of the several seams at *sea level* is marked on the map in strong black lines wherever it has been accurately ascertained; the supposed continuation of the strike is indicated by broken or dotted lines.

the northward as it approaches the undulation in the measures in that locality. It has been traced, by means of boring and sinking, from Cox Hill on the north side of the Big Pond, as far as Kidd's Point on the Little Entrance of the Bras d'Or, a distance of three miles, but between those two places its thickness nowhere exceeds four feet; at Kidd's Point it is only three feet six inches. The quality of the coal, however, shows no signs of deterioration.

The Indian Cove seam has been worked at a pit one mile to the westward of Indian Cove, and at a place about a mile further in the same direction. It has also been proved at a trial pit and boring near the Little Entrance. There is little variation in thickness at all these places. Its roof of bituminous shale, containing *modiolæ, cyprides, fish scales, &c.*, clearly establishes its identity from Indian Cove to the Little Entrance. On the shore of the Little Entrance there is another bed of coal four feet ten inches in depth, lying 200 feet below the preceding, which is probably the equivalent of the stony seam of the Sydney Mines section.

The inclination or dip of all the seams is about seven degrees, but its direction gradually comes round from north-east on the shore of Sydney Harbour to nearly due east at the Little Entrance. The amount of dip has, however, been found to decrease rapidly towards the north-east in the underground workings at the Sydney Mines, where, at the distance of one mile from the outcrop of the seam, it does not exceed five degrees.

The Boulardrie District, bounded on the east and west by the Little and Great Entrances respectively, and on the south by the millstone grit, occupies an area of about eight square miles, containing several valuable seams of coal. Though separated only from the Sydney Mines

district by the narrow channel of the Little Entrance, which is not more than 100 yards in width, the connection of the coal-seams on each side of this channel cannot, owing to serious disturbances caused by faults, be satisfactorily determined. On the north-west side of the island of Boulardrie, fortunately, there is less disturbance, and a continuous section is visible in the cliffs from Point Aconi to the millstone grit, a distance of about six miles, interrupted at only two or three places by low shingle beaches. The three upper seams have been clearly traced by borings and trial pits across the northern end of Boulardrie island, but those below have been seen only at the places marked on the map by black lines. There is, however, every reason to believe that they continue, without interruption, from the north-west shore in a south-easterly direction, as shown by the dotted lines, until they reach the faults above mentioned. The relative position and thickness of the coal-seams are shown in the following section, beginning at Point Aconi in descending order:—

			Ft.	In.	Ft.	In.
Strata of Sandstone and Shale			50	0	...	
Coal (Point Aconi Seam)			...		3	6
Strata			300	0	...	
Coal	3	3				
Shale	14	0	(Bonar's Seams)	11	0	7	3
Coal	4	0				
Strata			380	0	...	
Coal	2	0				
Clay	0	1½				
Coal	0	3	(Stubbert's Seam)	0	3	7	3
Clay	0	1½				
Coal	5	0				
Strata			280	0	...	
Coal	3	6				
Fire-clay	0	6	(Crawley's Seam)	0	6	7	6
Coal	4	0				
Strata (containing bituminous shale with Modiola, &c.)			560	0	...	

			Ft.	In.	Ft.	In.
Coal	2	6				
Shale	1	0	(Mill Pond Seam)	1	0	4	0
Coal	1	6				
Strata				400	0	...	
Coal (Black Rock Seam)				...		4	0
Strata (resting upon the Millstone Grit)				585	0	...	
				2,567	9	33	6
			Coal	33	6		
			Total Thickness	2,601	3		

The general resemblance of these seams and of certain strata associated with them, both in character and relative position, to those of the Sydney Mines' section, is very striking, though there are some discrepancies, not, however, of greater importance than in many instances in other parts of the coal-field, where the identity of the beds is indisputable. It may, therefore, be safely concluded that, taking each series in descending order, those of the Boulardrie, in the first column of the following list, are the equivalents of those placed opposite to them, in the Sydney Mines' section:—

Boulardrie Section.		Ft.	In.	*Sydney Mines' Section.*		Ft.	In.
Pt. Aconi Seam		3	6	Under the Sea			
Bonar's Seam	Coal	3	0	Cranberry Head	Coal	3	8
	Shale	11	0		Strata	15	8
	Coal	4	0		Coal	0	10
Stubbert's Seam	Coal	2	0	Lloyd's Cove Seam	Coal	2	0
	Clay	0	1½		Clay	0	2
	Coal	0	3		Coal	0	6
	Clay	0	1½		Clay	0	1
	Coal	5	0		Coal	3	6
Crawley's Seam	Coal	3	6	Chapel Point[1] Upper Seam	Coal	0	7
	Clay	0	6		Clay	0	5
	Coal	4	0		Coal	0	4

[1] This seam thickens as it proceeds westwards, the upper bed being four, and the lower two feet and a half, at Oxford Point, two miles west of Chapel Point.

		Ft.	In.			Ft.	In.
Mill Pond Seam	Coal	2	6	Main Seam[1]		6	0
	Shale	1	0				
	Coal	1	6				
Black Rock Seam Coal		4	0	Indian Cove Seam	Coal	0	8
					Shale	0	1
					Coal	4	0

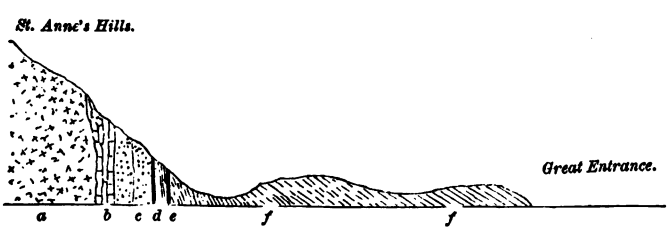
A very strong point in confirmation of the identity of the two series of seams is the fact that both the Black Rock and Indian Cove seams, the lowest beds in each section, have roofs of black bituminous shale, containing *modiolæ*, *cyprides, scales* and *spines of fishes, &c.*; and further, that beds of the same kind of shale, containing fossils similar to the preceding, are found between the Chapel Point and the main seam in the Sydney, and the Crawley and the Mill Pond seams, in the Boulardrie section, on almost exactly the same horizon.

The average dip of the strata in the Boulardrie district is north-east at angle of six degrees. The outcrops of the seams on the Little Entrance have been marked upon the map wherever they have been actually seen; their course and continuation to the northward can only be determined when the position and throw of the faults, which have caused so much disturbance in the original position of the strata, have been correctly ascertained.

The Cape Dauphin District, at the north-western extremity of the Sydney coal-field, is separated from that of Boulardrie by the waters of the Great Entrance of the Bras d'Or lakes. Though occupying an area of little more than two square miles, all the formations of the carboniferous series are here found between the southern flank of the Syenitic hills of St. Anne's and the Great Entrance, perfect sections of the members of each forma-

[1] There is a parting twenty inches from bottom of this seam at Sydney mines.

tion being visible at Cape Dauphin and Kelly's Cove—the northern and southern ends of the district. At both of these places the strata are inclined at an angle of sixty degrees dipping to the east, but midway between them the strata are nearly vertical, being squeezed or compressed within very narrow limits at their outcrops by the upheaval of the Syenitic rocks. The coal-measures, as shown in the map, occupy an area of one square mile, in the form of the segment of a basin or trough similar to that at Cow Bay at the eastern extremity of the coal-field. Two seams of coal, in a vertical position, have been discovered midway between Cape Dauphin and Kelly's Cove—one four, the other six feet in thickness, separated by eighty-three feet of strata. The six-feet, which is the lowest seam, has also been discovered in a vertical position half a mile to the eastward; and the four-feet, or upper seam, in a deep ravine half a mile to the southward, dipping easterly at an angle of twelve degrees. The position of the several members of the carboniferous series in this interesting locality is shown in the annexed section :—



a Syenite.
b Carboniferous Limestone.
c Millstone Grit.
d Six Feet Seam.
e Four Feet Seam.
ff Coal Measures.

At Kelly's Cove a narrow belt of quartzite is seen in the cliff lying between the carboniferous limestone and the Syenite, but it appears to have been squeezed out before it reached the locality of the above section.

CHAPTER III.

THE SYDNEY COAL-FIELD—*continued.*

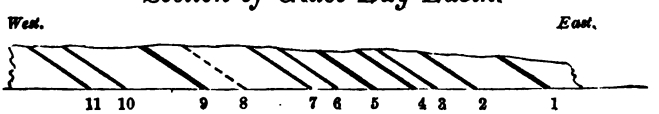
The Glace Bay District.—As the coal-measures in the eastern division, between Mira Bay and Sydney Harbour, are most fully developed in the vicinity of Glace Bay, where they have been carefully surveyed by Professor Lesley and other skilful geologists, it will be best to describe *them* in the first instance; we shall then be better prepared, taking the Glace Bay series as a starting-point, to define the mutual relations and establish the identity of the seams in the adjoining districts. On reference to the map it will be seen that the coal seams, marked on their strike by strong or broken lines, are disposed in the form of an elliptical basin or trough, of which the longitudinal axis runs in a nearly due east and west direction from Table Head towards the town of Sydney. By far the greatest portion of this basin lies under the sea; the western end only—extending from the coast to the millstone grit, being available for mining purposes, though workings may at a future day be continued some distance under the sea.[1] This contingency, however, is not likely to occur very shortly, as the coal

[1] Mr. Hull, the director of the Geological Survey of Ireland, in his work on the coal-fields of Great Britain, estimates that coal-mining may be carried on at a perpendicular depth of 4,000 feet. If this be correct, taking the dip of the Glace Bay seams at an angle of five degrees, workings may be continued, from a seam cropping out on the shore, four miles under the sea.

measures of the Glace Bay basin, bounded on the east and west by the sea coast and the millstone grit, and on the north and south by the anticlinals of Lingan and Cow Bay, underlie a land area of at least sixty square miles. The courses of these anticlinals will be pointed out at a subsequent page.

The Hub seam, the highest in the series, is followed in succession by the Harbour, Three Foot, Back Pit, Phelan, and several other seams, as shown in the annexed diagram, on the line marked Section 1 on the map. This section, with the aid of the table which follows, will, it is hoped, give a correct idea of the relative position of each of the seams in the series:—

Section of Glace Bay Basin.



1. Hub Seam.
2. Harbour Seam.
3. Three Foot Seam.
4. Back Pit „
5. Phelan „
6. Spencer or Ross Seam.
7. McRury Seam.
8. Lorway ? „
9. Gardener „
10. Two Feet „
11. Martin's „

Beginning at Table Head on the sea shore, we have, in descending order:—

		Ft.	In.	Ft.	In.
Strata of Sandstone, Shale, &c.		240	0	...	
Coarse Coal	1 2				
Good Coal	5 6				
Shale Band	0 1	0	1	9	8
Good Coal	3 0				
(Hub Seam)					
Strata		520	0	...	
Coarse Coal	0 3				
Good Coal	4 9	...		5	0
(Harbour Seam).					
Strata		243	0	...	
Coal (Three foot Seam)		...		3	0
Strata		54	0	...	

		Ft. In.	Ft. In.
Coal 1 4			
Black Shale . . 0 2			
Coal 0 8	(Back Pit Seam)	0 3	4 6
Clay 0 1			
Coal 2 6			
Strata		104 0	...
Coal (Phelan Seam)		...	8 3
Strata		135 0	...
Coal (Spencer or Ross Seam)		...	5 0
Strata		90 0	...
Coal (McRury Seam)		...	2 8
Strata		400 0	...
Coal (Lorway Seam)		...	4 6
Strata		260 0	...
Coal (Gardener Seam)		...	4 9
Strata		460 0	...
Coal (Not named)		...	2 0
Strata		250 0	...
Coal (Martin's Seam)		...	2 0
		2,756 4	51 4
	Coal . .	51 4	
	Total Thickness .	2,807 8	

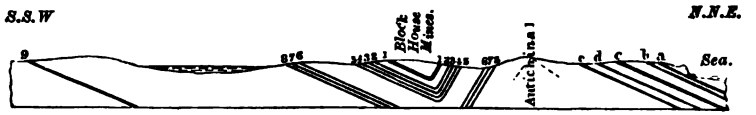
The Tracey seam of the Cow Bay district is said to lie 2,400 feet below the McRury seam, but it is not marked in the section or table, as it has not yet been found on the south side of Lingan Bay. For the same reason, the Lorway seam is marked in broken lines in the section, as it has only been proved about a mile to the southward of the line of section, and may possibly be a continuation of the Gardener seam.[1]

[1] There is every reason to believe that all the seams named in the section will be found in the positions marked by broken lines on the map, as no faults or dislocations have been noticed; but it must be observed that they have only been actually traced in such places along their strike as are marked by strong black lines, from the shores of Indian Bay to Schooner Pond. There are several other thin seams interstratified with the above, but, being of no value, they have not been marked on the map.

The Hub and Harbour seams are confined to the promontory bounded by the shores of Glace Bay and Indian Bay, where they run under the sea and do not reappear. All the others, down to the McRury seam inclusive, continue to the eastward as far as the north head of Cow Bay, where they also run under the sea. It is probable, however, that a three-feet seam, which crops out on Flint Island, a mile and a half to the eastward of Cow Bay Head, is a continuation of one of those seams, and that the island was at one time part of the adjacent mainland. Neither Martin's nor the two-feet seam above it have yet been traced beyond the places where they were first discovered. Many of the seams vary considerably in thickness in their course from Indian Bay to Schooner Pond; the most remarkable instances, together with some other peculiarities, will be noticed in a future chapter, when the workings opened in them come under consideration. The direction of the dip of the several seams in the Glace Bay basin of course varies as they proceed along their curved lines of strike, from north-east on the eastern to east on the northern side of the basin, the angle of inclination rarely exceeding five degrees.

The Cow Bay Basin is separated from that of Glace Bay by an anticlinal axis, formed by an undulation in the coal-measures, running in a westerly direction from the north end of Long Beach to its termination at a point, three miles to the westward of Sand Lake, where it runs out. Its course is indicated by the opposite dips of the strata on its north and south sides, and, occasionally, by blocks of weather-worn sandstone scattered along the surface, which have, apparently, been detached from a thick bed of that material cropping out at Long Beach and along the line of the undulation or upheaval of the

strata. The annexed diagram shows the position of the seams of the Cow Bay basin, and their separation from their equivalents of the Glace Bay basin on the opposite side of the anticlinal.



COW BAY SEAMS.	GLACE BAY SEAMS.
1.1. Block-house Seam.	*a.* Three-Feet Seam.
2.2. McAulay ,,	*b.* Back Pit ,,
3.3. Spencer ,,	*c.* Phelan ,,
4.4. McRury ,,	*d.* Spencer or Ross Seam.
5.5. Three-Feet ,,	*e.* McRury ,,
6.6. 7.7. 8.8. Long Beach Seams.	
9. Tracey Seam.	

In making a traverse from the sea coast along the line of Section No. 2, the McRury seam of the Cow Bay basin is the lowest that is met with to the northward of the anticlinal ridge. It will also be observed, by reference to the map, that the greater portion of the Cow Bay basin passes under the waters of the bay, not more than 200 acres of the Block-house seam—the best in the series, being available for mining purposes. The following table shows the thickness and relative position of the Cow Bay seams, commencing in the centre of the basin at the Block-house mines, and descending towards the anticlinal:

				Ft.	In.	Ft.	In.
Strata of Sandstone and Shale				200	0	...	
Top Coal	1	0	(Block-house Seam)	...		9	0
Coal	8	0					
Strata				350	0	...	
Coal	2	2					
Clay	0	1	(McAulay Seam)	0	1	4	10
Coal	2	8					
Strata				200	0	...	

	Ft.	In.	Ft.	In.
Coal (Spencer Seam—the Ross Seam of Glace Bay)	...		2	8
Strata	50	0	...	
Coal (McRury Seam)	...		4	4
Strata	100	0	...	
Coal (Three-Feet Seam)	...		3	0
Strata	200	0	...	
Coal	...		1	6
Strata	100	0	...	
Coal (Long Beach Seam)	...		3	2
	1,200	1	28	6
Coal	28	6		
Total Thickness	1,228	7		

Proceeding southerly from the centre of the basin on the same line of section, a similar series of strata is met with, dipping, of course, in the opposite direction. Three miles further to the southward, a five-feet bed of coal, named the Tracey Seam, crops out on the north shore of Mira Bay, which is said to lie at a depth of 2,400 feet below the 'Three-Feet' seam in the above section.

On the southern shore of Cow Bay there are several seams, or rather groups of seams, in the cliffs, running across the narrow promontory called the South Head. They are supposed to be continuations of some of the beds on the south side of the Cow Bay basin, but they bear such a slight resemblance, in stratigraphical features, to any of those beds, that it is hard to believe they can really be identical. Passing into the sea on the south side of the headland, all further traces of them are lost, as the space once occupied by the coal-measures at the eastern end of the Sydney coal-field, extending probably as far as the metamorphic rocks of Scatari Island; is now covered by the waters of Mira Bay. The following section, taken by the writer many years ago, from the South

Head to False Bay beach, may perhaps be useful in fixing the relations of the seams in question to those of the north side of Cow Bay:

			Ft.	In.	Ft.	In.
Strata			60	0	...	
Coal	2	0				
Fireclay	2	0				
Coal	2	6	First group of Seams		6	6
Fireclay	2	0	4	0		
Coal	2	0				
Strata			130	0	...	
Coal	2	6				
Fireclay	3	0				
Coal	1	6				
Shale	6	0	Second group of Seams		11	6
Coal	4	0	12	0		
Fireclay	3	0				
Coal	3	6				
Strata			30	0	...	
Coal	0	9				
Fireclay	4	0				
Shale	6	0	Third group of			
Coal	0	4	Layers		1	4
Fireclay	4	0	14	0		
Coal	0	3				
Strata			70	0	...	
Coal			...		1	0
Strata			50	0	...	
Coal			...		2	0
Strata, including some thin coals, down to the Tracey Seam			2,200	0	...	
			2,570	0	22	4
Coal			22	4		
Total Thickness			2,592	4		

There is some difference of opinion respecting the identity of certain seams in the Glace Bay and Cow Bay basins, but it seems to be generally admitted, by those who have carefully studied the subject, that the Phelan

seam of the Glace Bay is the equivalent of the McAulay seam of the Cow Bay basin.

Referring again to the section of the Glace Bay basin, the reader will observe that there are four seams designated the Lorway, the Gardener, the 'Two-Feet,' and the Martin seams. None of these have yet been traced to the eastward beyond the places marked in black lines on the map, but it is probable that they continue in that direction along the courses of the broken lines, and run out on the north side of the anticlinal. If this be so, they are probably the equivalents of the Long Beach seams; and the Six-Feet seams, on the north side of Lingan Harbour, three miles to the westward of the Lingan Mines, may be the continuation of the Tracey seam of the Cow Bay basin. Under this impression the writer has ventured to mark, in a broken line, its supposed strike parallel to the Glace Bay beds, making a deflection to the eastward near the western end of the anticlinal so often mentioned. It is expected that an examination of the coal-field will soon be undertaken by the accomplished geologists of the Canadian Survey, when these points will, no doubt, be satisfactorily determined; and the limits of the coal-field to the south-westward of the Cow Bay road (where some thin seams of coal have been discovered) be correctly ascertained.

The Lingan and Low Point District, bounded on the north by Sydney Harbour, on the south by Indian Bay, and on the north-east by the sea coast, covers an area of about fourteen square miles containing several valuable seams of coal. It is separated from the Glace Bay basin by an anticlinal running in the direction of the line A, B, C, (*see map*), the result, probably, of a fault which may be seen in the cliff a short distance to the northward of Little Head, and which may be traced in its course to

the westward, from A to B, by means of several perennial springs issuing at the surface along the line of fracture. On the north side of the fault or anticlinal, the coal-measures seen in the cliffs of Indian Bay dip, N. 34° E., or nearly at right angles to the dip of the Glace Bay series on the south shore of the same bay. From the North Head of Indian Bay to Low Point—a distance of five miles, the coal-measures are clearly exposed in the cliffs running nearly parallel to the coast as far as the Barasois with a strike of N. 56° W. and dip of twelve degrees. At the Barasois the strike begins to bend round to the westward, and the dip of the beds to increase, the former being N. 80° W. and the latter seventeen degrees, half a mile to the eastward of the lighthouse. On the south shore of Sydney Harbour, from the lighthouse to Mc Phee's ferry, the strike of the measures is nearly due west, the dip varying from thirty-nine degrees, half a mile to the westward of the lighthouse, to thirty degrees at the Ferry.

The three lowest seams in the following section of the Lingan series are seen in the cliff between the North Head and the harbour; all the others crop out in succession along the coast towards the lighthouse, where the Carr seam—the highest in the section—forms the common starting-point of the Lingan and Low Point series. The strike of the several seams, marked in broken lines on the map, is drawn parallel to that of the main seam, which has been correctly ascertained in the pit workings extending nearly a mile from the shore of Indian Bay towards Low Point. The outcrops of some of the seams have been observed in the brooks running into the Barasois Pond about a mile further to the westward, but their identity has not been determined.

Section of Lingan Series in descending order.

				Ft.	In.	Ft.	In.
	Strata of Sandstone and Shale			40	0	...	
1	Coal (Carr's Seam)			...		4	0
	Strata			220	0	...	
2	Coal	2	8				
	Fireclay	2	0				
	Coal	6	0				
	(Barasois Seam)			2	0	8	8
	Strata			54	0	...	
3	Coal (Dunphy's Seam)			...		4	0
	Strata			81	0	...	
4	Coal (David's Head Seam)			...		7	0
	Strata			240	0	...	
5	Coal (North Head Seam)			...		3	0
	Strata			82	0	...	
6	Coal	3	0				
	Shale	0	1				
	Coal	5	8				
	(Lignan Main Seam[1])			0	1	8	8
	Strata			83	0	...	
7	Coal (not named)			...		2	3
	Strata, with some thin layers of coal			125	0	...	
8	Layers of Coal and Shale	0	8				
	Coal	2	8				
	(Lowest Seam)			0	8	2	8
				927	9	40	3
	Coal			40	3		
	Total Thickness			968	0		

No portion of the Sydney coal-field presents such a perfect section of the measures as the Low Point shore, where the high angle of dip brings the outcrops of nine

[1] The above section was taken at the sea-shore. As the works progressed the shale became gradually thicker, until it exceeded eight feet at a distance of three quarters of a mile from the shore, when it began to decrease. A similar change occurred in the Phelan Seam in the Bridgeport workings on the south side of Indian Bay, where the same layer of shale, four inches in thickness on the shore, in the course of half a mile increased to 28 feet. It then began to decrease rapidly, and has entirely disappeared in the workings of the Caledonia Colliery further to the eastward.

seams, all except two of workable thickness, nearer to one another than in any other district. The following section, chiefly compiled from a report made by Dr. Dawson for the Victoria Mining Company in 1868, shows their thickness and relative position :—

				Ft.	In.	Ft.	In.
	Strata of Sandstone, Shale, &c.			40	0	...	
1	Coal (Carr's Seam)			...		4	0
	Strata			400	0	...	
2	Shale and Coal	1	3				
	Coal	1	0				
	Underclay	1	7				
	Coal	1	0				
	Shale	0	4	(Paint Seam)		4	4	9	0
	Coal	3	0				
	Shale	1	2				
	Coal	4	0				
	Strata			200	0	...	
3	Coal (Crandall Seam)			...		4	4
	Strata			400	0	...	
4	Coal (Ross Seam)			...		6	7
	Strata			325	0	...	
5	Coal (William Frazer Seam)			...		3	0
	Strata			112	0	...	
6	Coal (Number Three Seam)			...		3	0
	Strata			138	0	...	
	Coal (Hugh McGilvary Seam)			...		5	0
	Strata			122	0	...	
7	Coal (Daniel McGilvary Seam)			...		2	0
	Strata, with some thin layers of coal			1,000	0	...	
8	Coal	0	4				
	Clay	0	3				
	Coal	0	4	(Frazer Seam)		0	8	4	2
	Clay	0	5				
	Coal	3	6				
				2,742	0	41	1
	Coal			41	1		
	Total			2,783	1		

Comparing the number, thickness, and position of the several seams in the two preceding sections, it will be noticed that, with one exception, their coincidence is very remarkable. From No. 1 to No. 5 the agreement is perfect, although the thickness of the intervening strata, in the Low Point, is nearly four times greater than in the Lingan section—a phenomenon by no means unusual in almost every coal-field where the persistency in the coal seams exceeds that in the sedimentary strata with which they are associated. The exception just mentioned occurs in the Lingan seam No. 6, consisting of two beds of three feet and five feet eight inches of coal, separated by only one inch of shale, at Indian Bay, which is represented by the 'Three Feet' and the McGilvary five-feet seams, separated by 138 feet of strata, on the Low Point shore. The variable thickness of the shale parting in the Lingan seam has been already pointed out (*see foot-note, p.* 32) : with such an instance as an increase of twenty-eight feet in *half* a mile before us, it is not unreasonable to assume that the same bed of shale has increased to 138 feet in a distance of *seven* miles, more especially when it is borne in mind that the whole of the associated strata on the Low Point shore have increased to the extent previously stated.[1]

As it is generally admitted that the McAulay seam of Cow Bay, the Phelan seam of Glace Bay, and the main seam of Lingan (No. 6), are identical; and, as the latter has been traced to the Low Point shore where it splits into the 'Three Feet' and the Hugh McGilvary seams, it follows, of course, that the Daniel McGilvary seam

[1] One of the most remarkable instances of the splitting of a coal-seam occurs in the northern part of the South Staffordshire coal-field, where the several beds of the 'thick coal' or 'ten yard' seam have been split into nine distinct seams, the highest and lowest being separated by 420 feet of sandstones and shales, within a distance of five miles.

(No. 7) and the Frazer (No. 8)—the lowest in the section—are the equivalents of the Spencer and McRury seams of the Cow Bay series. According to this view the Three Feet, the Low Beach, and the Tracey seams of the Cow Bay series, comprised within a perpendicular depth of 2,750 feet, are entirely absent in the Low Point section. This difficulty, it is hoped, will be cleared up when the country between the Low Point shore and Lingan Harbour—at present a 'terra incognita' in a geological sense—has been thoroughly examined.

