CANADA
DEPARTMENT OF MINES
HON. LOUIS CODERRE, MINISTER; R. W. BROCK, DEPUTY MINISTER.

MINES BRANCH
EUGENE HAANEL, PH.D., DIRECTOR.

REPORT

ON THE

NON-METALLIC MINERALS

USED IN THE

CANADIAN MANUFACTURING INDUSTRIES

BY

Howells Fréchette, M.Sc.
Chief of the Non-Metalliferous Deposits Division.

OTTAWA
GOVERNMENT PRINTING BUREAU
1914

No. 305

LETTER OF TRANSMITTAL.

DR. EUGENE HAANEL,
Director Mines Branch,
Department of Mines,
Ottawa.

Sir,—I beg to submit, herewith, the following report on the non-metallic mine and quarry products used in the various manufacturing industries of Canada.

I have the honour to be,

Sir,
Your obedient servant,

(Signed) **Howells Fréchette.**

OTTAWA, April 15, 1914.

CONTENTS

Tables of Minerals Used by Industries

REPORT

ON THE

NON-METALLIC MINERALS

USED IN

Canadian Manufacturing Industries

BY

Howells Fréchette, M.Sc.,

Chief of the Non-Metalliferous Deposits Division.

NON-METALLIC MINERALS USED IN THE CANADIAN MANUFACTURING INDUSTRIES.

INTRODUCTORY.

The rapid industrial growth which Canada has been undergoing in recent years has greatly increased the demand for the non-metallic minerals and is constantly affording new uses to which they may be applied. In many of the manufacturing industries, minerals, in a more or less crude state, are used as raw material or, indirectly, as a means of producing the products of the factory.

A reference to the tables in this report will show that an unduly large proportion of the mineral used in these industries is imported. In some cases the importation is necessary or advisable, since some minerals and particular grades of others are not obtainable at present in Canada, or the material may be obtained from abroad for less than the cost of production and delivery of the Canadian. In other cases, however, it is due to the fact that the domestic products are not always prepared in the form most suitable for the purposes for which they are required. Frequently the buying and selling methods in use are at fault. For example, the Canadian producer, through lack of capital, is often at a great disadvantage, being unable to advertise extensively and thus attract attention to his product and secure a trial of it, even though his price be lower and his product as good, or better than the imported article. During the gathering of data for this report, it was found, in many cases, that the consumers of certain minerals were not aware that these were produced in the country, often quite close at hand. In such instances a list of the producers and their addresses was furnished.

There are a number of trade journals which reach the manufacturers, and it would seem that even small advertisements judiciously placed by the Canadian producers would aid

greatly in increasing the amount of domestic minerals used in our manufacturing industries.

The greatest bulk of imported minerals comes to this country from the United States. The American producers and jobbers have standardized their products and established grades with trade names, which they have brought to the attention of the consumers in this country by persistent and systematic advertising and efficient selling methods. Their goods have been tried and become known to the manufacturers, who, when satisfied with the results, have been loth to experiment further.

A great many manufacturers know little concerning some of the raw materials which they use, the selection of which is frequently left to the judgment of the supply firm with which they deal, or else is based on an original trial shipment. It is very seldom that specifications are used in purchasing. The orders are made to read "same as last shipment," or "suitable for *such and such a purpose.*"

Since the organization of the Mines Branch, numerous inquiries have been received with regard to the demand for non-metallic minerals; the uses to which they are applied; and the requirements of consumers with regard to purity and physical properties. In many cases, these inquiries were difficult to answer, owing to the lack of an intimate knowledge of the Canadian market and its requirements. In order that such data might be available I was commissioned to visit the manufacturers throughout the Dominion, with instructions to obtain from them as much information as possible regarding the non-metallic minerals used by them; the quantity of each consumed per year; the price delivered; and the source of supply, whether domestic, or imported.

An effort was made to visit *all* manufacturers using minerals, for the purpose of collecting this information. Unfortunately, a number of firms were unavoidably missed in the canvass. These were requested by letter to furnish the information sought, and although many complied, quite a large proportion failed to respond, even to repeated appeals. On this account, and because of the fact that a number of manufacturers, personally visited, refused to furnish data, especially regarding prices,

it is impossible to give complete figures. Therefore, when referring to the tables throughout this report, it should be remembered that the quantities indicated do not represent the total consumption of the various minerals. The figures, however, will be of value in indicating the possibilities of the market for these products.

I wish to thank the executive, and members in general, of the Canadian Manufacturers Association for the aid they have given me. My thanks are also due to Mr. L. L. Anthes, of the Anthes Foundry, Ltd., of Toronto and Winnipeg, Dr. Richard Moldenke, Secretary of the American Foundrymen's Association, Mr. C. W. Tobey of Collingwood, various members of the staff of the Department of Mines, and many others who have gone to considerable trouble to furnish me with special information. Grateful acknowledgment is hereby made for the information obtained from various books and reports, especially those of the Geological Survey of the United States, quotations from which appear throughout this report.

An appendix has been kindly prepared by Mr. John McLeish, Chief Statistician of the Mines Branch. This gives a list of the Canadian producers of the non-metallic minerals. It is hoped that it may aid manufacturers in finding a Canadian source of supply for such minerals as they employ.

Unless otherwise specified, the ton used throughout this report is the net ton, 2000 pounds.

ASBESTOS.

Under the name *asbestos*, there are several fibrous minerals used in commerce; *anthophyllite*, *amphibole* or *hornblende asbestos*, and *chrysotile* or *serpentine asbestos*. The last of these three is the best in quality, and is of most importance to Canadians, since the product of the mines of the Eastern Townships of Quebec is of this variety.

It occurs in reticulating veins up to 4 or 5 inches in width, in serpentine rock, the fibres being arranged at right angles to the walls of the veins. These fibres, which are easily separable, are very fine, of a silky appearance, and flexible to a high degree. Asbestos is unaffected by heat, except on continued exposure to high temperatures, and is noncombustible. It is a poor conductor of both heat and electricity, and is not attacked by the common acids.

The above characteristics make this mineral an important raw material in a number of manufacturing industries.

Asbestos fibre may be spun into yarn and rope, and woven into fabric, in which forms it finds many uses where a fire-resisting fabric is required. For these purposes a long fibre, both strong and very flexible. is desired. At present there are no factories in Canada weaving asbestos.

In this country the principal manufactures of asbestos are mill board, paper, and shingles, for which purpose a short fibre is used.

In the making of certain mineral flooring short fibre asbestos enters into the mixture, where it acts as a binder.

On account of its low electrical conductivity it is used as an insulator in electrical instruments. While asbestos paper and mill board are principally used for this purpose, considerable long and short fibre are also employed.

Short fibre is mixed with paints to produce a fire resisting paint.

It is also used in making stove cement, pipe covering, etc.

Long fibre, besides the uses referred to above, is used in making gaskets for packing glands and pipe joints where high temperatures or acid solutions are encountered, making of chemical and water filters, and as a surfacing of gas grates.

Asbestic is a name applied to impure very short fibre asbestos. It is used by plasterers, manufacturers of roofing, and also for a number of the purposes referred to above.

PREPARATION OF ASBESTOS.

In most cases in Canada asbestos is mined by open-cut methods. From the mine it is conveyed to the mill, where it is hand cobbed. The long fibre asbestos is separated as completely as possible, by hand, from the waste rock, and from that carrying the short fibre. The waste is discarded and the balance subjected to a complicated milling treatment in order to separate the fibre from the gangue. The first crushing is done by jaw crushers, and the final by cyclone or similar crushing devices. The fibre is removed partly by means of air currents and partly by screening out the finely powdered rock.

