tioned, there is a rolling-mill at Halifax, where scrap-iron is worked up into nail-plate, ships' knees, etc., by the Halifax Rolling-Mill Company.

Forge and Steel-Works in Pictou County.—The Nova Scotia Forge Company, at Trenton, near Glasgow, in the County of Pictou, are situated on the East river bank; they have very complete appliances for forging all classes of work out of scrap-iron; they make ships' knees, steamship and mill-shafts, and specially car-axles. Probably more work is turned out from this shop than from any other forge in Canada.

The Nova Scotia Steel Company's Works adjoin the forge. These steel-works are the only ones in the Dominion; they were completed in 1883, their first cast being made on the 25th July of that year. One 15-ton open-hearth Siemens' furnace, gas-producers, a reheating-furnace, with two trains of rolls, one 16 and the other 28-inch, complete the steel-making plant. The mill is driven by a reversible steam-engine of the latest type, and steam is furnished by seven multitubular boilers.

The works have an annual capacity of 9000 tons, and produce plates, bar, spring and machinery steel, from hematite pig and steel scrap. Everything is very compact and complete about the works, which are well situated on the banks of the East river, a short distance below Smelt brook, between the river and the line of the Intercolonial (Pictou and Truro Branch) Railway. Vessels can unload direct into the company's premises, and the railway has a siding into the works, so that shipping facilities by rail or water are equally good. The Pictou Coal Field being only a mile or two distant, fuel is very cheap. A nail-factory for cutting steel nails has recently been established in connection with the works.

THE SYDNEY COAL-FIELD, CAPE BRETON, N. S.

BY W. ROUTLEDGE, M.E., MANAGER OF THE RESERVE COLLIERY, CAPE BRETON.

(A Communication to the Secretary.)

As is well known, the Sydney coal-field comprises an area of about 200 square miles, being about 32 miles from the mouth of Big Bras d'Or, on the northwest, to Mira Bay on the southeast, by about 6 miles in width. The whole of this area is underlain by

valuable seams of bituminous coal, ranging from 2 feet up to 9 feet in thickness and lying at angles varying from 3° up to 40°, the dip of the greater portion being from 5° to 12°, and only in one place, at Victoria mines, amounting to 40°, as the result, no doubt, of some extraordinary upheaval.

The seams of coal in this coal-field are of the bituminous or soft variety, and all yield a coal well adapted for general purposes, while the product of some of them is specially applicable to the manufacture of gas. Much of it will compare very favorably with the best English coals. The aggregate thickness of coal in workable seams in the several basins (hereafter named) in the Sydney coal-field is from 25 to 60 feet; and as a rule the seams dip at a low angle and, so far as is known, are not affected by faults or dikes. As all the strata dip seaward, much of the coal will be available in the submarine as well as in the land-areas.

Although the Island of Cape Breton possesses so large an area of coal-bearing strata, very little has been done beyond explorations, except in the eastern or Sydney coal-field, where a number of first-class collieries have been opened, fully proving the extent of the field and also the approximate depth of the coal-measure.

Although geological surveyors and explorers generally make an attempt to connect continuously the several seams in the Sydney coal-field from one end to the other, it seems on a careful study of outcrops and sections that this field is practically composed of four separate basins, viz.: the Sydney mines, Lingan, Glace Bay, and Cow Bay basins. The great difference in the depth of seams in the several basins, and, moreover, the opposite curvature of the lines of strike of seams in the Sydney coal-field, and the fact that the dips on the north and south sides of Sydney River, and also Lingan Bay, are at right angles to each other, give strong presumption of the existence of these four separate basins in the field. The delineation of well-known lines of outcrop tends to show that what is here called the Glace Bay basin is elliptical in form, as the Cow Bay basin undoubtedly is, from proof in the workings of the Block House mines at Cow Bay.

The four basins may be described as follows:

No. 1, extending from the mouth of Big Bras d'Or River eight miles southward to Sydney River, and comprising what is generally known as the Sydney Mine Section.

No. 2, extending from Sydney River south about five miles to the shore of Lingan Bay, and usually termed the Lingan Tract.

No. 3, extending from the southern shore of Lingan Bay about eleven miles southward to the northern head of Cow Bay, and generally known as the Glace Bay Section.

No. 4, extending about four miles westwardly inland from the shore of Cow Bay and southwardly under the waters of Cow Bay, called the Block House Section.

No. 1. *The Sydney Mine Section.*—This basin contains four valuable seams of coal, besides a number of smaller ones, all lying at an easy angle of about 7°. The coal-seams in this basin are much thicker southward on Sydney River than to the north on Bras d'Or; but openings that have been made show that the quality of the coal remains uniformly the same. The southern termination of this basin may be supposed to be about at the middle of Sydney River, the seams of coal being broken off by what may be termed a submarine anticlinal, known as Petrie's Ledges, a dangerous reef of rocks running nearly the same course as the river.

A section of this basin shows the following important seams in descending order.