A still greater difficulty presents itself when we attempt to trace the connection between the coal measures of the Low Point and the Sydney Mines series. Looking at the map, it may naturally be supposed that, if the measures on the north shore bend round to the east in their course under the harbour, they will meet and coincide with those running in an opposite direction from the Low Point shore; and, thus united, will form the end or segment of a large basin. But, if this be granted, it may, with good reason, be asked, what has become of the 2,750 feet of strata at the bottom of the Cow Bay section, which ought to lie between the lowest measures of the Sydney Mines section and the millstone grit at Stubbert's Point; for beyond all doubt, the Sydney Mines measures are the very lowest in the coal-field. Even if this objection can be answered, there are still such great discrepancies in the number and thickness of the seams on the two sides of the harbour, that it seems hopeless to reconcile them. Taking into consideration the sudden change of dip of the millstone grit, from nearly east to due north, at the South Bar, it is evident there is one, perhaps two large faults, under the waters of the harbour, which have thrown the measures into their present anomalous posi-

tion. We must trust to the investigations which, in the course of time, will be made by parties interested in mining pursuits, or to the surveys which ere long will be made by the Government geologists, to unravel these difficulties.

CHAPTER IV.

THE INVERNESS AND RICHMOND COAL-FIELDS.

ALTHOUGH the lower carboniferous rocks extend, without interruption, along the western coast of Cape Breton, from Sea Coal Bay, at the southern end of the Gut of Canceau, to Cheticamp on the shore of the Gulf of St. Lawrence—a distance of eighty miles—small patches of the productive coal measures have only yet been discovered at Port Hood, Mabou, Broad Cove, and Chimney Corner in the county of Inverness, and at Sea Coal Bay in the county of Richmond. At all these places the measures consist of strata of sandstone and shale, similar to those of the Sydney coal-field, resting upon the mill-stone grit, and containing several seams of coal of considerable thickness, but of small extent, being evidently detached portions of a large coal-field lying under the waters of the Gulf of St. Lawrence, separated from each other in most cases by undulations of the lower carboniferous rocks projecting into the sea. As the lower members of the carboniferous series extend from the coast, at least ten miles inland, towards Margarie River and Lake Ainslie, it is very probable that small basins of the coal measures may some day be discovered in the interior. Two thin seams of coal have, indeed, been discovered on the eastern flanks of the conglomerate hills near the mouth of Middle River, which runs into the Bras d'Or Lake, but they probably are of older date than the coal measures on the Gulf shore, being apparently members of

the carboniferous limestone formation. They are of no economic value.

At Port Hood (see geological map of the island), a small patch of coal measures extends about two miles along the coast and half a mile inland, dipping to the north-west at an angle of twenty-seven degrees. Only one seam of workable thickness has yet been discovered, which crops out 360 feet from high water mark. Several thin seams are said to lie beneath, cropping out further inland; and one, supposed to be six feet thick, can be seen, at very low tide, dipping under the sea, which of course overlies the seam first mentioned. No regular section has been made, but the following shows the position of those above noticed:—

				Ft.	In.
Coal seen at low water supposed to be				6	0
Strata				360	0
Coal	1	0			
Coal and Shale	0	9	(Seam worked)	6	0
Coal	4	3			
Strata, containing several seams under 20 inches in thickness				1,500	0
			Total	1,872	0

At Mabou, ten miles to the northward of Port Hood, several seams of coal—one thirteen feet in thickness—are found on both sides of a narrow basin not more than half a mile in diameter in the direction of the coast line, extending westerly under the sea. About half a mile further north a similar series of seams occurs, having a northerly dip, forming the southern side of another basin, supposed to be identical with the preceding; but it must be noted, however, that the north side of this second basin has not yet been determined. These two basins, caused by an undulation of the measures, were probably once united, and have been separated by the denudation

of the strata which covered the crest of the anticlinal. The outcrops of four workable seams of coal have been examined in this locality, dipping northerly, on the south side of the first basin, at an angle of seventy degrees, within a horizontal distance of 200 yards; consequently, the vertical depth of the strata associated with them will not exceed 550 feet. As no section of the strata has been made, the thickness of each seam can only be given as follows:—

	Ft.	In.
The first or highest seam	5	0
„ second	7	0
„ third	13	0
„ fourth	3 0 to 4	6

The fourth bed, composed partly of cannel coal, is said to lie only a few feet below the thirteen-feet seam. The range of the beds inland being very small, this accumulation of twenty-nine feet of coal within a vertical depth of only 550 feet, which, under more favourable conditions, would be exceedingly valuable, may be considered at the present day of little importance for mining purposes.

At Broad Cove, twelve miles further to the north, midway between Mabou and Margarie River, there is another patch of coal measures, occupying an area of about one square mile, dipping to the north at an angle of ten degrees, but it does not appear that any attempt has been made to ascertain its correct limits. The following section has been compiled from a report made in 1865 by a surveyor for the Broad Cove Mining Company:—

	Ft.	In.
Coal (the highest bed)	3	0
Strata	340	0
Coal	5	0
Strata	100	0
Coal	7	0
Strata	240	0
Coal	3	6
Total	698	6

There are said to be indications of other seams between the first and third of the above series, but no openings have been made upon them.

At Chimney Corner, eight miles to the south of Margarie harbour, three seams of coal are seen in the cliffs, dipping to the north at an angle of forty degrees, but their extension inland has not yet been ascertained. Like the areas previously described, the Chimney Corner tract merely forms part of the margin of a basin lying under the sea. Their thickness and position is shown in the following section [1]:—

	Ft.	In.
Coal (the highest bed)	3	0
Strata	88	0
Coal	5	0
Strata	200	0
Coal	3	6
Total	299	6

It is not likely that the coal seams of Inverness will supply much coal for the market for many years to come, as the Sydney coal-field, so much more favourably situated both for working and shipment, will furnish all that will be required for many generations at less cost; but with a large export to the United States, the certain establishment of extensive iron works and other manufactories in the colonies, and a vastly increased consumption of coal by steamers, which are rapidly driving sailing vessels off the ocean, the most accessible parts of the Sydney coal-field will, in the course of time, be exhausted, when the coal seams of Inverness must be worked to meet the

[1] The writer is indebted for most of the information above given relative to the coal seams at Port Hood, Mabou, and Chimney Corner, to a valuable article in the Transactions of the North of England Institute of Mining Engineers, by J. Rutherford, Esq., Government Inspector of Mines in Nova Scotia.

supply required. In view of this contingency—distant though it may be—immediate steps should be taken by the Government to ascertain the exact situation and economic value of every seam of coal in Inverness; because, owing to the rapid wearing away of the cliffs on a coast exposed to the heavy surf of the gulf during the prevalent north-west winds, and to the combined action of severe frosts and rapid thaws, all vestiges of these valuable coal seams will soon be entirely obliterated. In proof of this view it need only be stated that Seal Island, composed of carboniferous strata, which, beyond all doubt, was once connected with the mainland, is now separated from it by a channel two miles in width, the intervening land having been entirely swept away by the waves. It is evident, therefore, that a belt of coast, at least two miles wide, has disappeared, effacing the outcrops of many valuable seams of coal. If this process be repeated to the extent of only one mile more, it is equally evident that all the outcrops now visible will be washed away, leaving 'not a wreck behind.' If correct plans are now made, showing the position of every seam, at a future time, when all traces of them have disappeared, they may be reached by cross-cuts driven from the bottom of shafts sunk upon the adjacent shore, and worked under the sea.

The Richmond Coal-field — the only one that now remains to be noticed—is situated at the southern extremity of the island, between the river Inhabitants and the Gut of Canceau. The carboniferous rocks in this district cover an area of about twenty square miles, and contain several workable seams of coal. In the cliff on the western shore of Sea Coal Bay, close to the southern end of the Gut of Canceau, there is a seam eleven feet in thickness, composed of alternating layers of coal and

bituminous shale; another, four feet thick, of clear coal; and a third, five feet and a half thick, including a fifteen inch layer of shale in the middle. All these seams occur within very narrow limits, dipping to the south-west at an angle of eighty degrees.[1]

At Little River, a small stream running into Sea Coal Bay, two miles and a half to the north-east of the preceding locality, there are two seams, one three, the other four feet in thickness, nearly in a vertical position, separated by 154 feet of sandstones and shales. Traces of coal have also been seen at two places to the eastward, near the mouth of the river Inhabitants. The measures in this coal-field are, however, so much disturbed by faults, that the extent and relative position of the several seams cannot be made out; any attempt to ascertain the true position, extent, and consequent value of the seams, will be attended with much expense, as the country is low, and there are few cliffs or natural sections; the outcrops of the strata also are concealed by a thick deposit of boulder-clay. The seams all occur in situations favourable for shipment, but it is not likely that, unless they can be found in less highly inclined positions, they can be worked with profit to any great depth, as, in addition to the difficulty of working vertical seams, the expense of keeping the mines free from water will be a very serious obstacle, and greatly increase the cost of production.

In compiling the preceding sketches, brief and imperfect as they must necessarily be within such narrow limits, the writer begs to say that his information has been derived either from authentic sources or his own

[1] Dr. Dawson, who was employed by the Government to make a survey of the district, says that the eleven-feet bed has been thrown over on its face, so that the underclay, which was originally the floor, now forms the roof of the seam.

personal observation, and that the reader may rely upon their accuracy in forming his estimate of the comparative value and importance of the various establishments in the island, which will be described in a future chapter. In the mean time it will be necessary to devote two or three chapters to the consideration of the rise and progress of the coal trade previous to the year 1858, when the General Mining Association surrendered their exclusive right to *all* the mines and minerals of Nova Scotia and Cape Breton, except certain stipulated areas in the coal-fields.

CHAPTER V.

THE EARLY HISTORY OF THE COAL TRADE.

FROM the discovery of the island of Cape Breton by Sebastian Cabot in 1498, to the year 1672—a period of nearly 200 years—although numerous voyages were made to the coast by intelligent enterprising navigators, there is no mention whatever, in any of their narratives, of the existence of the coal seams which, being plainly visible in the cliffs of almost every bay or headland, could not possibly have escaped observation. Captain Strong of the 'Marigold,' who visited Cape Breton in 1593, has given us an account of the chief productions of the island, including the various kinds of trees and even small shrubs, but has not once mentioned the coal seams; and Captain Leigh, of the 'Hopewell,' who spent several days on the coast in 1597, and landed, as he tells us, at five different places, all in the middle of the Sydney coal-field, is equally silent upon the subject. Both of these navigators—evidently, judging from their narratives, intelligent and observing men—must have been well aware of the value of coal as an article of commerce, as the English coal trade flourished greatly in their time (the reign of Elizabeth), and was considered an important source of national revenue.

It is still more surprising that Champlain, a man of education and a keen observer of natural phenomena, who circumnavigated the island in 1607, and has given us accurate descriptions of the chief harbours, and some

account of the productions of the island, does not make the slightest allusion to the coal seams, although he notices such small matters as the abundance of oysters; adding, which by the way is not true, that they are of very poor flavour.

Joan de Laet, in his history of the New World,[1] is equally silent about coal in his enumeration of the natural productions of the island; but he does not forget to tell us that such 'small deer' as crabs and lobsters are found 'in almost incredible abundance in the harbour, which the savages, in their language, call Cibo' (Sydney).

The first printed notice of the existence of coal in Cape Breton is met with in the '*Description géographique et historique des Costes de l'Amérique Septentrionale*,' by Nicholas Denys, published in Paris in 1672. According to the historian Charlevoix, Denys was appointed governor of all the eastern part of Acadié, including Cape Breton, in the year 1637. He subsequently obtained a concession (in 1654) from Louis XIV. of the whole island, with full powers to search for and work mines of gold, silver, copper, and other minerals, paying to the king one-tenth of the profit. In the preface to his book, he says, 'There are mines of coal through the whole extent of my concession, near the sea-coast, of a quality equal to the Scotch, which I have proved at various times on the spot, and also in France, where I brought them for trial.' He adds, 'at Baie des Espagnols (Sydney) there is a mountain of very good coal, four leagues up the river,' and 'another mine near the little entrance of the Bras d'Or Lakes;' also, that 'at Le Chadye, on the north-west coast (probably Mabou), there is a small river suitable for chaloups, where there is a plentiful salmon fishery and a

[1] Novus Orbis: Leyden, 1633.

coal mine.' Being almost exclusively engaged in the fisheries and fur trade, Denys, during his long residence in Cape Breton, made no attempt to work the coal seams, for want, probably, of a market. After his departure, in 1672, it appears that unauthorised persons helped themselves to whatever coal they needed from the cliffs, without permission from his sons, whom he left in charge of his property, as an ordonnance was issued on August 21, 1677, by M. Duchesneau, the Intendant of New France, recognising and establishing Denys's right to exact a duty of twenty sous per ton from all persons taking coal from Cape Breton. Denys's patent seems to have been revoked in 1690.[1]

The importance of the coal of Cape Breton was fully recognised in a memoir, submitted in 1708 to the French government by M. Raudot, intendant of the finances, and his son, intendant of the marine of Canada, recommending the establishment of an entrepôt on the seaboard, open at all seasons of the year, where the productions of Europe and the West Indies could be stored ready for shipment to Canada. The Messrs. Raudot recommended that a port in Cape Breton should be chosen for this purpose, 'as the island could furnish *old France with coal*, codfish, oils, plaster, and timber, of its own growth and produce.'

The next notice of the coal of Cape Breton occurs in the Journal of Admiral Hovenden Walker, who commanded the unfortunate expedition sent to reduce Quebec in 1711. Several ships and nearly a thousand men having been lost at the mouth of the St. Lawrence, owing,

[1] The existence of coal upon the *Continent* of North America is first mentioned by the Jesuit, Father Hennepin, in 1698. He says, 'there is a coal mine above Fort Crevecœur, on the Illinois river;' also, 'there are mines of coal, slate, and iron in the country occupied by the Pimitoui Indians.' (Peoria).

as it was alleged, to the ignorance of the pilots, it was decided at a Council of War to give up the enterprise and proceed to Spanish Bay (Sydney), which had been selected as the most convenient rendezvous in case of the fleet being dispersed. Admiral Walker says, 'The island had always, in time of peace, been used in common both by the English and the French for loading coals, which are extraordinarily good here, and taken out of the cliffs with iron crow-bars only, and no other labour.' The *English*, who took coal in common with the French, were most likely New England colonists, who fished on the coast in summer and carried away a few tons of coal on their homeward voyage; the same, probably, that helped themselves some years before without permission from M. Denys.

The first attempt at mining, in any thing like a regular form, was made upon the ten-feet seam on the north side of Cow Bay in 1720, when it was found necessary to obtain a supply of fuel for the host of officers, soldiers, mechanics, traders, and labourers, who went out to lay the foundations of the celebrated fortress of Louisbourg. Some relics have been found recently in the old workings, but they may have belonged to a later period. Cargoes of coal were, about this time, exported from Cow Bay to Boston; for, although direct trade between the French and English colonists was forbidden by the treaty of neutrality, the New England traders, notwithstanding, carried on an active clandestine trade with Louisbourg, receiving French products in exchange for bricks, lumber and provisions. When Messrs. Bradstreet and Newton visited Louisbourg, by order of the Governor of Nova Scotia, to demand redress for the depredations committed by the Cape Breton Indians at Canceau, in 1724, they found fourteen English trading vessels in that port, ex-

clusive of one which had left to load coal at Cow Bay for Boston. This small beginning was, perhaps, the inauguration of the foreign coal trade at Cape Breton. In 1728 the French shipped some few cargoes to Martinique for boiling sugar, but from that time until the fall of Louisbourg, in 1745, there are no records of any further exportations. The value of the coal-fields of Cape Breton had, at this time, become well-known in France, as Charlevoix states, in his 'History of New France,' published in 1744, that the 'island abounded in coal pits, which were in the mountains; consequently, the trouble and expense of digging deep and making drains to carry off the water were greatly saved.' Three places, in the map appended to his work, bear names indicative of the known existence of coal in their vicinity, namely, Ance du Charbon, Cap Charbon, and Baie du Charbon, now called Big Pond, North Head of Indian Bay, and Schooner Pond Cove respectively.

Whilst England held possession of Cape Breton, from its conquest in 1745 to its restoration to France in 1749, the garrison of Louisbourg was supplied with coal from mines opened at the Burnt Head and Little Entrance of the Bras d'Or. It is quite evident the garrison was abundantly supplied, for Admiral Knowles, the governor, complains that 'the cost of fuel in the winter of 1745–46 was £6,000, notwithstanding the number of houses that were pulled down and burned.'

Colonel Hopson, who succeeded Admiral Knowles in the government of Cape Breton, reported in April 1748, to the Duke of Newcastle, that he was apprehensive of an attack upon the colliery at Burnt Head by the Indians, who were warmly attached to the French, and that he had sent to Boston for a blockhouse to be erected there for its protection. The blockhouse was surrounded by a

ditch (the remains of which may still be seen), and garrisoned by an officer and fifty soldiers. An officer and a few soldiers were also stationed at the Little Entrance of the Bras d'Or. Here, also, may be seen the ruins of an old building which still goes by the name of the 'King's Store.'

The workmen employed at Burnt Head were mostly Frenchmen, who had remained in Cape Breton after the fall of Louisbourg, and taken the oath of allegiance to the British sovereign. Some of them owned small vessels, in which they carried coal and wood to Louisbourg for the use of the English garrison. Having rendered themselves obnoxious to their old compatriots by taking the oath of allegiance, these unfortunate Frenchmen were attacked in their settlement at Indian Bay in the month of July, 1748, by a band of forty French Canadians, led by a noted rover named Jacques Costé, when their houses and about 2,000 cords of wood were burned and three of their vessels captured. Costé carried off twenty-four men and women from Indian Bay, and an English officer and one soldier from the Little Entrance of the Bras d'Or, to Canada. No attempt was made upon the colliery and fort at Burnt Head, commanded by Lieutenant Rhodes; but owing to the capture of the schooners and their crews, Louisbourg was deprived of its usual supply of coal for more than a month. The Abbé Raynal says, in his 'History of Commerce,' that there was 'a prodigious demand for Cape Breton coal from New England from the year 1745 to 1749;' but there is nothing in the Colonial Documents in the Record Office to show that any considerable quantity of coal was shipped from Louisbourg.

During the occupation of the island by the French, from its restoration in 1749 to its second and final con-

quest in 1758, it does not appear that much coal was exported to the British colonies, although an active trade was carried on by the English colonists with Louisbourg at this period, as Colonel Cornwallis, the Governor of Nova Scotia, says that, in 1751, 150 vessels belonging to New York and Boston traded with Louisbourg; and his successor, Colonel Lawrence, complains, in 1754, that the Boston traders supplied Louisbourg in preference to Halifax with provisions, and that there were sometimes thirty of their vessels lying in the former port. It is reasonable to conclude that some of these vessels occasionally took return cargoes of coal from Cape Breton, but there is no record of such a trade having subsisted. In confirmation of this the Abbé Raynal says 'the mines would probably have been forsaken altogether during the French occupation of the island, from 1749 to 1758, had not ships sent out to the French West India Islands wanted ballast.' M. Pichon, secretary of Count Raymond, the Governor of Louisbourg, tells us, in his 'History of Cape Breton,' published in 1760, that he accompanied a party of officers sent by the Governor, in the spring of 1752, to survey the coasts of the island and to collect statistical information. In the course of their travels they visited all the bays and harbours on the north-east coast; but Pichon says nothing about the mines except that 'there were two pits [he probably means seams] at Baie des Espagnols (Sydney), and that the English had a coal pit at Burnt Head defended by a fort of considerable strength, where, with fifty men, they successfully repulsed the attacks of the savages and kept possession of the fort.' He adds, that the pit took fire in 1752, when the fort also was entirely consumed. Traces of this fire may still be seen along the outcrop of the seam as far as Glace Bay, a distance of nearly one mile.

There are no records of any coal having been raised in Cape Breton for several years following the reduction of Louisbourg in 1758, except about 3,000 tons annually for the use of the garrisons at that place and at Halifax. It is stated, in a letter from Lieut.-Colonel Francklyn to the Lords of Trade, that this coal cost the Government four shillings per ton, exclusive of implements and stores.

After the Treaty of Paris, in 1763,[1] instructions were sent out to the governor at Halifax to issue free grants of land, in Nova Scotia proper, to the officers of the army and navy who had served in America; but he was requested to issue no grants in Cape Breton, which was then annexed to Nova Scotia, until an accurate survey should be made of the island. This survey was not completed until 1767; but, in the meantime, as the prohibition did not extend to the leasing of mines, several officers, who had noted the great value of the coal seams, applied for leases in Cape Breton.

On March 19, 1764, Brigadier-General Howe and some other officers of distinction, who had served in the late war in America, petitioned the king for a grant of land in Cape Breton, 'being,' as they stated, 'desirous of becoming adventurers in opening coal mines, and of endeavouring to establish a colliery for the better supplying the several colonies and garrisons on the Continent with fuel. That, to enable them to carry this their design into execution, they humbly pray to have granted to them as their allotment a tract of land on the east shore of the island, extending from the point on the north side of Mira Bay to the south-east side of the

[1] The existence of coals on the Wabash, in Indiana, was observed by Col. Croghan in 1763, when he was a prisoner in the hands of a band of Indians. The Pittsburg coal was not discovered until 1770. The anthracite coalfield of Pennsylvania was discovered about the same time.

entrance into the Bras d'Or and seven miles inland, and supposed to contain about 55,000 acres.' They offered to pay a royalty of two shillings sterling per chaldron, London measure, on every chaldron exported. It will be seen, by reference to the map, that the tract applied for embraced nearly the whole of the Sydney coal-field.

In the month of May, 1764, Sir Samuel Fluyders and three associates applied to the Lords of Trade for a lease of all the coals in the island, offering, 'upon having the mines for ten years free of tax, to pay two shillings and sixpence sterling for every chaldron they ship for the further term of ten years; three shillings and ninepence for the next ten years; and five shillings per chaldron for the last ten years of their lease.' In a subsequent application, Sir Samuel and his friends, finding, probably, there was no chance of obtaining the whole island, asked for a grant of 100,000 acres between the Mira River and the great entrance of the Bras d'Or, and a lease of all the coal thereon for thirty years; undertaking to settle thereon not less than one hundred persons every five years; to build a town on one of the harbours; to pay a quit-rent after the first ten years of two shillings and one penny upon every hundred acres of land; and a royalty of two shillings and sixpence sterling per chaldron during the first ten years, and five shillings per chaldron during the remainder of their lease on all coal exported.

Neither of these proposals was accepted by the Government, although the Lords of Trade recommended that a lease should be granted to Brigadier-General Howe and his associates, because it would be the means of lowering the price of coal in England, from which large quantities were exported to America; would be a boon

to the colonies, where fuel was becoming daily scarcer; and would be a source of considerable revenue.[1]

Several other applications were made for leases about the same time, but only one will be noticed, as it shows the exaggerated notions which then prevailed of the extent of the coal seams in Cape Breton. 'A design is on foot for establishing a company to work to advantage the coal mines, which have this great superiority over all others, that the coals are within three feet of the surface, and the most excellent ever seen. There will be no occasion for digging underground, or making drains to carry off the water, as in England, for the mines consist of entire mountains of coal, and are sufficient to supply all the British plantations in America for ten centuries.'[2] This very flattening 'design,' like its predecessors, came to nought, as likewise did a scheme for making salt, started by one William Hutton in the same year, who obtained permission to dig for coal at any place except where the troops were at work.

Notwithstanding the failure of so many attempts to obtain leases, others, with more moderate, and consequently more feasible views, were anxious to embark in coal-mining. In the month of September 1766, Lieut.-Colonel Francklyn, the Governor of Nova Scotia, understanding that applications would shortly be made for leases, addressed a letter to the Lords of Trade, giving such information as he thought would be useful to their lordships in forming a just appreciation of the coal seams, and concluded by recommending that the mines should be leased. He stated in his letter that the only mine then open was situated on the north shore of Cow

[1] Records in State Paper Office.
[2] Scot's Magazine, July, 1765.

Bay,[1] and that the establishment consisted of a picketted fort 100 feet square, with a block-house, barracks and store-houses; also a wharf convenient for shipment close to the mines. Vessels of 80 to 100 tons could load at this wharf between June 1 and October 15, 'when the wharf must be taken down and rebuilt in the spring, the bay being so open, and the drifts of ice so violent, as to carry it away in the winter season.' He says the mine is in good order and well propped, 'the vein being good, and, as he was told, twelve feet thick and half a mile wide,' and could employ twenty men daily. Francklyn proposed that coal should be sold at the mines for exportation, and recommended that it should be taken to Halifax for reshipment in vessels going out in ballast. He calculated that a revenue of 500*l.* to 1000*l.* might be raised, which he proposed to expend in making roads. This wise advice, however, was not followed; on the contrary, at a Council held at the Court of St. James's on December 3, in the same year, 'His Majesty, with the advice of the Privy Council, declared his royal pleasure not at present to authorise or permit any coal mines to be opened and worked in the island of Cape Breton, and that all petitions and proposals for that purpose be dismissed this Board.'

It might have been supposed that this clear and positive order would have been strictly complied with, yet it appears from the Records that Lord William Campbell, who was appointed Governor of Nova Scotia in November 1766, granted an exclusive right, in the month of April following, to Benjamin Gerrish, William Lloyd, James Armstrong, and Peter Bard, merchants of Halifax, to dig 3,000 chaldrons of coal 'anywhere, except from such

[1] The site of the works now known as the Block House Mines.

places where his Majesty's troops were at work digging for the use of the garrisons.' The grant, which was to determine in eight months, authorised the lessees to raise 3,000 chaldrons, paying 400*l.* sterling for the privilege, with a provision that, in case of any sudden or unforeseen accident they were prevented from digging and carrying away 3,000 chaldrons in eight months, a reasonable extension of their time should be allowed. The lessees were also bound to send 1,500 chaldrons to Halifax, and to sell it there at no higher rate than twenty-six shillings sterling per chaldron. Gerrish and his partners opened a mine at Spanish River (Sydney)—the exact locality is not mentioned—from whence they shipped during the year—

To Halifax	1,783	
,, New York	60	
,, Providence	54	
,, Boston	44	
,, Philadelphia	45	
,, Louisbourg	76	
,, England	217	
Total	2,279	chaldrons.