The asbestos is graded according to length of fibre. The market price varies greatly according to grade and the demand. The long fibre always commands a much higher price than the short.

Amount of asbestos used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	1	11	—
Quebec	10	6536 5/20	—
Ontario	27	537 5/20	33 5/20
Prairie Provinces	3	251 10/20	—
British Columbia	1	100	—
Canada (Total)	42	7435	33 5/20

Amount of asbestic used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	—	—	—
Quebec	2	3000 10/20	—
Ontario	5	43 10/20	—
Prairie Provinces	—	—	—
British Columbia	1	15	—
Canada (Total)	8	3059	—

The following imports are reported by the Department of Customs:—

	1910-1911	1911-1912	1912-1913
Asbestos in any form other than crude, and all manufactures of	$254,331	$349,655	$498,215

BARITE.

Barite is a natural sulphate of barium. It is of high specific gravity—4·5, as compared with quartz, for example, which has a specific gravity of about 2·65. It is usually white or nearly so when pure, but it is often found stained by iron oxide and other impurities. This mineral is also known by the following names; *barytes, heavy spar, lead bloom, and cawk.*

INDUSTRIAL USES.

Paint making. Barite is used for three purposes by paint manufacturers.

1. As a "filler" for white lead and other paints. It was first employed purely as an adulterant both on account of its weight and its cheapness as compared with the white lead with which it was mixed. Later it was recognized that it had properties which gave to the paint certain advantages. For example, the fine angular grains were found to give to the surface of the paint a "tooth" which offered a good bond to subsequent coats. It also adds to the life of the paint, since it is unaffected by weather and chemical fumes.

2. As a vehicle for colour in paint making. In "The Barytes Deposits of Lake Ainslie and North Cheticamp, N.S.,"[1] Henry S. Poole says: "The fitness of barytes as a pigment is due not merely to its weight and absence of colour, but to its aptitude to take colour-stain uniformly and make a small quantity of a decided colour cover much surface, a property not equally borne by other white substances, such as gypsum and marble, which the manufacturers of barytes for the market find it desirable to remove by special treatment. Barytes acts as a base for aniline and certain other pigments."

3. For putty making. Putty is often made by simply mixing whiting and linseed oil to the consistency of dough. By substituting barite for part of the whiting a lesser quantity of oil may be used to produce the same bulk, thus saving on the price of oil.

[1]Report No. 953, Geological Survey, Department of Mines, page 34.

For the above three purposes the barite is ground to the fineness of flour, and in the case of the first two it is also lixiviated, as described later, in order to remove any stain.

Rubber manufacturing. Barite is used for "weighting" or "filling". For this purpose the mineral is very finely ground, but need not be lixiviated as the colour is not of much importance. The presence of barite, it is claimed, is desirable in rubber up to a certain percentage, as it adds to the resiliency and the durability of the product.

Textile manufacturing. A very small quantity of finely powdered lixiviated barite is used in Canada for filling cotton goods.

Wall Paper manufacturing. Barite is used in the preparation of certain pigments employed in the printing of wall paper. The colours are precipitated on barite. For this purpose the mineral is finely ground and lixiviated. Absence of colour is essential.

Tanning industry. In the finishing of some leathers barite enters into the composition of the dressing. For this it is finely ground but need not be lixiviated.

Chemical manufacturing. Barite is used as a source of barium in the manufacturing of various chemicals.

In addition to the above uses to which barite is put, it has been stated that it is used to some extent as an adulterant in candy making, etc. This is, of course, not legitimate. The writer is not aware of any being used in Canada for this purpose.

Lithopone, consisting of zinc oxide, zinc sulphide, and barium sulphate, is manufactured in the following manner. Solutions of zinc sulphate and barium sulphide are mixed, producing a heavy white precipitate of zinc sulphide and barium sulphate. This is carefully dried and roasted in a furnace, with the result that some of the zinc sulphide is converted to zinc oxide. The barium sulphide used is produced by heating a mixture of barite and charcoal, which causes a reduction of the barium sulphate to barium sulphide.

There is no one manufacturing this in Canada according to the writer's knowledge.

Blanc fixé is sulphate of barium produced by chemical methods. As a rule, it is whiter and of greater fineness than prepared barytes. It is used for a number of the above purposes, as well as for coating paper and several other uses.

PREPARATION.

Barite is prepared for the market in the following manner:— It is first crushed to about ½ inch, by jaw crushers, then, if it is to be lixiviated, it is boiled in dilute sulphuric acid in order to remove such impurities as calcite and iron oxide, the acid is drawn off and the barite thoroughly washed with water. It is dried and then ground to the fineness of flour in a buhr mill. It is graded by colour, the whitest material commanding the highest price.

The price ranges from $10 to $25 a ton according to grade and freight rates to the point of consumption. For paint-making purposes the average price in Ontario and Quebec is $18.50 per ton.

Amount of barite used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	2	113	—
Quebec	13	373	1905 10/20
Ontario	17	30	865
Prairie Provinces	1	—	40
British Columbia	2	—	110
Canada (Total)	35	516	2920 10/20

CARBONATES OF LIME AND MAGNESIA.

Those minerals consisting of the carbonates of lime and magnesia constitute a class of the greatest industrial importance. They are used for a multitude of purposes and in large quantities.

Calcite.

Calcite, or *calc spar*, in composition, calcium carbonate (carbonate of lime) is represented by the chemical formula $CaCO_3$. It is a very common mineral in veins and is one of the most widespread rock-forming minerals.

Magnesite.

Magnesite is composed of magnesium carbonate, $MgCO_3$. It occurs generally as a decomposition product of magnesian rocks.

Dolomite.

Dolomite is calcium-magnesium carbonate, $CaMg(CO_3)_2$, being intermediate between calcite and magnesite. Its occurrence is similar to that of calcite, which it closely resembles.

Limestone.

Limestone is a sedimentary rock, consisting, when pure, of calcium carbonate. When rendered crystalline by metamorphism, it is called *crystalline limestone*, or if of fine texture, *marble*.

Part of the lime is nearly always replaced by magnesia. When the percentage of magnesia reaches 21·7, the rock is then analogous in composition to the mineral dolomite, and the name *dolomite* is applied to it. Rock containing intermediate proportions of magnesia is known as *magnesian*, or *dolomitic limestone*, or *calcareous dolomite*, depending on whether the percentage of magnesia is low or high. When the percentage of magnesia is above the theoretical composition of dolomite, it is termed *high magnesia dolomite*. When the replacement is complete or approaching completeness we have the rock *magnesite*.

Frequently this classification is not adhered to, and one simply speaks of limestone as being *high magnesian* or *low magnesian*, including in the former the dolomites.

Lithographic stone is a homogeneous, fine grained, porous limestone. It varies in colour, sometimes being cream, yellow, drab or grey. The lighter colours are preferred, as the lack of contrast between a dark stone and the transfer ink makes the work of the engraver very difficult. Any irregularities in texture, or small seams or flaws, cause trouble in engraving and printing. Lithographic stones which have been produced in Canada are of good quality but of dark colour. At present all lithographic stones are imported.

Besides the compact, hard limestones and crystalline limestones there are two varieties of industrial importance, namely, *chalk* and *calcareous marl.*

Chalk, not found in Canada, is a soft, pulverulent, white variety of limestone. Finely ground chalk, from which the gritty impurities have been removed by washing, is called *whiting, Paris white,* or *Spanish white.*

Calcareous marl is a soft earthy variety, very often containing much clay intermixed with it, though sometimes consisting of almost pure calcium carbonate.

In general, limestones very often contain impurities in considerable quantities, the principal impurities being iron, alumina, and silica.

Lime.