			Thickness. Feet.	In.
No. 1. Cranberry Head seam	21 feet down,	. . .	4	0
No. 2. Lloyd's Cove "	302 "	. . .	6	0
No. 3. Chapel Point "	665 "	. . .	2	0
No. 4. Sydney Main "	1030 "	. . .	6	0
No. 5. Indian Cove "	1500 "	. . .	4	8
No. 6. Shaley "	1690 "	. . .	3	0
Total thickness of workable seams,		. . .	25	8

With the exception of Chapel Point seam and Shaley seam, all the seams in this section have been worked to some extent. The Main seam at the Sydney mines has been worked for more than forty years, and produces a first-class domestic coal. Lloyd's Cove seam has been partially worked by the owners of Sydney mines, but operations ceased in this seam about twenty years ago, owing to the ability of the company to supply all the demand from one pit. This seam has a stone band about two feet from the top, which does not seriously damage the character of the coal. The Indian Cove seam has also been worked in this district by the General Mining Association of London, at their No. 3 Pit at Sydney mines, on Ingraham's coal area on the Bras d'Or road, and by parties owning mining areas on Little Bras d'Or River; but the character of the coal was not such as to bring a paying price in the various home

and foreign markets, and all workings on this seam have been abandoned except by the farmers, who mine for home-consumption. The only colliery at present working on this basin is the pioneer colliery of Cape Breton, the Sydney mine.

No. 2. *The Lingan Tract.*—By crossing Sydney River to the south, Basin No. 2, or the Lingan tract, is reached. It extends five miles southwards from the southern shore of Sydney River to the northern head of Lingan Bay, and is underlain by valuable seams of coal, only one of which is less than three feet thick. The angle of dip in this basin is peculiar. At the Lingan or southern end the seams lie at an angle of 12°, whereas at the northern end, on Sydney River, the angle increases to 40°.

The following seams, in descending order, are found in this basin.

		Thickness. Feet.	In.
No. 1. Carr's	seam, 30 feet down,	4	0
No. 2. Barrasois	" 260 "	8	0
No. 3. Dunphy's	" 300 "	4	0
No. 4. Davy's Head	" 360 "	7	0
No. 5. Northern Head	" 650 "	3	0
No. 6. Lingan Main	" 700 "	8	6
No. 7. Laffin's	" 750 "	2	8
No. 8. Small	" 860 "	2	3
Total thickness of coal,		39	5

All the above seams have been proved to some extent by the farmers and fishermen on the shores of Sydney River and Lingan Bay. The Lingan Main seam has been extensively worked by the General Mining Association of London, at their Lingan mines, and is found to yield an excellent gas-coal. In this seam, workings are extended for some distance under the sea, where the coal retains its usual good character. Three feet from the top of the Lingan Main seam, where it is exposed in the cliff on the northern side of Lingan Bay, there is a stone band one inch in thickness. This band continues to increase in thickness until, about 1000 yards northwest from the shore (low water level line), the seam is divided by a band 14 feet thick. From this point the band gradually decreases till the seam nearly becomes united again.

The Ross or Davy's Head seam has been extensively worked by the Victoria Coal Company at the Victoria mines on the southern bank of Sydney River. The coal from this seam was largely used for domestic purposes, and is much appreciated in the various markets.

The Barrasois seam, cropping out at the surface about half-way between Lingan and Victoria mines, has been proved with a slope by the General Mining Association. As no sales of any moment have been made from this seam, the character of the coal is not known; but from appearances it will probably prove a good domestic coal. So far as the slope has gone down, the dip is very slight and does not approach in amount the dip at the Lingan or Victoria mines.

At the southern or Lingan end of this basin is the anticlinal which without doubt terminates this basin. The thickness of coal-measures proved is about 1000 feet.

No. 3. *The Glace Bay Section.*—On the other side of the Lingan basin, to the south, is basin No. 3, in which there are not less than fourteen seams, eight of which are over three feet in thickness. The depth of the coal formation is already proved to 3000 feet. In extent of area, number of seams, and quantity of coal, this is the most valuable of the several basins composing the Sydney coal-field. It yields coal of the best kind for the manufacture of gas and for domestic and steam purposes; and it possesses the largest number of collieries in actual operation, and the best railway facilities, giving access to the famous harbors of Sydney and Louisburg. Two important railways intersect it, both running within easy distance of the several coal-areas now worked, as well as of areas owned by speculators with license to work in the future. The seams already proved are, in descending order, as follows:

		Thickness. Feet.	In.
No. 1. Hub	seam, 240 feet down, ...	9	6
No. 2. Harbor	" 770 "	5	6
No. 3. Boutelier	" 1030 "	3	0
No. 4. Back Pit	" 1080 "	4	6
No. 5. Phelan	" 1190 "	8	0
No. 6. Ross or Emery	" 1330 "	4	6
No. 7. Small	" 1420 "	2	6
No. 8. Lorway	" 1830 "	4	0
No. 9. Gardiner	" 2290 "	4	9
No. 10. Gardiner (New)	" 2400 "	5	6
No. 11. Clarke's	" 2850 "	2	0
No. 12. Martin's	" 3100 "	2	0
Total thickness of coal, ...		55	9

All the above seams down to No. 6 have been proved to some extent by small workings in the cliffs, from Glace Bay Head round to Lingan Sand Bar, which clearly show their thickness and angle

of dip. Below No. 6, the several seams have been fully proved by pits, borings, and working slopes.

The upper or Hub seam has been extensively worked by the Glace Bay Mining Company. At the Roost slope and McLay pit this seam yields a very tender and friable coal, which is probably the most easily and cheaply worked coal in Cape Breton. Nevertheless, it has the reputation of being the best gas-coal in the island, while it also ranks well for domestic purposes.