On February 22, 1768, they petitioned for further time to enable them to ship the balance of their contract, alleging 'that it could not be completed in the time specified, because several of their works had fallen in; larger quantities than usual had been imported from Europe; and a large quantity of coal had been smuggled from Cape Breton to New England by one Alexander Lee,[1] of Louisbourg, which brought down the price so much that it would not pay them to ship more than

[1] March 22nd, 1767. Alexander Lee was prosecuted by the Attorney-General for having, contrary to the Governor's proclamation, dug and carried away a large quantity of coals from Cow Bay, in the Isle of Breton. (Minutes of Council.)

above mentioned.' This contravention of the king's order did not escape the notice of the Secretary of State, who called upon the Governor to state why he had granted a lease to Gerrish and his partners in direct opposition to his Majesty's orders, to which Lord William Campbell replied that, 'having been told the coal composed the surface of the island, and could be easily taken away by any adventurer,' he considered it was better to use it and apply the proceeds to the making of roads in the province. He also informed the Secretary of State that the mines had been quite neglected since 1758, and that if the detachment of the 59th Regiment was removed from Louisbourg, 'the coal mines in the neighbourhood could be uninterruptedly worked by any people who thought proper to go there, as the prohibition before proceeded from a fixed guard of troops on the spot.' He suggested, at the same time, that the soldiers stationed there might be usefully employed in working the mines.

In the month of February 1768, the Secretary of State again informed the Governor that 'no more licences must be granted for taking coals from the cliffs in the island of Cape Breton.' It is hard to conceive what could have been the reason for persisting in this mistaken policy; for if short leases had been granted, a great deal of coal which fell from the cliffs every spring, and was washed away by the surf, might have been collected to supply Halifax with fuel. Besides, it would have saved the Government a vast amount of trouble and expense in keeping off trespassers, who about this time carried off large quantities of coal from the cliffs. This illicit traffic continued to increase to such a degree, that the Governor, on May 4, 1770, informed the Council he had applied to Lieut.-Colonel Leslie, commanding his Majesty's troops in the province, and had obtained from

him a promise to furnish a sufficient force to prevent trespassing on the king's rights in future, and that he wished to learn the opinion of the Council as to the measures proper to be taken. 'On which the Council advised that the chief magistrate at Louisbourg should be directed to proceed to Cow Bay, and require all persons there[1] to depart immediately; and that he should put the troops into the barracks or houses there belonging to the king, giving them orders to prevent any coals being dug or carried thence without the Governor's special order. It was ordered also that a proclamation be issued, strictly prohibiting all persons to dig or carry away any coals from the Isle of Breton.' A detachment was accordingly sent down to Cow Bay early in the spring, where 500 chaldrons of coal, dug by trespassers during the previous winter, ready for shipment, were seized and sent to Halifax for the use of the troops.

Both the garrison and town of Halifax were about this time chiefly supplied with coal from a mine recently opened at Spanish River (Sydney), which was worked by soldiers, but when the troubles began in the British Provinces (now the United States), and a large force was collected there, the troops consumed so much coal that the town suffered greatly from the scarcity of fuel. In this difficulty the House of Assembly, in 1775, petitioned the king for leave to dig coals in Cape Breton, but apparently without success. In 1777 forty men of Colonel Legge's regiment were employed in digging coals at the Spanish River mines. During the American revolutionary war, it was found necessary to send ships of war to convoy the vessels employed in carrying coal from

[1] The coal smugglers, as they were styled, had not only dug a large quantity of coal, but had coolly taken up their quarters in the old barracks, where they resided without molestation.

Spanish River to Halifax for the use of the garrison. On July 21, 1781, sixteen vessels employed in this service, accompanied by a transport having a party of the 70th Regiment on board, going to work at the mines, convoyed by the 'Charlestown' frigate, of twenty-eight guns, the sloops 'Allegiance' and 'Vulture,' of sixteen guns each, and the cutter 'Little Jack,' of six guns, had nearly reached their destination, when they were discovered and chased by two French frigates, the 'L'Astrée'[1] and 'L'Hermione,' of forty-four guns each. A smart action commenced at 8 P.M., which continued until dark, when the French frigates drew off, taking with them the 'Little Jack.' Owing to the skilful management of Captain Evans, of the 'Charlestown,' who was unfortunately killed, the transport and colliers got safely into Spanish River. The frigate and sloops, being greatly crippled in the action, bore up for Halifax.[1]

So far, as the reader will observe, nothing like a regular mine had been opened in Cape Breton. Nor is this to be wondered at, seeing that the Government persisted in the absurd policy of refusing to grant leases to parties who, with fair encouragement, would have worked the mines efficiently, and sought for markets in the neighbouring colonies. Even when the Government undertook the working of the mines, no regular system was pursued. Having obtained all that was easily accessible from the face of the cliff at one place, instead of driving a level further into the seam, it was abandoned, and work commenced at another. That the contraband traders should have followed this system is not surprising, as their works

[1] The 'L'Astrée' was commanded by La Perouse, the celebrated navigator, who was lost in 1788 on the Isle of Vanikoro, near the New Hebrides.

[2] For particulars, see History of Cape Breton, p. 383, by R. Brown: London, 1869.

were at any time liable to be taken possession of by the Government. Consequently, when they had exhausted any particular seam, and could not pursue it further without some labour, they removed to another, where the coal could be literally shovelled from the outcrop into their boats. Under such circumstances, the reader will not be surprised to learn that, after the island had been twenty-two years in the undisturbed possession of Great Britain, and surrounded by colonies requiring large supplies of fuel, the quantity raised in any single year, as far as we can learn, never exceeded 3,000 chaldrons.

CHAPTER VI.

THE EARLY HISTORY OF THE COAL TRADE—*continued.*
(1784 TO 1826.)

WHEN the island of Cape Breton was erected into a separate government in 1784, the first Governor, Lieut.-Col. Desbarres, who had been employed in making a marine survey of the island, and was well acquainted with its mineral resources, directed his earnest attention to the working of the coal mines, which, he felt assured, would prove 'an inexhaustible source of revenue.' Up to this time all the coal shipped at Spanish River[1] had been taken from the seams cropping out in Lloyd's Cove and Indian Cove; but Governor Desbarres very judiciously commenced mining operations in the 'Six Feet' or 'Sydney main coal,' as it is generally called (see Section, p. 16), on the north side of the harbour, where 400 acres of land were reserved for the special use of the works. The order forbidding the granting of land in Cape Breton, issued in 1763, was revoked when the government was separated from that of Nova Scotia; but it was decided, at a council held at St. James's on August 26, 1784, that 'Whereas it has been represented to us that several parts of our island of Cape Breton have been found to abound in coals, it is our will and pleasure, that in all grants of

[1] Governor Desbarres laid the foundations of a town at the head of Spanish River which he called 'Sydney,' after Lord Sydney, at that time Secretary of State for the Colonies. Spanish River, in consequence, took the name of Sydney Harbour, by which it is still known.

land to be made by you, a clause be inserted, reserving to us, our heirs and successors, all coals, and also all mines of gold, silver, copper, and lead, which may be discovered in such lands.'

Under Desbarres' administration, from 1784 to 1787 inclusive, the mines were worked on Government account by means of a level driven into the seam from the foot of the cliff, where a wharf was constructed for the shipment of the coal. This wharf was repaired and extended from time to time, and continued to be used as the place of shipment until the year 1834. Traces of this wharf and the mouth of the level may still be seen. The selling price was eleven shillings and sixpence per ton; but this left such a small, if any profit to the Government, that Colonel Macormick, who succeeded Desbarres, strongly recommended that the mines should be leased. Accordingly, on January 1, 1788, they were leased to Thomas Moxley, who held them until his death in 1791. Coal was sold during Moxley's lease at eleven shillings and sixpence per ton.[1] The royalty paid is not given in any of the accounts returned to the British Government. The revenue derived from the mines, at least the balance remaining, after the Governor had deducted three shillings and sixpence per ton for his own private use, was paid into the treasury of the colony. This perquisite of the Governor was abolished in 1792 by order of the Secretary of State for the Colonies.

In the month of October 1792, the mines were leased to Messrs. Tremain and Stout for seven years, at a royalty of three shillings per ton, and at the expiration of the

[1] In the documents in the Record Office the quantities of coal are given in *chaldrons*, and the prices, royalty, &c., in *Halifax currency*. To render the returns more intelligible to English readers, the chaldrons are reduced to tons of 2,240 lbs. each, and the prices are expressed in sterling money. This must be understood to be the rule in all cases in the text.

lease in 1799 they were allowed to go on as tenants at will, subject to six months' notice. They held the mines until February 5, 1800, upon these terms.

To ensure the proper and efficient working of the mines, Sir John Wentworth, the Governor of Nova Scotia, suggested to the Secretary of State, in 1792, that it would be advisable to send out a competent engineer to inspect the mines, and to construct a stone pier at a more convenient place for shipment, as vessels were often detained waiting for their cargoes. Acting upon this suggestion, the British Government, in 1793, sent out Mr. Miller, a mining engineer, who proposed to erect a pier at Indian Cove at an estimated cost of 2,822*l.*; but this was not approved by the Government, as it was considered the amount of the coal sales did not justify such an outlay, especially since the lessees of the mines had just rebuilt the old wharf. Mr. Miller held the office of Government Superintendent of the mines until his death in 1799.[1]

On reference to the Table I. at the end of this chapter, it will be seen that the sales of coal, trifling as they were in amount, were subject to great fluctuations. This was owing, in a great measure, to the extensive depredations committed on the coal seams in the cliffs along the coast. In one year more than 700 tons were taken from Cow Bay and other places to the island of St. Pierre alone. On October 11, 1790, the Governor informed the Secre-

[1] Mr. Miller was probably the first person who noticed the fossil trees (already mentioned) in the coal measures of Cape Breton. In a private letter, addressed to Mr. King, the Under Secretary of State, he says: 'I had some thoughts of sending a cask of petrified branches of trees, in part converted into coal, to my Lord Duke, if I was assured it would be acceptable to his Grace. This phenomenon favours the opinion that coal strata are no other than decayed forests compressed, indurated, and petrified. I could also send a trunk of a large tree petrified.'

tary of State that at least three cruisers would be required to stop this illicit traffic. In the course of that year, one hired vessel, commanded by Captain Prichard, captured three vessels stealing coal in Cow Bay; three others escaped. In 1795 an ordonnance of Council was promulgated, declaring 'all vessels carrying away coals from the cliffs, without authority, liable to forfeiture.' A more marked improvement, however, it will be seen by the table, occurred towards the close of the century, owing probably to the large supplies required by the great number of troops in garrison at Halifax during the French war. Much apprehension was felt during the war for the safety of the mines, which could easily have been destroyed by the enemy. A block-house, which is still standing, was erected at the mines; and two batteries, of four guns each, were constructed—one in front of the block-house, the other on Peck's Head. No attack, fortunately, was made upon the works, which continued to supply the garrisons of Halifax, St. John's, and St. Pierre during the war.

Upon the expiration of Tremain and Stout's tenancy in February 1800, the Government took possession of the mines and worked them until the end of the following year, under the management of Mr. Campbell, the *Attorney-General* of the colony! It is not stated whether his management was successful or not, but it is evident he was satisfied that the mines could be worked with profit, as he took them upon a lease of seven years under a royalty of four shillings per ton, stipulating, at the same time, to sell the coal at ten shillings and threepence per ton. This, however, does not appear to have answered his expectations, as he applied in 1803 for a reduction of one shilling and sixpence per ton on the royalty, but failing to obtain it, he not only stopped paying

the royalty, but contested several points in his lease, and gave so much trouble, that the Governor recommended the Secretary of State either to cancel the lease or call upon Mr. Campbell to resign his office of Attorney-General.

In the month of May following Campbell surrendered his lease, when the Government again resumed possession, and worked them for several years; not, however, with much success, as we find General Nepean, the Governor, complaining to Lord Liverpool in 1810, that from June 1808, to September 1810, the mines had only realised a profit of tenpence per ton upon a sale of 16,899 tons. This is not surprising, considering that five officers were employed in the management of such a small business, at a cost of 510*l.* per annum, viz.:

	£
Superintendent	100
Agent and shipping officer	225
Medical officer	100
Harbour Master	50
Collector of accounts	35
Total	£510

being thirteen per cent. on the gross amount of the sales in 1810. An attempt was made in 1811 to lease the mines to Messrs. Jonathan and John Tremain of Halifax, who offered to take them for twenty-one years at a royalty of two shillings and one penny per ton. Finding, upon more careful enquiry, that the working charges were much greater than they expected, the Messrs. Tremains withdrew their offer, and the Government was compelled to go on working the mines on their own account; but with such small success, that the new Governor, General Swayne, reported to Lord Bathurst in January 1813, that the finances of the colony were reduced to the lowest ebb, and that the coal mines, which were the

only source of revenue, were in a state of bankruptcy. In the course of the year 1813 Messrs. Ritchie and T. Leaver took a lease of the mines at a royalty of three shillings and eightpence per ton, which they held until January 31, 1818, when, having got into difficulties, they were obliged to transfer their interest in the mines to their assignees, Messrs. G. W. Bown and J. Leaver, who held them until the expiration of the lease in December 1820. As it was generally expected at this time that the island of Cape Breton would soon be annexed to the government of Nova Scotia, the acting Governor, Captain Stewart, considered it advisable, upon the termination of the last lease, to renew it only for one year to G. W. Bown at a royalty of three shillings and sixpence per ton.

The island of Cape Breton having, by an order of the King in Council, in the year 1820, been annexed to the government of Nova Scotia and constituted a county of that province, under the name of the 'County of Cape Breton,' Sir James Kempt, the Governor of Nova Scotia, in the autumn of the same year, visited the island, with the object of making himself acquainted with its wants and resources. He seems to have devoted his special attention to the coal mines, concerning which he stated, in his report to Lord Bathurst, that the average sales for several years had been about 8,000 tons, and that, in any one year, they had never exceeded 10,000 tons, yielding a revenue of £1,400 to £1,600 per annum to the Government. He found fifty-two men employed at the mines, and estimated, from the best information he could get, that the cost of raising and shipping the coal was about seven shillings and sixpence per ton. Mr. G. W. Bown's lease having expired, Sir James Kempt let the mines to Messrs. T. S. and W. R. Bown for a term of five

years from January 1, 1822, at a royalty of four shillings and three pence per ton, stipulating that the lessees should keep the works in efficient condition to meet the demand, and that they should not sell at a higher rate than thirteen shillings and twopence per ton.

Table I., at the end of this chapter, shows the quantity of coal sold in each year, from the opening of the mines in 1785 to the close of 1826, when they came into the possession of the General Mining Association; the prices at which the coal was sold, and the rate of royalty per ton when they were worked under lease. Owing to the absence of regular returns in the Record Office, the table is not quite complete, but the shipments in the years 1823–24 and 25, which are missing, probably did not vary much from those of the three years preceding. It will be observed, by reference to the table, that the sales did not increase much until the year 1799, and that they showed but slight improvement from that time up to the end of 1826. Even within those narrow limits the fluctuations were considerable, the sales in one year—as, for instance, in 1805—being sometimes nearly twice as large as in the year preceding. There is every reason to believe that these fluctuations were due, in a great measure, to the quantity of coal stolen in some years from the cliffs, as it was found that, whenever the Government withdrew the cruising vessels, this illicit traffic was carried on to a great extent. Governor Ainslie reported, in February 1819, that, after dispensing with the services of the schooner 'Eclipse,' in the previous year, the quantity of coal stolen from the cliffs exceeded 2,000 tons. It might reasonably have been expected that, in the course of forty years, the sales would have reached a higher figure than 10,000 tons, especially since the rapidly growing cities of the United States at that time derived

their whole supply of bituminous coal from Great Britain and the Virginia mines,[1] but it does not appear that more than an occasional cargo was sent from Sydney to New York or Boston. The small demand for Sydney coal in the United States may, however, easily be accounted for on other grounds. The coal was sent to market in such bad condition that it could not find purchasers so long as a plentiful supply of English coal, carefully screened, and even hand-picked, was in the market. At the Sydney mines no pains were taken to separate the large from the small coal; the colliers, who were not skilled workmen, had no inducement to make as much large as possible, being paid at the same rate per chaldron for small as for large; and it was so much tossed about and trampled upon in its way from the pits, subject to not less than four lifts before it was stowed in the ship's hold, that it was little better than mere slack. Under these circumstances it is not surprising that Sydney coal did not sell readily in the United States. The lessees of the mines, it must be admitted, were less to blame for this state of things than the Government, which persisted in granting only short leases at exorbitant rates of royalty. It could not be expected that men of capital would employ their money in an undertaking of magnitude under a lease of five or seven years; and it is equally certain that, without capital, the mines could not be worked with profit. An intelligent foreigner, the Abbé Raynal, in his 'History of the Commerce of the West Indies,' had pointed this out, so far back as the year 1781, when he asserted that nothing but capital was wanted to open the mines of Cape Breton, and make them sources of profit both to the

[1] The anthracite of Pennsylvania had not, at this period, come into use; the first cargo of 365 tons was offered for sale in New York in the year 1820.

colony and the adventurers, as an advantageous mart would be found in the islands and on the continent of America, where the dearness of wood was already experienced. It will be seen, in the next chapter, that the mines, after struggling through many difficulties, fell at length into the hands of parties provided with ample capital, and that, under the guarantee of a long lease, they have, as foretold by Raynal, proved a source of profit both to the colony and the adventurers. Before we close this chapter the reader, perhaps, will peruse with some interest a short account of the system upon which the works were conducted in the early days of mining in Cape Breton—a system which happily has been long abandoned—as it will enable him to compare it with that which now generally prevails, to the manifest advantage both of the lessees and their employés.

The Sydney main seam was first opened in 1785 by driving an adit from the shore near the old wharf.[1] This adit, as it proceeded along the strike of the seam, drained all the coal lying between high-water level and the outcrop—a belt about one mile in length, with an average width of 200 yards. As the workings advanced from the shore in a westerly direction, new shafts were sunk at intervals of about 200 yards, so that the length of haulage from the faces of the bords to the bottom of the shaft never exceeded that distance. The bords, or rooms, were intended to be six yards wide, separated by pillars of four yards, driven parallel with the adit or level; but this parallelism was rarely maintained, and it was not unusual to find the bords seven or eight yards, and the pillars only two or three yards, wide. As a natural consequence, the pillars, being too weak to bear the weight of the

[1] The site of the old wharf is marked on the map, and also on the sectional view of the north-west shore of Sydney harbour, at the end of the book.

superincumbent strata, were crushed in and entirely lost; whereas, if they had been left sufficiently strong, at least three-fourths of the coal which they contained might have been saved. The coal was worked by 'holing' across the bord in the middle, 'sheering' the sides, and breaking it down by wedging. As no separation of large and small was made, the same price being paid for the whole, the colliers had no interest in making as much large coal as possible, so that before it left the face of the bord the proportion of large coal obtained did not amount to two-thirds of the whole.[1] The coal was hauled in 'two-bushel' tubs, upon small iron-shod sledges, over a road-way formed of round poles two to three inches in diameter, laid transversely, close together, by strong, active young men, who were paid at a certain price per tub. Upon reaching the bottom of the shaft three of these tubs were emptied into a large tub which was raised to the surface, a height of about ninety feet, by a double-horse gin. At the top of the shaft the large tub was emptied into a shoot or hopper, from which the coal was discharged into carts containing twelve bushels. If a vessel happened to be loading at the time, the carts were driven over a rough, shaky road, formed of round poles three or four inches in diameter, laid close together —the 'Corduroy Road' of the colonies—to the wharf, where their contents were discharged into the vessel. When no vessel was loading, and also in winter, when the navigation was closed, the coals were deposited in a large heap near the wharf, over which the carts were dragged.

[1] The workmen were mostly young Irishmen who had been employed in the Newfoundland fisheries. Having earned enough for their purposes, some purchased crown land in Cape Breton, others proceeded to the United States, but very few remained any length of time at the mines. There were, consequently, very few skilled colliers regularly employed at the mines.

As sometimes 3,000 to 4,000 tons were accumulated in one heap ready for shipment, it may easily be conceived that, after undergoing so many removals, with a final crushing by the horses and carts, the coal was reduced almost wholly to slack before it reached the vessel. Besides, as vessels drawing more than nine or ten feet could not load at the wharf, they had to anchor in the stream, and receive their cargoes from lighters, by which means the coal was still further damaged. Taking all these things into consideration, it is not surprising that Sydney coal could not find a ready market.

All the workmen of the establishment, consisting of overmen, mechanics, colliers, haulers, and labourers, in addition to their wages, whether by the day or by contract, were allowed rations of beef, pork, bread, and molasses, which were given out weekly. If a man was absent from his work, of course he had to pay for his rations; but whether a man worked faithfully or not, he received the same allowances, thus placing the industrious and skilful men on the same level as the idle and ignorant. The working time, both in the pit and on the surface, extended from 5 A.M. to 7 P.M., with an allowance of one hour for breakfast at 9 A.M., and the same for dinner at 1 P.M. All hands, being summoned to breakfast by ringing of the bell, abandoned their work and rushed to the store, whence each, having swallowed a glass of raw rum, went to his breakfast. The same process was repeated with regard to dinner, and again at 7 P.M., when the day's work was done. Some of the men were engaged for four, others for twelve months, commencing on January 1. There were only two pay-days in the year—one for the four-months' men, on May 1, the other for the twelve-months' men, on December 31. As the men, in the meantime, were not furnished with any

accounts of their wages or purchases at the store, they generally found, at the final settlement, that, after paying for clothing, stores, rum, &c., they had very small balances to receive. We need not wonder that, under this system, the lessees, as has often been asserted, made more profit by the sale of their stores than of their coal.

All the men, except the two overmen and four mechanics, lived in two barracks or cook-rooms (as they were called), where they took their meals and slept in the same apartments. Their sleeping berths were ranged along the sides of the two rooms in tiers, one above another, as in a ship. It may easily be imagined what sort of a place the cook-room was, where forty men ate, slept, and washed—when they did wash, which was only once a week—in a single apartment. In winter, it is true, they had abundant means of making it warm enough, which is about all that can be said in its favour; in summer it became so very *lively* that most of the men preferred sleeping during the fine weather under the spruce trees in the vicinity. It could hardly be expected that either harmony or good order prevailed in two rooms occupied by eighty or ninety men under such conditions, where all were upon equal terms and free from restraint. Brawling and fighting seemed to be the order, or rather the disorder, of the day, from Monday until Saturday, Sunday being truly a day of rest, which, strange to say, was devoutly observed. The writer, who had the misfortune to occupy a house for more than twelve months about 100 yards from the cook-rooms, can testify that he rarely enjoyed an undisturbed night's rest during the whole of that period.

Neither did the external aspect of the establishment in any way counterbalance its moral deficiencies. No improvements had been made upon the 400 acres of excel-

lent land belonging to the mines; the roads were scarcely passable, and of houses there were none, except the workmen's barracks, half-a-dozen log and sod huts occupied by the overmen and mechanics, a couple of storehouses, and an old framed house,[1] perfectly innocent of paint, belonging to the managing lessee of the mines. There was neither a school-house nor place of worship, except a small Roman Catholic chapel in the vicinity, where the priest from Sydney officiated once, or perhaps twice, in the course of a year. Such was the dilapidated condition of the Sydney mines when they came into the possession of the present lessees on January 1, 1827. All that had been done was worse than useless, as the property, instead of being improved, was seriously damaged. About seventy-five acres of the main seam had been worked out, leaving the pillars behind, which, owing to the settling of the roof, could not be recovered. To show the wasteful, reckless way in which the works had been conducted, it need only be stated that from seventy-five acres of a six-feet seam, which ought at least to have yielded 500,000, only 275,000 tons had been raised since the mine was commenced in 1785.

[1] This house was built over some old workings which had settled down and thrown the floor so far out of level that one side of the sitting-room was two feet below the other. When the Government superintendent of the mines, an old naval officer, used to make his visit of inspection, his first remark generally was; 'Well Mr. B., I see you are still carrying top-galiant sails; recollect there is a heavy ground swell; take care you don't come to grief one of these days!'

TABLE I.—*Coal Sales at Sydney, from* 1785 *to* 1826, *inclusive.*

Year.	Tons sold.	Selling price per Ton	Royalty per Ton	Names of Lessees	Remarks
		s. d.	*s. d.*		
1785	1668	11 6	Nil	Worked by Government	
1786	No return	do.	do.	do.	
1787		9 8	do.	do.	No separate returns given from 1787 to 1791 inclusive. Average is 2,666 per annum
1788		11 6	Not stated	T. Moxley	
1789	13351	do.	do.	do.	
1790		do.	do.	do.	
1791		do.	do.	do.	
1792	2143	Not stated	3 0	Tremain and Stout	
1793	1926	do.	do.	do.	
1794	4405	do.	do.	do.	
1795	5320	do.	do.	do.	Including 911 tons from cliffs
1796	5249	do.	do.	do.	do. 995 tons do.
1797	6039	do.	do.	do.	
1798	5948	do.	do.	do.	
1799	8947	do.	do.	do.	
1800	8401	do.	Nil	Worked by Government	
1801	5775	do.	do.	do.	
1802	7769	10 3	4 0	Wm. Campbell	
1803	6601	do.	do.	do.	
1804	5976	do.	Nil	Worked by Government	
1805	10130	do.	do.	do.	
1806	4938	do.	do.	do.	
1807	5119	do.	do.	do.	
1808	6616	do.	do.	do.	With 365 from cliffs
1809	8919	do.	do.	do.	
1810	8609	do.	do.	do.	With 170 from cliffs
1811	8516	do.	do.	do.	
1812	9570	do.	do.	do.	
1813	9744	13 2	3 8	Ritchie & Leaver	
1814	9866	do.	do.	do.	
1815	9336	do.	do.	do.	
1816	8619	do.	do.	do.	
1817	9284	do.	do.	do.	
1818	7920	do.	do.	G. W. Bown & J. Leaver	
1819	8692	do.	do.	do.	
1820	9980	do.	do.	do.	
1821	11388	do.	3 6	G. W. Bown	
1822	7512	do.	4 3	T. S. & W. R. Bown	
1823	„	do.	do.	do.	No returns for these three years. Probably averaged about 9,000 tons
1824	„	do.	do.	do.	
1825	„	do.	do.	do.	
1826	12600	do.	do.	do.	