On heating limestone to a red heat for several hours, it gives off its carbon dioxide (CO_2), leaving calcium oxide (CaO) and such non-volatile impurities as it contained. The term *lime* or *quicklime* is applied to this product of calcination, whether the original material was a true limestone or a dolomite, but if a magnesite be calcined the product is called *magnesia* or *calcined magnesite.*

The National Lime Manufacturers' Association of the United States have adopted the following classification of limes, based on the content of magnesia:[1]

[1] Warner and Lazell: Glossary of terms in connection with the Manufacture of Lime. Proceedings of the National Lime Manufacturers' Association, 1910.

See also page 6, Lime: Its Properties and Uses, Circular No. 30, Bureau of Standards, Washington.

High-calcium lime contains	0%	to	5%	magnesia.
Magnesian lime	"	5%	"	25%	"
Dolomitic lime	"	25%	"	45%	"
Super-dolomitic lime	"	over 45%			"

Lime, made from limestone containing much argillaceous matter, is known as *hydraulic lime* from the property it possesses of setting under water.

Quicklime has a very strong affinity for water. When water is added to it the lime combines chemically with a definite proportion of water forming *hydrated lime* ($Ca(HO)_2$), or *slaked lime*, at the same time evolving heat.

Lime when exposed to the air absorbs water and carbon dioxide, forming what is known as *air-slaked lime*.

USES.

Limestone, dolomite, and marble are very valuable as building stones, not only on account of their strength and appearance but because of the ease with which they may be wrought into shape.[1] Lime, the calcined product of these stones, is also a valuable building material. In fact, the principal use of lime is for this purpose.

From the standpoint of the amount consumed and diversity of uses in the industries, no other non-metallic mineral products, except coal, can compare with limestone and its group. The various industries employing them will be dealt with individually and their requisites stated briefly.

The following table from the chapter on lime in the "Mineral Resources of the United States"[2] serves well to show the many uses to which lime is put, and also indicates the type of lime preferable in each case.

[1] See "Building and Ornamental Stones of Canada," Report No. 100, Mines Branch.
[2] Page 650, Part II, 1911.

CHEMICAL USES OF LIME

Agricultural industry:
- As a soil amendment, c, m.
- As an insecticide, c, m.
- As a fungicide, c, m.

Bleaching industry:
- Manufacture of bleaching powder, "Chloride of lime," c.
- Bleaching and renovating of rags, jute, ramie, and various paper stocks, c, m.

Caustic alkali industry:
- Manufacture of soda, potash, and ammonia, c.

Chemical industries:
- Manufacture of ammonia, c.
- Manufacture of calcium carbide, calcium cyanimid, and calcium nitrate, c.
- Manufacture of potassium dichromate and sodium dichromate, c.
- Manufacture of fertilizers, c, m.
- Manufacture of magnesia, m.
- Manufacture of acetate of lime, c.
- Manufacture of wood alcohol, c.
- Manufacture of bone ash, c, m.
- Manufacture of calcium carbides, c.
- Manufacture of calcium-light pencils, c.
- In refining mercury, c.
- In dehydrating alcohol, c.
- In distillation of wood, c.

Gas manufacture:
- Purification of coal gas and water gas, c, m.

Glass manufacture:
- Most varieties of glass and glazes, c.

Milling industry:
- Clarifying grain, c, m.

Miscellaneous manufactures:
- Rubber, c, m.
- Glue, c, m.
- Pottery and porcelain, c, m.

Dyeing fabrics, c, m.
Polishing material, c, m.
Oil, fat, and soap manufacture:
Manufacture of soap, c.
Manufacture of glycerine, c.
Manufacture of candles, c.
Renovating fats, greases, tallow, butter, c, m.
Removing the acidity of oils and petroleum, c, m.
Lubricating greases, c, m.
Paint and varnish manufacture:
Cold-water paint, c, m.
Refining linseed oil, c, m.
Manufacture of linoleum, c, m.
Manufacture of varnish, c, m.
Paper industry:
Soda method, c.
Sulphite method, m.
For strawboard, c, m.
As a filler, c, m.
Preserving industry:
Preserving eggs, c.
Sanitation:
As a disinfectant and deodorizer, c.
Purification of water for cities, c.
Purification of sewage, c.
Smelting industry:
Reduction of iron ores, c, m.
Sugar manufacture:
Beet root, c.
Molasses, c.
Tanning industry:
Tanning cowhides, c.
Tanning goat and kid hides, c, m.
Water softening and purifying, c, m.

(NOTE: High calcium lime is indicated by "c", magnesian, and dolomitic lime by "m.")

Aerated Water and Carbon Dioxide making. Whiting and magnesite are used for the production of carbon dioxide (CO_2)

which is principally used for the purpose of aerating beverages. On adding an acid to whiting, carbonate of lime, the acid forms a new salt with the lime and liberates carbon dioxide, which is collected under pressure. In some cases marble dust (*stone flour*) is used in place of whiting.

As will be pointed out later, the majority of users of magnesite employ it in the calcined form. During calcination it gives off carbon dioxide equal to about half its weight. When the calcining is done in retorts the gas may be saved and stored in iron cylinders, under pressure. Much of the carbon dioxide used in Eastern Canada is produced in this manner. It must be regarded only as a by-product of the calcining, since the calcined magnesite, or magnesia, is the more valuable of the two products.

Where the carbon dioxide is used for aerating beverages, the materials from which it is made must not contain any impurities which would give off poisonous or objectionable gases during the treatment. Sulphides and arsenides should not be present except in very small quantities.

Artificial stone and mineral floor making. In the mixture of which the exposed face of artificial stone is made, crushed calcite, crystalline limestone, and marble are used. The material should be crushed to pass through a twenty mesh screen. White is the colour usually specified, but other colours, including black, are occasionally used to obtain the desired effect. The presence of minerals, which on weathering would produce stains, is objectionable.

Magnesia is one of the principal ingredients in one type of mineral floors. It is mixed with marble dust and other materials and bonded by means of magnesium chloride.

The presence of lime is deleterious, since it tends to bleach any colouring matter added to the mixture and to cause swelling and cracking of the finished floors. Over five per cent of lime, three per cent of carbon dioxide, or four per cent of moisture renders magnesia unsuitable for this purpose. It should be very finely ground.

Terrazzo flooring is made with small chips of marble embedded in cement. Various colours of marble are used. The

fragments should be of fairly uniform size. It is graded into a number of sizes, ranging from a quarter of an inch to an inch and a half in diameter.

Sand-lime brick making. Sand-lime brick is manufactured by pressing a mixture of sand and lime into shape under great force and then subjecting the brick to the action of steam under pressure for several hours. Both high calcium and magnesian limes are used, but the better results are obtained from the former. Argillaceous matter is inert under the conditions of this process, and its presence simply reduces the quantity of available calcium, or magnesium oxide, per ton of lime. Free silica acts as the silica of the sand to which the lime is added; thus it is of no advantage and reduces the percentage of the active agents in the lime. In general, the purer the lime the better it is.

Button manufacturing. Whiting is used as a polishing material for pearl buttons. It should be free from grit and very fine.

Cement manufacturing. In the manufacturing of cement large quantities of limestone are used. The cement companies usually supply themselves from their own quarries. The limestone should not contain over five per cent of magnesium carbonate. Ferric oxide should not be so high as to analyze over four per cent in the cement. Free silica is objectionable. In "Portland Cement",[1] by Richard K. Meade, M. S., he says: "In determining the suitability of a limestone to be used in the manufacture of cement, it is necessary to take into consideration the shale or clay which is to be used with it, as in every case it is the mixture of the two, made in proper proportions, which must have the right composition.....".

In the manufacture of slag cement slaked lime is mixed and ground with blast furnace slag. A high calcium lime is required.