The Harbor or International seam has been extensively worked by the Glace Bay Mining Company at the Harbor and Sterling pits, and by the International Mining Company at Bridgeport. At both places the coal has given great satisfaction, breaking in fine large blocks, highly esteemed for gas and domestic purposes.

The next seam now worked is the Phelan, which has been more extensively mined than any other in this section. At the old Bridgeport mine, owned by the General Mining Association of London, a considerable amount was worked over thirty years ago. At present it is largely worked at the Reserve mines, owned by the Sydney and Louisburg Coal and Railway Company of London; at Caledonia Colliery, owned by the Caledonia Mining Company; and at the Clyde or Ontario mines, owned by Messrs. Campbell of Halifax. The coal from the Phelan seam turns out well, and gives general satisfaction as a steam and domestic coal at the old Bridgeport mine. The Phelan seam is somewhat undulating, but maintains an average dip of 5°.

The next working seam in descending order is one partially worked at Schooner Pond, and there known as the Ross seam. It was also worked at the Emery mine, under the name of the Emery seam. The coal from the Emery slope gave great satisfaction, and the nature of the roof indicated a good seam for long-wall working. The Emery coal had a splendid reputation for both steam and domestic purposes.

Below the Ross or Emery seam comes the Lorway seam, four feet in thickness, of good, clean coal. This seam has only been worked to a small extent at the Lorway West pit, owned by the Sydney and Louisburg Coal and Railway Company. Unlike any other seam in this section, it shows in the coal very close and numerous cleavages. At the face of the breast it presents a firm, solid appearance, and with careful blasting makes good, large coals; but from its thin cleavage this coal is not adapted for banking during severe winters. In fact it is one of those seams that would prove

most remunerative when worked during the summer months, or the season of navigation only.

Below the Lorway, the next working seam, and the most westerly worked in this section, is the Gardiner, which has been fully proved by the sinking of the Gardiner pit by the Gardiner Coal Mining Company of Montreal.

About 130 feet below the Gardiner, another seam, 5 feet 6 inches thick, has been proved at the outcrop which, from the appearance of the coal, seems well adapted for gas purposes.

Westward of this new Gardiner seam are two small seams, called Clarke's and Martin's, containing very fine coal, but not of sufficient thickness to work profitably in competition with the larger seams. So far as is known, these seams define the western limit of the Glace Bay basin.

No. 4. *The Block House Section.*—Basin No. 4 is separated from No. 3 by an anticlinal, running nearly east and west, and forming the range of hills between Cow Bay and Schooner Pond, over which the road from Schooner Pond to Cow Bay is made through a formidable accumulation of conglomerate boulders. Most of the seams being cut off by the waters of Cow Bay harbor, this basin is limited in extent; nevertheless, it contains coal-seams of a very valuable character. It may be said to be the only basin in the Sydney coal-field that has been thoroughly proved. In the Block House seam, slopes have been driven from the southern outcrop down to the lowest level of the basin and out again (at a greater angle) on the northern outcrop near the anticlinal, and again at a point proving the extent of the basin to the westward of Cow Bay. The coal-measures thus developed in this basin are about 1300 feet, containing seven seams of coal, five of which are more than three feet thick, the highest and most valuable—the Block House seam—being nine feet thick. But unfortunately, in point of surface-area, this is the most limited of the four basins. It is almost entirely covered by the area of the Block House Mining Company.

Geologists have endeavored to identify this basin with that of Glace Bay, but the intervening anticlinal, the positive proof given in the workings of the Block House seam, and the great disparity in the number of working seams in the two basins, practically discourage such an attempt. On the eastern side of Cow Bay Harbor there is a continuation of the seams running through the point of land between Cow Bay and Mira Bay. At False Bay Beach, the most southern point of Cow Bay, is found the Tracey seam. Up to

this time this seam has not been found at any other place in the Sydney coal-field, and in all probability it curves round to the north in conformity to seams in the Block House basin, and is broken off by the anticlinal. On account of its isolated position this seam has not been included in this paper among the seams in the Block House or Cow Bay Basin.

The first seam in descending order is the Block House, which has been worked very extensively by the Block House Mining Company of New York. This seam, like most seams yielding gas coals, is in some parts very friable, but on the whole, it yields coal of an average good appearance, which for some years has been in great demand in New York and Boston as a gas-coal. One strange and singular peculiarity in this seam is, that in many parts of the workings it is found for a distance of ten or twelve yards, thickly mixed with lumps of fire clay. In all cases where this disturbance occurs, the angle of the dip remains the same. The workings in this seam have proved conclusively the basin formation of the district.

The only other seam working in this basin is the McAuley seam; it has been extensively worked by Messrs. Archibald & Co. at the Gowrie Colliery, has been found to be a good domestic coal, and is in good demand in the various provincial markets.

None of the other seams in this section have been proved by working, but their existence, depth, and angle of dip, have all been undoubtedly proved by trial-pits near the several crops.

From the foregoing brief description of the Sydney coal-field, it will be seen that the small island of Cape Breton is destined at some future day to take an important position among the coal-producing countries of the world.

In order to show how capitalists are taking advantage of its mineral wealth, I add a short account of the present working collieries.