CHAPTER VII.

OPERATIONS OF THE GENERAL MINING ASSOCIATION IN CAPE BRETON, FROM 1827 TO 1857, INCLUSIVE.

SOME few of the readers of these pages may, perhaps, be old enough to recollect that one of the prominent events of the year 1825 was a mania for embarking in mining speculations, and that a number of Joint Stock Companies were formed for working mines of all kinds, but chiefly gold and silver, in North and South America, in the sanguine expectation of realising large profits by their operations. One of these companies, styled the General Mining Association, organised by Messrs. Rundell, Bridge & Rundell, the late well-known firm of jewellers and goldsmiths, purchased, not only extensive mining tracts in Brazil and Colombia, but also a lease of all the mines and minerals of the province of Nova Scotia, which George IV., by an act of the royal prerogative, had granted to his brother, the late Duke of York. Frequent rumours had, from time to time, reached England of the existence of rich veins of copper ore in Nova Scotia, which probably induced the duke to apply for a lease, in the hope thereby of repairing his damaged fortunes. At all events, the duke obtained a lease for sixty years of all the reserved mines, with certain exceptions, which will shortly be specified, and transferred it to Messrs. Rundell, Bridge & Co., upon their agreeing to pay over to him a certain share of the profits which should accrue from year to year. By this prudent arrangement the Duke of York,

who had not the means of working the mines on his own account, secured for himself a share of the profits without the risk of incurring any loss whatever.

Having completed their arrangements with the Duke of York in 1825, Messrs. Rundell & Co., or rather the General Mining Association, sent out Mr. Backwell, a Cornish mining engineer, to examine and report upon the veins of copper which, as it turned out, had acquired for Nova Scotia an undeserved reputation for great wealth in that mineral. Mr. Backwell spent a summer in examining every known deposit of copper in the province, but did not succeed in finding any worth working. Small pieces of native copper were found in the trap rocks of Cape D'Or, in the Bay of Fundy, and some trifling deposits of the grey sulphuret of copper in the sandstones of the coal formation, on the shores of Northumberland Strait, but nowhere in sufficient quantity to make them of economical importance. In the course of his explorations Mr. Backwell collected some useful information concerning the coal-fields of the province, and reported to the Directors of the General Mining Association that, in his opinion, they would do well to abandon their search for copper, and devote their immediate attention to the opening of the coal mines.

Disappointed in their expectation respecting the value of the copper veins, the Directors, acting upon Mr. Backwell's suggestion, in the spring of 1826 sent out the writer of these pages specially to survey and report upon the coal-fields of Nova Scotia and Cape Breton.[1] In the progress of this survey it was found that in the coal-fields of Pictou and Sydney, the best seams of coal in the province were already leased and worked by other parties, and, conse-

[1] The lease from the Crown to the Duke of York was not executed until August 25, 1826; it will expire on August 15, 1886.

quently, they were not included in the Duke of York's lease, which did not cover any mines that were under lease at the time of its ratification. Fortunately for the General Mining Association, Messrs. T. S. & W. R. Bown, whose lease of the Sydney mines would expire on the 31st December, 1826 (see p. 66), were not disposed to renew their tenancy at such a high rate of royalty as they hitherto had paid (four shillings and three pence per ton), because nearly all that portion of the seam which was drained by a level was nearly exhausted, and it would be necessary to erect costly pumping machinery. Sir James Kempt being apprehensive that, under these circumstances, there would be a difficulty in leasing the mines, and that the revenue of the province would suffer accordingly, intimated to the writer, that if the General Mining Association would work the mines *for one year* on the terms then in force, perhaps, in the course of that time some other arrangement might be made for a longer lease upon more favourable conditions. This offer was readily accepted, and, in consequence, the Sydney mines—beyond all doubt the most valuable in Cape Breton—came into the possession of the General Mining Association on the 1st January, 1827.[1]

When the Duke of York transferred his lease to the General Mining Association, the latter, of course, became liable for the rents, royalties, &c., under which it was held, and bound to conform to its various stipulations. According to the lease, the royalty payable on coal was one shilling sterling per ton; but when the General Mining Association, in 1828, by agreement with the Provincial Government, obtained a lease of the Sydney

[1] In the course of the following year the General Mining Association purchased the lease of the Pictou (Albion) mines from the parties who then held them, and thus became exclusive tenants of *all* the mines and minerals belonging to the Crown in Nova Scotia and Cape Breton.

and Pictou, or reserved mines, upon which the duke had no claim, terminable in 1886, it was agreed, by all the parties concerned, that the General Mining Association, upon payment of a fixed rent of 3,000*l.* sterling a year, should be allowed to sell 20,000 chaldron, Newcastle measure, in Nova Scotia and Cape Breton, and that they should pay two shillings Halifax currency (equal to one shilling and sevenpence sterling) per Newcastle chaldron upon all the coal sold over that quantity. By this arrangement the rate of royalty paid under the duke's lease was set aside, and an uniform rate established for all the coal raised, whether from mines held under the duke's lease, or from the reserved mines at Pictou and Sydney. This arrangement, however, did not interfere with the terms of the agreement under which the Duke of York, or rather his representatives, were entitled to receive one-fourth of the net profits accruing from the working of the mines. The rents and royalty above specified were paid until the year 1845, when the British Government consented to allow the Association to sell 26,000 instead of 20,000 chaldrons, Newcastle measure, for the fixed rent of 3,000*l.* per annum; but, as a set off-against this privilege, it was stipulated that small coal should also pay royalty, from which, under the former agreement, it had been exempt. This last agreement continued in force until December 31, 1857, when the General Mining Association surrendered their claim to *all* the mines and minerals except coal within certain defined limits, as will be explained in a future chapter.

Having obtained undisputed possession of all the coal-fields in Cape Breton in 1827, the General Mining Association immediately took the necessary steps for ascertaining the most suitable locality for establishing their works upon a large scale. After a careful examination of the qualities and situations of the various seams, it was finally decided

that the Sydney 'Six Feet,' or 'Main Seam,'[1] which had been worked by the former lessees, as already stated, was in every respect the most suitable, taking into consideration its superior quality as a domestic fuel, and its situation on the shores of one of the best harbours in North America. As it would take some time to erect machinery, sink shafts, and construct a railway to a convenient place of shipment, it was determined to continue the working of the small portion of the seam still available above water level, which, it was calculated, would, in the meantime, supply about 10,000 tons per annum for two or three years; and, to enable the Association to meet the demand which it was expected would arise in the United States when the coal was shipped in good condition, to open an auxiliary colliery, upon a small scale, on the south side of Indian Bay, in the Phelan seam.[2]

The following extracts from a report recently made by Mr. Henry How, Professor of Chemistry, at King's College, Windsor, on the analysis of average samples taken from all parts of the seam, will clearly prove that the high character which the Sydney coal has long enjoyed, both as a domestic fuel and as a steam coal, has been justly acquired :—

Composition of Average Samples of the whole Seam of Coal.

By Medium Coking.

Moisture	3·04
Volatile combustible matter	31·14
Fixed carbon	61·50
Ash (reddish brown)	4·32
	100·00
Coke, per cent.	65·82
Theoretical evaporative power	8·45 lbs.

[1] The situation and extent of this seam will be seen on the map of the coal-field; its position in the Sydney series in the tabulated section at p. 16.

[2] This was called the Bridgeport Mine. See map of the coal-field, and section at p. 24.

By Fast Coking.	
Total volatile matters	37·48
Coke	62·52
	100·00
Theoretical evaporative power	7·98 lbs.
By Slow Coking.	
Total volatile matters	29·70
Coke	70·30
	100·00
Theoretical evaporative power	9·06 lbs.
Mean coke, per cent.	66·21
Mean theoretical evaporative power	8·49 lbs.
Ash, per cent.	4·32
Sulphur, per cent.	1·24
Specific gravity of average samples	1·30
Calculated weight of one cubic foot, unbroken	81·10 lbs.
" " " broken	54·50 lbs.
Space for one ton, 2,240 lbs., on stowage (economic weight)	41·40 cub. ft.
Composition of Ash.	
Sand and clay	29·57
Peroxide of iron	51·33
Alumina	4·84
Sulphate of lime	10·98
Lime	3·05
Magnesia, Phosphoric acid, decided traces, Manganese, traces, Chlorine, traces	0·23
	100·00

The details given above explain the well-known high favour in which this coal has been held for upwards of forty years[1] for domestic use, and also for steam-producing by those who have employed it carefully.

[1] Prof. How's analysis was made in January 1871.

'The mean theoretical evaporative power, or number of pounds of boiling water which should be evaporated by one pound of coal, 8·49, compares very favourably with the actual power of British coals, as found in the Navy Trials in which I assisted; these were:—

Average of 37 samples	from	Wales	. .	9·05 lbs.
„ 17	„	Newcastle	. .	8·37
„ 28	„	Lancashire	. .	7·94
„ 8	„	Scotland	. .	7·70
„ 8	„	Derbyshire	. .	7·58

This fact alone would always have been significant as indicating that the Sydney coal should prove a good steam coal; but since late experiments have shown that, when burnt in proper furnaces, the bituminous coals have been found to give no smoke, and to have an evaporative power even superior to that of Welsh steam-coals, it is now of the highest importance. It is necessary to draw attention in this connection to the resemblance of the Sydney coal to those bituminous coals which gave these results, in containing a low per-centage of ash.'

Although rather out of place in chronological order, it may be as well, to avoid the necessity of recurring to the subject, to submit some further remarks on the character of the Sydney coal. It must, however, be borne in mind that the coal which obtained the high character attached to it, was raised from a considerable depth, and shipped in good condition, very different in every respect from that sent to market previous to the year 1827. It possesses many valuable properties as a domestic fuel, igniting readily, burning freely, and making a bright cheerful fire. The ashes are small in quantity, and being comparatively heavy, settle under the grate, thereby leaving a clean tidy hearth in front of the fire. Before anthracite came into such general use in the United States

when bituminous coal was largely imported, it is said to have been a common practice among the coal-dealers to dispose of Sydney coal to their customers under the name of Liverpool orrell—a favourite fuel at that time in New York and Boston. Its good qualities have been long recognised in the British provinces, where it is generally used, and readily sells at from two to three shillings per ton higher than any other provincial coal. It has long been used by the garrison at Halifax, and is the only coal the Commissariat officers will receive in the fuel-yard, though, it is said, they have been urgently pressed, by persons interested in other mines, to accept tenders for their coals at lower rates.

The Sydney coal has maintained a deservedly high reputation as a steam coal ever since it was first used for that purpose, and favourably reported upon by Commander Nott, of her Majesty's steam sloop the 'Dee,' which took in a supply on her voyage from England to Quebec during the Canadian outbreak in 1838. Before the steamers of the Cunard Line discontinued calling at Halifax, about three years ago, they were furnished with supplies of Sydney coal both on their outward and homeward voyages. It is still used by the mail steamers running from Halifax to Bermuda and the West Indies, and also by the French steamers on the Newfoundland station. In 1860 a cargo was shipped direct from Sydney to Brest, for trial by the Director of Naval Construction at that port, who reported to the Minister of Marine 'that in steam power it was little inferior to the Cardiff and quite equal to the Newcastle coal.' The British ships of war engaged in protecting the fisheries, and casual vessels bound to Canada and the West Indies, occasionally touch at Sydney for supplies of coal. Some years ago stores of Sydney coal were deposited in the dockyard at Halifax

for the service of ships of war on the North American station, but the practice was discontinued, and Welsh coal was imported to supply its place, because it was alleged that the latter possessed greater evaporative power than the Sydney, in the proportion of 9 to 7; and also that the dense black smoke emitted by Sydney coal during combustion, not only discovered the ship's place to an enemy at a great distance, but also damaged the sails and discoloured the paint. Admitting these objections to be substantial during the time of war, they ought to be disregarded in times of peace, when ships of war can be supplied at Halifax with Sydney coal at thirteen shillings per ton, while, on the contrary, Welsh coal costs at least thirty shillings. But even these objections, trifling as they are, have now been set aside by the introduction of furnaces which consume the smoke; and, as has been proved by a series of experiments made on board her Majesty's steamers 'Urgent' and 'Lucifer,' at Portsmouth, by using equal proportions of Welsh and Newcastle coals, mixed together, a saving of 14½ per cent. is made in the consumption of fuel, and 7½ per cent. gained in the effective horse-power of the engines. Since the Sydney and Newcastle coals are so much alike in their constituents and general characteristics,[1] a mixture of Sydney and Welsh coal would undoubtedly produce the same results; and it is therefore hoped the Admiralty will send out

[1] It will be seen by comparing the composition of Sydney coal (taking the average of slow, medium, and fast coking) with that of the Hartley, used on board the 'Urgent' and 'Lucifer' in the above trials, that their resemblance is very striking, the slight difference in the excess of fixed carbon in the Sydney being in its favour as a steam coal:—

	Sydney.	Hartley.
Volatile matter, water included	33·82	36·16
Fixed carbon	61·86	59·32
Ash	4·32	4·52
	100·00	100·00

instructions to the officers on the North American station to use it, if not altogether, at any rate mixed with Welsh in equal proportions, to the great relief of British taxpayers.

The General Mining Association, as stated at page 77, obtained possession of the Sydney mines in 1827, for one year certain; but, as the arrangement made in 1828 for an extension of the lease was not completed until the following year, no active steps were taken for opening out the works until the beginning of 1830. The first shaft (marked 'a' on the map) was sunk 250 yards to the dip of the old workings, where it struck the coal-seam at a depth of 200 feet from the surface. An engine of 30 horse-power was also erected for raising coal, and another of 20 horse-power for pumping water. Work-shops, warehouses, and dwelling-houses were also built, and a number of skilled workmen and colliers brought out from England to carry on the works on the most improved system. To supersede horses and carts a light temporary railway was constructed from the pit to the old wharf, pending the completion of a substantial line to a secure place of shipment inside the bar, sheltered from the north-east swell to which the outer harbour is exposed. Small coasting vessels continued to load at the old wharf, but large vessels were loaded by means of schooner lighters, carrying about 60 tons each, at a secure place of shipment some distance up the harbour. To carry on the works with success, and to place them beyond the diasastrous effects of an accident to the steam-engines, an iron foundry, with fitting shops, lathes, and everything necessary for repairing all kinds of mining machinery, was erected on the spot, as there was at that time no place, within a distance of 800 miles, where such repairs could be efficiently made.

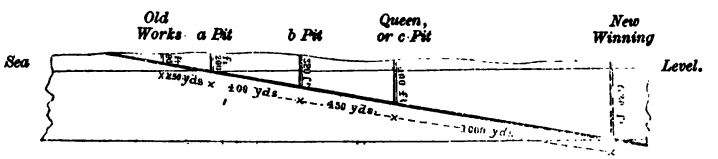
As the trade increased it was found necessary, in 1834, to sink another shaft (marked 'b' on the map) 400 yards farther to the dip. This shaft was 320 feet in depth, and was equipped with a pumping engine of 80 and a winding engine of 30 horse-power. During the same year the railway, three miles in length, was completed from the pits to North Sydney (*see* map), where vessels of large burden have ever since received their cargoes with safety and despatch direct from the pit.

This pit (the 'b') continued to supply the demand until 1854, when, owing to a heavy influx of water, which overpowered the pumping engine, it was abandoned, and the Queen, or 'c' pit (*see* map), which had been previously sunk and equipped in anticipation of such a misfortune, was brought into operation. All the pillars had, before this happened, been taken out of the 'a' pit, but there was a considerable portion still remaining in the 'b' pit when it was lost. The great body of water in the 'b' pit workings is effectually prevented from communicating with those to the dip by a barrier rib of solid coal 150 feet in width.

The Queen, or 'c' pit, is 400 feet in depth. It is worked by a pumping engine of 150 and a winding engine of 60 horse-power. All the whole coal has been worked to the rise of the shaft, except a few acres near the harbour shore. The greatest part, also, of the whole coal, to the extent of 1,000 yards to the dip of the shaft, has been worked; from this part of the mine the coal is drawn up inclined planes by two underground engines, of 30 horse-power each, supplied with steam by boilers on the surface. A portion of the pillars has been worked in this part of the mine; in the course of a few years the whole will be removed, and at the same time, pro-

bably, some of those now under water in the 'b' pit will be recovered. All the coal now shipped from the Sydney mines is raised from the Queen pit, which is capable of supplying 150,000 tons per annum. It is conveyed by railway to the shipping wharves at North Sydney (*see* map).

Locomotives were first employed in 1854, horses having been previously used in hauling the coal. The annexed diagram shows the position and depth of the several shafts sunk at the Sydney mines since 1827 in section :—



The new shafts now in progress of sinking at the 'new winning,' 1,000 yards farther to the dip, will be described in a future chapter when the operations subsequent to the year 1857 claim our attention.

The Lloyd's Cove and Indian Cove seams were worked by the French for the supply of Louisbourg, and subsequently by the British Government for the use of the troops at Halifax. They have also been worked by the General Mining Association to a small extent, but, owing to their inferior quality, have been some time abandoned.

The Bridgeport mines, situated on the southern shore of Indian Bay, were first opened by the General Mining Association in 1830, when a level was driven from the outcrop along the strike of the seam, now known as the 'Phelan seam' (*see* map of the coal-field and section at page 25). As the level proceeded to the southward pits were sunk at intervals of about a quarter of a mile,

from which the coal was raised by horse-gins. At the face of the cliff the seam consisted of an upper bed, three feet in thickness, and a lower bed, five feet three inches in thickness, separated by a four-inch layer of shale; but, as the level advanced, the layer of shale gradually increased, until, at the distance of half-a-mile from the shore, it attained a thickness of twenty-eight feet. Beyond this point it rapidly declined, and at a trial bore-hole, 300 yards to the dip of the level, it was found to be only fourteen inches thick, the upper bed of coal being three feet and a half and the lower six feet in thickness. In the first instance the coal was brought out of the level and boated off to vessels at anchor in the open bay, but in 1833 a light railway, two miles in length, was laid from the pit along the sand-beach to the harbour, which was adapted only for vessels drawing eleven feet of water when loaded. The Bridgeport is a good domestic fuel, but not equal to the Sydney coal; on the other hand it is more valuable as a gas-coal, yielding nearly 10,000 cubic feet of gas per ton. Its constituents by analysis are—

Volatile matter	33·20
Fixed carbon	61·39
Ash	5·41
	100·00

Owing to a great decline in the demand for this coal in 1841 and 1842 the mine was closed in the latter year, but the whole of the coal on the banks was not disposed of for some time afterwards. The railway materials and moveable plant were transferred to the Sydney mines.

The Lingan mines, situated on the northern shore of Indian Bay (*see* map), were first opened by the General Mining Association in 1855, when it was expected that,

owing to the removal of the duty upon coal in the United States under the provisions of the Reciprocity Treaty, a considerable demand would arise for Lingan coal, which had been found very suitable for the manufacture of gas. Its superior quality as a smith's coal had long been known, and, as the seam cropped out in the face of the cliff in a conspicuous position, it had attracted the attention of the coal smugglers at a very early period. The seam, marked No. 6 in the tabular section, p. 32, is eight feet six inches in thickness, and is supposed to be a continuation of the Bridgeport or Phelan seam. The colliery was first opened by driving an adit from the shore on the strike of the seam, a distance of about half-a-mile, when it was intersected by a slope driven from the outcrop of the coal, where an engine of 30 horse-power was erected for drawing the coal up the slope and pumping the water from the workings to the dip of the adit. The seam has been worked on both sides of the slope, which has recently been continued downwards under the sea, where the best coal is found, in quantity practically illimitable. The coal is conveyed by railway, something less than a mile in length, to the harbour, which is navigable by vessels drawing fourteen feet of water. The Lingan coal has been used to a considerable extent in the United States for gas manufacture. According to the report of the engineer of the New York Gas Company, it yields 9,600 cubic feet of gas per ton. The annexed extracts from an analysis recently made by Professor How, of King's College, Nova Scotia, will show that it is equally well adapted for other useful purposes :—

By Medium Coking.

Moisture	3·17
Volatile combustible matter	26·86
Fixed Carbon	66·91
Ash	3·06
	100·00
Theoretical evaporative power	9·07 lbs.

By Slow Coking.

Total volatile matters	25·43
Coke	74·57
	100 00
Theoretical evaporative power	9·81 lbs.

By Fast Coking.

Total volatile matters	33·70
Coke	66·30
	100·00
Theoretical evaporative power	8·71 lbs.
Mean theoretical evaporative power	9·19 lbs.
Prejudicial sulphur per cent.	·710
Specific gravity „	1·282
Weight of one cubic foot, unbroken	79·95 lbs.
„ „ broken	53·56 „
Economic weight, or space for stowage of one ton of 2,240 lbs.	41·81 cubic feet

On these results Professor How remarks that the Lingan is an excellent gas-coal, owing to its low amount of sulphur, ninety-eight British coals, tried in the Navy Enquiry, having yielded an average of 1·25 per cent. For the same reason, he adds, taking into account also the excellent quality of the coke, the Lingan should prove a valuable coal for blacksmiths' uses and for smelting.

It will be seen from the following extracts from Prof. How's report that the Lingan possesses all the most im-

portant qualities requisite to establish its character as a good steam-coal:—'The ash is very low in all parts of the seam, the average of the whole being only 3·06 per cent. This gives great evaporative power to the coal, and hence, according to late results, it should be valuable for steam purposes. The mean of all my experiments gives for the theoretical evaporative power of the coal 9·19 lbs. as the amount of boiling water which should be evaporated by one pound of coal. This is somewhat above the practical result, even from Welsh steam-coals, in our British Navy steam trials, which gave the highest weight, viz. 9·05 lbs. As it is now known that bituminous coal can be made to give, without smoke, greater heating power than Welsh steam-coals, when their ash is low, a bituminous coal like this of Lingan assumes a new value.' . . . 'I find that the average percentage of ash from fourteen analyses of North of England coals is 3·77, while the Lingan gives only 3·06 per cent., so that in proper furnaces it ought to prove a very good steam-coal indeed.' . . . 'The analysis of the ashes leads me to conclude that, except, perhaps, in the case of that of the bottom coal [one-third of the thickness of the seam], there will not be much clinker formed, as in the other parts of the seam the sulphate of lime and lime bear too small a proportion to the other ingredients, of which a considerable amount is clay; this is especially the case with the middle coal, so that, even when the coal is used altogether, there will probably be little clinker, and the ash will be readily cleaned from the furnace.'

The Bras d'Or Mine, situated on the southern shore of the little entrance of the Bras d'Or, about four miles from the sea, was opened by the General Mining Association in 1833, upon a small scale, by driving a level from the water's edge along the strike of the seam. This seam,

which is probably a continuation of the 'stony seam' of the Sydney mines section (*see* p. 16), is five feet in thickness, dipping easterly at an angle of six degrees. It was worked for three or four years, but, owing to its inferior quality, it was impossible to effect a sale at a remunerative price, and was, consequently, abandoned. About 9,000 tons altogether were raised, but it was not all disposed of until 1853, though sold at a merely nominal rate. Being outside the limits of the General Mining Association's reservations, under the arrangement made with the Government in 1857, which will shortly come under consideration, it has since been re-opened and worked by another party, as will be explained in its proper place.

The Point Aconi Mine, near the little entrance of the Bras d'Or, on the island of Boulardrie, was opened upon a small scale in 1857, for the purpose of obtaining a few cargoes for trial as a gas-coal, but the results were not encouraging, and the works were abandoned. The seam, known as the 'Stubbert seam' (*see* Boulardrie section, p. 19), is seven feet in thickness and is of good quality for domestic purposes.

CHAPTER VIII.

PROGRESS OF THE COAL TRADE FROM 1827 TO 1857, INCLUSIVE.

THE chief object of the General Mining Association in opening the coal mines of Cape Breton was to establish an extensive trade with the United States, which at that time derived their principal supplies of bituminous coal from England. It was not expected that the British provinces, where wood was abundant and cheap, would be large consumers; but the result has proved otherwise, as the reader will learn by an inspection of Tables II., III., and IV. at the end of this chapter. These tables, containing the particulars of thirty-one years' experience in the trade, will place the subject before the reader in a more intelligible shape than many pages of explanations, and enable him to draw his own conclusions. Table II., giving the selling price at each mine, the rent and royalty paid to the Government, the import duty in the United States, and the reductions in these several items from time to time, will, by comparison with Table III., showing the annual sales, exhibit the general effect of those reductions; while Table IV. will prove that the principal increase in the sales was due, specially, to the rapidly growing demand for Cape Breton coal in the British provinces.

It must, undoubtedly, have been a great disappointment to the General Mining Association to find in 1857 that, after a struggle of thirty years, in which neither

trouble nor expense was spared, the sale of Cape Breton coal had made such little progress in the United States; it may, however, be some satisfaction to the present proprietors to know that the want of success in that direction was owing to circumstances entirely beyond the control of the Association or their agents in the United States. The following remarks will prove this assertion. In the first place, when the Association began to work the Sydney mines in 1827, commercial intercourse between the United States and the British provinces was hampered by so many restrictions, that it was impossible to deliver Cape Breton coal in New York or Boston at a price that would command the market. In addition to an import duty of six shillings and ninepence per ton upon the coal (Table II.), colonial vessels entering ports of the United States were subject to a duty of four shillings per ton upon their registered tonnage, and United States vessels were liable to a similar duty trading to colonial ports. Besides, as Halifax was the only free port in Nova Scotia, British vessels trading at the mines could not proceed direct to the United States, but were obliged to touch at Halifax to clear out for their destination; whilst American vessels, on the other hand, could not enter any port in the province except Halifax, unless driven in by stress of weather for shelter. In the course of the following year, however, the tonnage dues were abolished by both countries, and the ports of Sydney and Bridgeport were opened to foreign vessels, through the influence of the directors of the Association in England.