Calcium carbide manufacturing. (Quantities of lime used included in table XI). On heating lime to a high temperature, in an electric furnace, in the presence of a definite quantity of coke, a chemical union takes place between the calcium of the

[1] Published by Williams and Norgate, London. See page 46.

lime and the carbon of the coke, forming calcium carbide (CaC_2). As pure a lime as possible is required. Magnesia should not exceed three per cent; some manufacturers specify one per cent, or less. The lime should be free from sulphur, phosphorus, and arsenic. Iron and silica should be low. The total impurities, including magnesia, should be under five per cent.

These same specifications apply to lime used in preparing cyanamid.

Pharmacists and chemical manufacturers. Lime, chalk, and magnesite are used for a number of purposes in the chemical industry. For practically all of these purposes, the purest obtainable material is demanded.

Illuminating-gas works. Illuminating gas, as it leaves the retorts, carries with it certain impurities which must be removed before it is fit to turn into the service mains. The gas is passed through beds of hydrated lime, which combines chemically with certain of these impurities and removes them from the gas. The calcium oxide is the active agent in this operation, and, therefore, the high calcium limes are most desirable.

Lime is also employed in extracting the ammonia from the ammonia liquor which is a by-product of gas making.

Electrical goods manufacturing. Marble is used, in the form of polished slabs, for the mounting of instruments for switch boards. The marble for this purpose should be free from electrical defects; that is, it should be free from graphite, pyrite, and other electro-conductive minerals. The presence of seams of quartz is objectionable, since they are likely to cause deflection of the drill when holes are being bored.

Marble dust is used in the mixture of plaster of Paris for cementing incandescent lamp bulbs into their metal sockets. It should be finely powdered and free from large particles. Whiting is used, also, for this purpose, and in the making of dry batteries.

Hydrated lime enters into the composition of the insulation for electric wires. A high calcium lime is most desirable.

Manufacturing of explosives. In the manufacturing of one kind of high explosive chalk is used. It must be very pure—absolutely free from siliceous grit.

Foundries. In many foundries limestone is added to the cupola charge as a flux for the siliceous matter of the coke ash, and the sand adhering to the pig iron. Little attention is paid to the composition of the resulting slag from the foundry cupola, and, therefore, as one might expect, little attention is paid to the composition of the limestone used. The limestone employed is almost always that which is most easily obtained. A fluid slag may be produced with either a high calcium limestone or a dolomite. The stone should be low in silica, since the silica contained will require part of the lime to slag it, thus reducing the quantity of available lime.

Glass manufacturing. Calcium oxide is one of the principal constituents of several kinds of glass. It is added to the glass mixture in the form of limestone or lime. Most producers prefer the latter, as the evolution of the carbon dioxide of the former is liable to cause flaws in the finished product. A high calcium content is essential. Magnesia, alumina, and iron are objectionable. For the making of the better grades of glass there should not be over three-tenths of one per cent of iron oxide, or the equivalent amount of iron, in the raw limestone; for lime, one-half of one per cent is the limit.

The following analyses will serve to indicate the composition of limestones suitable for glass making purposes.

Analyses of limestone used in glass making.[1]

Calcium carbonate.....	($CaCO_3$)	90·23	97·72	98·90	94·80	99·08
Magnesium carbonate.....	($MgCO_3$)	0·0	0·0	·07	1·21	·34
Iron oxide.....	(Fe_2O_3)	0·59	·20	·30	·80	·08
Alumina.....	(Al_2O_3)	—	1·10			—
Silicates and silica.....	(SiO_2)	8·87	1·01	a ·72	3·20	a ·47

a. Insoluble in acids.

[1] Extract from table, page 595, Mineral Resources of the United States, Part II, 1911.

Match manufacturing. Magnesia and whiting are used in compounding the mixture for the heads of matches. A fairly pure material is required, and should be very finely ground.

Glue and fertilizer manufacturing. In the manufacturing of glue and fertilizer, lime is used. The purity of the lime is not a matter of importance, except in its effect on the percentage of calcium oxide and magnesia available.

It is said[1] that lime for fertilizer purposes should contain sufficient magnesia to make its ratio to the calcium oxide as four is to seven.

Metallurgical works. In the extraction of metals from their ores by smelting, the metals are reduced to the metallic form or converted into sulphides, called mattes. The gangue minerals of the ore and the ash of the fuel must be removed. This is accomplished by smelting with some fluxing material and allowing the slag to flow from the furnace. The nature of the flux depends upon the chemical composition of the material to be fluxed. If they are basic, an acid flux, such as quartz, must be used, but if they are acid the flux must be basic. Being the most active of the cheap bases, lime, in the form of limestone, is most frequently used in the smelting of acid ores.

As already pointed out, under foundries, the limestone should be of low silica content. The desirability or undesirability of magnesia is determined by the particular process of smelting in which it is to be employed. Sulphur and phosphorus are most undesirable, especially in the smelting of iron and the converting of iron into steel. As a rule arsenic is a very objectionable impurity.

In the basic method of steel converting, calcined magnesite is frequently used as a furnace lining, either in the form of bricks or shaped within the furnace from the ground material. For this purpose it should be very low in silica. Calcined dolomite is also used as a furnace lining.

Oil refining. Lime is used in the refining of petroleum for the purpose of removing acidity from the oil after treatment with sulphuric acid.

[1] Page 17, Circular 30, "Lime: Its Properties and Uses," Bureau of Standards, Washington.

The lime may be either high calcium, or dolomitic.

Paint manufacturing. Lime, magnesia, and whiting are used in the paint industry for a number of purposes, especially in the making of cold-water paints. High magnesian limes are preferred and should be air-slaked or hydrated. They should be very finely ground, free from grit, and as nearly white as possible.

Whiting and finely ground marble are used for making putty and wood filler.

Polish manufacturing. Whiting and very finely ground marble are used in manufacturing certain metal-polishing pastes and creams. Freedom from coarse gritty matter is the main requisite.

The manufacturers of polishes often put up a "sweeping compound," which is principally composed either of sand or crushed calcite. The calcite should be crushed to pass through a twelve-mesh sieve and should be free from dust. The waste product from the concentration of certain ores should be well adapted to this use.

Enamelware manufacturing. Some manufacturers of enamelled metal ware use calcite in the composition of their enamel mixture. For this purpose the calcite should be very pure, containing not more than traces of iron oxide. It should be ground to one hundred mesh.

Pulp and paper manufacturing. Wood pulp is manufactured by two chemical processes, known as the sulphite process and the soda process.

In these processes the wood fibre of which the pulp is composed is bleached and freed from the resins and the cementing material of the wood by means of chemical solutions.

In the first process the solution consists of calcium and magnesium bisulphite, and is prepared by subjecting dolomitic limestone to the combined action of sulphur dioxide and water. Quicklime or hydrated lime may be substituted for the limestone. Both the calcium and magnesium are active agents. The high magnesian limestones are preferred because of the better pulp resulting from their use.

Caustic soda is the active element of the solution used in the soda process. After the treatment of the wood with this solution the soda may be recausticized by means of lime. A high calcium lime is desirable, as magnesia plays no part in the reactions.

Rubber goods manufacturing. In the manufacture of rubber goods, lime, magnesia, and whiting are used as weighting materials. They should be very finely powdered (200 mesh) and free from grit.

The grade of whiting generally used is that known as "gilders'." Phosphorus is very objectionable.

Sugar refining. In the manufacturing of beet and cane sugar, lime is employed as a reagent in the processes involved. The manufacturers generally calcine the limestone themselves amd make use of the carbon dioxide given off.

