

power, our limestones should be considered as being among our valued assets. An accurate knowledge is required of them for use in those industries which are capable of great expansion in the province.

At the present time the value of the products of three or four of our industries in which the rock plays an important part, represents about 20 per cent. of our total annual mineral production of over \$13,000,000. Limestone has as great a bearing on the wealth of other countries.

The following is a list of manufactures and industries—arranged in alphabetical order—some, of course, consuming only a small amount of lime, in which limestone is used as a raw material: Acetate of lime, agricultural uses, ammonium sulphate, beet sugar, bone ash, building stone, calcium carbide, carbon dioxide, cement (natural and Portland), chalk chloride of lime, as a dehydrating agent, disinfectant, in dyeing, gas manufacture, glass, furnace linings, lime for mortar and whitening, lime pencils used in the oxyhydrogen light, lime water, lithographic stone, marble, as a polishing material, potassium dichromate, pottery glaze, for preserving eggs, etc., pulp and paper making, as a chemical reagent, silicate brick, smelting of iron, lead, etc., soap, soda manufacture, tanning.

In Ontario very little use has been made of the crystalline limestones which are adapted to decorative and monumental purposes. At the present time, so far as known, only two quarries are worked for marble. The marble used in this country nearly all comes from the large quarries of the United States. Although there are in the province native varieties that are as good, trade prejudices favor the imported article.

Referring to the uses in Ontario of limestones for fluxing purposes, Mr. Miller states that owing to greater cost in some localities of obtaining stone carrying a high percentage of calcium carbonate, rock high in magnesia is often utilized, while crystalline limestone from the town of Renfrew has been used in the smelting and refining operations at Sudbury.

Mr. C. B. Fox, M.A., chemist and metallurgist at the Hamilton Steel & Iron Company's plant, reports that dolomite quarried in Wentworth County has been used for several years in the company's blast furnaces. An average analysis of this stone is:—

	Per cent.
Silica75
Alumina and ferric oxide.....	1.00
Lime	30.24
Magnesia	20.18
Phosphorus021
Sulphur050

In the Steel Works, calcium carbonate is used for desulphurizing and removing the phosphorus from the steel in the open hearth process. This has an average analysis of:—

	Per cent.
Silica	2.00
Alumina and ferric oxide	1.10
Lime	51.00
Magnesia	1.10
Phosphorus015
Sulphur05

Mr. Fox adds:—

"This calcite stone comes from the vicinity of Port Colborne, on Lake Erie, the nearest point to Hamilton at which calcite stone is found, all the limestone of our mountain being dolomite, with silica running from one-quarter of one per cent. up to six or eight. If the silica runs above three per cent. it hardly pays to use it here.

"It is generally conceded by blast furnace men that dolomite stone takes more fuel than calcite when used in a blast furnace, and calcite is generally supposed to be more efficient in the removal of sulphur. When smelting lean ores requiring a large amount of flux (i.e., where the proportion of ore to stone is lower than 3 to 1), the slag is liable to be dark and spongy, and difficult to handle when dolomite is used. On the other hand, it is claimed for dolomite that it prevents sticking and hanging in a furnace, and causes the stock to descend more easily.

"We have had samples of stone from a quarry at St. Mary's, which shows the stone there to be a calcite of about the same purity as that from Port Colborne."

In keeping with the object of this report, which is to show where limestones of various chemical compositions are to be found in the province, and with a view to assist those who are in search of raw materials of particular kinds, quite the bulk of the volume before us, the preparation of which has manifestly required an immense amount of labor and research, is taken up with a detailed classification and description of localities in which limestones occur. Hence with the information afforded, and by the aid of a map also contained in the report, the searcher for stone of a special chemical composition should have no difficulty in locating areas in which suitable outcrops occur. The report is a further testimony to the good and practical work for which the Ontario Bureau of Mines has already established a reputation.

THE STRATIGRAPHY OF THE CASCADE COAL BASIN.*

By D. B. DOWLING.

(By permission of the Acting Director Geological Survey.)

Previous to the uplift of the Rocky Mountains all that part of the continent had for ages suffered but little from earth movements except, perhaps, a shallowing of the sea from Carboniferous times. There is little if any deposit to mark the lapse of time between the Carboniferous and the earlier stages of the Cretaceous, but the succession of the beds indicate no physical break. During most of the Cretaceous time the sea does not seem to have maintained any great depth, but shallow water conditions are marked at its inauguration, at about the middle period and again toward the close. This was followed by fresh water inundations, probably in the form of large lakes in which were deposited the Tertiary beds of Alberta.

The shallow water periods of the Cretaceous also show intervals of emergence during which land conditions prevailed and vegetation flourished. As the elevation of the land was not greatly above the sea, frequent inundations followed and the vegetation was covered up to be gradually changed to coal beds. We have thus three horizons that can be considered coal bearing in the Cretaceous.

1. The lower part of the formation—called the Kootenay series. Typical sections of this are given in the Crow's Nest Pass, as well as in several of the Rocky Mountain coal areas and in the Queen Charlotte Islands.
2. The middle portion of the formation—The Belly River series. This is exposed between Lethbridge and Medicine Hat, on the Belly River, and on the Peace River near Dunvegan. To this we may refer probably some of the seams that are exposed in the foothills near the outer range of the mountains.

* A paper read at the March meeting, 1905, of the Canadian Mining Institute.