The Sydney Mines.—These collieries, the pioneers of our Cape Breton coal-trade, are located on the northern side of the Sydney or Spanish River, about one mile inland from Cranberry Head, the northern entrance of the river. This establishment is probably more like an English colliery than any other of the Cape Breton mines. It is owned by the General Mining Association of London, a wealthy English corporation; and the equipments of the colliery are purely English. A stranger arriving at Sydney Bar from England, after a long sea-voyage, and seeing the old-fashioned

wagons on the wharves, would fancy he was near one of the Newcastle collieries. The mining areas of the Association at the Sydney mines comprise sixteen square miles of land-area, and seven square miles of submarine area. Several shafts have been sunk on this property to prove it satisfactorily. The present working establishments consist of what is known as the New Winning, being a pair of shafts about 680 feet deep, to the main seam. The present plant is equal to an output far exceeding any quantity that has been called for up to this time. This colliery is connected with one of the best shipping-places in Cape Breton by a line of railway three miles long, leading from the colliery to North Sydney, on Sydney River, where extensive wharves are erected for the delivery of coal to vessels of large draught. The highest annual shipments from these mines have never exceeded 140,000 tons. The mechanical plant in actual operation for raising and shipping coal, is a pair of English hoisting-engines and one powerful English pumping-engine, besides five English locomotives and a number of other smaller engines for various purposes.

The Victoria Mines.—This colliery, owned by the Lingan and Low Point Coal Company, is located on the southern bank of Sydney River, about two miles from Low Point lighthouse, and was established for working submarine areas underlying the entrance of Sydney River. With the exception of that portion of the underground work comprising a pair of slopes passing through the General Mining Association's coal, all the works in this colliery will be under water. The seam has about six feet of clean coal, dipping at an angle of from 40 to 45 degrees. The colliery is connected by four miles of railway with a shipping-place owned by the Company, at South Bar, on Sydney River (opposite North Bar), where wharves are erected in a sheltered position with a good draught of water. The working is by a slope driven at the full dip of the seam, and coal is raised by a pair of 16-inch cylinder (colonial) engines. The water from the mines is forced by Cameron steam-pumps up a separate pumping-slope; for working the railway, one of Neilson's (Glasgow) tank-locomotives is employed. The annual output, so far, has not been large, but it is capable of considerable extension; and with the substantial improvements already made, and the New Winning (further eastward) opened by the present new company, it is destined to become one of our first-class collieries, and assume an important position in the Cape Breton coal-trade of the future.

The Lingan Mines.—These mines, five miles further south, are

owned by the General Mining Association of London, and located on the Lingan main seam, in basin No. 2. For thickness of seam, quality of coal, and facility for shipping, this colliery will compare favorably with any others in Cape Breton. A snug little harbor, with about 14 feet draught of water, where coal can be shipped in all kinds of weather, lies about one mile from the slope. The coal is raised from these mines by a slope extending from the outcrop to the full dip of the seam, more than half a mile down under the sea. This colliery is well laid out and capable of doing a large amount of work, if required. Of late years the output has not been large. Wharves are laid out, capable of shipping 800 tons per day, and, if required, the channel into the harbor could be deepened to admit larger vessels. The machinery consists of one powerful double engine for hauling coals and pumping water; and one of Black, Hawthorn & Co.'s locomotives for hauling coal to the wharf. The extent of coal-area at Lingan mines is about sixteen square miles land-area, and eight square miles under the sea.

The International Mines.—These are reached from the foregoing by following the shore line and crossing over Lingan Bay. They are owned by the International Coal and Railroad Company of Montreal. In extent of coal-area, these mines are the next largest to those of the General Mining Association of London. They contain four square miles underlain by nearly all the seams in the Glace Bay, or No. 3 basin, many of them, of course, at great depths. The seam at present worked by a shaft 80 feet in depth, is called the Harbor seam of Glace Bay, and is six feet thick. The mines are connected by 12 miles of railway with a splendid shipping-place on the east side of the southern branch of Sydney River, where an extensive pier, 1000 feet long, has been erected for delivering coal to the largest class of vessels, drawing from 16 up to 30 feet of water. The output of these mines has fallen off, on account of the present almost prohibitory duty on coal entering the United States; their highest annual sales have been about 82,000 tons. The machinery comprises one pair of 16-inch engines for hoisting coal, two Cameron steam-pumps for raising water, three capital English locomotives, and the usual number of coal-cars.

The Glace Bay Mines.—These are about three miles southeast from the International, and are owned by the Glace Bay Mining Company of Halifax. This is one of the first mining properties opened after the abandonment by the General Mining Association of London of its exclusive mining rights in Nova Scotia. As one of

the first parties taking up areas at that time, this company seems to have been short-sighted in taking so small an area. Its mining rights cover two and a half square miles, underlain by all the seams of the Glace Bay basin, the greatest number of them lying at great depths. The property has been fully developed in the two upper seams, viz., the Hub and the Harbor, to both of which pits have been sunk and extensively worked. The product of both seams has an excellent reputation as a gas-coal, and is largely consumed in the Dominion markets. The Hub seam is one of the highest in the Sydney coal-field, and probably the easiest coal to work. The Glace Bay Company own the whole of the coal in this seam, which is of limited extent; and their present pit and openings are sufficient to work all the coal. The product of this seam is brought to the shipping place by a short line of railway. The Harbor seam is worked by a shaft 300 feet deep. The coal is shipped direct from the tubs coming out of the pit. This Company has great facilities for shipping coal, as it owns the entire rights and privileges of Little Glace Bay harbor, and commands sufficient depth of water to load vessels down to 18 feet draught. Like Lingan and Cow Bay, this harbor is useful for shipping coals later in the season than is practicable at wharves situated on the upper part of Sydney River; but owing to their being on the seaboard, they are all, on the other hand, somewhat more exposed.