A high calcium limestone is specified, containing very little magnesia. It should also be low in insoluble matter, iron, alumina, and alkali. The alkali should not exceed one-quarter of one per cent. Oyster shells are sometimes substituted for limestone.

Tanning. Lime is used to aid in the de-hairing of pelts preparatory to tanning. A high calcium lime is the most desirable in this process for most kinds of skins, but it is said that magnesia is a valuable constituent for use on goat hides. The lime should be low in iron oxide and insoluble matter. In most cases quicklime is used, but hydrated lime is said to be more satisfactory. Quicklime is liable to become air-slaked, thus losing its caustic property. Hydrated lime absorbs carbon dioxide very slowly when properly stored, hence the loss is likely to be much less from this source.

It may, here, be pointed out that quicklime requires careful storing to overcome the danger of fire being started from the rise of temperature occasioned by the absorption of moisture. Hydrated lime is not subject to this rise of temperature. Insurance underwriters recognize this and take it into consideration when fixing the rate of risks.

There are a great number of other important uses to which limestone and its allied materials are put, but the above are those of major importance to the Canadian producer.

There are a number of methods employed in the calcining of limestone and magnesite and in the hydrating of lime. Descriptions of these various methods would require too much space for incorporation in this report. It is the intention of this Department to publish a report dealing directly with the limestone industry, in which will be given detailed accounts of the various processes involved.

PRICES.

The following prices represent the cost per ton of the material delivered in the eastern portion of Canada. The variation of price is due to transportation costs, as well as to the higher price commanded by the better grades over the poorer.

Limestone (crushed), 80 cents to $2, average $1.50.
Marble (chips), $1 to $7.50.
Marble (dust), $8 to $10.
Calcite (ground), $28 to $35.
Whiting, $8 to $14.
Magnesite (lump), $7.50 to $12.
Magnesia (powder), $19 to $30, average about $21.
Lime, here listed according to uses.

	Paint	Sand-Lime Brick	Glass	Paper and Pulp	Tanners
High.....	$20.00	$6.00	$7.00	$8.00	$7.50
Low.....	12.00	4.00	5.00	6.30	4.00
Average.....	14.00	4.75	5.85	6.75	5.00

Amount of calcite used in the manufacturing industries, as reported by consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	—	—	—
Quebec	1	—	20
Ontario	1	—	20
Prairie Provinces	1	65	—
British Columbia	—	—	—
Canada (Total)	3	65	40

Amount of raw magnesite used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	—	—	—
Quebec	1	750	750
Ontario	3	—	787
Prairie Provinces	—	—	—
British Columbia	—	—	—
Canada (Total)	4	750	1537

Amount of calcined magnesite used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	3	600	1850
Quebec	5	—	$850\frac{10}{20}$
Ontario	6	125	$472\frac{15}{20}$
Prairie Provinces	2	100	101
British Columbia	1	—	210
Canada (Total)	17	825	$3484\frac{5}{20}$

Amount of limestone and dolomite used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	12	426,985	—
Quebec	14	2,735	3,000
Ontario	33	250,934	14,020
Prairie Provinces	8	1,116	—
British Columbia	11	95,748	—
Canada (Total)	78	777,518	17,020

Amount of marble dust and chips used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	1	—	416
Quebec	4	620	150
Ontario	9	8006	772 15/20
Prairie Provinces	5	425	80
British Columbia	—	—	—
Canada (Total)	19	9051	1418 15/20

Amount of lime used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	17	2798	60
Quebec	30	20759	3588
Ontario	40	22688	2466
Prairie Provinces	15	3430	400
British Columbia	5	412	—
Canada (Total)	107	50,087	6514

Amount of whiting used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	5	—	$283\frac{5}{20}$
Quebec	16	—	$4046\frac{10}{20}$
Ontario	32	—	$2165\frac{13}{20}$
Prairie Provinces	8	—	$308\frac{14}{20}$
British Columbia	4	—	$800\frac{15}{20}$
Canada (Total)	65	—	$7604\frac{17}{20}$

Amount of chalk used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	—	—	—
Quebec	—	—	—
Ontario	—	—	—
Prairie Provinces	—	—	—
British Columbia	1	—	60
Canada (Total)	1	—	60

The following imports are reported by the Department of Customs:—

	1910–1911		1911–1912		1912–1913	
Marble, sawn or sand rubbed, not polished		$174,532		$175,177		$239,147
Marble, not hammered or chiselled		25,606		56,336		61,009
Marble, manufactures of, n.o.p.		108,121		169,238		210,427
Lithographic stone, not engraved		10,366		12,116		7,307
Whiting, gilders' whiting and Paris white	cwt. 254,839	97,338	cwt. 266,114	99,760	cwt. 290,494	119,578
Lime	brls. 194,809	143,338	brls. 230,013	162,593	brls. 360,243	225,444
Magnesia	lbs. 589,009	10,959	lbs. 424,792	13,703	lbs. 791,015	27,467

CHROMITE.

Chromite or *chrome iron ore*, when pure, consists of a compound of ferrous oxide and chromic oxide, represented by the formula $FeO.Cr_2O_3$. It occurs in peridotite and serpentine rocks, in irregular masses or disseminated in small grains which must be won by crushing and concentrating. It is also found in sand resulting from the disintegration of these rocks.

Chromite is used in the chemical industry for making chromic acid and the various salts of chromium, which in turn are used for making paint and ink pigments, and other purposes.

It is also employed as a source of chromium in the manufacture of chrome steel. In this case the iron content is also utilized. Chromite is very basic in chemical reaction and highly refractory, suiting it to the manufacturing of fire bricks for certain metallurgical purposes, and also for the lining of basic open hearth steel furnaces, the only use to which it is put in Canada at present.

When used for refractory purposes silica is an objectionable impurity and should be reduced by concentration to at most five per cent.

It costs about $18 a ton delivered in Ontario.

Amount of chromite used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	—	—	—
Quebec	—	—	—
Ontario	1	—	50
Prairie Provinces	—	—	—
British Columbia	—	—	—
Canada (Total)	1	—	50

CLAYS.

Clay, in nearly all cases, consists principally of silicate of alumina, and contains water and many lesser constituents, such as iron oxide, lime, magnesia, and alkalies in greatly varying percentages. It often contains sandy matter made up of quartz, feldspar, and other minerals.

In general, clay is a plastic material, the result of weathering or breaking down of rocks. The clay particles exist in a finely divided state, making it, when wet, unctuous to the touch.

The uses to which clay may be put depend upon its physical properties, such as its plasticity, the effect of drying, its behaviour at various temperatures, tensile strength, and its colour, both raw and after firing.

Regarding the testing of clays, Dr. Merrill[1] says: "The most complete test of a clay now known would be obtained by use of analysis, coupled with a fire test made especially to develop such points as the analysis indicates to be weak ones. Fire tests are of two kinds—one consists in subjecting the clay to absolute heat without the action of any accompaniments, and the other in putting the clay through the course of treatment for which it is designed to be used. The former develops the absolute quality of the clay as good or bad, the latter proves or disproves the fitness of the clay for the work. The latter is better, of course, as a business test wherever it is practicable to use it."

Clays and their uses.

Very complete data on the requirements as to composition and physical properties of clays for special purposes may be found in "Clays: Their Occurrence, Properties and Uses" by Professor Heinrich Ries.[2] The description in detail of the various clays of commerce would require more space than is available for the subject, and is outside the intended scope of this report.

[1] Page 236, "The Non-Metallic Minerals, Their Occurrence and Uses," by George P. Merrill, John Wiley and Sons, New York.

[2] Published by John Wiley and Sons, New York.

In the table of minerals used, clays are divided under the following headings:—

(a) *Clay.*—Under this heading are included clays not specified elsewhere, common brick clay, unclassified clays, and local clays generally.