These restrictions were, however, scarcely removed when another obstacle of a more serious nature arose to the Cape Breton coal trade. Wood was so generally used as fuel in the United States in 1827, that the consumption of coal in Boston and New York only amounted in that

year to 172,428 tons, of which Great Britain supplied 34,647, Virginia 79,214, and Pennsylvania 58,567 tons. As the demand for coal was rapidly increasing, and wood was becoming scarcer and dearer, there appeared to be a favourable opening for the introduction of a large quantity of foreign coal; but, unfortunately for the Cape Breton mines, just at this juncture the anthracite coal of Pennsylvania, which had hitherto reached the markets on the sea-board in very small quantities, obtained an outlet to the ocean by means of the Schuylkill navigation, which was opened in 1825. This canal, 108 miles in length, formed an uninterrupted communication between Pottsville, the centre of the anthracite region, and the port of Philadelphia, from whence the coal was shipped, at moderate rates of freight, direct to Boston and New York, where, of course, it was delivered free of duty, and came into competition with Cape Breton coal, burdened with an import duty of six shillings and ninepence per ton. Although objectionable in some points, the anthracite, when it became well known and the mode of using it understood, was found to be superior to bituminous coal on account of its cleanliness, durability, and freedom from smoke. Consequently it soon came into general use, and established a character which it has ever since maintained, notwithstanding the reduction of the duty on foreign coals and their lower cost. In 1847, after twenty years' experience, anthracite sold readily in Boston at six dollars, whilst Sydney could hardly be disposed of at five dollars and a half per ton. In the same year the sales of anthracite amounted to 2,982,309, whilst Sydney only reached 23,539 tons.

It might be supposed, from the amount of shipments to the United States between the years 1830 and 1833 inclusive, as shown in Table IV., that there was a marked

increase in the demand; but this was not the fact, for the Association shipped the greater portion of the coal that went to the United States on consignment to their agents, with instructions to sell at such prices as it would bring —prices which, it need scarcely be added, seldom covered cost and charges. This practice was discontinued in the two following years, but, unfortunately, was resumed in 1836–37 and 38 under a still more objectionable form, large quantities of coal having been shipped and yarded in dépôts at New York at a heavy cost. It may easily be imagined that, so long as a large stock of coal was kept in store, it was impossible for the regular traders to sell their cargoes direct from the ship. These were driven out of the business, while, on the other hand, the Association were unable to sell from their dépôt at a remunerating price subject to such heavy charges for wharfage, yarding, rent, and agencies. The coal, in consequence, after remaining a long time on hand and suffering much deterioration from exposure to the weather, was obliged to be sold at 'an alarming sacrifice.'

It will be seen by Table IV. that a large quantity of coal was sold in 1839—namely, 45,356 tons. This large exceptional shipment occurred under a contract with a colonial firm, which undertook to sell 30,000 tons upon condition of being supplied at a rate considerably under the regular selling price. Neither the Association nor the contractors made any profit by this transaction.

Notwithstanding a reduction of four shillings per ton in the duty in 1847, and its total abolition in 1857 under the provisions of the Reciprocity Treaty, the exports to the United States continued to decline, the average sales during that period having reached only 15,400 tons per annum. Indeed, this low average even would not have been reached if the sales had been confined to Sydney

coal; it was only brought up to that amount by the introduction of Lingan coal in 1855 for the use of the gas-works. It will thus be seen that neither reduced selling prices nor its admission duty free could secure for Sydney coal a market in the United States in competition with their own anthracite, which had now come into general use for domestic purposes.[1]

The loss of the American market has, happily, been compensated for, in a great measure, by the gradual and steadily increasing demand in the British provinces. In the early years of their settlement, when wood was plentiful at every man's door, we have seen (Table I.) that the use of Sydney coal was confined to the town and garrison of Halifax, and that the average sales from 1785 to 1826 only amounted to 5,600 tons per annum. As wood became scarce the sales would naturally have increased had they not been checked by the high price at the mines, which, up to 1826, was seldom under thirteen shillings per ton. As the same price was maintained up to the year 1833, notwithstanding a considerable increase in the population, the average sales did not exceed 10,000 tons per annum. When, however, the selling price was reduced in 1834, the sales in that and the five subsequent years averaged 25,000 tons per annum. Again, when a further reduction of price was made in 1839, the sales began to increase rapidly until the year 1857—the limit of the period under consideration—when they reached 98,300 tons per annum. These results are too palpable to be overlooked. They plainly show that the General Mining Association must look chiefly to the British provinces for a market for their Sydney coal, where its character is well known and appreciated, and that they

[1] The quantity of anthracite raised in the United States in 1870 amounted to 15,723,030 tons.

will find it their interest to foster the trade by selling at low prices to regular customers, thereby securing a fair profit on their outlay, perfectly free from the fluctuations, and consequent losses, attendant upon a foreign trade, liable at any moment to be suspended by a hostile tariff.

It formerly was the custom, as has been already mentioned, to ship the large and small coal together, charging the same price for the whole; but the General Mining Association soon found that coal shipped in this condition could not be sold in the United States, where it had to compete with English coal carefully screened, and even hand-picked specially for the New York market. The practice was, therefore, discontinued in 1831, when the small coal was offered for sale at half price; as this reduction was not sufficient to create a demand, it was further lowered in 1837 to three shillings and fivepence per ton, being one-third of that of large coal. Since that time it will be observed, by reference to Table IV., the sale of this description of coal has been gradually increasing both in the United States and the colonies. In the former it is chiefly used in the furnaces of steam-engines employed in manufactories, as its facility of ignition and very low price enable it to compete successfully with anthracite. In the colonies it is used for lime-burning, and also in common fires mixed with wood, by farmers and persons who cannot afford to purchase large coal.

TABLE II.—*Mines. Selling Prices, Rent and Royalty, and United States Duty per Ton from* 1827 *to* 1857, *inclusive.*

Year	Selling prices per Ton										Crown Rent and Royalty per Ton	United States Duty per Ton	Remarks
	Sydney		Bridgeport		Bras d'Or		Lingan		Pt. Aconi				
	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small			
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	
1827	13 2	—	—	—	—	—	—	—	—	—	4 3	6 9	
1828	do.	—	—	—	—	—	—	—	—	—	do.	do.	
1829	do.	—	—	—	—	—	—	—	—	—	2 9¾	do.	Duty imposed by Congress on April 27, 1824
1830	do.	—	13 2	—	—	—	—	—	—	—	2 3	do.	
1831	do.	—	11 5	—	—	—	—	—	—	—	1 8	do.	
1832	do.	6 7	do.	—	—	—	—	—	—	—	1 2¼	do.	
1833	do.	do.	do.	—	13 2	—	—	—	—	—	1 0¼	5 6	
1834	11 5	5 8	10 10	3 5	11 5	—	—	—	—	—	1 2¾	do.	
1835	9 7	3 5	9 2	do.	9 7	—	—	—	—	—	1 1¼	do.	
1836	do.	do.	do.	do.	do.	—	—	—	—	—	0 11¼	do.	
1837	10 10	do.	10 3	do.	10 3	3 5	—	—	—	—	0 10	do.	By Compromise Act of Congress of 1833
1838	do.	do.	do.	do.	do.	do.	—	—	—	—	0 10¼	do.	
1839	10 3	do.	do.	do.	do.	do.	—	—	—	—	0 9¼	do.	
1840	do.	do.	9 2	do.	do.	do.	—	—	—	—	0 10¼	do.	
1841	do.	do.	do.	do.	do.	do.	—	—	—	—	0 9	do.	
1842	do.	do.	do.	do.	do.	do.	—	—	—	—	0 9¾	7 0	
1843	do.	do.	do.	do.	do.	do.	—	—	—	—	0 11¼	do.	
1844	do.	do.	do.	do.	do.	do.	—	—	—	—	0 10¼	do.	By Act of Congress of August 30, 1842
1845	do.	do.	do.	do.	—	3 0	—	—	—	—	0 9¼	do.	
1846	do.	do.	do.	do.	—	do.	—	—	—	—	0 8¾	do.	
1847	do.	do.	do.	do.	—	do.	—	—	—	—	0 8	3 0	
1848	do.	do.	do.	do.	—	do.	—	—	—	—	do.	do.	
1849	do.	do.	do.	do.	—	do.	—	—	—	—	0 8¼	do.	
1850	do.	do.	—	do.	—	do.	—	—	—	—	0 8	do.	By Act of Congress of December 1, 1846
1851	do.	do.	—	—	—	—	—	—	—	—	0 8¼	do.	
1852	do.	do.	—	—	—	3 9	—	—	—	—	0 8	do.	
1853	do.	do.	—	—	—	do.	—	—	—	—	0 7¾	do.	
1854	do.	do.	—	—	—	—	10 8	—	—	—	do.	do.	
1855	do.	do.	—	—	—	—	do.	3 9	—	3 0	do.	Free	
1856	do.	do.	—	—	—	—	do.	do.	10 3	do.	do.	do.	Under Treaty of Reciprocity
1857	do.	do.	—	—	—	—	10 0	3 5	do.	do.	0 7½	do.	

NOTE.—In estimating the Rent and royalty, the sales of the Pictou and Joggins mines had to be taken into account, as the fixed rent of 3,000*l.* per annum, under the agreement of 1828, covered a portion of the sales at those mines.

TABLE III.—*Quantity of Coal sold, in Tons, at the Sydney, Bridgeport, Bras d'Or, Lingan, and Point Aconi Mines from* 1827 *to* 1857, *inclusive.*

Year	Sydney		Bridgeport		Bras d'Or		Lingan		Point Aconi		Totals	
	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small
1827	12037	—	—	—	—	—	—	—	—	—	12037	—
1828	14375	—	—	—	—	—	—	—	—	—	14375	—
1829	13863	—	—	—	—	—	—	—	—	—	13863	—
1830	16665	—	1621	—	—	—	—	—	—	—	18286	—
1831	20896	—	4287	—	—	—	—	—	—	—	25183	—
1832	27736	201	4827	—	—	—	—	—	—	—	32563	201
1833	19815	185	15252	—	1417	—	—	—	—	—	36484	185
1834	16223	29	13499	17	171	—	—	—	—	—	29983	46
1835	20905	70	9976	17	64	—	—	—	—	—	30945	87
1836	43064	248	11555	84	131	—	—	—	—	—	54750	332
1837	47407	1108	17063	257	1965	8	—	—	—	—	66435	1373
1838	38628	608	17582	627	369	33	—	—	—	—	56579	1268
1839	60920	431	17469	686	19	67	—	—	—	—	78408	1184
1840	51148	1237	16854	1097	42	47	—	—	—	—	63044	2381
1841	66595	1669	12124	442	25	46	—	—	—	—	78744	2157
1842	67888	2212	5717	652	173	68	—	—	—	—	73778	2932
1843	65582	2349	—	126	98	54	—	—	—	—	65680	2529
1844	63843	1851	—	148	89	39	—	—	—	—	63932	2038
1845	67825	4642	2279	227	—	1535	—	—	—	—	70104	6404
1846	60027	3708	207	134	—	764	—	—	—	—	60234	4606
1847	72971	4853	190	165	—	535	—	—	—	—	73161	5553
1848	70417	4089	115	175	—	570	—	—	—	—	70532	4834
1849	69869	4281	19	129	—	560	—	—	—	—	69888	4970
1850	67844	5651	—	25	—	75	—	—	—	—	67844	5751
1851	64131	5231	—	—	—	—	—	—	—	—	64131	5231
1852	73885	5125	—	—	—	53	—	—	—	—	73885	5178
1853	72696	4516	—	—	—	14	—	—	—	—	72696	4530
1854	93178	5815	—	—	—	—	322	11	—	—	93500	5826
1855	82269	6182	—	—	—	—	4472	560	—	59	86741	6801
1856	94777	6714	—	—	—	—	8801	367	98	156	103676	7237
1857	107430	8641	—	—	—	—	9537	341	451	149	117418	9131

TABLE IV.—*Quantity of Cape Breton Coal sold, in Tons, in Nova Scotia and Cape Breton, the neighbouring Colonies, and the United States from* 1827 *to* 1857, *inclusive.*

Year	Nova Scotia and Cape Breton		Neighbouring Colonies		United States		Totals	
	Large	Small	Large	Small	Large	Small	Large	Small
1827	11738	—	299	—	—	—	12037	—
1828	11910	—	997	—	1468	—	14375	—
1829	9132	—	1832	—	2899	—	13863	—
1830	8812	—	1112	—	8362	—	18286	—
1831	7493	—	735	—	16955	—	25183	—
1832	5328	201	2769	—	24466	—	32563	201
1833	9912	185	3587	—	22985	—	36484	185
1834	18975	46	4437	—	6481	—	29893	46
1835	13080	37	6388	—	11477	50	30945	87
1836	12039	165	9352	—	33359	167	54750	332
1837	13699	38	17217	372	35519	963	66435	1373
1838	19198	360	11086	82	26295	826	56579	1268
1839	19637	235	13415	—	45356	949	78408	1184
1840	23489	1232	11757	123	27798	1026	63044	2381
1841	30915	536	16276	243	31553	1378	78744	2157
1842	28610	1706	28221	280	16947	946	73778	2932
1843	27575	960	19734	453	18371	625	65680	2529
1844	24189	1346	22327	412	17416	280	63932	2038
1845	21185	2847	24724	1977	24915	1580	70104	6404
1846	26327	2585	21106	1069	12801	952	60234	4606
1847	26897	2579	22725	1865	23539	1109	73161	5553
1848	31938	2085	22595	1870	15999	879	70532	4834
1849	33004	2582	19958	694	16926	1694	69888	4970
1850	27505	2168	25225	1363	15114	2220	67844	5751
1851	30084	1628	23256	442	10791	3161	64131	5231
1852	33756	1964	28988	613	12141	2601	73885	5178
1853	24413	2002	37100	742	11183	1786	72696	4530
1854	33134	2572	40961	535	19405	2719	93500	5826
1855	33370	2416	36282	333	17088	4052	86741	6801
1856	45678	2847	40938	182	17060	4208	103676	7237
1857	40570	2704	57794	213	19054	6214	117418	9131

CHAPTER IX.

SURRENDER OF THE DUKE OF YORK'S LEASE; NEW LEASE FROM THE GOVERNMENT OF NOVA SCOTIA TO THE GENERAL MINING ASSOCIATION.

HAVING now brought down our narrative to the year 1858—a most important epoch in the history of the coal trade—it will be necessary, in order to place the subject clearly before the reader, to revert to some transactions which have already been noticed in a previous chapter. It will be recollected that, although the Sydney mines had been worked ever since the establishment of a separate government in the island in 1785, no sensible progress had been made in the trade up to the year 1820, when Cape Breton was annexed to the Government of Nova Scotia. During the next six years no improvement took place; and, when the lease of the Messrs. Bowns expired in 1826, the Governor, Sir James Kempt, could not find any parties in Nova Scotia disposed to take the mines, though men possessed of ample means were not wanting. These, however, had their capital employed in other pursuits, and were unwilling to embark in mining speculations, with which they were entirely unacquainted. Under these circumstances the reserved mines of Sydney and Pictou, as has already been related, fell into the hands of the General Mining Association. When it first became known in the province, in 1826, that a lease of the mines had been granted to the Duke of York, by whom they had been sublet to a rich English

company prepared to work them on a large scale, the intelligence was received with great satisfaction by the colonists, who justly anticipated that the prosperity of the country would be increased, and the revenue proportionably augmented, by their operations. Not a word was then uttered against the Duke of York's lease, nor against the transfer of the reserved mines to the Association in the following year.

The experience of a few years amply verified the favourable anticipations of the colonists. The expenditure of 300,000*l.* previous to the year 1846, in a colony containing not more than 250,000 inhabitants, in sinking pits, constructing railways and wharves, building houses, erecting machinery, and in opening a foreign trade, was sensibly felt throughout the length and breadth of the land. The farmers obtained a good market for their produce, the merchants a ready sale for their importations, hundreds of the people constant employment at good wages, and the commercial marine lucrative freights. The benefits conferred upon the province by the operations of the General Mining Association were fully acknowledged by a committee of the House of Assembly, appointed in the session of 1839 to investigate a matter connected with the Pictou mines, which, among other things, reported 'that the operations of the Mining Association had been highly advantageous to the province by the introduction of science and skill, by the erection of machinery, by the creation of a foreign trade in coals, and by the annual expenditure of upwards of 50,000*l.* in the midst of a population employed in agricultural pursuits; and that it was the duty of the Legislature to favour and encourage the introduction and employment of capital, and the protection of those who were largely extending the trade and developing the resources of the

province from unnecessary interruption and annoyance.' Five out of six of the members composing this committee were leading men of the Liberal party, who, though they cheerfully recognised the benefits derived by the country from the operations of the Association, had frequently expressed their dissatisfaction on the floors of the Assembly with the Duke of York's lease, and, on more than one occasion, had called its legality in question. On a subsequent occasion one of the members, who took an active part in the discussion of the question, asserted that all the coal-fields of the province had been granted to strangers, thus creating a monopoly of an article of vital importance for domestic uses and for mechanical and manufacturing purposes; that the monopoly included all mines and minerals of every kind; that the development of the provincial resources was prevented; that the allowance paid to the Duke of York's representatives was a clog on the industry of the province,[1] a tax on its fuel, and an export duty on coal sent abroad; that the proprietor of the soil only owned the material on which he exercised agricultural pursuits, and nothing beneath belonged to him, whereas Canadian grants reserved only gold and silver. It was admitted that the Association had exercised their rights with great forbearance, but then, it was argued, they had the power at any time of withdrawing the privileges which the owners of the soil enjoyed only on sufferance.

It cannot be denied that, on principles of common justice and national policy, the House of Assembly had good reason for expressing, as they did in 1845, their opinion that the lease to the Duke of York 'was im-

[1] If this referred to the share of the profits payable to the Duke of York, it was no clog to the industry of the province, but a serious tax on the profits of the General Mining Association.

provident and unconstitutional.' But if it was 'improvident and unconstitutional' in 1845 it was equally so in 1827, when the Association began to expend their money in the provinces; and they ought, in common fairness, to have been candidly told that their rights would be disputed, and should not have been allowed to invest a capital of 300,000*l.* in the country without fair warning, and then find themselves denounced as monopolists and oppressors of the poor by the very people who, up to that time, had alone profited by their vast expenditure. Having challenged the rights of the Association to the mines of the province, the House of Assembly, in the session of 1845, passed a resolution authorising the Executive to take the opinion of counsel in England upon the legality of the Duke of York's lease. In accordance with this resolution a case was prepared and submitted to three eminent lawyers in England, who unanimously gave their opinion in favour of the legality of the title of the General Mining Association.

Though candidly told by their own counsel that the claims of the Association could not be set aside, and informed officially by Lord Stanley in 1844, and by Lord Grey in 1849, that the British Government was determined to uphold the rights of the Association, the question was debated with considerable warmth on the floors of the Assembly in every succeeding session up to that of 1852. Finding that all their debates amounted to nothing, the House of Assembly gave up the idea of upsetting the Association's claims, and prudently resolved to adopt a more pacific course, which, as will shortly be seen, soon produced beneficial results, and gave to the Provincial Government the possession and control of nearly all the mines and minerals of the country. In the sessions of 1852, 1854, and 1855 resolutions were passed authorising the Governor and Council to open negotia-

tions with the General Mining Association for the purpose of ascertaining upon what terms the latter would agree to surrender their claims to all the mines except those they were working; but the Association, though well disposed to enter into some satisfactory arrangement with the Provincial Government, were not in a position to negotiate for that purpose, on account of a lawsuit then pending in the Court of Chancery with the Duke of York's executors. In the following year, however, this suit having been settled, the House of Assembly passed an address offering to confirm the Association in the undisputed possession of all the coal-mines they had opened, to increase the areas of their operations to any reasonable extent they might desire, and to reduce the royalty to one-half of its amount, provided the Association would surrender their exclusive right or claim to all the other mines and minerals in the province. At the same time a resolution was passed requesting the Executive Government to take proper steps for effecting a settlement of this vexed question. In accordance with this resolution proposals were made to send delegates from Nova Scotia to confer with the directors of the General Mining Association, which were readily agreed to, as the Association were equally desirous of closing an irritating controversy, which had been detrimental to their interests, and which, if persisted in, might lead to further embarrassing and more serious complications. Having thus secured the assent of the Association to the proposed conference, the following resolution, in the session of 1857, was submitted by the Attorney-General and adopted by the House of Assembly:—'That, if the Provincial Government shall find it necessary, for effecting a satisfactory compromise of this question, to employ commissioners, this House does authorise the selection by

the Provincial Government of two members, prominently representing the different views held in this House on the subject, who shall have power to effect a settlement of the controversy, provided both of the commissioners shall agree thereto, subject to the ratification of the Legislature, and this House will provide for the expense.'

In conformity with this resolution Mr. Johnston, the Attorney-General of Nova Scotia, and Mr. Archibald, a prominent member of the Opposition, were sent to England in the month of June 1857. Upon their arrival in London they immediately entered upon the duties of their important mission, and had frequent interviews with a committee appointed by the directors of the General Mining Association. According to their own testimony, as stated to the House of Assembly, the delegates were met, upon all occasions, with the utmost frankness and consideration by the directors' committee, and every question was discussed in all its bearings in a friendly spirit, both parties being anxious to come to a fair and satisfactory settlement. Governed by such motives, their endeavours were happily crowned with success, though, as may easily be conceived, serious difficulties had to be surmounted in reconciling and satisfying the conflicting claims of the *four* parties interested in the question; namely, the Crown, the Duke of York's representatives, the province of Nova Scotia, and the General Mining Association. To arrive at a satisfactory settlement or compromise, each of these parties agreed to make certain concessions upon condition of receiving corresponding privileges, which, it was hoped, would in the end prove beneficial to their respective interests.

1. The Crown, it will be remembered, by the original lease to the Duke of York, was entitled to a royalty of one shilling per ton upon coal; but, when the agreement

was made, in 1828, to lease the reserved mines to the General Mining Association, it was stipulated that the Crown should surrender its claim to the royalty payable by the Duke of York, and that the Association should pay a fixed rent of 3,000*l.* per annum and a royalty of two shillings Halifax currency, or one shilling and sevenpence sterling, upon all coal sold above 20,000 chaldrons, Newcastle measure. Upon the faith of this agreement the Association invested a large capital in opening the mines; but unfortunately, owing to some legal difficulties connected with the Duke of York's affairs, the agreement was never duly signed and executed. The rent and royalty accruing under the agreement was devoted by the Crown to the payment of the salaries of the officers on the civil establishment of Nova Scotia; but when the Crown, in 1849, inadvertently conveyed to the Government of the province all its interest in the mines, in consideration of an undertaking on the part of the latter to pay the civil list, without making due provision for the execution of the agreement of 1828, it was found that the Crown, as advised by its legal officers, would be responsible to the General Mining Association for damages in case the Assembly of Nova Scotia should refuse to complete it. To escape from this awkward dilemma, when the Nova Scotia delegates and the Mining Association agreed upon the terms of a settlement, the Crown readily gave its assent; and, as a contribution towards an arrangement which relieved it from further responsibility, willingly consented to give up its claim to the sum of 30,000*l.* due by the estate of the Duke of York.

2. During the long-pending suit in Chancery relative to the estate of the Duke of York, the profits due to the Duke's representatives, which had been suffered to accumulate, amounted in 1857 to about 54,000*l.* In order

to remove all obstacles in the negotiations with the Nova Scotia delegates, the Mining Association agreed to pay the Duke's representatives the sum of 46,000*l.*, in addition to the 54,000*l.* above mentioned, upon the condition of their resigning all their claims to any portion of the profits during the remainder of the lease. By this arrangement matters were greatly simplified, two parties only—the Government of Nova Scotia and the Mining Association —being then interested in the settlement of the question.

3. The Government of Nova Scotia, in consideration of obtaining the surrender of the Association's claims to all the mines and minerals of the province except those enumerated in the next paragraph, agreed to abolish the fixed rent of 3,000*l.* per annum and the royalty on small coal hitherto paid by the Association; to reduce the royalty on large coal to fourpence and eight-tenths of a penny per ton upon all coal sold up to 250,000 tons; to reduce the royalty to threepence and two-tenths of a penny per ton upon all coal sold over 250,000 tons; to guarantee that no export duty should be imposed upon coal shipped by the Association to foreign countries; and to confirm the Association in undisturbed possession of all the mines they had opened during the remainder of their lease.

4. In addition to the privileges mentioned in the last paragraph, and in consideration of their surrender of their claims to other mines and minerals, the General Mining Association, by the terms of this new arrangement, secured an exclusive right to all the coal-seams in the following areas: namely, in the island of Cape Breton, in a tract of eighteen square miles (coloured red on the map), bounded on the east by Sydney Harbour, on the west by the Great Entrance of the Bras d'Or lakes, on the north by the sea-coast from Cranberry Head to Point Aconi,

and on the south by a straight line drawn from Stubbert's Point, in Sydney Harbour, to the head of Mill Creek, on the west shore of Boulandrie Island: in a tract of fourteen square miles (coloured red on the map), bounded on the east by the shores of Indian Bay and Lingan Basin, on the west by Sydney Harbour, on the north by the sea-coast from the North Head of Indian Bay to Low Point Lighthouse, and on the south by a straight line drawn from McPhee's Ferry, on Sydney Harbour, to tide-water in the north-west brook of Lingan: and in a block of two square miles (also coloured red on the map), on the south-east side of Indian Bay, the site of the Bridgeport mines: and in Nova Scotia proper to four square miles of coal-lands at the Albion mines, in the county of Pictou, and to four square miles at the Joggin mines, and four square miles at Spring Hill, in the county of Cumberland.

In the session of 1858 the agreement concluded by the delegates and the Association, as above specified, was submitted to the Legislature of Nova Scotia, and, after much discussion, was duly ratified, notwithstanding the strenuous opposition of some leading members of the Liberal party.