The machinery at these mines is all of American manufacture, and much lighter than English mining-machinery. The railway is operated by a small tank-locomotive, made by Neilson of Glasgow.

Caledonia Colliery.—This is likewise located on Glace Bay, about one mile from Little Glace Bay harbor. It is owned by the Caledonia Coal and Railway Company of Boston, and comprises two square miles of mining-area, underlain by all the seams in Glace Bay basin, below the Harbor seam. Two pits are sunk to the Phelan seam, which is the only coal mined by this Company. The machinery is first-class, the hoisting engine being of American make and very powerful. The colliery is connected by a railway with the shipping-place, on the south side of Glace Bay harbor. The railway is operated with a small locomotive built by Neilson of Glasgow.

The Clyde Mines.—These mines, situated on the south side of Caledonia Harbor, about one mile along the shore, and sometimes called the Ontario Colliery, are owned by the Messrs. Campbell of Halifax, and comprise a splendid property of one and a half square miles. So far, very little work has been done here; the seam has

been opened by a slope to its full dip. The coal worked here is the same as at the Caledonia, being the Phelan seam of 8 feet 6 inches thickness. On account of the small quantity mined, the product of this colliery has not gone much beyond the Halifax market, where it has the reputation of being a good domestic coal. No plant of any consequence has been erected here, there being only a small American hoisting-engine for drawing coals up the slope. The tubs are hauled about a mile to Caledonia Harbor, and discharged directly to vessels, the coal worked during the shipping season being riddled and cleaned in the pit. In proportion to the extent of mining-area, this is probably as fine a property as any in the Sydney coal-field.

Schooner Pond Colliery.—This colliery, about two miles further south along the shore, is owned by the Sydney and Louisburg Coal and Railway Company of London, and has a mining-area of two square miles, the principal portion of which is a submarine area, extending from the shore (outside of the Clyde area), some distance under the waters of the Atlantic. Very little has been done here beyond driving a pair of slopes through the coal in the Clyde area, to reach the coals under the sea, owned by the Schooner Pond Company; and, owing to the slight covering of strata, no work of an extensive character has yet been done. The Ross seam, or, as it is now called, the Emery seam, is proved at these mines. The coal is much thicker than in some places at the Emery, but of about the same quality. An excellent 3-feet-gauge railway, 18 miles long, connects this mine with the shipping-port on Sydney River; and its limited product has been shipped there. A portion of Schooner Pond area lies to the northeast (under the sea), and another portion lies to the southwest (under the land) of the Clyde area, and this case seems to be one of those in which an amalgamation of two properties would be immensely beneficial to the owners of both, especially as both could be worked with one plant.

The Block House Mines.—These mines, lying beyond the anticlinal from the foregoing, form one of the most extensive of the new collieries. They are owned by the Block House Mining Company of New York, and have a mining-area of two square miles. The seam worked here is the upper seam in No. 4, or Block House basin, and is called the Block House seam. It is not in any other area. The coal is 9 feet thick, and has a reputation as a first-class gas coal. From causes before named, the sales of this colliery have fallen off considerably during the last few years, although an exten-

sive plant has been erected for doing a large work. This area contains also all the other seams of the Block House basin. The Block House coal is worked by both a pit and a pair of slopes. In winter, when the coal is banked, it is all worked by the pit. During the shipping season all the coal is worked by the slope, coming out at the outcrop of the coal in the cliffs. The tubs going direct to the wharf are discharged into the vessels, the coal having been previously riddled and cleaned in the mine. This colliery enjoys a great advantage in having no surface-hauling, vessels being able to moor close alongside the mouth of the slope. But the progress of these works is greatly retarded by the present uncertain character of the shipping-place. When the wind is blowing from certain quarters, no coal can be shipped, owing to a heavy swell coming in from the sea; and gales often cause serious damage to the wharf and shipping property.

The Gowrie Mines.—These mines, situated about a mile west of Block House, are owned by the Messrs. Archibald & Co., of North Sydney. This mine works what is termed the McAulay seam in the Block House basin. It is 4 feet 10 inches in thickness. The extent of mining-area held by this Company is two square miles, underlain by all the seams below and including the McAulay.

The coal from this seam works small and makes a considerable amount of slack, but, owing to no blasting powder being used, the coal stands the severe Cape Breton winters. From trials in the American gas-works, this coal has a fair reputation for making gas, but it is principally used as a domestic and steam-coal. A new industry has been started at the Gowrie colliery, in the making of Yeadon's patent fuel from the slack coal. Machinery has been imported from England, and very good-looking bricks of patent fuel are produced. It is hoped that a remunerative business will be done.