(b) *Ball Clay.*—This is a very plastic clay of high tensile strength used in porcelain making to give plasticity to the body of the mix. It must be very low in impurities which would tend to colour the finished product, when intended for use in making white ware. It is used also as a bond in abrasive wheels.

(c) *China Clay* or *Kaolin.*—This is a white clay, consisting, almost entirely, of hydrated silicate of alumina. It is not very plastic as a rule. As its name implies it is used largely in the making of china and porcelain. It is also used as a filler of cotton goods and paper, in the coating of book and wall paper, in the coating of cloth for window blinds, and in the manufacture of paints. It also enters into the composition of some mineral floorings.

(d) *Fire Clay.*—Clays possessing a very high refractoriness are termed fire clays. They differ among themselves greatly in many of their physical properties and in composition, but are always low in impurities such as lime, magnesia, iron oxide, and alkalies, which are fluxing materials. When there is a high percentage of uncombined silica in a fire clay it is called ganister. This name is also applied to a silicious rock used in making firebricks. Fire clay should not fuse below 3000° Fahrenheit.

The uses of fire clay depend primarily upon its refractoriness. It is manufactured into certain classes of firebrick, furnace and stove linings, crucibles, and briquettes for gas grates. It is also extensively used for bonding the brick work of boiler settings, cupola and metallurgical furnace linings. The quantities given in the accompanying tables do not include that used for boiler setting, except in a few instances.

(e) *Pipe Clay.*—This is a plastic white clay, relatively high in silica. It is used in manufacturing porcelain and enamelware. It is used also in paint making, on which to deposit certain colours. For this purpose it should be free from grit, and uniformly white.

(f) *Sagger Clay.*—This clay is used in the mixture for making saggers, the vessels in which porcelain and pottery is placed for burning. The necessary degree of refractoriness varies according to the temperature of the heat the saggers must stand while in use.

(g) *Slip Clay.*—This term is applied to clay used as a glaze for stoneware. It contains a comparatively high percentage of fluxing impurities, and should melt at a low temperature to a greenish or brown glass. This clay is used also as a bond in abrasive wheels.

(h) *Stone Clay.*—This is the name given to the clay forming the body of stone ware. It is usually refractory or semi-refractory and should vitrify without losing its shape. It should be of good tensile strength and sufficiently plastic to work well on the potter's wheel.

PREPARATION OF CLAYS.

In most cases clays are sold in the condition that they come from the pit, though sometimes they are ground, washed and dried.

For certain purposes, such as paper filling and coating, grit in clay, even in small proportions, is objected to, as it is harmful to the apparatus used in manufacturing as well as giving an imperfect product. Impurities which would tend to colour or cause spots in white ware often occur in china clay. In order to remove these objectionable impurities and grit, the clay must be washed.

The washing treatment consists of thoroughly sludging the clay with water into an extremely thin mud, then by screening and differential settling the coarser and heavier particles are removed. The clay water is either passed through a filter press or the clay allowed to settle in settling basins and then dried.

PRICES.

The prices of clays range greatly according to grade and cost of transportation, and also according to the quantities in which they are purchased. The prices below represent the cost delivered at the points of consumption.

(a) Common Clay.—Throughout Eastern Canada the cost ranges from twenty-five cents to one dollar, while in the west the price goes as high as two dollars.

(b) Ball Clay.—$8 to $12.85 in Ontario and Quebec.

(c) China Clay.—The following table gives the prices of china clay as reported by the various industries using it:—

Users	Price per ton		
	Highest	Lowest	Average
Chemical and pharmaceutical manufacturers....	$50.00	$14.00	
Glass polishers.....	10.00	9.00	
Paint manufacturers.....	35.00	10.00	$21.00
Paper "	21.00	7.75	10.75
Porcelain and enamelware manufacturers	13.50	11.50	13.00
Textile manufacturers	60.00	7.00	13.00
Wall paper manufacturers	11.00	9.00	10.50

(d) Fire Clay.—In Eastern Canada the prices of fire clay range from $3.20 to $20, the average being about $6.75, while in the west the price averages much higher for imported clay. British Columbia fire clay costs about $5 at the coast.

(e) Pipe Clay.—This clay ranges from $8 to $22.

(f) Sagger Clay.—In Ontario and Quebec the price is from $4.25 to $6.

(g) Slip Clay.—The price was obtained in only one case, it being $25 per ton.

(h) Stone Clay.—The price in Eastern Canada is from $5 to $14.

Amount of common clay used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	3	20	—
Quebec	18	2374	530
Ontario	20	6575	$\frac{5}{20}$
Prairie Provinces	8	145	—
British Columbia	10	$200\frac{7}{20}$	—
Canada (Total)	59	$9314\frac{7}{20}$	$530\frac{5}{20}$

Amount of ball clay used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	—	—	—
Quebec	4	—	810
Ontario	4	—	575
Prairie Provinces	—	—	—
British Columbia	—	—	—
Canada (Total)	8	—	1385

Amount of china clay used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	3	—	$23\frac{18}{20}$
Quebec	28	—	10715
Ontario	54	—	10576
Prairie Provinces	2	—	4
British Columbia	5	—	1552
Canada (Total)	92	—	$22870\frac{18}{20}$

Amount of fire clay and ganister used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	39	1623 10/20	2572
Quebec	39	—	1157 10/20
Ontario	182	—	23895
Prairie Provinces	23	44	543 10/20
British Columbia	25	751 10/20	251 10/20
Canada (Total)	309	17034	38839 10/20

Amount of pipe clay used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	1	—	1
Quebec	2	—	65
Ontario	2	—	61
Prairie Provinces	—	—	—
British Columbia	—	—	—
Canada (Total)	5	—	127

Amount of sagger clay used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	1	—	10
Quebec	3	—	1050
Ontario	2	—	185
Prairie Provinces	—	—	—
British Columbia	—	—	—
Canada (Total)	6	—	1245

Amount of slip clay used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	1	—	10
Quebec	—	—	—
Ontario	4	—	42
Prairie Provinces	—	—	—
British Columbia	—	—	—
Canada (Total)	5	—	52

Amount of stone clay used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	1	—	500
Quebec	1	—	175
Ontario	4	—	630
Prairie Provinces	—	—	—
British Columbia	—	—	—
Canada (Total)	6	—	1305

The following imports are reported by the Department of Customs:—

	1910–1911		1911–1912		1912–1913	
	cwt.		cwt.		cwt.	
China clay, ground or unground	367,052	$144,904	366,185	$120,262	419,688	$145,425
Fire clay, ground or unground		129,728		118,863		158,759
Ganister	14,180	2,912	13,486	2,566	11,544	2,056
Pipe clay, ground or unground		256		1,642		308
Clays, all other, n.o.p.		24,645		16,904		22,878

CORUNDUM AND EMERY.

Corundum, which is practically pure alumina, is, next to diamond, the hardest mineral found. It has a hardness of 9 on Mohs' scale.

It occurs in a rock matrix from which it must be separated by crushing and concentration, after which it is ground and sized according to the demands of the markets, great care being taken to obtain uniform grading as regards the size of the grains.

Owing to its hardness and to the fact that it is not brittle it is admirably suited for use as an abrasive. It is employed for grinding and polishing both in the form of powder and wheels.

In the making of wheels the grains of corundum are mixed with clay and fluxes and moulded into shape, after which the wheels are "fired" at such a temperature as to establish a strong bond between the particles.

Emery is an impure corundum. It is almost black in colour and contains magnetite and hematite intimately mixed.[1]

Its uses are the same as pure corundum but its abrasive power is very much less.