Thus, after years of controversy, this vexed question was settled upon a basis which, it is hoped, will ultimately prove beneficial both to the province and the General Mining Association. On the one hand the province was freed from the monopoly of coal, which the Association had enjoyed for thirty years; secured in the control and possession of all the other mines and minerals —now open to the enterprise of its people—and relieved from the constant discussion of an irritating subject, which had long disturbed the harmony of the Assembly, affected the peace and welfare of the country, and threatened to 'lead to a painful and injurious embroilment with the

British Government.' On the other the Mining Association, now in undisputed possession of the large areas of coal-lands, secured to them by this agreement, was relieved from a moiety of the royalty hitherto paid, which would enable them to reduce their selling prices and extend their operations, perfectly confident in the security of their investments.

It was supposed, and not without reason, that, under this arrangement, an active competition would arise, prejudicial to the interests of the Mining Association, as the result has verified. But it must be borne in mind that the subject had assumed such a serious aspect in Nova Scotia that its settlement, in some form or other, could be no longer deferred without creating complications detrimental to the continuance of the relations which had so long subsisted between the mother country and that loyal province. The Association, therefore, found themselves in this dilemma: they must either have consented to surrender their claims upon the conditions above specified (which the writer, who was one of the committee appointed to confer with the Nova Scotia delegates, can vouch were the best that could be obtained), or have provided means for opening, in a *bonâ fide* manner, every mine of every description in the province which any person might apply for, as it was stipulated by an Act of the Legislature of 1853, passed after the British Government had conveyed to the province (under the Civil List Bill) all its interest in the mines—That, upon the application of any person for a lease of an unopened mine, the Government should give notice thereof to the General Mining Association, and, if the Association failed to open and work it within twelve months from the date of the notice, the said mine should be forfeited, and the Government should be at liberty to lease it to the applicant. It

is quite preposterous to suppose that, if there had been many applications for leases under this Act, the Association, with so many mines already in operation, could have found capital to open new ones, and that leases, therefore, must have been granted to the applicants, and an active competition must have arisen, whilst, at the same time, the Association would have possessed none of the advantages secured by their agreement with the delegates of Nova Scotia.

Several new collieries have been opened since the question was settled in 1857, which have become active competitors with the Association; but it does not appear the Association has lost much by giving up all the other minerals, as none have been worked except the gold mines, which, though they have given employment to a considerable number of miners and labourers, do not seem to have yielded much profit to those who have embarked their capital in them, as it appears from the Mining Inspector's returns that the cost of working has, in most cases, swallowed up the proceeds of the sales of gold.

CHAPTER X.

ACCOUNT OF NEW COLLIERIES OPENED IN CAPE BRETON BETWEEN THE YEARS 1858 AND 1870.

THE Government of Nova Scotia having, as explained in the last chapter, obtained possession and control of all the mines and minerals of the province except those within the limits specified, in order to give every facility and encouragement to persons disposed to embark in mining adventures, prepared an Act embodying the following favourable conditions, which was passed by the Legislature in the month of February 1858 :—

1. Any person applying to the Chief Commissioner of Mines shall be entitled to a license of exploration, covering a single tract of five square miles upon any lands not already under license or lease for mining purposes, and to dig and explore for minerals other than gold, upon paying the sum of twenty dollars (four pounds sterling) and giving bonds to pay for damages done to private lands. Such license to be in force for the term of one year from the date of application.

2. Upon such application and payment being made, the Chief Commissioner of Mines shall cause the lands applied for to be surveyed, and laid off, and a full description thereof embodied in the license of exploration.

3. The cost of the survey shall be defrayed by the Chief Commissioner of Mines, but the search for minerals under such licenses shall be made free of all expense to

the Government, and the holder shall, within the time the same shall be in force, make a report of the result of his explorations to the Chief Commissioner of Mines.

4. Such licenses of exploration may be renewed for a further period of twelve months, on giving sufficient reasons therefor to the Chief Commissioner of Mines, and on payment of the further sum of twenty dollars.

5. The holder of an exploration license may, at any time before the expiration thereof, select from the land covered by such license an area of one square mile, for the purpose of working the mines and minerals thereon, and may make an application for a license to work the same on payment of the sum of fifty dollars (ten pounds sterling).

6. Having complied with certain regulations respecting damages to private lands, &c., the applicant shall be entitled to a license to occupy and work one square mile, which shall be in force for two years from the date of application, provided effective mining operations are commenced and continued in good faith until the termination of such term.

7. All these conditions having been complied with, the holder of a license to work shall, at the end of the two years aforesaid, be entitled to a lease of the premises described therein, containing all the ordinary provisions of mining leases.

8. Under special circumstances the Governor in Council may authorise the granting a lease, or license, to occupy and work a larger area than one square mile if, upon due investigation, the public interests would be better subserved thereby.

9. All leases of coal-mines shall terminate on, or before, the 25th day of August, 1886; leases of mines, other than coal shall be for twenty-one years; in the

granting of leases, there shall be reserved a space of twenty yards in width between the lines of the respective grantees.

10. The produce of all mines, after it has been brought into marketable condition, shall be subject to the following royalties, that is to say :—of five per cent. on all such ores and minerals, except gold, iron, and coal; of eight cents ($3\frac{8}{10}$d. stg.) on every ton of iron, and of ten cents ($4\frac{8}{10}$d. stg.) on every ton of 2,240lbs. of coal, payable at such times as the leases shall respectively stipulate.

11. If any mines or minerals claimed under a lease from the Crown, or under a lease granted pursuant to this Act, have been abandoned for the space of one year, have not been effectively and continuously worked, or have been worked only colourably, or to prevent a forfeiture under the terms of the lease, notice shall be served upon the lessee, requiring him to attend at an appointed time and place, for the investigation thereof. The decision thereon shall be left to the Chief Commissioner of Mines, subject to the right of appeal to a Judge in Chambers.

By a subsequent Act, passed in the month of May, 1866, the lessees of all mines in full work on the termination of their leases in 1886, are entitled to the right of renewal thereof for a further term of twenty years, and also to two successive renewals of twenty years each, on the expiration of those preceding.

The General Mining Association, according to this Act, are entitled to the same privilege of renewing their leases within the limits of such areas as they may be *actually working* at the time, but not to the large tracts now in their possession.

In consequence of the liberal terms offered to persons disposed to embark in coal-mining, by the provisions of

the Act of February, 1858, applications were made by certain parties, early in the spring of that year, for leases of mining areas at Little Glace Bay, Bridgeport, and Cow Bay, who immediately commenced operations upon a small scale. Coal being, at that time, admitted into the United States free of duty, under the Reciprocity Treaty, the occupiers of those areas were able to dispose of their coal at remunerative prices, which induced many others to follow their example. In the course of the following five years, more than forty licenses of exploration were issued for tracts in the Sydney coal-field alone, and some in the Richmond coal-field, near the Gut of Canceau. During the next three or four years, several licenses were granted for explorations on the west shore of the island between Port Hood and Margarie, and also under the sea along the coast from Mira Bay to Point Aconi. One enthusiastic adventurer even took out a license for a submarine area, accessible only by sinking a shaft upon the little rock called Flint Island, more than a mile from the mainland. Many of these licenses were taken out by persons quite destitute of the means of working them, in the expectation of being able to sell their claims to other parties at a profit. Some of these were fortunate enough to realise their expectations, by selling their rights to companies prepared to open the mines; but many others, including those who had taken out licenses for tracts far beyond the boundaries of the Sydney coal-field, were unable to find purchasers, and consequently were obliged to surrender their licenses.

During the last ten years, many persons who had obtained leases with the *bonâ fide* intention of working, and had expended considerable sums in opening mines, being disappointed with the results of their operations, have been obliged to abandon them. Those who were

fortunate, however, in securing more valuable locations, have carried out their original plans with more or less success; and, though it is believed their operations have not yielded much profit,[1] owing to the loss of their best market in the United States, consequent upon the abrogation of the Reciprocity Treaty in 1866, have persisted in keeping their mines open, in the hopes of seeing, at no distant day, their produce admitted into the United States free of duty.

The following list comprises all the new mines that have been opened in Cape Breton since the passing of the Act of 1858—both those now in operation, and those which have been abandoned. In the short account of each mine which follows, it has not been thought necessary to give a detailed statement, in all cases, of the transfers which have been made from the original holders of the leases to the present occupants, as it would merely take up more space, without serving any useful purpose. For the sake of convenient reference, the Roman numerals affixed to the heading of each mine correspond with those marked on the areas occupied by the lessees on the map of the coal-field.

Name of Mine or Colliery	Situation	County
South Head . .	Cow Bay . .	Cape Breton
Tracey's . .	Mira Bay . .	,,
Gowrie . . .	Cow Bay . .	,,
Block House . .	,, . .	,,

[1] Mr. Moren, the President of the Glace Bay Mining Company, wrote as follows in a Halifax paper on March 14, 1870: 'I claim that our coal owners are entitled to protection, because for several years past they have been literally working for nothing. This is too notorious to require any special proofs from me. I may state this fact, however, known to all the stockholders of the Glace Bay Mining Company, that for the last four years they have received an average dividend of but one and a-half per cent. Also, that other coal companies, which have done a larger business, have not paid anything.'

Name of Mine or Colliery	Situation	County
Acadia	Schooner Pond	Cape Breton
Clyde	Glace Bay	,,
Caledonia	,,	,,
Glace Bay	Little Glace Bay	,,
International	Bridgeport	,,
Victoria	Low Point	,,
Ingraham's	Bras d'Or Road	,,
Collins	Little Bras d'Or	,,
Matheson's	,,	,,
Black Rock	Great Bras d'Or	,,
New Campbelltown	,,	Victoria
Chimney Corner	Margarie	Inverness
Broad Cove	Gulf Shore	,,
Mabou	,,	,,
Port Hood	St. George's Bay	,,
Richmond	Little River	Richmond
Sea Coal Bay	Gut of Canceau	,,

I. THE SOUTH HEAD COLLIERY, COW BAY.

The mining area (I. on map) upon which this colliery is situated consists of about fifty acres, situated at the extreme end of the narrow promontory lying between Mira and Cow Bays. It will be seen by reference to the section (p. 29), that there are several seams of coal in this area, but hitherto the workings have been confined to the second group in the series, consisting of four beds of coal, separated by thick strata of shale and fire-clay. In this group there are eleven feet and a-half of coal, but the lowest bed, only three feet and a-half in thickness, is supposed to be worth working. This part of the seam is said to be of good quality, hard and compact, and capable of withstanding exposure to the weather. It contains about 262,500 tons of coal.[1] The mine was first

[1] In this and the subsequent estimates of the quantity of coal in each area it is assumed that each acre of coal one foot in thickness contains 1,500 tons, taking the average specific gravity at 1·250.

opened in 1863, by means of a level driven from the eastern shore of the bay, where a wharf was erected, which was destroyed by a gale in 1867. When the present owners of the mine—a New York Company—purchased the lease, they sunk a pit seventy-one feet in depth, about eighty yards from the crop of the seam, and erected an engine of ten horse-power to raise the coal. A light railway, three-quarters of a mile in length, was also laid down to a new wharf further up the bay. This second wharf also was almost totally destroyed by an easterly gale in 1869. It has not since been rebuilt. The sales since the mine was first opened in 1865 have averaged about 1,200 tons per annum. See Table V.

II. TRACEY'S COLLIERY, MIRA BAY.

This Colliery was opened on the seam, marked No. 9 in the sectional diagram at p. 27, near its outcrop at the north end of False Bay Beach, by Mr. Tracey and some others in 1864. The extent of their mining area, marked II. on the map, is about one square mile, and contains 3,520,000 tons of coal. This seam, supposed to be the lowest in the coal-field, consists of an upper bed two feet six inches, and a lower one foot two inches in thickness, separated by a ten-inch layer of shale. In 1864, 540, and in 1865, 2,391 tons of coal were raised, but as the quality did not prove so good as had been anticipated, the mine was abandoned in the following year.

III. GOWRIE MINES, COW BAY.

This mining area, consisting of 1,280 acres on the north side of Cow Bay, marked III. on the map, was leased to Messrs. Archibald & Co., of North Sydney, in 1861.

There are two workable seams of coal upon this property, the McAulay of four feet ten inches, and the McRury of four feet four inches in thickness (see diagram, p. 26, and section, p. 27), dipping to the north-east at an angle of six degrees. The contents of this area will be—

			Ft.	in.		
In the McAulay seam,	775	acres	4	10	thick	5,500,000
„ McRury „	965	„	4	4	„	6,372,000
					Tons	11,872,000

The greatest depth of the McRury seam from the surface will be about 200 yards in the centre of the basin.

Operations were commenced in the first instance by opening an old French working in the McAulay seam near the shore, from whence a level was driven on the strike. In 1864, a pit seventy-five feet in depth was sunk thirty-five chains from the shore, upon the continuation of the level, but this having proved incapable of supplying all the coal required, a new pit was sunk 350 yards to the dip of the level. This pit is 208 feet in depth, and is worked by a twenty-five horse-power engine, capable of pumping the water and raising 300 tons of coal per day.

Owing to the presence of a peculiar slickensides fracture crossing the usual cleats or joints, this coal can be worked without blasting, which prevents much breakage; but, on the other hand, for the same reason, it can only be obtained in small lumps. The proportion of small coal made in working is very large, amounting to one-third of the whole of the produce. The Gowrie coal by analysis consists of—

Moisture	1·80
Volatile matter	27·08
Fixed carbon	60·45
Sulphur	3·42
Ash	7·25
	100·00

It yields, according to the report of the New York Gas Company, which took a considerable quantity of this coal in 1865, 9,000 cubic feet of gas per ton. It has not since been shipped for that purpose, on account most likely of the presence of an excess of sulphur. Notwithstanding the large proportion of ash, it is much esteemed for raising steam, as it does not form a clinker on the furnace bars. It is also used to some extent in the Colonies, chiefly for domestic purposes.

The shipments, since the colliery was opened nine years ago, have averaged 27,000 tons of large and 7,000 of small per annum, of which about equal proportions have been sold in the Home market, the British Colonies, and the United States, exclusive of an average sale of about 2,000 tons during the last five years in the West Indies.

The coal is conveyed by a railway, three-quarters of a mile in length, from the pit to a wharf constructed at a great expense on the north shore of the bay, where vessels drawing seventeen feet can load at low water. This wharf is 1,300 feet in length, and though protected by a breakwater 300 yards to the eastward, erected at a cost of 18,000*l.*, it is not a safe place for vessels to load at all times, being exposed to the heavy swell that sets into the bay during south-easterly gales. Several fine vessels have been lost in Cow Bay since it was first used as a shipping place. There is little risk during the summer season; but late in the autumn, when easterly

gales spring up so suddenly that vessels have not time to get out of the bay, it is not a safe shipping place. This is proved by the fact that shipowners at that season demand a higher rate of freight to cover the risk. In the face of this difficulty, nevertheless, the experience of the last few years has proved that a considerable export of coal can be made from Cow Bay.

IV. BLOCK HOUSE MINE, COW BAY.[1]

The tract, marked IV. on the map, on the north side of Cow Bay, covering an area of 1,280 acres, was first leased to Mr. Marshall Bourinot, of Sydney, in 1859, by whom it was sold, in 1863, to a New York Company. There are three workable seams (above three feet in thickness) upon this property, namely, the uppermost or Block House seam, nine feet; the middle, or McAulay, four feet ten inches; and the lowest, or McRury, four feet four inches in thickness. The Tracey seam, already described, underlies both the Block House and the Gowrie areas, but at such a great depth as to render it practically inaccessible. The Block House seam, lying in the centre of the Cow Bay basin, occupies an area of about 200, the McAulay 550, and the McRury 580 acres. As at least one-fourth of the area of the Block House seam has already been worked out, there remains only about 150 acres of solid coal. No coal whatever has been taken from the two other seams in this area; therefore, it contains at present the following quantity of coal:—

[1] Correct accounts of the quantity of coal shipped from the Gowrie, as well as all the other new mines, since they were first opened up to the end of the year 1870, will be found in Table V.

				Ft.	in.		
In the	Block House seam,	150	acres	9	0	thick	2,000,000
„	McAulay „	550	„	4	10	„	3,980,000
„	McRury „	580	„	4	4	„	3,770,000
						Tons	9,750,000

The Block House Mine was first opened by driving a level through some old workings into the solid coal, where a pit was sunk near to the shore. Most of the coal is now drawn up an inclined plane or slope from the workings to the level of the wharf, by an engine of forty-five horse-power, from whence it is discharged into the vessels. In the winter months, when no vessels are loading, it is raised up a shaft to the surface by an engine of forty horse-power, where it is deposited ready for shipment in the following summer. This pit communicates with the wharf by means of a light railway one quarter of a mile in length. The wharf is about 800 feet in length, having a depth of twenty feet at its extreme end at low water. A large business can be done in fine weather, but during easterly gales the bay is open to the swell of the Atlantic, when vessels can neither lie at the wharf nor at anchor in safety. The wharf, too, having no protection by means of a breakwater, as in the case last mentioned, is liable in the spring to be seriously damaged by the large masses of drift ice which float into the bay. It has been more than once nearly totally destroyed either by easterly gales or drift ice, and several vessels, loading or waiting their turns to load, have been wrecked. The want of a good secure place of shipment is much felt by the owners of the mines at Cow Bay and in the vicinity. It is well worth their while to consider whether they would not be gainers by jointly constructing a railway either to Louisbourg or Sydney, or by con-

necting their works by means of short branches with the line recently made by the International Company from Bridgeport to the latter harbour.

The quality of the Block House coal is very superior, being free from sulphur and other impurities. The seam is also free from faults, but the workings are often interrupted by large wedge-shaped masses of shale which penetrate it in various directions, thereby causing much trouble to the miner and expense to his employers. It consists, by analysis, of—

Moisture	5·00
Volatile matter . . .	33·80
Fixed carbon . . .	55·80
Ash	5·40
	100·00

It is chiefly used in the manufacture of gas in New York and Boston, and is reported to yield 10,500 cubic feet per ton. It is also said to have given satisfactory results when mixed with Welsh steam coal, having effected a saving of twelve per cent. in consumption, compared with Welsh coal alone. During the eleven years the colliery has been in operation, the shipments have averaged 47,000 tons per annum.

V. ACADIA COLLIERY, SCHOONER POND.

This mining area, comprising 640 acres, marked V. on the map, was taken up by Mr. Ross in 1862. There is only one workable seam on the property, five feet in thickness, dipping nearly due north at an angle of six degrees. Its relative position in the Glace Bay series will be seen by reference to the diagram and section at page 24. As the seam crops out close to the northern boundary

of the area and dips under the lands of the Clyde Company, the quantity of coal that can be obtained is very trifling—quite insufficient for the establishment of a colliery except upon a very limited scale. The mine was opened in 1863 by means of a level driven from the sea shore. The coal is said to be of good quality, suitable for raising steam, and for the manufacture of gas, yielding 9,500 cubic feet per ton. Owing to the exposed situation of the place of shipment in the open bay, which can only be used in fine weather with an off-shore wind, very little work has been done at this colliery. In the three years ending in 1866 the shipments averaged 2,800 tons per annum. No coal has been raised since that year, except a few tons in 1869. It is said the owners of the Acadia Colliery have sold their area to the Clyde Company which occupies the adjacent area.

VI. CLYDE COLLIERY, GLACE BAY.

The tract owned by the Clyde Company comprises an area of 880 acres on the coast between Glace Bay and Schooner Pond, marked VI. on the map. There are three seams of coal upon the property,—the Phelan, averaging seven feet nine inches; the Ross, five feet; and the Back Pit, one foot six inches,[1] in thickness. (See diagram and section, p. 24). The Phelan seam occupies an area of 490, and the Ross of 785 acres. The quantity of workable coal is, therefore—

		Ft.	in.		
In the Phelan seam,	490 acres	7	9	thick	5,800,000
„ Ross „	785 „	5	0	„	6,700,000
				Tons	12,500,000

[1] In the Glace Bay section this seam is four feet six inches in thickness. In its course to the eastward it has decreased to one foot six inches.

Operations were begun in 1863 by driving a slope from the crop of the Phelan seam, dipping north at an angle of seven degrees. It consists of—

Volatile matter	33·00
Fixed carbon	57·37
Ash	9·63
	100·00

Owing to an excess of ash, it is not a first-rate coal for raising steam, but it is well adapted for domestic purposes, and also for gas-making, yielding 9,700 cubic feet per ton. In the three years ending in 1866, the shipments averaged 6,000 tons per annum. Very little has been done since, on account of the difficulty and expense of maintaining the wharf in good order. It has been found quite impossible to build a wharf capable of withstanding the pressure of the immense fields of ice driven upon the coast by easterly gales every spring. A costly structure of wood, 400 feet in length, has more than once been destroyed by drift ice.

VII. CALEDONIA COLLIERY, GLACE BAY.

The mining area owned by the Caledonia Company comprises about 1,340 acres (marked VII. on the map), situated to the south-east of Little Glace Bay Brook. About half of this area lies under the land—the remainder under the adjacent waters of Glace Bay and Glace Bay Pond. There are five seams of coal upon the property, but as two of them, the 'Three Foot' and the McRury seams, are under four feet in thickness, they will not be taken into account. There are also the Lorway and Gardener seams, of four feet six inches and four feet nine inches, but they lie at such a depth from the surface, namely, 500 to 600 feet at their highest point within the area, that they will be left out of the following esti-

mate of the quantity of coal available at a moderate depth. All these seams will, no doubt, be worked at a future day; but it is not probable that they will be opened until the coal, now so abundant in more accessible situations, has been nearly exhausted. For the present, then, we have three workable seams on this area—the Back Pit, four feet and a-half in thickness, underlying an area of 658 acres; the Phelan, of eight feet, under 970; and the Ross, of five feet, under 1,270 acres. (See diagram and section, p. 24.) The area therefore contains—

			Ft.	in.		
In the Back Pit seam,	658	acres	4	6	thick	4,440,000
„ Phelan „	970	„	8	0	„	11,640,000
„ Ross „	1,270	„	5	0	„	9,525,000
					Tons	25,605,000

The average depth of the seams from the surface does not reach 100 yards; at the lowest point, near Hilliard's Cove, the Ross seam will be found at a depth considerably under 200 yards. Operations were commenced in 1865 by sinking pumping, and drawing shafts 186 feet in depth upon the Phelan seam, which dips to the north-east at an angle of five degrees. This seam averages eight feet in thickness, but only six feet and a-half are worked, the remainder being left to support the tender shale roof. The coal of this seam, by analysis, consists of—

Volatile matter	33·00
Fixed carbon	57·37
Ash	9·63
	100·00

According to the report of the Cambridge Gas Company, it yields 9,700 cubic feet of gas. The coal is conveyed by a railway, two miles in length, to Port Caledonia, on the eastern side of Glace Bay Pond, where a capacious

dock has been excavated in the sand beach communicating with the sea by means of a channel eighty feet in width, protected by two parallel piers constructed of strong piling filled in with stone, about 1,200 feet in length. The depth of water is fifteen feet and a-half, but it is liable to be filled with sand, as there is not at present any outflow of water to scour it out. The railway, harbour, and general equipment of the colliery were completed in 1868. The shipments during the last three years have averaged 19,000 tons of large and 1,000 tons of small coal per annum, the greatest part of which has been sent to the United States for gas manufacture.

VIII. GLACE BAY COLLIERY, LITTLE GLACE BAY.

The mining rights owned by the Glace Bay Company extend over an area of 1,400 acres (marked VIII. on the map). There are five workable seams on the property, each more than four feet in thickness, within a moderate depth from the surface; and two seams—the Lorway and Gardener—of the thickness already mentioned, but too deep to be worked with advantage. The two latter will not, therefore, be included in the following estimate of the quantity of coal in the area. Taking the seams in descending order, the contents are—

		Ft.	in.		
In the Hub seam,	140 acres	9	8	thick	2,000,000
„ Harbour „	920 „	5	0	„	6,900,000
„ Back Pit „	1,160 „	4	6	„	7,800,000
„ Phelan „	1,350 „	8	3	„	16,700,000
„ Ross „	1,400 „	5	0	„	10,500,000
				Tons	43,900,000

The relative position of these seams will be seen by reference to the diagram and section of the Glace Bay series at p. 24. Their dip is north-east at an angle of

five degrees. According to the report of the Philadelphia Gas Company, the Hub seam coal yields 10,000 cubic feet of gas per ton, but at the Halifax Gas-Works only 8,500 feet were obtained. By analysis it yields—

Moisture	5·52
Volatile matter . . .	31·02
Fixed carbon . . .	62·53
Ash	93
	100·00

The Glace Bay coals are chiefly used in the manufacture of gas in the United States, but they are said to be well adapted for raising steam, lighting quickly and burning freely.

The lease of the Glace Bay area was first taken up by Mr. Archbold, of Sydney, in the spring of 1858, who opened both the Hub and Harbour seams by driving levels from the shore. The coal was taken off in boats to vessels anchored in the open bay. When Mr. Archbold transferred the lease, in 1861, to the present holders—the Glace Bay Company, composed of shareholders residing chiefly in Halifax and Boston—a powerful steam dredging engine was built for excavating a dock or harbour in the long narrow pond at the head of Little Glace Bay. The Hub seam was also opened by sinking a pair of shafts 130 feet in depth, and the Harbour seam by a shaft forty feet in depth close to the harbour. Two steam engines of fifteen and thirty horse-power are employed in working the mines. A railway, one mile and a-half in length, connects the Hub Pits with the wharves. The artificial harbour, formed by dredging, now covers an area of six acres, which is to be further enlarged. It communicates with the bay by a channel or entrance sixty feet in width, having a depth of seventeen feet, and is protected by

parallel piers 450 feet in length made of strong piling. The amount expended in forming this harbour up to the year 1866 is said to have amounted to 22,000*l.* A steam tug is employed for towing vessels into the harbour. The average sales to the end of 1870 have amounted to 33,000 tons of large and 2,000 tons of small coal per annum, most of which is shipped to New York and Boston. In 1864, before the abrogation of the Reciprocity Treaty, Glace Bay coal was sold at $2 : 40, or 9*s.* 7*d.* sterling, per ton, which, it is said, enabled the directors to pay a dividend of 40 per cent. to the shareholders.

