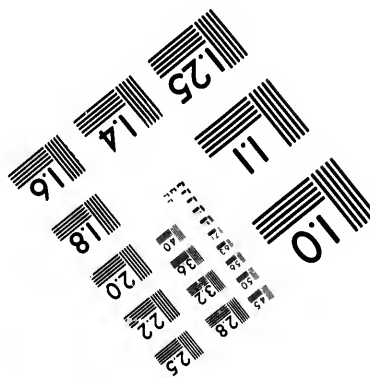
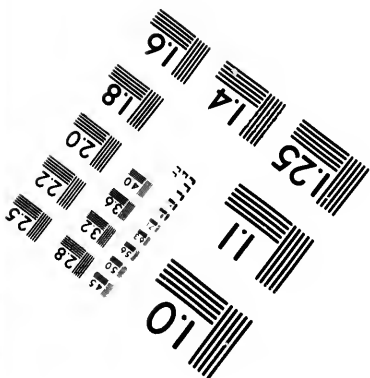
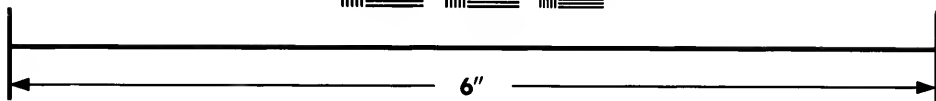
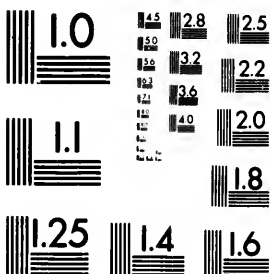


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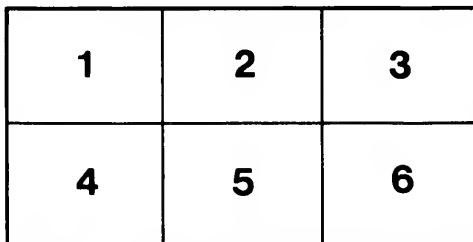
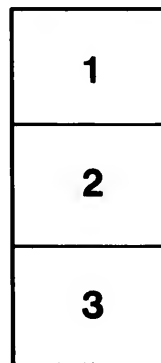
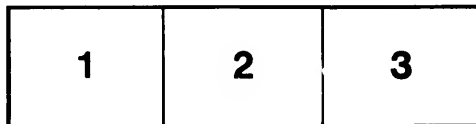
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MINERALS

OF

NOVA SCOTIA.

BY

EDWIN GILPIN, A.M., LL.D., FGS.,

MEMBER ROYAL SOCIETY OF CANADA, ETC., ETC.,

INSPECTOR OF MINES.