The prices as reported by Canadian users vary from 5½ to 12 cents per pound for corundum, and from 2½ to 7 cents per pound for emery, the prices depending largely upon the quantities purchased.

Amount of corundum used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	1	$\frac{1}{20}$	—
Quebec	2	$1\frac{2}{20}$	—
Ontario	17	$141\frac{13}{20}$	3
Prairie Provinces	2	$\frac{6}{20}$	—
British Columbia	—	—	—
Canada (Total)	22	$143\frac{2}{20}$	3

[1] J. D. Dana, "System of Mineralogy."

Amount of emery used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces.....	13	—	$8\frac{15}{20}$
Quebec.....	13	—	12
Ontario.....	92	—	$1046\frac{6}{20}$
Prairie Provinces.....	10	—	$6\frac{4}{20}$
British Columbia.....	7	—	$\frac{17}{20}$
Canada (Total).....	135	—	$1073\frac{12}{20}$

The following imports are reported by the Department of Customs:—

	1910-1911	1911-1912	1912-1913
Emery, in bulk, crushed or ground.....	$42,188	$47,263	$48,469

CRYOLITE.

Cryolite consists of a double fluoride of aluminium and sodium, represented by the formula $Na_3Al F_6$. It occurs as a secondary mineral in veins. The main source of supply is Greenland. It has not been found in commercial quantities in Canada.

Cryolite finds its principal use, in Canada, in the electrolytic reduction of aluminium, in which process it acts as an electrolyte. It is used to a small extent in the manufacturing of opal glass.

Amount of cryolite used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	—	—	—
Quebec	1	—	242
Ontario	1	—	1 10/20
Prairie Provinces	—	—	—
British Columbia	—	—	—
Canada (Total)	2	—	243 10/20

The following imports are reported by the Department of Customs:—

	1910-1911		1911-1912		1912-1913	
	cwt.	$	cwt.	$	cwt.	$
Cryolite	9,618	48,244	7,996	35,639	13,751	57,780

FELDSPAR.

There are several varieties of *feldspar*, all of which consist of silicates of alumina and one or more of the alkali group—potash, soda, lime, and baryta. The hardness of the various varieties range from 5 to 7, with an average of 6 on Mohs' scale. With the exception of *orthoclase* and the rare variety, *hyalophane*, which are monoclinic, the feldspars all belong to the triclinic system of crystallization.

Orthoclase and *microcline* are the two varieties of chief industrial importance. They are identical in composition and physical properties, belonging, however, to different crystal systems. The chemical composition of the pure mineral is as follows:—

Silica (SiO_2)	64·7%
Alumina (Al_2O_3)	18·4%
Potash (K_2O)	16·9%
	100·0

Part of the potash is sometimes replaced by soda.

Albite is used to some extent, either alone or mixed with orthoclase. It is a soda feldspar, having the following composition, when pure:—

Silica (SiO_2)	68·6%
Alumina (Al_2O_3)	19·6%
Soda (Na_2O)	11·8%
	100·0%

Part of the soda is usually replaced by potash and lime.

While these feldspars are common constituents of many igneous rocks they usually occur in such small grains, and intermixed to such a degree with other minerals, that their utilization is not economically possible. In some localities they occur in comparatively large masses in coarsely crystallized pegmatites along with quartz, tourmaline, and mica, from which, in the course of mining, they may be fairly easily separated by hand.

TREATMENT.

The "spar," which comes from the mine or quarry in the form of lumps, must be crushed and ground to about 150 to 200 mesh to prepare it for most of the uses to which it is put. When the product is to be used for ceramic purposes, great care must be taken to avoid the introduction of particles of iron from the grinding machines. For this reason the grinding is usually done in special chaser mills, or pebble mills. In the chaser mills the spar is ground under quartzite or buhrstone wheels running over a bed of quartzite blocks. The pebble mills are lined with quartz, while flint pebbles are used to effect the grinding. In some cases the crushing is preceded by calcining in kilns in order to shatter the mineral and thus facilitate the crushing and grinding.[1]

According to the same authority feldspar is graded as follows:—No. 1, No. 2 (sometimes called "Standard"), and No. 3. "No. 1 is carefully selected, free from iron-bearing minerals, largely free from muscovite, and contains little or no quartz, usually less than 5 per cent; No. 2 is largely free from iron-bearing minerals and muscovite, but usually contains when ground from 15 to 20 per cent of quartz; No. 3 is not carefully selected and contains somewhat higher percentages of quartz, muscovite, and iron-bearing minerals."

USES.

The main uses of feldspar are in the ceramic arts. Feldspar, either No. 1 or No. 2 grade, is one of the principal ingredients of the body and the glaze of porcelain. In the body it fuses during the firing and forms a firm bond between the particles of quartz and clay. In the glaze it fuses and combines with the other ingredients to form an opalescent, glassy covering to the ware on which it is applied. Thus it will be seen that the temperature of fusion is an important factor in selecting a feldspar for these purposes. The melting point depends largely upon the percentages of alkalies in the spar. The higher the percentage of potash the lower will be the point of fusion. Where a small

[1] Page 856, Mineral Resources of the United States, Part II, 1907.

part of the potash is replaced by soda it will be found that the point of fusion is still lower.

The spar should be as free as possible from iron-bearing or other dark-burning minerals. "Several dark-burning minerals —hornblende, tourmaline, and black mica—if not completely separated, show in the fired sample or finished ware as very fine black specks. These would hardly be noticed by the uninitiated, but contribute a gray cast to the ware."[1] Though quartz is added to the feldspar in the various mixtures, some users specify against free silica in excess of 5 per cent. They prefer to add the quartz themselves, thus obviating the danger of irregular results arising through the fluctuation of silica contents of the high-silica spar.

Feldspar, usually No. 2 grade, is used in enameling brick and metal. The spar is one of the fluxing materials which goes to form the porcelain-like coating of the ware. For this purpose, also, the spar should be as free as possible from the dark-burning minerals.

In the making of artificial teeth only the highest grade of feldspar, containing no dark-burning minerals whatever, is used.

In the manufacturing of abrasive wheels feldspar is one of the bonding materials used. On firing the wheels, the feldspar fuses and firmly cements the grains of emery, corundum or carborundum together. For this purpose No. 3 grade is employed, and, since the colour is not of importance, small quantities of foreign minerals are not objected to.

The addition of alumina to the mixture for glassmaking causes opalescence. Since feldspar contains alumina in a readily fusible form it is used in manufacturing opal glass. White mica in very small quantities, and free silica are permissible, but the spar should be as free as possible from iron-bearing or other minerals which would tend to colour the finished product.

Very finely ground feldspar is used in preparing certain scouring soaps and polishes.

[1] Page 436, Transactions American Ceramic Society, Vol. XII. "The requirements of Pottery Materials," by Harrison Everett Ashley.

Coarsely granular feldspar of low grade is used as a surfacer for some prepared roofings.

In making artificial stone the surface to be exposed to view is made of a mixture of some fine grained mineral and cement. In some cases feldspar is the mineral used. Generally the white spar is specified but the red is employed to produce certain effects. For this purpose the mineral is ground to pass a twenty mesh screen. The presence of small quantities of dark-coloured minerals makes little difference, but such minerals as pyrite, which on weathering would cause stains, are decidedly objectionable.

A small quantity of low grade feldspar, crushed to about one-eight of an inch, is sold as "poultry grit."

The price of feldspar, laid down at points in Ontario and Quebec, ranges from $7.20 to $14 for No. 1 and No. 2; No. 1 commanding from $2 to $4 per ton more than No. 2 or "Standard" grade.

No figures of imports are available.