IX. INTERNATIONAL MINES, BRIDGEPORT.

This area of four square miles (marked IX. on the map), was taken up in separate lots, in 1858, by Messrs. Cadougan and McLeod, by whom it was sold in 1863 to the International—a New York company. There are four workable seams of coal on the property, exclusive of the Lorway and Gardener seams, which are found at an inconvenient depth for working, namely, the Harbour, Back Pit, Phelan, and Ross seams. (See diagram and section, p. 24.) Their average dip being north-east, at an angle of four degrees, the depth of the Ross, the lowest seam at the extremity of the area, will be 320 yards below the surface. Taking the several seams at the thickness given in the section (p. 24), the total quantity of coal will amount, as shown in the following statement, to 47,600,000 tons.

			Ft.	in.		
In 540	acres of the	Harbour seam	5	0	thick	4,000,000
„ 1,470	„ „	Back Pit „	4	6	„	9,900,000
„ 1,650	„ „	Phelan „	8	3	„	20,500,000
„ 1,760	„ „	Ross „	5	0	„	13,200,000
			Total Tons			47,600,000

All the coal hitherto raised on this area has been taken from the Harbour seam. No analysis has been published, but it is said to be a hard, compact coal, standing the weather better than many of the Cape Breton coals, and to be, comparatively, free from shale and sulphur. It is used in the United States chiefly for gas-making. The mine was first opened in 1858, by driving a level from the shore along the strike of the seam, from which bords were worked at right angles up to the outcrop. The coal was taken off in scows to vessels at anchor in the open bay. When the International Company purchased the property in 1863, they surveyed and marked out a line of railway from the mines to the harbour of Sydney, a distance of twelve miles and a half, with the intention of immediately proceeding with its construction; but, owing to the abrogation of the Reciprocity Treaty, and the imposition of a duty of five shillings per ton, the intention was suspended. In the year 1869, having good reason to expect that the duty would soon be taken off, the directors of the company decided upon the construction of the railway, which was completed and opened for use in the autumn of 1870. The course of the railway, and the situation of the shipping wharves near the town of Sydney, are marked on the map. The wharf is one thousand feet in length, and is provided with berths suitable for vessels of the largest class. The railway, with its equipment of locomotives and waggons, will afford great facilities to those mining companies which do not possess any places of shipment, as it is understood the International will soon be prepared to carry and ship their coal at moderate rates. The only pit now in operation is about 80 feet deep, sunk upon the original level, at a distance of 1,200 yards from the shore. It is worked by a small engine of ten horse-power. Having now completed their railway, the International will, no

doubt, soon prepare pit-room upon a larger scale, commensurate with the demand for their coal which, it is said, can readily be sold in the United States. Owing to the want of a safe place of shipment, the sales, from the opening of the mine in 1858 up to the close of 1870, have not averaged more than 6,000 tons of large, and 1,500 tons of small coal per annum.

X. VICTORIA MINES, LOW POINT.

The area owned by the Victoria company (marked X. on the map), lies under the waters of Sydney Harbour, and is bounded at high-water mark by the Lingan tract of the General Mining Association. It extends, according to the best information the writer has been able to obtain, about four miles along the shore from McPhee's Ferry to Low Point lighthouse, having an average width of half a mile, and consequently comprises an area of 1,280 acres. It will be seen, by reference to the section at p. 33, that six seams of coal, of a thickness of four feet or upwards, crop out on the Low Point shore within the limits of this area, which, if undisturbed by faults, probably extend, as marked on the map, from their respective outcrops down to its northern boundary. Assuming this to be the case, which is very doubtful, the quantity of coal contained in the area will exceed 50,000,000 tons, as shown in the following statement :—

			Ft.	in.		
In	Carr's seam,	782 acres	4	0	thick	4,690,000
„	Paint's „	980 „	9	0	„	13,230,000
„	Crandall „	1,052 „	4	4	„	6,700,000
„	Ross „	1,150 „	6	7	„	11,350,000
„	McGilvray	1,295 „	5	0	„	9,710,000
„	Frazer „	1,595 „	4	2	„	9,960,000
			Total tons			55,640,000

In estimating the area of each seam, it must be observed that its width from the crop to the northern boundary has been taken upon the slope, not upon the horizontal width of the surface. In consequence of the rapid dip of the seams, the quantity of coal contained in each superficial acre is about one fourth more than in seams of an ordinary inclination. This advantage, however, is more than counterbalanced by the growing expense of pumping water and drawing coal, which increases proportionably with the depth. It is questionable how far these seams can be worked to the dip at a cost which will remunerate the owners, and considering that the Ross seam at its lowest point in the area is 4,800 feet below the surface, it is evident that, at anything like the present selling price of coal, only a small portion of the total quantity above estimated can be economically worked. Besides, great caution will be necessary in working, as all the seams crop out under the waters of the harbour. In working the main seam at the Sydney mines, some years ago, the sea water found its way into the exploring levels through a thickness of 300 feet of strata, which it was necessary to shut off by strong framed dams.

When the Victoria mine was first opened in 1865, bords were commenced at the foot of a slope 300 feet from the outcrop, but it was abandoned in consequence of the quantity of salt water which found its way into the works. The mine is now worked by a new slope 650 feet in length, two steam engines being employed in drawing coal and pumping water. The 'Ross' is the only seam at present worked; its total thickness (see section, p. 33) is 6 ft. 7 in., but 4 in. at the top, of inferior quality, is left. The Ross coal, according to Dr. Dawson's analysis consists of—

Volatile matter	38·70
Fixed carbon	58·40
Ash	2·90
	100·00

The coal is conveyed by a railway, three miles and a half in length, to a wharf at the South Bar, in a safe and well-sheltered situation with sufficient depth of water for vessels of large burthen. The shipments during the last three years have averaged 2,500 tons of large and 500 tons of small coal per annum, most of which has been sold in the British Provinces.

XI. INGRAHAM'S COLLIERY, BRAS D'OR ROAD.

The lease of the area upon which this colliery is situated was taken up by Messrs. Roach and McInnis in 1863, by whom it was sold to the Messrs. Ingraham, the present owners. It adjoins the General Mining Association's Sydney Mines Tract, and covers an area of one square mile. It is marked XI. on the map. There is only one seam of coal on the property, 4 ft. 8 in. in thickness, of inferior quality, dipping to the north-east at an angle of six degrees. The quantity of coal in the area is very trifling, occupying only about 20 acres on the crop of the Indian Cove seam. (See section, p. 16.) It was opened in 1864 by driving a slope from the outcrop to the dip. A few tons of coal were raised at intervals during the next four years for land sales, but it was abandoned in 1869, and is now filled with water.

XII. COLLINS' COLLIERY, LITTLE BRAS D'OR.

In the year 1859, Mr. Gotreau took out a lease of a small area on the south side of the Little Entrance of the

Bras d'Or lakes, adjoining the General Mining Association's Sydney Mines Tract, which he sold in 1863 to Mr. Collins, who in that year obtained a lease of an adjoining area. This property, now occupied by Mr. Collins, contains 640 acres, marked XII. on the map. It includes the workings of the mine opened by the General Mining Association in 1833. (See p. 89.) There is only one seam of coal upon the area, 5 ft. in thickness, supposed to be the stony seam of the Sydney Mines section (pp. 16, 18), which dips easterly at an angle of six degrees. Its limits have not been accurately ascertained, but as its area probably does not exceed 100 acres, it will not contain more than 750,000 tons of coal. The mine has been partly worked by a level from the shore, and partly by a slope driven from the outcrop at a point 250 yards inland. The shipping-place is conveniently situated close to the works, where vessels of large burthen can load. Vessels of small draught can reach the sea through the Little Entrance, but those drawing more than 9 ft. of water must go all round the island of Boulardrie to the Great Entrance, a distance of 45 miles. The coal, though sold at a low price, has failed to find a market for the reasons stated at p. 90. From 1861 to 1865 the sales of coal averaged 4,000 tons of large and 270 tons of small per annum. No coal whatever was raised in 1866, and only a few hundred tons in 1867 and 1868. During the last two years the mine may be said to have been practically abandoned, the sales having reached only 40 tons.

XIII. MATHESON'S COLLIERY, LITTLE BRAS D'OR.

The area upon which this colliery is situated was taken up by Mr. Campbell in 1862, who subsequently sold or leased it to Mr. Matheson. It contains 640 acres, and is

marked XIII. on the map. There is only one seam of coal upon the property, three feet in thickness, dipping to the east at an angle of eight degrees. As this seam crops out close to the General Mining Association's coal lands, and dips immediately under them, its extent does not exceed five or six acres. Its identity has not been clearly established, but it probably is a continuation of the seam worked by Mr. Collins on the opposite side of the Little Entrance of the Bras d'Or. The shipments up to the close of 1868, when the mine was abandoned, averaged only 800 tons per annum.

XIV. BLACK ROCK COLLIERY, GREAT BRAS D'OR.

The Black Rock area of 640 acres, marked XIV. on the map, was leased to Mr. Campbell in 1864. There is only one workable seam of coal upon this area, 4 ft. in thickness, dipping north-east at an angle of six degrees. This seam, for the reasons fully given at pp. 20, 21, is beyond all doubt identical with the Indian Cove seam of the Sydney Mines section. The area of the seam within the limits of the lease is about 450 acres, and will consequently contain about 2,700,000 tons of coal. A colliery upon a very small scale was opened by Mr. Ross in 1867 by driving a level from the shore. Owing to the inferior quality of the coal the sales have not exceeded 200 tons per annum. As there is not a safe place for shipment within a reasonable distance it is not likely that this colliery will be long worked, as it cannot compete with so many others much more favourably situated in every respect.

XV. NEW CAMPBELLTOWN COLLIERY, GREAT BRAS D'OR.

The mining area upon which this colliery is situated, on the north side of the Great Entrance of the Bras d'Or,

and at the western extremity of the Sydney coal-field, comprises 640 acres, marked XV. on the map.

There are two workable seams of coal upon the area—one four, the other six, feet in thickness. The peculiar position of these seams will be learned by reference to the description given of the Cape Dauphin district at page 22. It is impossible to state the extent of each seam, as they have not been observed at more than two or three places, and the stratification is so much disturbed by the protrusion of the syenitic ridge of St. Ann's, that their continuation in any given direction cannot be determined.

If the two seams underlie the whole of the area, which is extremely doubtful, it will contain over 9,000,000 tons of coal. A lease of this area was granted to Mr. Campbell in 1862, who commenced operations by driving a level from the valley at the foot of the hill (marked on the map), which intersected the six feet vertical seam at a distance of 151 yards from the entrance, and at a depth of 90 feet from its outcrop. Both the four and six feet seams were worked at the same time by means of this level or tunnel. Subsequently, the four feet seam was opened in the valley mentioned at page 22, where it dips to the east at an angle of twelve degrees, by means of a slope driven from the outcrop. Owing to the difficulty of keeping this slope free from water it was abandoned in 1866, since which time the workings have been confined to the vertical seams. The average sales from 1863 to 1869, inclusive, were 4,000 tons of large and 350 tons of small per annum. The sales reached their highest figure in 1866, since which they have been declining, having fallen in 1870 to 309 tons of large and 154 of small coal per annum. This colliery possesses an excellent place of shipment at Kelly's Cove, suitable for vessels of the largest burthen, two miles distant by the railway from

the vertical seams; but this important advantage is not sufficient to compensate for the inferior quality of the coal, which, though sold at a low price, cannot obtain a market in competition with the produce of most of the other Cape Breton mines.

XVI. CHIMNEY CORNER COLLIERY, MARGARIE.

This colliery was opened in 1867. Its position will be seen, marked XVI., on the north west-shore of the island, about eight miles to the southward of Margarie Harbour. (See map facing title-page.) No mention is made in the government reports of the extent of the area leased, but it probably does not exceed one square mile. The seam in which the workings have been commenced is five feet in thickness, dipping north at an angle of forty degrees, being the middle seam in the section given at p. 40. No data have been furnished from which the quantity of coal in this area can be ascertained. Owing to its rapid dip and the want of a secure place of shipment—the nearest being Port Hood, 40 miles distant—it is questionable whether this seam can be worked profitably, although it would seem that the lessees are of a different opinion, as they have expended during the last two years nearly 3,000*l.* in opening the works, erecting a steam engine for pumping and drawing, and building houses for their workmen.

The coal sold during the last four years has averaged only 125 tons per annum.

XVII. BROAD COVE AREA, GULF SHORE.

A lease of this area of one square mile, marked XVII. on the map of the island, was granted to Messrs. McCully and Blanchard in 1865, who proposed to open a mine

upon the seven feet seam. (See section, p. 39.) The coal is of good quality, consisting of, according to analysis—

Moisture	9·00
Volatile matter	34·00
Fixed carbon	57·00
	100·00

This seam dips to the north at an angle of ten degrees, but no estimate can be made of the quantity of coal in the area, as its limits have not been defined. As there is no safe place of shipment nearer than Port Hood, the lessees proposed to form an artificial harbour by cutting a channel through the beach into a sheet of water called McIsaac's Pond, in the vicinity. An attempt was made to organise a company in London in 1866 to open the mine and construct the harbour, but without success. Fifty tons of coal were raised in 1867, but since that time the lessees have wisely taken no active steps for establishing a colliery, as it would be impossible to ship any considerable quantity of coal in such an exposed situation; and it is very doubtful whether a harbour, if constructed, could be kept open upon a coast unprotected from the sand and shingle which accumulates during the prevailing westerly winds on the Gulf shore.

XVIII. MABOU AREA, GULF SHORE.

An attempt was made in 1866 to open a mine in one of the valuable seams at this place, marked XVIII. in the map of the island, but it does not appear from the inspector's reports that any progress has been made in the undertaking up to the close of 1870. This is owing, it is presumed, to the want of a good harbour for shipping the products of the mine within a reasonable

distance. Although the area of the coal basin is not great, as will be seen from the description of the coal measures at this locality (p. 39), the quantity of coal contained in one square mile will amount to 27,000,000 tons, the aggregate thickness of the four workable seams being more than twenty-nine feet. It will be long, however, before this coal can be made available for economic uses; for in addition to the want of a harbour, the cost of raising the coal will be comparatively great on account of the rapid dip of the seams.

XIX. PORT HOOD COLLIERY, ST. GEORGE'S BAY.

An attempt to establish a colliery at Port Hood, marked XIX. on the map of the island, was made in 1865, by the 'Cape Breton Mining Company,' by driving a slope from the crop of the six feet seam. (See section, p. 38.) An engine of fourteen horse-power was erected, and a considerable outlay incurred in buildings, &c.; but, owing probably to the quality of the coal, the works have been suspended since 1867. There is a safe shipping-place close to the works. In 1866, the company sold 1,657 tons of large and 1,171 of small; and in 1867, 3,710 tons of large and 765 of small coal; but none has been raised since. It is not likely that operations will be resumed, as none of the mines on the west side of the island can possibly compete with the collieries of the Sydney district.

XX. RICHMOND COLLIERY, LITTLE RIVER.

This colliery, marked XX. on the map of the island, is situated on the banks of Little River, a small stream running into the basin of the river Inhabitants, near the southern end of the Gut of Canceau. A description of

the seams will be found at p. 42. A lease was taken out in 1859 by Mr. Marmaud, who subsequently transferred his interest to an American company. In 1865 a shaft 200 feet in depth was sunk, and a crosscut driven to intersect the two vertical seams—one three, the other four feet in thickness—which are separated by 154 feet of sandstone and shale. The coal, according to Dr. Dawson's analysis, consists of—

Volatile matter	30·25
Fixed carbon	56·40
Ashes	13·25
	100·00

An engine of thirty horse power was erected for pumping and drawing; a railway, three miles in length, constructed to a secure place of shipment in the basin of the river Inhabitants, and every preparation made for an active business; but, for some reason not stated (probably the great cost of working the coal), the works were entirely suspended in 1867. From 1863 to 1867, inclusive, the shipments averaged 700 tons of large coal per annum.

XXI. SEA-COAL BAY, GUT OF CANCEAU.

An attempt was made in 1861 to establish a colliery at this place, but, as might have been expected, without success, the mixed bed of coal and bituminous shale, containing, according to Dr. Dawson's analysis, thirty per cent. of ash, being quite unfit for any industrial purpose. (See p. 41.) A considerable amount has been expended in explorations, and in erecting wharves and buildings. The shipments from 1863 to 1867 averaged 270 tons of large and small coal per annum, but no coal has been raised since the latter year.

NEW MINES IN PROGRESS.

Since the preceding pages were written, a new company has been formed in London, called the 'Glasgow and Cape Breton Coal and Railway Company,' for the purpose of working the seams in a reserved area of one square mile, situated in the rear of the General Mining Association's area on the south side of Indian Bay; and for constructing a railway from thence to Fresh Water Creek near the town of Sydney. Three seams have been opened at the outcrop said to be 8 feet, 6 feet 9 inches, and 4 feet in thickness, which are probably continuations of the Phelan, Ross, and McRury seams of the Glace Bay section, although they do not quite agree in thickness with the latter. The Lorway, Gardener, and Tracey seams will be found upon this property, but at a great depth; they are therefore left out of the following estimate of the quantity of coal contained in the area, as it is not likely they will be worked for many years to come:—

			Ft.	in.		
In the	Phelan	seam,	170 acres	8	0 thick	2,040,000
„	Ross	„	430 „	6	9 „	4,353,000
„	McRury	„	540 „	4	0 „	3,240,000
				Total tons		9,633,000

According to their prospectus, the directors of the Glasgow and Cape Breton Coal and Railway Company expect to sell 100,000 tons of coal, at a profit of 15,000*l.*, per annum. They also propose to construct, in addition to their own main line of ten miles from their works to Sydney, branches about twelve miles in length, to the Block House, Gowrie, Acadia, Clyde, and Caledonia collieries; and to carry their produce to Sydney at the

rate of three halfpence per ton per mile; three of the companies through whose property the railway will pass, having offered to guarantee to send from 50,000 to 100,000 tons each over their line annually.

Estimating that they will derive a profit of 19,167*l.* from this source, after paying all charges, in addition to 15,000*l.* per annum from the profit on the sale of coal, the directors conclude that they will be able to pay their shareholders an annual dividend of thirty-four per cent. on their capital of 100,000*l.*

As the chief object of the writer is to state facts for the information of persons interested in the Cape Breton mines, he refrains from making any comments upon the above estimates, sincerely wishing that the flattering anticipations of the directors of the Glasgow and Cape Breton Coal and Railway Company may be realised, because, in that case, other companies which, under more favourable conditions, have for years derived little or no profit from their collieries in Cape Breton, may then look forward hopefully to as good, if not better, returns from their outlay.

Two other leases of one square mile each have been recently granted upon the Lorway and Gardener seams of the Glace Bay series, (see p. 24), but nothing has yet been done beyond the sinking of trial pits to prove the seams. When collieries are opened the proprietors will have the advantage of sending their produce to Sydney, either by the International or the Glasgow and Cape Breton Company's railways.

CHAPTER XI.

IMPROVEMENTS MADE AT THE SYDNEY AND LINGAN MINES—GENERAL MINING ASSOCIATION'S PROPERTY IN CAPE BRETON.

HAVING completed our survey of the new mines opened between the years 1858 and 1870, inclusive, it will now be necessary, in order to furnish the reader with an account of the present condition and capabilities of *all* the mines in Cape Breton, to notice the improvements made at the works of the General Mining Association during the same period. The collieries of the association, as has been shown in a former chapter, were able to supply all the demand previous to the year 1856, when the Reciprocity Treaty came into operation; but when the heavy duty with which coal had hitherto been burdened was removed, it was reasonably expected that a vastly increased demand would arise in the United States, and preparations were accordingly made for meeting it. As the area of *whole* coal at the Sydney mines was rapidly diminishing, it was determined to open a new colliery upon the main seam at Cox Hill, two miles to the westward of the old mines, where its continuation, thickness, and good quality had been proved by trials along its outcrop. A branch railway from the main line was therefore commenced, and a considerable sum expended therein, when it was discovered, by further explorations, the seam thinned so rapidly to the dip, that the intention of opening a colliery at Cox Hill was abandoned.[1]

[1] The amount expended on this branch will not be lost, as it will form part of the line from Sydney Harbour—the nearest good shipping-place—to

In this emergency the directors decided upon opening a new colliery near Lloyd's Cove (see map), to work the main seam upon their submarine area of five square miles, of which a lease was obtained from the Government in 1865. For this purpose the sinking of two shafts was commenced in 1868, but, as heavy feeders of water were met with about 300 feet from the surface which overpowered the small engines erected for keeping the shafts clear of water, it was deemed advisable to suspend the sinking until the permanent pumping and coal-raising engines should be erected. These powerful engines have now been erected, and the sinking will be resumed. The pumping engine is a single cylinder high-pressure Cornish engine of 240 horse-power nominal; the cylinder being 62 inches in diameter, with a nine feet stroke; the beam, which is 34 feet in length, weighs 18 tons. The winding or coal-drawing engine of 160 horse-power nominal has two high-pressure horizontal cylinders, 36 inches in diameter, with a five feet stroke, connected by a crank shaft 15 inches in diameter, carrying a rope drum 20 feet in diameter; which, making full allowances for ordinary delays and stoppages, is capable of raising 1,000 tons of coal per day of ten hours. The depth of the shafts will be about 650 feet. The water will be raised by means of two lifts of pumps 20 inches in diameter. These engines are, beyond all doubt, the most perfect and most powerful that have been erected for mining purposes in British America.[1] When the sinking of the shafts is completed, the Sydney mines will be able to supply 300,000 tons of coal per annum, in addition to the 150,000 tons per annum which

Point Aconi, when the valuable seams in the Boulardrie district are opened at some future day.

[1] A pair of engines of exactly the same dimensions have been also erected by the General Mining Association at their collieries at Pictou.

the present works are now capable of furnishing. The engine houses, furnaces, and everything appertaining to the plant at the New Winning being of the most efficient and substantial description, no further outlay will be necessary except for ordinary repairs during the next fifty years at least, and the whole of the gettable coal in the submarine area of 3,200 acres can be drained and raised without any further expenditure for new steam machinery.

The construction of a mile of new railway, from the present terminus at the Queen Pit to the New Winning, is in progress, and will soon be completed. Two new and powerful locomotives have been added to the rolling stock, and the arrangements for shipping the coal have been greatly improved during the last few years. It may be safely asserted that the Sydney Mines will, in the course of a year or two, be the most complete mining establishment in the dominion. The Sydney Mines also possess another advantage which must be noticed; being situated near the mouth of the harbour, the shipping-place is seldom closed by ice before the first of February; and generally open before the first of April, except, occasionally, when the drift ice from the Gulf of St. Lawrence is forced into the harbour by an easterly wind. The upper part of the harbour, near the town of Sydney, where the wharves of the two other principal mining establishments are situated, generally freezes up two or three weeks earlier in the winter, and the ice seldom breaks up before the middle or end of April in the spring.

Great improvements have also been made at the Lingan Mines since 1857. These consist, chiefly, of a railway one mile in length, from the pit or slope to the harbour, which is worked by a small locomotive; additional shipping places; and houses for the manager,

clerks, overmen, and workmen. The harbour also has been deepened by dredging to allow vessels drawing fourteen feet of water to cross the bar at spring tides. Vessels drawing more than fourteen feet have to receive a small portion of their cargoes from lighters outside the bar, but this inconvenience will soon be overcome by a few months' dredging. The good character which the Lingan obtained a few years ago as a gas coal was, unfortunately, lost in 1869 and 1870 from a want of proper care in picking out the iron pyrites found in some parts of the seam, but it is gratifying to learn that, by more careful management, the Lingan coal has now recovered its former good reputation in the United States.

The machinery, wharves, rolling stock, and general equipment of the colliery are in good order, and capable of producing from 70,000 to 80,000 tons per annum. This may be increased, by a moderate outlay, to any amount likely to be required, as the General Mining Association have obtained leases of two submarine areas of 3,200 acres each, on the coast between the north head of Indian Bay and the Low Point lighthouse—one adjoining the Lingan works, the other at the Barasois, two miles to the westward. (See map.) Workings have been opened in the first by means of a continuation of the Lingan slope to the dip under the sea; and in the latter, by driving a slope from the surface near the Barasois Pond in the seam called the 'Barasois Seam,' in the Lingan section (p. 32). The length of this slope is 370 yards; both coal and water are drawn by a high-pressure engine of thirty horse-power. When this colliery is fully opened out, its produce can be sent for shipment to Lingan Harbour, by a railway two miles in length; or to Sydney Harbour, by a line three miles in length, in connection with the railway of the Victoria Colliery at Low Point.

The following schedule of the principal items of the property of the General Mining Association in Cape Breton will, it is hoped, give the shareholders a tolerably correct idea of the great extent and value of their possessions. It will also clearly prove that, when the coal trade revives under a more liberal tariff in the United States, the Association will be prepared, not only to supply any reasonable quantity of coal that may be required from their present works, but also to open at least half-a-dozen new collieries, if necessary, within a short distance of commodious harbours, for the shipment of their produce.

Schedule of Property of the General Mining Association in Cape Breton.

1. Acreage of Coal Areas under lease.

	Acres
Point Aconi, and Sydney mines, area G. M. A. (1) on Map	11,700
Lingan „ „ „ „ „ (2) „	8,420
Bridgeport „ „ „ „ (3) „	1,280
Sydney mines, submarine „ „ (4) „	3,200
Barasois „ „ „ „ „ (5) „	3,200
Lingan „ „ „ „ „ (6) „	3,200
Total	31,000

2. Quantity of Coal in above Areas.[1]

In Area G. M. A. (1).

	Acres	Thickness	Tons	Total
In the Bonar Seam	294	7 3	3,197,250	
„ Stubbert „	890	7 3	9,678,750	
„ Crawley „	1,813	7 6	20,396,250	
„ Mill Pond „	4,099	4 0	24,594,000	
„ Black Rock	5,202	4 0	31,212,000	
„ Lloyd's Cove	552	6 0	4,968,000	
	Carried forward		94,046,250	

[1] Coal contained in seams less than four feet in thickness is not included.

	Acres	Thickness		Tons	Totals
Brought forward				94,046,250	
In the Main Cove . .	150	6	0	1,350,000	
„ „ „ . .	2,154	4	0	12,924,000	
„ „ Six-feet Seam Pillars				1,300,000	
„ Indian Cove .	6,498	4	8	45,486,000	
					155,106,250

In Area G. M. A. (2).