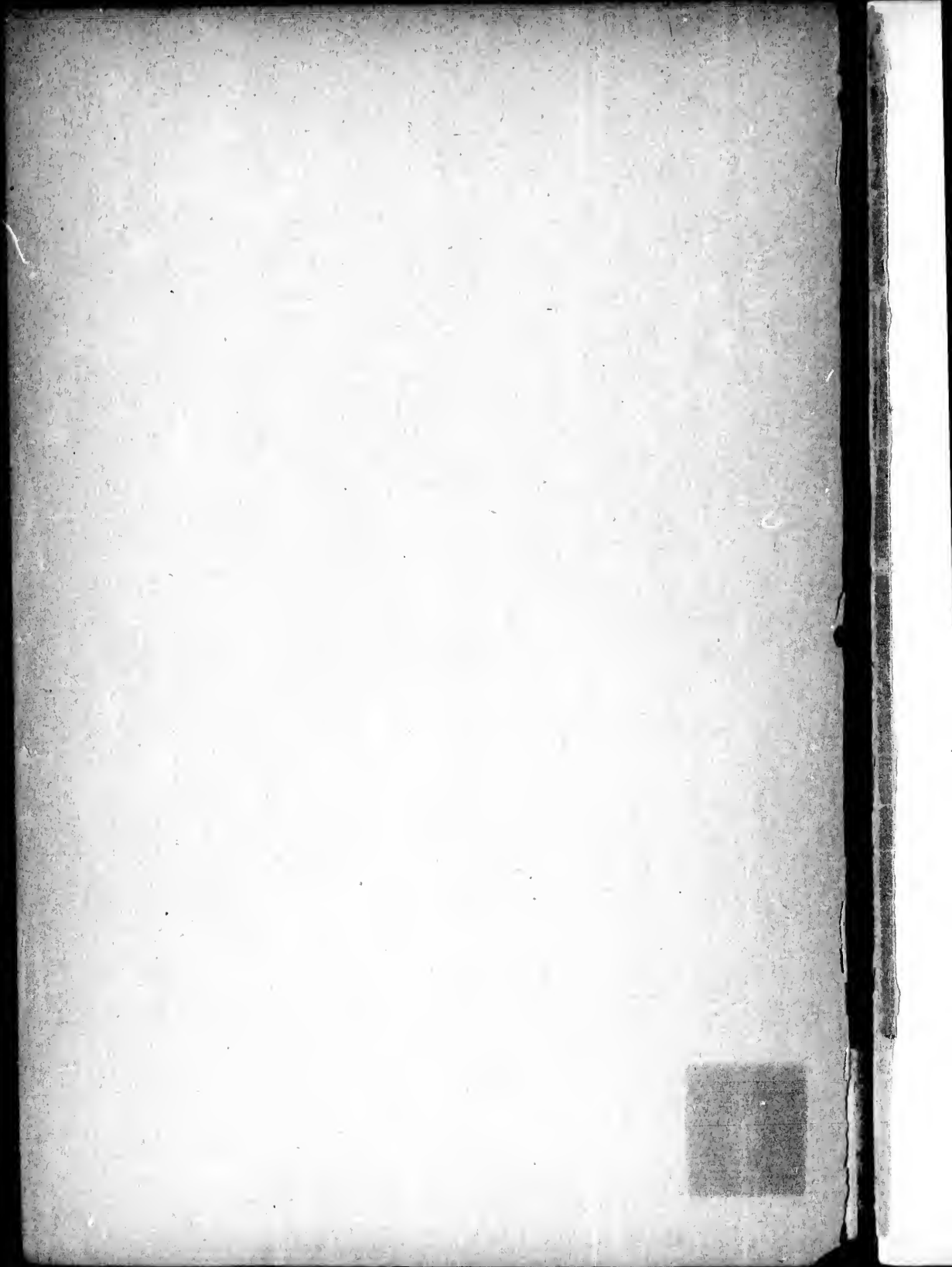
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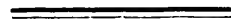
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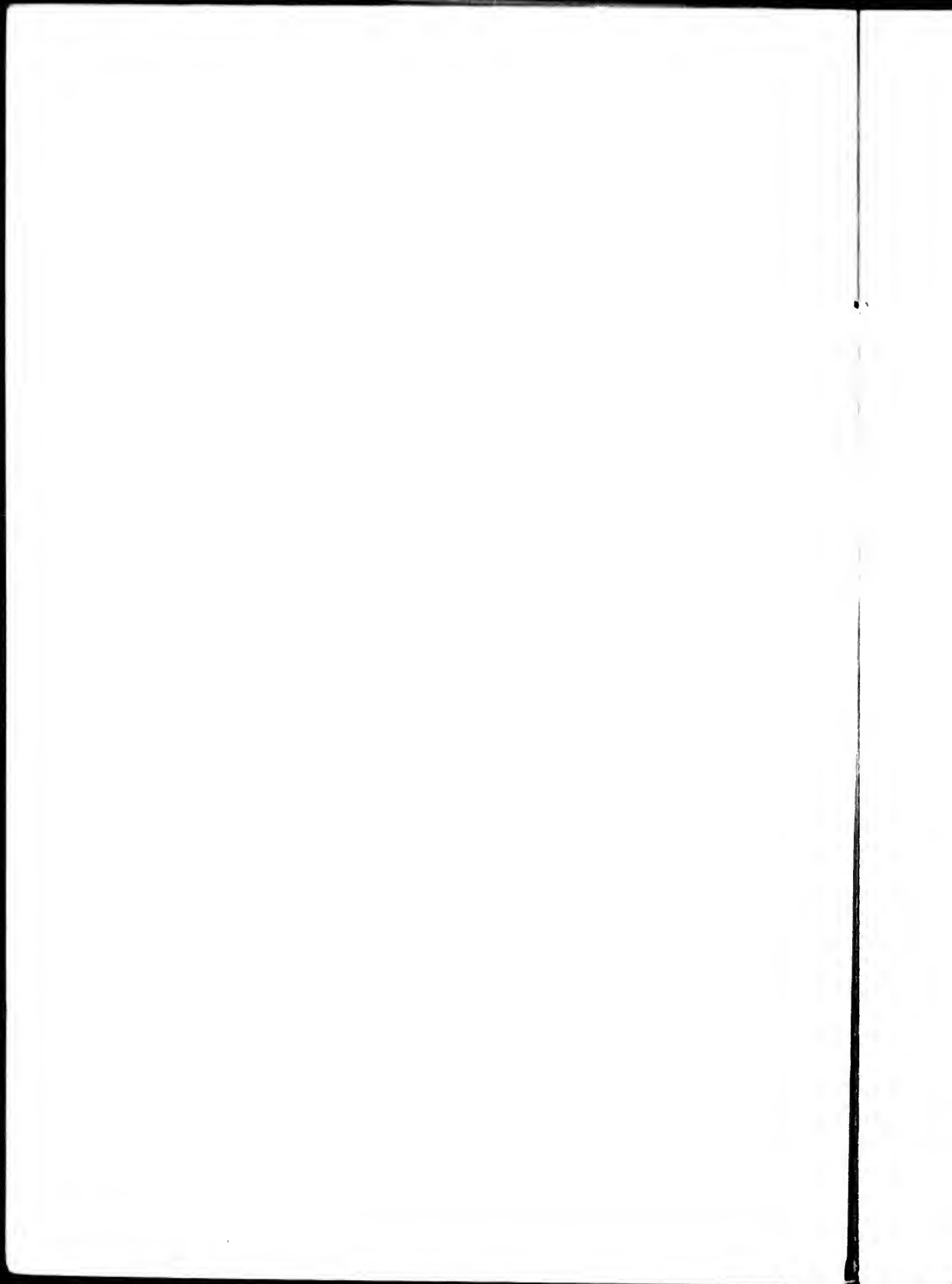
Halifax, March 1st, 1893.