The McAulay seam at this colliery is worked by a shaft over 200 feet deep, with an English hoisting-engine. The pit is connected with the shipping-place by about a mile of railway, worked part of the distance by a self-acting incline. The shipping-place here is much safer than at Block House, being inside a strong breakwater, first erected by the enterprising proprietors for the protection of the coal-wharf, but since purchased by the Dominion Government as a general shelter for vessels in Cow Bay. Even with this protection, heavy gales cause great destruction in some seasons.

The Reserve Colliery.—Taking a stretch across the country inland,

and again crossing the anticlinal in a northern direction to a distance of about 8 miles, we reach the collieries of the Sydney and Louisburg Coal and Railway Company of London, the first of which is the Reserve colliery, so called from the fact that this area was set apart by the Provincial Government as a mining reservation, to encourage the building of a railway from Sydney for the conveyance of coal. The mining-area is one square mile, and contains all the seams in the Glace Bay basin below Back Pit, or No. 4 seam. This colliery is working the Phelan seam by a pair of diverging slopes, hauling coal out of each. It is well laid out underground for doing a large amount of work, the plant and machinery being of the best and most substantial character. The coal from this seam has been sent to various markets, has been found suitable for gas, and enjoys an excellent reputation for domestic and steam purposes. The slack coal makes a superior coke.

The Emery Colliery.—This area, situated about one mile to westward, is also owned by the Sydney and Louisburg Coal and Railway Company. It is proved by workings in the old Emery slope. The Emery seam is about 5 feet thick, and has a loose roof, indicating its suitableness for long-wall working. In the short time the works have been in operation, the coal has gained a first-class reputation for steam purposes; and there is no doubt of its being useful for gas and domestic purposes. The extent of mining-area is two square miles; the mechanical arrangements are of the same style and character as those at the Reserve colliery. The further proposed working of this area is by a slope drift from Reserve seam, cutting the Emery seam at the extreme dip of Emery area. Adjoining this area is the Lorway mining area of two square miles, also owned by the Sydney and Louisburg Coal and Railway Company. One pit has been sunk to a depth of about 70 feet, but nothing has been done in working. All the mines in operation owned by the Sydney and Louisburg Coal and Railway Company are connected with their shipping-place on Sydney River by a private railway of three feet gauge, about twelve miles long. The railway is worked by three English locomotives (two of them are Fairlie twin engines) and the requisite number of coal-cars for doing a large business. A branch railway connects the several collieries with the magnificent harbor of Louisburg. The length of this branch is about twenty-two miles. The shipping-wharves at Sydney and Louisburg, owned by this company, are of the most substantial character and capable of accommodating vessels of great draught.

Gardiner Colliery.—This colliery, situated two miles north of Lorway on the shores of the Lingan basin, is owned by the Gardiner Coal Mining Company of Montreal. The mining-area is two square miles, and is underlain by the present working Gardiner seam and another good seam 5 feet 6 inches in thickness, besides the smaller seams known as Clarke's and Martin's seams in Glace Bay, or No. 3 basin. This colliery is the only one having a pit sunk to the extreme dip of the area and having all the coal to work to the rise. No work has been done at this mine for some years. The pit is about 160 feet deep. The machinery is of substantial character, the hoisting-engine having been made by the Messrs. Coupe, of Wigan. The pit is drained by two Cameron steam-pumps, which give great satisfaction. This pit, although not deep, made an immense quantity of water during sinking, and was the first pit sunk on Cape Breton with steam-pumps. The seam worked is about 4 feet 9 inches in thickness, and is a very good steam-coal. The works underground are well laid out, and in case of increased demand could raise a large quantity of coal.

From the foregoing description of the collieries, it will be seen what efforts have been made to utilize these vast stores of coal. It must be borne in mind that previous to 1858 all the minerals (with few exceptions) were owned by a wealthy London corporation, which in that year abandoned nearly all its claims, retaining only those in which it had collieries established, and thus threw into the hands of the Provincial Government an immense area of mining-property. The Government, in order to properly regulate and manage this interest, had to wait for the requisite legislation. Up to the year 1862 the time was spent in prospecting and forming companies for working new properties. After that year the new companies may be said to have got fairly into operation. The following table will show the progress made up to the end of 1884.

From the table, it will be seen that the Cape Breton coal-trade began to expand after the abandonment of the monopoly by the General Mining Association. From 1861 to and including 1865, the production of coal was considerably increased by the demand for provincial coals in the United States markets, consequent on the war; during which time very little coal was carried in United States vessels, owing to the fear of capture by Southern cruisers. Provincial ship-owners as well as coal-owners reaped a good harvest during the war. But this good fortune was not destined to last long. The enormous demands of the United States treasury during