	Acres	Thickness		Tons	
In the Carr Seam . .	280	4	0	1,680,000	
„ Barasois „ . .	540	8	8	7,020,000	
„ Dunphy „ . .	690	4	0	4,140,000	
„ David „ . .	990	7	0	10,395,000	
„ Main „ . .	1,840	8	8	23,920,000	
					47,155,000

In Area G. M. A. (3).

	Acres	Thickness		Tons	
In the Back Pit Seam .	562	4	6	3,793,500	
„ Phelan „ .	1,050	8	0	12,600,000	
„ Spencer „ .	1,185	6	9	12,998,125	
„ McRury „ .	1,280	4	0	7,680,000	
					37,071,625

In Area G. M. A. (4).

	Acres	Thickness		Tons	
In the Lloyd's Cove Seam	1,650	6	0	14,950,000	
„ Main „ „	3,200	6	0	28,800,000	
„ Indian Cove „	3,200	4	8	22,400,000	
					66,150,000

In Area G. M. A. (5).

	Acres	Thickness		Tons	
In the Carr Seam . .	3,100	4	0	18,600,000	
„ Barasois „ . .	3,170	8	8	41,210,000	
„ Dunphy „ . .	3,200	4	0	19,200,000	
„ David „ . .	3,200	7	0	33,600,000	
„ Main „ . .	3,200	8	8	41,600,000	
					154,210,000
Totals carried forward . . .					459,692,875

	Tons
Totals brought forward	459,692,871

In Area G. M. A. (6).

	Acres	Thickness	Tons	
In the Carr Seam . .	2,480	4 0	14,880,000	
„ Barasois „ . .	2,720	8 8	35,360,000	
„ Dunphy „ . .	2,900	4 0	17,400,000	
„ David „ . .	3,110	7 0	32,655,000	
„ Main „ . .	3,200	8 8	41,600,000	
				141,895,000
Grand Total				601,587,875

3. Real Estate. (Freehold.)

	Acres
Lands containing Coal leased to the Association . .	4,734
„ „ „ „ to others	2,377
„ „ „ not leased	208
Lands outside limits of the Coal-field in various parts of the Island	6,039
Total quantity of land belonging to the General Mining Association	13,358

4. Railways, Rolling Stock, Wharves, etc.

There are at the Sydney and Lingan mines six miles of railway, five locomotives, and about three hundred coal waggons and trucks: eight loading berths at the Sydney and three at the Lingan shipping places: and several miles of light railway underground, with a full equipment of coal tubs and trams, at each colliery. Also about one hundred horses, of which about three-fourths are employed in the pits.

5. Fixed Steam Engines.

Under this head are comprised two pumping engines of 240 and 150 horse-power; two winding engines of 160

and 60 horse-power; two combined pumping and drawing engines of 30 horse-power each; two underground drawing engines of 30 horse-power each; two sinking engines of 30 horse-power each; and one foundry engine of 24 horse-power which also works the lathes, planing-machines, boring mill, &c.; making a total of eleven steam engines of an aggregate force of 814 horse-power.

6. Buildings.

Consisting of 200 dwelling-houses for managers, clerks, overmen, and workmen; twelve shops for engine-fitters, blacksmiths, and carpenters; six stone and brick engine-houses; one iron foundry; twelve stables and barns; six warehouses; and four school-houses.

In addition to the above there are, at the Sydney mines, cupola furnaces, lathes, planing and screw-cutting machines, a boring mill, a steam hammer, and all the tools and implements required in the construction and repairs of steam engines and other mining machinery; and, at the Lingan mines a steam dredger for deepening the harbour, and a steam tug for towing vessels.

It may safely be asserted that, with such extensive areas, containing some of the most valuable seams of coal in the island, and with such a complete plant and equipment, capable of raising any quantity of coal that may be required, the shareholders of the General Mining Association, as soon as they obtain a market for their produce, will again receive the dividends which they enjoyed before the abolition of the Reciprocity Treaty. This market, it is confidently expected, will soon be obtained, as a resolution admitting coal duty free into the United States, adopted by a large majority in the House of Representatives, was only lost in the Senate owing to the want of time to discuss it immediately before the close of the last

session. This resolution, most probably, will be again brought forward in the early days of the approaching session of Congress, and passed, to the advantage alike of the producers of coal in the British Provinces and of consumers in the great cities of the Atlantic seaboard of the United States.

CHAPTER XII.

PROGRESS OF THE COAL TRADE FROM 1858 TO 1870, INCLUSIVE. FUTURE PROSPECTS OF THE TRADE.

HAVING in the last two chapters furnished the reader with brief descriptions of the present condition and capabilities of the coal mines now open in Cape Breton, it is hoped that the information embodied in the Tables Nos. V. and VI., compiled from the annual returns of the Government inspector of mines, and other authentic sources, will enable him to form a tolerably correct idea of the great importance and progress of the coal trade since the year 1858, when the General Mining Association surrendered their rights to a great portion of the coal-fields; and several new mines in consequence came into operation.

The figures in the tables speak for themselves, but a few remarks will, nevertheless, be necessary to explain away some apparent anomalies. In the first place, going back to Table IV., it will be seen that, in 1857, before any new mines were opened, the total sales of Cape Breton coal, including small coal, were 126,549 tons, being an advance of 27,223 tons upon the sales of 1854, the last year previous to the admission of coal into the United States free of duty under the Reciprocity Treaty. This advance, it must be observed, was almost wholly due to the increased consumption in the British Provinces, and not to the effect of the abolition of the duty in the United States.

2. Up to the close of the year 1861, the increase in the sales was not material, being only an advance of 27,673 tons upon those of 1857, mostly due to the introduction of Lingan coal into the New York Gas-Works, and a small export from the new mines, which, previously to the former date, had not got into full operation.

3. In 1862, the exportation of coal from the new mines began to be sensibly felt, the sales having reached 36,699 tons. In the same year, the sales of the Sydney and Lingan mines amounted to 145,874 tons, being an advance of 10,116 tons upon those of the preceding year.

4. During the years 1863, 1864, and 1865, rapid progress was made in the sales of Cape Breton coal, which advanced from 182,583 in 1862, to 424,552 tons in 1865. This great increase was, as will be seen by Table V., chiefly owing to the introduction of the new mines coal into the gas-works of the United States. The Lingan mines participated to a large extent in the active demand for gas coal, the sales having advanced from 4,942 tons in 1858, to 55,108 tons in 1865; but the Sydney coal being almost wholly used for domestic purposes, and unsuitable for gas-making, did not share in the prosperity of the neighbouring mines; on the contrary, the consumption of Sydney coal in the United States gradually declined, owing to the almost universal use of anthracite. The total sales of the Cape Breton mines in 1865—their most prosperous year—amounted to 424,552 tons, towards which the Sydney and Lingan contributed 163,687, and the new mines 260,865 tons.

5. After the expiration of the Reciprocity Treaty in 1865, the sale of Cape Breton coal in the United States rapidly declined to 355,000, 318,000, to 256,000 tons, in the years 1866, 1867, and 1868, respectively.

6. During the last two years—1869 and 1870—there

has been a slight improvement in the trade, although the duty has not been reduced. This apparent anomaly can be easily explained. Previous to the year 1865, when coal was admitted duty free, the mining companies were able to sell their coal at remunerative prices; but when the duty of five shillings per ton was imposed, it was found impossible to deliver the coal in the United States at such a rate as would secure a market without making considerable reductions in the selling prices at the mines. In consequence of these reductions, some of the mines, which in former years paid handsome dividends, have during the last three years made no profit whatever, but their owners have continued their operations solely with the view of retaining their customers, in the hope of being able, when the duty is taken off, to advance their selling prices. It is reported that some of the companies are selling their coal this year (1871) at six shillings per ton, which, it is presumed, can be done without loss; therefore, taking the average freight at ten shillings per ton, and the duty at five shillings, the coal can be delivered in the United States at twenty-one shillings per ton. When the duty is taken off, if the coal-owners raise their selling price to eight shillings per ton, which would leave a moderate profit, the coal can then be delivered in the United States at eighteen shillings per ton. We may therefore reasonably conclude that if the Cape Breton mines found a market for 144,751 tons of coal (see Table VI.) in 1870 at a cost of twenty-one shillings, there is every prospect of selling a much larger quantity when the coal can be delivered at Boston or New York at the rate of eighteen shillings per ton. Since the abrogation of the Reciprocity Treaty, the gas-works of the United States have been supplied chiefly from the mines of Pennsylvania, Maryland, and Virginia, at an enhanced price to the consumers,

but, when colonial coal is admitted duty free, the coal-owners of Cape Breton will be able to deliver their coal at lower rates, the cost of sea freight being considerably less than that of land transportation. This will naturally lead also to an increased consumption of coal, as gas-works will be established in places which hitherto have been debarred from using gas, owing to the high price of American coals.

Independently of the increased demand which may be looked for in the United States, there is every prospect of a rapidly improving trade with the neighbouring British Colonies. By reference to the annexed Table VI., showing the quantity of coal sold in each of the colonies separately, it will be seen that the total sales of large and small coal amounted in 1870 to 171,727 tons, being an advance of 70,446 tons upon the sales of 1857, and more than three times the quantity sold in 1850. (See Table IV.) As Canada and Prince Edward's Island are quite destitute of coal, and New Brunswick and Newfoundland contain only some thin seams of no economic value, all these colonies must look to Nova Scotia and Cape Breton for supplies of fuel for steam, domestic, and manufacturing purposes. Canada, it is true, receives a considerable quantity of coal from Great Britain (131,000 tons in 1869), in the form of ballast for ships employed in the timber trade; but this cannot last long, because the consumption of coal in England is increasing so rapidly that all the most accessible seams are nearly exhausted, and the selling price must advance in the same ratio as the difficulty of working. For the same reason, it is probable Cape Breton will ere long enjoy a share of the markets of the West Indies and South America, at present entirely supplied by Great Britain. In the year 1869, the exports to those countries were as follows:—

	Tons
To British West Indies	134,969
„ Foreign „	369,763
„ Brazil „	230,143
„ Uruguay „	167,821
„ Argentine Confederation	66,513
Total	969,209

Cape Breton will, in this case, enjoy peculiar advantages from her geographical position and the proximity of her mines to the seaboard. Situated, as a glance at the outline map facing the title-page will show, in the centre of the colonies, and within a reasonable distance of the United States, the harbour of Sydney is undoubtedly destined to become the great emporium of the coal trade.[1] This harbour, universally admitted to be one of the best in America, has a clear width of two miles, and a depth of ten fathoms at its entrance. Five miles from the lighthouse, the main channel divides into two arms or branches, one running westerly, the other southerly, protected from the sea swell by sand beaches jutting out from each shore, which contract the channel to a width of three-fourths of a mile. These branches—each about five miles in length, would afford anchorage for all the navies of Europe. Everywhere within the beaches there is deep water close to the shore. Commodious wharves, in connection with the coal mines, have been erected at three

[1] The following table shows the distances from Sydney to some of the chief ports in the Colonies and the United States:—

	Miles
From Quebec (Canada)	720
„ Miramichi (New Brunswick)	300
„ St. John's (Newfoundland)	400
„ St. John's (New Brunswick)	540
„ Halifax (Nova Scotia)	240
„ Portland (United States)	580
„ Boston („ „)	600
„ New York („ „)	750

places—one on the north, and two on the south side of the harbour,[1] where vessels of the largest burthen can load at low water.[2] The harbour of Sydney, being free from rocks and shoals, and the dense fogs which often envelope the southern coast of Nova Scotia, can be approached at all times without danger, and entered with every wind. In proof of this last assertion, it need only be stated, that, some years ago H.M.S. 'Wellesley,' of seventy-two guns, bearing the flag of the late Earl of Dundonald, beat up the harbour, from its entrance to the head of the south arm, against a stiff breeze directly ahead.

Situated almost on the direct route from Europe to Canada and the United States, Sydney must soon become the great coaling station for steamboats, which will, ere long, entirely supersede sailing vessels for passengers and the conveyance of the more valuable class of merchandise. The only obstacle to the realisation of this object is the fact that the harbour is closed by ice during the months of February and March, and part of April; but this may be overcome by supplying steamers during those months with coal from the Port of Louisbourg, which is open all the year, and only eighteen miles distant from the eastern portion of the coal-field. There is every reason to believe that, in the course of a year or two, an uninterrupted line of railway will be formed between Halifax and San Francisco, by the completion of the inter-colonial line, connecting the port of Halifax with the European and North American Railway. New York will, by this route, be brought twenty-four hours nearer to Europe than by the present lines of steamers running direct to

[1] The Glasgow and Cape Breton Mining Company are erecting a wharf, also near the town of Sydney, in connection with their works.

[2] The difference between high and low water is only six feet in spring tides.

New York; and as the gain of every hour is an object of great importance, a still further saving of six hours may be effected by continuing the inter-colonial line from Pictou to Louisbourg—a distance of about one hundred and thirty miles. The opening of the navigation of the St. Lawrence to American vessels, under the Washington Treaty, will be the means of placing lines of steamers on the direct route from Chicago to England, which will find their advantage in coaling at Sydney on their outward and return voyages, as they can then carry much larger cargoes of merchandise, having, on leaving Liverpool, to take in only as much coal as will carry them to Sydney, where they will get a fresh supply to carry them up to Chicago and back to Sydney. By this arrangement, which will be highly advantageous to steamboat owners, the Sydney mines will supply two-thirds of all the coal required for making the outward and home voyages. By this arrangement they will also obtain the fuel required, at Sydney for eight shillings per ton, against at least sixteen shillings per ton in all the English ports, except those which supply steam coals, very few of which have any direct trade with the United States. It is needless to dwell upon the immense advantages which must accrue to the owners of the Cape Breton Collieries by this course of trade, and the great extent to which it may be carried.

It is well known that coal is the basis of the prosperity of Great Britain, and of the success of her manufacturing enterprise, which has converted districts, once barely habitable, into seats of active and profitable industry.[1]

[1] Lancashire, which a few centuries ago was looked upon as a kind of morass or waste, and one of the poorest counties in England, now, owing to its coal mines, has a population of 1,280 persons to the square mile, while the principal agricultural counties have only from 148 to 230 persons to the square mile.

When her coal seams are exhausted, the bulk of her population will be compelled to emigrate, while those who remain will have to live upon the cultivation of the soil. Professor Jevons, in a work 'On the Coal Question,' published in 1865, estimated that the rate of growth, at that period, in the aggregate annual consumption of coal, amounted to about three and a-half per cent. per annum, reckoning each annual percentage on the previous year's consumption. Calculating upon the consumption of 1865, namely 98,150,587 tons, he estimated that the whole quantity of available coal in Great Britain would be exhausted in 110 years. The Royal Commissioners appointed to enquire into the matter have just published their report, in which they impugn Professor Jevons' estimate. They state that the total available quantity of coal in the United Kingdom is 146,480 millions of tons, which, according to the estimate of Mr. Price Williams, who has given great attention to questions of this kind, will be exhausted in 360 years. Although the exhaustion of the English coal-fields is still far distant, the best and most accessible seams only have been worked, and have, in consequence, suffered great diminution. Those which remain must be worked at a greater cost, and coal can only be supplied to manufacturers at enhanced prices—prices liable to be still further increased by the action of the trades' unions, at present so rampant in Great Britain. If these unions succeed in curtailing the hours, and advancing the price of labour, it will be impossible for employers to hold their own in competition with other countries, and they will be compelled to take their capital to America, where they will find more suitable places for pursuing their vocations in the vast, almost untouched, coal-fields of Indiana and Illinois. Happily, some may find their way to Cape Breton, only

seven days distant from England, which offers most favourable conditions for the introduction of the cotton manufacture, possessing a healthy temperate climate, cheap food, a hardy industrious population, and vast deposits of coal of the best quality. Even at the present time, many articles of general consumption in the colonies may be manufactured and sold to advantage, being protected by a duty of fifteen per cent. on foreign productions. For instance, salt, an article indispensable in curing fish, might be made from the brine springs of St. Patrick's Channel, in the very centre of the prolific fisheries of cod, mackerel, and herring, in the seas which surround the island. The fishermen would then obtain their salt at first cost, unburdened with freight and expenses attending its importation from England, and the coal-owners would find a market for their surplus produce of small coal, now in a great measure unsaleable. The manufacture of iron might also be successfully established, for although no valuable beds or veins of iron ore have been discovered in the island, an inexhaustible supply of rich magnetic ore could be obtained from the extensive deposits in the rocks of the Laurentian series of Canada, between the river Ottawa and the Rideau canal. Great quantities of this ore are now sent by the Rideau canal to Kingston, and thence by lake and canal navigation to the iron-works at Pittsburg on the Ohio. Surely, it could be delivered at a less cost in the ports of Cape Breton, as the vessels employed in transporting it would have return cargoes of coal to Quebec, Montreal, and other towns on the St. Lawrence.

With so many favourable conditions for the establishment of various manufactures, with cheap land in suitable situations for the erection of works, with abundance of timber, freestone, granite, limestone, and almost every

article required in the construction of manufacturing premises, and, above all, with cheap fuel of the best quality, there is every reason to conclude that ere long Cape Breton will become a prosperous manufacturing country, and absorb the labour of its redundant population, now compelled to seek for employment in the United States and the neighbouring colonies. With all these advantages, in addition to its admirable geographical position as a coaling station for steamers navigating the Atlantic, the island of Cape Breton, we may safely prophesy, will before long become one of the most prosperous portions of the New Dominion.

December 31, 1870.

Names of Collier	1867		1868		1869		1870	
	Large	Small	Large	Small	Large	Small	Large	Small
Sydney . .	526	99384	2434	93573	3897	91986	3747	102607	6344
Lingan . .	386	36995	155	20694	42	30147	230	25092	2652
Glace Bay .	905	49137	2889	47316	2403	28739	920	54378	1405
Block House .	065	71149	77	36965	—	73933	—	40006	—
Gowrie . .	5882	31875	6743	36676	10327	38303	11306	38178	14699
Caledonia. .	—	32	—	9147	680	21622	1159	26805	1081
International .	1508	18691	2116	4765	994	6285	1225	10640	—
Victoria . .	—	287	—	2406	120	4237	668	6444	844
New Campbellt	453	4900	162	1328	94	186	45	309	154
Collins .	—	288	60	483	23	13	3	40	—
Acadia . .	—	—	—	—	—	—	—	—	—
Matheson . .	—	805	—	—	—	33	—	—	—
Tracey . .	38	—	—	—	—	—	—	—	—
Ingraham .	—	43	—	40	—	40	—	—	—
Clyde . .	6	236	17	800	51	2123	156	2125	—
Schooner Pond	2	—	—	—	—	53	—	—	—
South Head	11	24	—	1863	8	300	48	—	—
Port Hood	1389	4337	819	—	—	—	—	—	—
Black Rock	—	196	—	118	—	186	—	—	—
Mabou .	—	—	—	—	—	—	—	—	—
Broad Cove	—	—	—	—	—	—	—	—	—
Chimney Corne	—	1	—	131	—	292	40	—	—
Richmond	3	615	34	12	8	—	—	—	—
Sea Coal Bay	—	—	—	—	—	—	—	—	—
Tons in each Y	6174	318995	15506	256317	18647	298478	19547	306624	27179

which it was shipped.

Names	ova Scotia		Cape Breton		Total sold at each Colliery	
	ge	Small	Large	Small	Large	Small
Sydney	9[5]	—	1411[5]	2897	102607	6344
Lingan	9	402	92	84	25092	2652
Victoria	8	844	74	—	6444	844
Internati		—	—	—	10640	—
Glace Ba	9[11]	437	—	—	54378	1405
Caledonia	8	—	42	24	26805	1081
Block Ho	2	—	290	—	40006	—
Gowrie	3[17]	3503	512	441	38178	14699
Clyde	0	—	—	—	2125	—
New Can	1	—	37	154	309	154
Collins	0	—	—	—	40	—
Total to	9	5186	2458	3600	306624	27179

[1] Nea

steam-en w York, Boston, and Cambridge companies, and for

[2] Use

[3] Use

[4] Nin w York, Brooklyn, and Boston companies, and for

[5] Nea

[6] Use ne burning.

[7] Use

[8] All ses.

[9] Nin West Indies is used for steam purposes and sugar

[10] Use

MAPS.

Explanation of the Map of the Sydney Coal Field.

Strike of coal seams at high-water level	———
Strike of supposed continuation of coal seams	- - - -
Direction and angle of dip of coal seams	→ 8°
Anticlinal and sectional lines	———
Railways	▬ ▬ ▬
Coal shafts and slopes	●

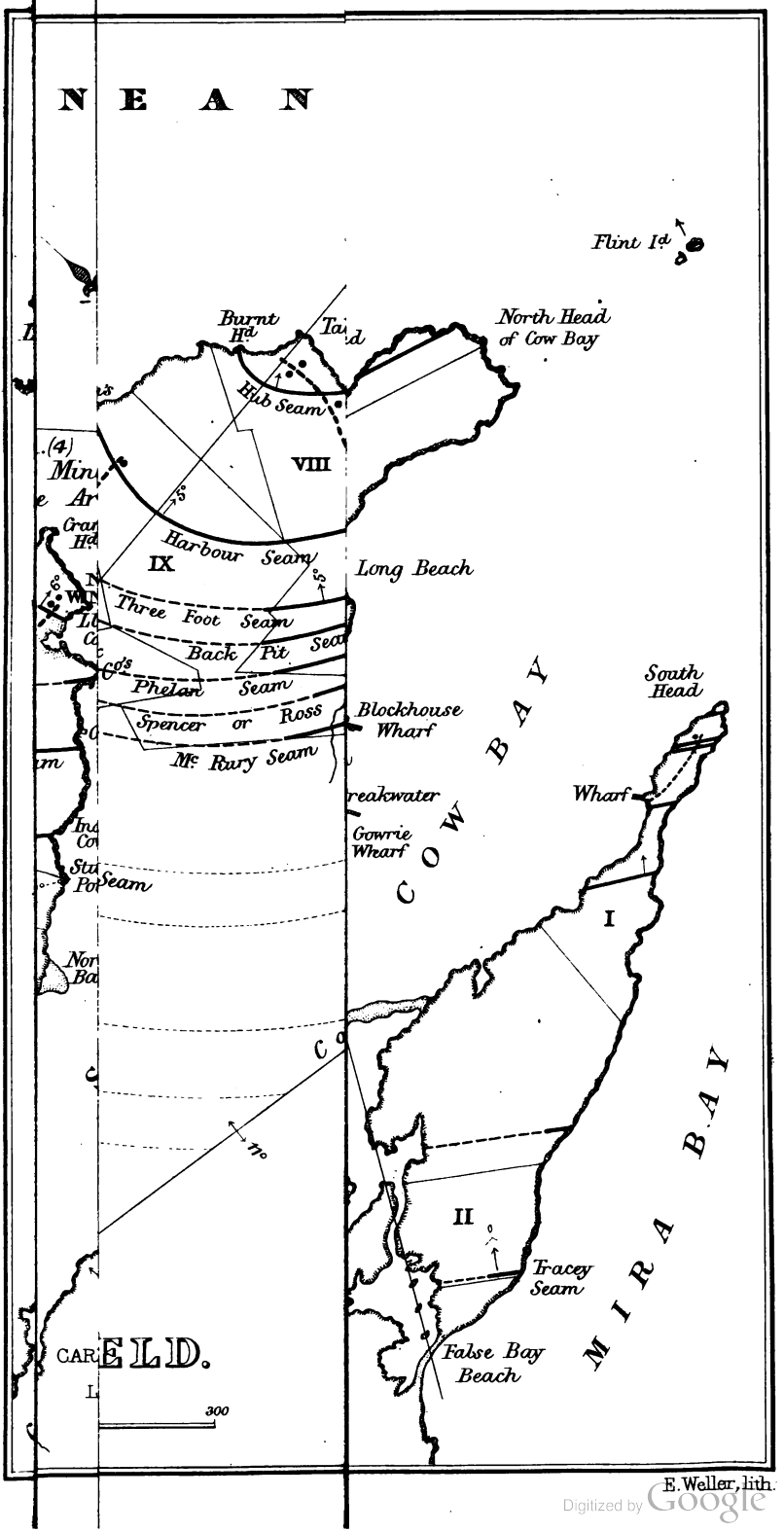
General Mining Association's	Sydney Mines and Point Aconi Area, marked G. M. A. (1)	Coloured Red
	Lingan Area, marked G. M. A. (2)	
	Bridgeport Area, marked G. M. A. (3)	
	Sydney Mines Submarine Area, marked G. M. A. (4)	
	Barasois Submarine Area, marked G. M. A. (5)	
	Lingan „ „ „ „ (6)	

South Head	Area, marked	I.	coloured Blue
Tracey	„ „	II.	„ „
Gowrie	„ „	III.	„ Yellow
Block House	„ „	IV.	„ Blue
Acadia	„ „	V.	„ Yellow
Clyde	„ „	VI.	„ Blue
Caledonia	„ „	VII.	„ Green
Glace Bay	„ „	VIII.	„ Yellow
International	„ „	IX.	„ Blue
Victoria	„ „	X.	„ „
Ingraham	„ „	XI.	„ „
Collins	„ „	XII.	„ „
Matheson	„ „	XIII.	„ Yellow
Black Rock	„ „	XIV.	„ Blue
New Campbelltown	„ „	XV.	„ „
Glasgow and Cape Breton Co.'s	„	. . .	„ Yellow

Explanation of Map facing Title Page.

Chimney Corner	Area, marked	XVI.	Coloured Black
Broad Cove	„ „	XVII.	
Mabou	„ „	XVIII.	
Port Hood	„ „	XIX.	
Richmond	„ „	XX.	
Sea Coal Bay	„ „	XXI.	

Spottiswoode & Co., Printers, London and Westminster.



Y

t s h M o u n t a i n s

Coal lft

Coal 3.8

s S y s t e m

NEW WINNING

Cranberry Head

Point Aconi

i

E. weller Litho.

ORE O

al 8.8 Coal 3 ft.

nager's House

North Head

Sectio

E. Weller, *Litho.*