The following notes have been prepared to accompany the collection of Nova Scotia minerals prepared for the World's Columbian Exposition at Chicago.

Further information can be obtained on application to the Department of Mines, Halifax, Nova Scotia.

E. GILPIN,

*Inspector of Mines.*



## THE MINERALS OF NOVA SCOTIA.

The following description of the mineral resources of Nova Scotia is not intended to give more than a brief outline, sufficient to show their extent, position, and variety.

This Province, forming the most easterly extension of the American Continent, south of the St. Lawrence, may for practical purposes be considered the point of America approaching nearest to Europe. It stands like a pier projecting into the Atlantic, and from its position seems marked to play an important part in the future of the Continent.

Were it even a barren and inhospitable land, its position would make it important as the future gateway of travel between Europe and the future centre of the Continent. When in addition to its position it is displayed as bordering on the richest fisheries in the world ; as possessing an equable climate favourable to human longevity, and admitting of the most successful culture of the fruits, etc., of the temperate zone ; and as abounding in coal and ores of iron, gold, and many other minerals ; it may confidently challenge comparison with the most favored of its neighbouring provinces and states.

The minerals which have hitherto received most attention are coal, iron, gold, and gypsum ; but manganese, antimony, copper, barytes, lead, clays, building stones, grindstones, etc., are important, although hitherto but partially developed, sources of wealth.

### COAL FIELDS.

The first to be noticed is the Sydney coal field on the East shore of Cape Breton. Its area of available coal is estimated at over 300 square miles. It contains twelve seams from 3 to 12 feet in thickness. The coals are highly bituminous and adapted for coke and gas making. It is classified for steam purposes as superior to Newcastle and nearly equal to the best Welsh steam coal. Some of the beds enjoy a special reputation for domestic coals.

The following analysis will show the general character of these seams:

Moisture.....	1 260
Volatile Combustible matter.....	35 514
Fixed Carbon.....	59 411
Ash.....	4 115
Sulphur.....	1 000

Coal is also found at Loch Lomond, River Inhabitants, Port Hood, Mabou, and other points in Cape Breton, but as yet little attention has been paid to it.

The Pictou Coal field covers an area of about 35 square miles, and is noted for the unusual development of some of its beds. There are sixteen seams known, from 3 to 34 feet in thickness. The coal is not as bituminous as that from the Sydney Coal field, but is still a coking coal, except in the case of a few seams. The coal from this district is used at the iron furnaces at Londonderry and Ferrona, and has a good reputation for steam purposes.