Name of Colliery.		1858	1859	1860	1861	1862	1863	1864	1865	1866	1867	1868	1869	1870
		Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Mining Assn. vious to 1858..	1,819,899													
ey Mines.....	.....	100,872	109,730	117,616	100,458	111,681	104,373	88,850	108,579	109,168	101,818	97,470	95,733	108,951
ria Mines.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	287	2,526	4,905	7,288
n	.....	40,042	9,299	16,298	35,300	34,203	36,059	44,372	55,108	50,686	37,150	20,736	30,377	25,744
national.....	.....	696	1,358	1,937	1,480	2,548	4,198	6,719	16,374	10,720	20,807	5,769	7,510	10,640
Bay.....	.....	469	2,373	2,297	5,544	7,730	26,724	72,077	82,247	57,905	52,026	49,719	29,615	55,783
onia.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10	32	9,827	22,781	27,886
or Ontario...	.....	.....	.....	.....	.....	30	508	4,669	8,762	5,955	253	815	2,279	2,125
ner Pond.....	.....	.....	.....	.....	.....	370	1,360	6,337	973	37	.....	.....	53	.....
House.....	.....	.....	.....	3,736	7,622	16,934	15,690	70,650	91,600	89,914	71,226	36,965	73,933	40,006
ie.....	.....	.....	.....	.....	.....	2,876	15,070	28,738	43,770	33,324	38,618	47,003	49,609	52,877
ve.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ay.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
y	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ner.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ry.....	.....	.....	450	1,502	3,818	8,119	6,907	5,966	6,791	1,633	1,220	2,417	437	40
s.....	1,819,899	142,079	123,215	143,404	154,222	184,563	207,889	328,108	414,204	359,352	323,437	273,283	317,232	311,340

Name of Colliery.	1871	1872	1873	1874	1875	1876	1877	1878	1879	1880	1881	1882	1883	1884
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
ley Mines.....	105,494	102,690	127,399	96,958	92,829	70,636	88,087	106,366	108,259	115,307	133,135	133,623	131,673	131,393
oria Mines.....	17,452	19,422	12,899	15,310	14,790	13,122	10,088	10,547	.....	.....	.....	.....	154	10,408
an.....	21,940	38,504	36,720	19,697	25,673	16,533	19,130	11,527	10,220	27,897	32,376	64	12,918	20,871
rnational.....	80,261	20,498	75,380	36,395	41,961	25,324	24,851	14,348	21,523	58,897	76,285	102,927	96,997	80,798
e Bay.....	39,515	30,715	68,199	46,535	25,797	28,962	35,376	20,429	23,279	26,400	31,611	69,049	72,677	32,753
donia.....	25,655	44,186	75,202	39,338	12,734	31,568	23,248	19,072	13,384	22,120	42,933	59,296	51,557	65,440
e or Ontario.....	1,830	2,600	8,394	7,070	5,426	11,288	12,389	18,831	14,322	7,852	13,410	23,366	19,522	5,715
oner Pond.....	.....	1,268	13,901	1,523	1,638	2,719	1,665	7,347	.....	.....	.....	.....	.....	.....
k House.....	3,768	42,748	52,571	28,897	22,154	33,220	57,577	56,759	23,519	44,517	56,849	57,437	57,791	19,585
rie.....	42,431	46,704	29,625	32,857	31,134	26,260	24,851	30,956	31,242	46,204	61,369	65,364	70,548	82,340
rve.....	.....	27,802	63,929	28,769	11,752	876	116	7,347	17,269	31,614	68,884	74,432	104,777	86,550
way.....	.....	1,478	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ry.....	.....	.....	28,540	22,137	6,425	655	131	.....	.....	.....	.....	.....	.....	.....
liner.....	.....	.....	9,169	20,196	11,380	.....	.....	.....	.....	.....	.....	.....	.....	.....
lry.....	.....	.....	.....	67	4,047	5,241	1,851	1,181	4,151	4,215	45	125	.....	76
ls.....	338,346	378,615	631,832	395,739	307,750	266,401	299,360	304,713	267,178	385,066	516,897	585,683	618,104	535,929

COMPARATIVE TABULAR STATEMENT OF THE ANALYSIS AND ECONOMIC VALUE OF THE COAL SEAMS IN THE SYDNEY COAL FIELD, CAPE BRETON COUNTY, NOVA SCOTIA.

Name of Seam.	Name of Mine when Worked.	Thickness of Seam.		Volatile Matter.	Fixed Carbon.	Ash.	Sulphur.	Cubic feet of Gas per Ton.	Cal. value in lbs. work per lb. Coal.	Authority for Analysis.	Course and Angle of Dip.
		Ft.	In.								
Sydney Mine.....	Sydney Mines,	6	0	32.74	61.54	5.72	3.37	8,200	8.49	How & Buist,	N. 60° E. Angle 6°
Davy's Head.....	Victoria Mines,	6	6	38.70	58.40	2.90	.....	8,000	8.02	Dawson,	N. 3° W. Angle 40°
Lingan Mine.....	Lingan Mines,	8	6	30.03	66.90	3.07	.77	9,600	9.07	How & Buist,	N. 37° E. Angle 12°
Harbor Seam.....	International Mines	5	6	34.09	62.92	2.99	2.26	10,000	7.76	N. Y. Gas Co.,	N. 84° E. Angle 5°
Harbor Seam.....	Glace Bay Mines,	5	0	30.21	67.78	2.01	.90	10,000	9.31	Harrington,	N. 27° E. Angle 5°
Hub Seam.....	Glace Bay Mines,	9	6	28.62	68.14	3.24	2.29	10,000	8.59	Harrington,	N. 50° E. Angle 5°
Phelan Seam.....	Caledonia Mines,	8	0	33.00	57.37	9.63	.....	9,700	7.88	H. Poole,	N. 27° E. Angle 5°
Phelan Seam.....	Reserve Mines,	6	0	37.26	58.39	4.35	2.06	9,500	8.02	Harrington,	N. 58° E. Angle 5°
Phelan Seam.....	Clyde Mines,	8	0	32.82	64.33	2.85	2.17	9,700	7.88	Harrington,	N. 21° E. Angle 5°
Ross or Emery.....	Schooner Pd. Mines	7	0	38.10	58.46	3.44	1.21	9,500	8.03	Harrington,	N. 23° E. Angle 8°
Ross or Emery.....	Emery Mines,	5	0	38.10	58.46	3.44	1.21	9,500	8.03	Harrington,	.....
Gardiner	Gardiner Mines,	4	9	34.33	61.97	3.70	.....	10,700	8.51	Dawson & others,	N. 85° E. Angle 5°
Lorway Seam	Lorway W. Pit,	4	0	34.84	55.98	13.28	6.27	9,500	8.02	Harrington,	N. 51° E. Angle 5°
Block House.....	Block House Mines	9	0	31.94	62.79	5.27	3.76	10,500	7.67	Harrington,	N. 26° E. Angle 6°
McAulay.....	Gowrie Mines,	4	10	36.25	58.05	5.70	2.34	9,000	7.97	Richard & Buist,	N. 18° E. Angle 7°
	Average,	..	...	34.07	61.45	4.77	2.39	9,560	8.21	.....	.....