The Cumberland Coal field has not yet been explored over all its area, which is estimated at 300 square miles.

Operations have been hitherto practically confined to Springhill and Joggins. At the former place there are seven seams, from three to twelve feet in thickness, three of which are extensively worked. The coal is similar in character to that from the Pictou district, and is largely used on the Grand Trunk, Canadian Pacific, and other railways.

Coal is known in Colchester, Hants, and Antigonish counties, but no attention has yet been paid to it.

The foregoing remarks show that there is a large supply of coal available in the Province, and that the different qualities are suited for almost every domestic and industrial use.

The annual production is steadily increasing, and is now in round numbers about two millions of tons per annum. The output is consumed locally, and in the neighboring provinces; and a large proportion is sold in Quebec and the city of Montreal. Were facilities available for cheaper transportation into the Lakes immense amounts of these coals could be sold west of Montreal, and were the duty levied on coal by the United States removed, large markets could be secured in the New England States. These deposits, situated on tide water, varied in quality, and of inexhaustible extent, are but waiting an opportunity for a fourfold development.

The Cape Breton coals are known as yielding from 9,000 to 11,000 feet of gas per ton, of from 15 to 17 candle power; as coking coals to give from 55 to 62 per cent. of excellent furnace coke, comparing favourably with the typical Conelsville coke.

Important as the foregoing qualifications of the Nova Scotia coals are for many purposes, it is however in connection with iron smelting that their future development promises to be most important locally.

The iron ores of this Province so far as they have been developed and tested promise to be unusually large and varied. At present there are only four furnaces in operation, two of which in Pictou County have been but a few months in operation and have already passed the experimental stage. The Londonderry furnaces have been running for a number of years, and yield an excellent product from a mixture of limonite and hematite.

In the western portion of the province, there are important deposits of red hematites and magnetites at Tor Brook, Clementsport, and Nictaux. The Torbrook mine in this district furnishes annually about 30,000 tons for the Londonderry furnaces.

On the opposite side of the Bay of Fundy, the Cobequid Mountains contain important bodies of limonite and carbonate ores, which have been worked for many years at Londonderry. The Cobequids continue to the eastward into Pictou County, and here the deposits consist of limonite and specular ores. In addition, the Clinton Shales contain numerous beds of red hematite, some of which are fifty feet in thickness. There are also important deposits of limonite and spathic ores in lower carboniferous strata. The iron contents of these ores run from 35 to nearly 70 per cent., some of the ores ranking as good Bessemer, while all are good furnace ores. In this county the ores are in close proximity to coal and fluxes, and every railway facility exists.

The continuation of this ferriferous range reaches the Gulf of St. Lawrence at Arisaig. This locality has hitherto received little attention, but several beds of red hematites of good quality are known. These ores being close to shipping will probably be utilised for furnaces in Pictou and Cape Breton Counties.

In Guysboro several large deposits of specular ore have received a limited attention, and similar deposits occur in Richmond County.

Upper Stewiacke, Grand Lake, Goshen, Selma, Pugwash, Brookfield, may be mentioned as points where important deposits are indicated.

In Cape Breton the presence of numerous deposits has been known for some time, but no mining or development work of any extent has been done. At Whyhogomah, in Laurentian strata, are red hematite deposits, probably containing large amounts of ore. Promising deposits are known at East Bay and George's River. Loch Lomond, Big Pond, Smith's Brook, Lake Ainslie, Lewis Mountain, may be mentioned as yielding iron ores. The scheme, now in contemplation, of erecting a blast furnace plant in the vicinity of the coal mines, would stimulate prospecting, and no doubt many more deposits would be found and prove of value.

The following analyses will serve to convey an idea of the composition of some of the Nova Scotia Iron ores.

	CAPE BRETON.		NOVA SCOTIA PROPER.			
	Big Pond.	Whyhogomah.	Pictou. (Specular.)	Pictou. (Limonite.)	Londonderry. (Limonite.)	Torbrook. (Hematite.)
Metallic Iron . . . . .	61.39	60.90	64.41	56.83	57.85	59.86
Silica . . . . .	9.04	10.80	3.68	4.80	4.79	5.93
Phosphorus . . . . .	tr :	tr :	.....	.....	.....	.....
Sulphur . . . . .	tr :	tr :	.16	trace	.60	.11
Phosphoric Acid . . . . .	.....	.....	.08	.15	.18	.....
Alumina . . . . .	.....	1.40	2.95	.....	.56	3.14
Magnesia . . . . .	1.22	1.64	0.46	.....	.10	.....
Lime . . . . .	.....	1.85	.41	.63	.15	2.16
Manganese . . . . .	.....	.....	2.74	.20	.25	.....
Water . . . . .	1.53	.....	.....	.....	10.71	.....

#### GOLD FIELDS.

The Nova Scotia gold fields have not yet attained a prominent position among the gold producing countries of the world, but this fact is only a repetition of the common saying that distance lends enchantment to the view. Few people can bring themselves to believe that in an old settled country there are valuable deposits of gold; such mines, like those of diamonds, must exist, they think, only in desert and remote places. However, no small number of men who have grasped the true state of affairs have made themselves rich at gold

mining in Nova Scotia. And year by year the profits increase through improved mining and milling methods.

The Atlantic coast of Nova Scotia from Canso to Yarmouth is occupied by a series of very old rocks, whose age, certainly greater than the silurian, is still a subject of debate among geologists. These rocks, consisting of slates and quartzites, are broken through at numerous points by intrusions of granitic rocks which have induced much local metamorphism. They have been folded, by a force acting at right angles to the general trend of the shore, into numerous plications, having a general east and west course. The folds have usually high dips, and the anticlinal crests, where cut off by denudation, show layers or veins of quartz, intercalated with the slates and quartzites. These quartz fillings occupy the spaces between the layers of rock formed by the compressing and elevating force, and are frequently auriferous.

These anticlinal crests are very numerous, and the veins in some of them have been worked for a long time. Recent experience has shown that the most productive veins lie close to the course of the anticlinal, and that many veins producing gold do not come up on one side of the anticlinal axis and drop down again on the other side, but turn over and descend again without coming at all to daylight.

The veins vary in thickness from three inches to twelve feet, and their gold contents run in the worked veins from four penny-weights to twenty ounces per ton. In the case of the richer veins the gold usually occurs in zones or bands of the veins which have frequently a lenticular shape, and usually a decided dip to the East or to the West. In some veins, however, the gold occurs in irregular pockets, apparently following no fixed law of deposition. The veins carry, in addition to gold, iron, copper, zinc, and lead sulphides, and frequently show considerable per centages of arsenical pyrites. These minerals are not valuable as a source of supply of the metals they are composed of, but are sometimes saved in the mills to be treated a second time for the gold they contain.

Hitherto, mining on these veins has been carried to a limited depth only, the deepest shaft not having reached seven hundred feet, while the average depth does not exceed two hundred feet. The veins being usually in firm rocks, with well defined walls, are opened by shafts sunk on their dip. These shafts are sunk at short intervals,

stopes are usually started direct from the shafts and carried underhand, and the hoisting done from the shaft nearest the ground being worked. This system works well enough in shallow mines and good ground, but it is being abandoned for more regular and systematic methods of development.

Mining costs vary with the conditions of each vein, but it may be asserted that the expenses of mining, pumping and hoisting are lower than in any similar class of works elsewhere. The compact nature of the rocks renders the workings, when proper precautions are taken to exclude surface waters, so dry as to give very small pumping costs.

The quartz passes from the mine without dressing, etc., to the mill which is usually driven by steam. The mills are almost invariably stampers, and vary in size from five to thirty-five stamps. The pattern of the mills is based on the best United States models, with improvements suggested by local experience. As the quartz carries its precious burden, as coarse and free gold, amalgamation is carried on in the mortar and on plates. The gold bullion is of good quality, carrying little silver, and averages, I believe, about \$19.25 at the mint.

The production of gold during the year 1892 was in round numbers about 20,000 ounces, from a dozen localities. The business, although small is, when pursued methodically, remunerative, and is capable of unlimited extension, as there are numerous anticlinals unworked and many more to be discovered in unexplored districts. The mines are all within easy reach of roads, and of the harbors along the coast, and aid is furnished by the Provincial Government in opening roads to new mines. The Nova Scotians make excellent miners, and prefer this work to almost any other occupation.