the war compelled that government, in 1866, to put a duty of $1.25 per ton on provincial and other coals, and consequently a decrease of shipments is shown from 1865 up to and including 1868. Circumstances having arisen to warrant the United States Government in making, in 1868, a reduction of 50 cents per ton on the duty, the shipments again began to show an improvement; and in 1873 they more than doubled those of 1869. But this increase was assisted by the high price of coal in England, which enabled steamers to buy bunker-coal at a much cheaper rate in Cape Breton. There was also greater demand for Cape Breton coal up the St. Lawrence, from the fact that sailing vessels did not bring so much coal out for ballast as was done in former years. As will be seen from the table this was only a temporary increase; for in 1874 the product of coal was reduced over 230,000 tons, the falling off in the shipments to the United States being 135,599 tons. This was caused, to a certain extent, by the over-stocked markets of 1873, and the sudden financial panic in the fall of that year, which unsettled the commercial machinery on the whole of the Atlantic seaboard.

Much as Cape Breton coal-owners may deplore the loss of trade in the United States in 1874, it is very gratifying to find the demand for coal so much increased in the neighboring provinces as to bring the production nearly up to that of 1865, the year in which over half the product of the Cape Breton mines was shipped to the United States. This shows that in the last nine years there has been a steady annual increase of demand in the provinces for Cape Breton coal. The foregoing tabular statement is intended to show the economic value of the several seams in the Sydney coal-field.

In the foregoing tabular statement the results are obtained from laboratory analyses, except those as to the production of gas, which are given from the reports of the various companies, which have tried the coals for gas purposes. The following figures show that the bituminous coals of this coal-field compare very favorably with coals from other localities:

	Vol. Matter.	Carbon.	Ash.
Pennsylvania, United States,	29.50	64.40	6.10
Virginia, "	33.68	57.76	8.56
Indiana, "	39.00	52.00	9.00
Illinois, "	36.59	59.47	3 94
Iowa, "	44.00	48.50	7.50
Missouri, "	34.06	50.81	15.13
Newcastle, England,	37.60	57.00	5.40
Staffordshire, "	37.86	59.64	2.50
Derbyshire, "	35.10	61.65	3.25

	Vol. Matter.	Carbon.	Ash.
Yorkshire, England, ...	35.67	62 08	2.25
North Wales, ...	36.56	57.49	6.25
Picton, Nova Scotia, ...	29.63	56.98	13.39
Sydney, Cape Breton, ...	34.07	61.43	4.50

For gas-purposes the Cape Breton coals have given general satisfaction in the United States for a number of years; but owing to import duties are not much in demand in that market.

The season for shipping usually ends in the latter part of December, after which the harbors are closed by ice until the beginning of May, so that consumers using this coal are under the necessity of laying in large stocks to serve over winter, and producers have to bank coal during the winter months at the mines in order to keep the men employed, and to be ready for quick shipments. On both sides there is considerable loss, from depreciation, and in the expense of lifting coal from the bank. Before closing these notes, it may not be out of place to make a few remarks on the system of working and the prices for cutting coal, etc., in this coal-field. As has been shown, all the seams worked crop out at the surface. The existence of full sections of coal-seams in the cliffs enables prospectors to fix on the locality of the crop, and commence operations by driving down a slope on the full dip of the seam. The system of working the coal is principally the bord-and-pillar, or, as it is called here, the "room-and-rib." Rooms are usually driven from 15 to 18 feet wide, with a rib of the same width between, and 66 feet between the cross-cuts. The system of paying for coal-hewing or coal-cutting, as it is called, varies at nearly every colliery; some pay by the ton on all coal not passing through a half-inch riddle (slack being left in the pits); others pay by cubic yard; some by running yard; and others again by the tub. But, in all cases, the holings and shearings are passed over a half-inch riddle, and the slack is left in the pit.

The amount of slack taken out from screening over a half-inch screen is, on an average, about 20 per cent. Taking a six-feet seam as a basis, the cost per ton for cutting (with coal riddled in pit as above) is about 40 cents.