#### GYPSUM.

Few countries show such wide-spread and valuable deposits of gypsum as Nova Scotia. Here the mineral, as soft and hard gypsum, occurs with limestone, in measures of lower carboniferous age, in immense beds frequently running for miles in white cliffs. Owing to facilities for shipment, the greatest development of gypsum mining has been effected in the vicinity of Windsor, in Hants County. The annual export from this district is about 150,000 tons, valued at about one dollar a ton. The rock is taken from open quarries, trammed to the vessels, and shipped to the United States, principally for agricultural



purposes, although a considerable amount is used for constructive purposes. Numerous deposits occur in the Island of Cape Breton, and are utilised to a small extent for shipments to Montreal and United States ports. The mineral is found of every grade of quality, and in many of the quarries it is of almost chemical purity. Locally it is used to a small extent, either applied directly as a dressing to the soil, or as the basis of several forms of fertilisers. The total production for the year 1892 may be estimated at about 170,000 tons. Free sulphur, borates, and salts of magnesia, occur in the gypsum, but are not, as yet, found in quantities of economic value.

The occurrence of salt as crystals and layers in the gypsum, and in the form of brine springs in connection with the marls, etc., accompanying it, lead to the belief that boring operations would disclose workable deposits of this valuable mineral. As yet, however, no attention has been paid to this subject.

#### ANTIMONY.

Some years ago a valuable mine of Antimony ore was worked at Rawdon in Hants County. Owing to legal and other troubles the mine has remained closed for some time. The ore was of good quality and decidedly auriferous. As the district in which the deposit was worked shows traces of ore over a considerable extent of ground, it is probable that additional veins will be found.

#### BARYTES.

Sulphate of Barytes is found at Five Islands, River John, Gay's River, Loch Lomond, etc. It has been worked intermittently at these places to supply local works. The output seldom exceeds a few hundred tons in any one year. Carbonate of Strontium, is noted by the officers of the Geological Survey as occurring at several points in the Lower Carboniferous Limestones in Cape Breton.

#### MANGANESE.

Manganese ores are common in the Carboniferous and Devonian rocks of several parts of the Province. The most continuous mining of this ore has been carried on at Teny Cape in Hants County. Here the ore is a very pure binoxide, presented as pockets and irregular veins in Limestone. The annual production from this district has

seldom exceeded 200 tons, most of which it is said is used by glass makers. There is a large district here showing signs of this ore.

Near Truro, and in connection with the limonite deposits of Pictou County, considerable amounts of a similar grade of Manganese ore have been mined at different times.

In Cape Breton County, near Loch Lomond, a very good quality of the ore occurs in connection with limestones and slates, and is worked to a small extent. Hitherto only the high grade ores have been worked in Nova Scotia, and I am not aware of any deposit having been found adapted to the iron and steel makers' use. It is, however, reasonable to expect that where the ore is so abundant in its more concentrated state, that bodies must exist mixed with iron, etc.

#### COPPER.

The copper ores of Nova Scotia have hitherto received little attention, beyond attempts by local parties to open the more promising prospects.

The upper carboniferous measures, extending through Pictou, Colchester and Cumberland counties, show at numerous points sandstones containing copper ore, frequently of high grade, but hitherto the deposits have proved too irregular for systematic mining. In the county of Antigonish, in Devonian strata associated with dioritic dykes, some copper pyrites deposits have been developed enough to show good promise. The distance of the ores from shipping and the price of copper has, however, discouraged further work.

In the island of Cape Breton the traces of copper are wide spread, and promise that some day Cape Breton will prove like its neighbor Newfoundland, the seat of an important copper mining industry. The felsites, etc., of Laurentian age seem to be the principal copper-containing rocks. At Coxheath, near Sydney, the Eastern Development Company, of Boston, are gradually developing a property which promises to become an important copper producer. This locality being close to iron ore, limestone and coal, and on tide water, is unusually well situated to form the site of an important centre for smelting the copper ores, not only of Cape Breton, but of the Gulf of St. Lawrence, Newfoundland, etc.

The commencement of copper smelting at this point will undoubt-

edly direct the attention of prospectors to the numerous signs of copper ore in Cape Breton, and the supply of ore in large amounts can be safely calculated on.

#### LEAD.

The Carboniferous limestones of Nova Scotia, already mentioned so frequently in this sketch, are frequently met carrying lead ore, as Galena. Usually the ore as observed is finely disseminated, or segregated into small veins. At several points, however, in the Stewiacke district, in Halifax County, especially at Pembroke and Smithfield, the bodies of galena are large and important. At the latter point a deposit has been proved to contain ore in quantity to permit of working.

There is a probability of this deposit being opened out and utilized in the near future for supplying the home market, which is of considerable dimensions. As a rule the silver per centages of the Nova Scotia galenas are not high, when they are met in the limestones, but samples from veins in older rocks have shown promising contents of both gold and silver.

Molybdenite is found at several points in Lunenburg and Cape Breton counties in quantities which would repay working. Deposits of pyrites of fair quality are known in Cape Breton county, and in some deposits copper and nickel are reported as occurring in small quantities. No attention has however yet been paid to these ores.

The Triassic trap and amygdaloid of the Bay of Fundy yield in profusion zeolites and the associated varieties of quartz, and nowhere perhaps in the world can the collector of these minerals find a richer gathering ground.

The more common minerals applied to the Builder's art are abundant and varied in Nova Scotia. The marbles, granites, redstones, etc., of Nova Scotia should find a wide market in the United States. In the counties of Cumberland, Colchester and Pictou there are numerous deposits of the best sandstone, or freestone, of every variety of color and texture. Quarries have been opened at points most accessible to shipping, and a small trade has been built up with neighboring Provinces and the United States. As wood is almost universally used in Nova Scotia for structural purposes the local market for all the varieties of building stones is limited. At numerous points on the Atlantic

shore, the granites, already referred to in connection with the gold districts, furnish excellent stone, of different textures and shades. Small amounts have been used at Halifax in the fortifications, and for foundations, etc. A quarry at Shelburne yields stone satisfactorily used for street paving, and superior to the imported article.

The carboniferous limestones are sometimes used for structural and railway purposes. The Cobequid Mountains and some districts in Cape Breton contain syenites, red granites, gneisses, etc., of excellent quality. None of these stones have been quarried.

At West Bay, Ben Eoin, East Bay, and other points in Cape Breton are deposits of marble of good quality and many beautiful shades.

The Bras d'Or Marble Company have begun a quarry for marble on their property at West Bay. The quality of their rock appears excellent, and it should command a ready sale. There are large amounts of this marble burned into an excellent lime for use locally and in the neighboring provinces.

The measures already referred to as yielding building stone in Pictou, Colchester and Cumberland counties also yield stone, worked to some extent at Lower Cove, Cumberland county, into grindstones, snathes, whetstones, etc. In connection with this reference to building stones and abrasive materials it may be mentioned that deposits of tripoli, infusorial earth, and emery sand are met at numerous points but have not hitherto been utilised.

Clays suitable for firebrick abound in the coal measures, and the manufacture of this article should pay well as there is a considerable local demand at the collieries, furnaces, etc. A few small potteries supply the home market. The deposits of brick clay are abundant and excellent. Improved methods of manufacture, producing a better quality of brick, would greatly extend its consumption, as in the cities and villages the superiority of brick over wood for dwelling houses is being recognised more and more.

From these very brief notes it will be seen that although the area of the Province is small, its mineral resources are large and varied, and the slow rate of their development is due chiefly to the inclination of the people to engage in the pursuits of fishing and lumbering, which yield ready returns with a small outlay of capital. The consolidation of the principal collieries of the Sydney district, under a wealthy

syndicate of capitalists in the New England States, with a view to developing a large export of coal to Boston, etc., shows that outside attention is being drawn to the mineral resources, and it is believed that this is but the commencement of a large and wide-spread interest in the capabilities of Nova Scotia.

The coal, gold, copper, lead and silver ores are all held by the crown, and can be leased on easy terms. Part of the iron ore is held in fee simple by the owners of the soil, and part belongs to the crown. Licenses to search, covering five square miles, and running for eighteen months, can be procured for \$30, and a lease of the mineral sought can be selected out of the license. The leases are of various sizes up to one square mile in extent. The gold and silver leases are for forty years, those of other minerals are for eighty years. These leases carry powers to expropriate any surface lands needed for mining purposes, and are unusually favorable. The royalties are on coal ten cents a ton, on gold two per cent on the bullion, valued at \$18.50 an ounce. The iron ore royalty is five cents a ton, and so on.

The advantages of these titles, proceeding directly from the government, are evident, and have been much appreciated by mining people, who find that they are met in coming to Nova Scotia, not by grasping private individuals, but by a Government anxious to promote the development of mining.