Amount of feldspar used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	2	—	130
Quebec	4	250	1000
Ontario	16	130	$1725\frac{1}{20}$
Prairie Provinces	—	—	—
British Columbia	—	—	—
Canada (Total)	22	380	$2855\frac{1}{20}$

FLUORSPAR.

Fluorspar or *fluorite* is a mineral consisting of calcium fluoride. It varies from colourless to dark purple, often blue, yellow, green, or rose. It usually occurs in veins, often intermingled with other minerals, such as galena, sphalerite, quartz, and calcite. Fluorite is frequently spoken of as *spar*, *fluor* or when clear and colourless as *glass spar*.

PREPARATION.

In some cases fluorite is sold in the crude form as it comes from the pit, but more often it is crushed or ground. Where the deposits contain other minerals and a pure product is required, the material is crushed and jigged to remove the impurities.

According to F. J. Fohs,[1] fluorspar is classed as lump, gravel, and ground, and graded according to purity as given below. The term *gravel* is applied to the granular material resulting from natural disintegration and to the product of crushing.

Commercial fluorspar is divided into three main grades known as "No. 1," "No. 2", and "No. 3," according to purity.

No. 1 contains at least 96 per cent of calcium fluoride. It is usually white or only slightly coloured.

No. 2 contains from 90 per cent to 96 per cent of calcium fluoride, with less than 4 per cent silica, the remainder being chiefly calcite. The colour is usually darker than that of No. 1 grade.

No. 3 contains from 60 per cent to 90 per cent of calcium fluoride.

No. 1 grade, when ground, is further subdivided as follows: "Extra No. 1 Ground," "No. 1 Ground," and No. 2 Ground."

Extra No. 1 Ground contains less than 1 per cent of impurities.

No. 1 Ground contains at least 98 per cent of calcium fluoride and not over 1 per cent of silica.

[1] "Fluorspar Grades and Markets," page 720, Mining and Scientific Press, Nov. 27, 1909.

No. 2 Ground contains from 96 to 98 per cent of calcium fluoride and as much as 2 per cent of silica.

The ground fluorite is usually of about 85 mesh.

USES.

The main use of fluorite is as a flux in the metallurgical industries. In the manufacture of basic open-hearth steel, large quantities are used to render the high calcium slag employed more fluid. No. 3 grade, containing 85 per cent, or more, calcium fluoride and about 3 per cent, or less, silica, is specified. In some cases fluorite is used as a flux in blast furnace and foundry practice. For these purposes the cheapest grades are used.

Fluorite enters into the composition of the mixture used in enameling iron and steel ware. It is used also in the making of opal glass. "No. 1 ground," containing less than a half per cent of oxide of iron is specified. Small quantities are used in etching glass.

In the chemical industry, fluorite is employed as a source of fluorine in the manufacture of hydrofluoric acid and various fluorides. For chemical purposes the higher grades are used exclusively.

Fluorspar is employed in the electrolytic refining of lead to prepare the lead fluosilicate used as electrolyte, and also in the electro-reduction of aluminium.

PRICES.

The prices of fluorite for metallurigical purposes, laid down at the points of consumption, were reported as varying from $5 to $9.50, averaging $7.85.

For glass and enamelware making the cost reaches as high as $35 per ton.

No figures of imports are available.

Amount of fluorspar used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	3	—	6910
Quebec	3	—	$65\frac{1}{20}$
Ontario	16	$40\frac{5}{20}$	$3445\frac{19}{20}$
Prairie Provinces	1	—	1
British Columbia	2	—	$2\frac{10}{20}$
Canada (Total)	25	$40\frac{5}{20}$	$10424\frac{1}{20}$

FULLERS' EARTH.

Fullers' earth is a clay-like material which has the property of deodorizing and clarifying fats, oils, and greases.

There is none produced in Canada.

PREPARATION.

Regarding the preparation of fullers' earth, F. B. Van Horn says:[1] "The fullers' earth in Florida is usually mined by pick and shovel, and hauled to the mill, where the earth is broken up into small lumps and put through rotary driers. It is then taken by elevator to the crushers and ground and bolted into several grades, 120 mesh being the finest. The material is then ready for shipment."

USES.

Fullers' earth is used in the meat packing industry to clarify lard. The earth is usually ground to 120 mesh and is generally of English origin.

In the refining of petroleum a considerable quantity is used. For this purpose the earth is not ground so fine.

Small quantities are used to remove grease from woollen goods.

PRICES.

The price of fullers' earth laid down at the points of consumption varies from $14 to $17.

Amount of fullers' earth used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	2	—	2
Quebec	3	—	160
Ontario	13	—	756 18/20
Prairie Provinces	7	—	103 10/20
British Columbia	1	—	35
Canada (Total)	26	—	1057

The following imports are reported by the Department of Customs:—

	1910-1911	1911-1912	1912-1913
Fullers' earth, in bulk only	$5,012	$7,324	$14,150

[1] "Fullers' Earth," page 733, Mineral Resources of the United States, Part II, 1907.

GARNET.

Small quantities of *garnet* are used in Canada for making "sand belts" used in finishing wooden articles, particularly wheels, shafts, and handles for agricultural implements.

For this purpose the garnet must be crushed, to give sharp cutting edges, and very carefully graded as to size.

It is worth about $40 per ton delivered in Ontario. There is none produced in Canada.

Amount of garnet used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	—	—	—
Quebec	—	—	—
Ontario	4	—	4
Prairie Provinces	—	—	—
British Columbia	—	—	—
Canada (Total)	4	—	4

GRAPHITE.

The element carbon exists in three allotropic forms, one of which is the mineral *graphite*, also known as *plumbago*, and *black lead*.

This mineral is soft, unctuous, and black or steel grey, has a metallic lustre, and is electro-conductive to a high degree.

It is, practically, always associated with either igneous or metamorphic rocks, occurring in three manners.

(1) Veins of crystalline (columnar, or foliated) graphite.
(2) Lenticular masses of crystalline (flake), or amorphous graphite.
(3) Particles of graphite, either crystalline (flake), or amorphous, disseminated through the country rock.

The workable deposits, in nearly all cases, belong to the last of these classes.

There are a number of minerals which are commonly associated with graphite, such as quartz, calcite, mica, chlorite, pyrite, and pyrrhotite, varying, of course, according to the rocks in which the graphite occurs.

PREPARATION.

Crude graphite of the third class, referred to above, and that containing impurities, must be subjected to a very elaborate milling treatment to prepare it for the market.

It must be ground to such a degree of fineness as to detach the particles of graphite from the associated minerals. This grinding is not an easy matter, as the graphite cakes badly in the machines. Following the grinding, the graphite is separated from the accompanying minerals either by a wet or dry process of concentration.[1] The resulting concentrates are then graded into various sizes by screening and bolting.

The graphite is further graded according to purity.

[1] For descriptions of various processes see: "Graphite, its Properties, Occurrence, Refining and Uses," by Fritz Cirkel. Report No. 18, Mines Branch.

USES.

Though one of the most important uses of graphite is for the manufacture of refractory articles, there is very little used in Canada for this purpose. In the manufacturing of crucibles, retorts, etc., flake graphite of a number of sizes is used. It should be of slow combustion and good thermal conductivity; but the amount, and chemical composition of the contained impurities are the main factors in determining the suitability of any graphite to this purpose. The presence of fluxing impurities would tend to shorten the life of the finished article, if not render it unfit for use.

Stove polishes consist essentially of finely ground graphite, usually 160 mesh, with which is mixed clay or some other material to act as a bond. Both the flake and amorphous varieties are used. Professor B. L. Miller says:[1] "If flake graphite is used a higher lustre is obtained which has a decidedly steel grey colour. This is owing to the flattening out of the flakes on the metal surface when rubbed by the brush, and to the fact that light reflected from the surface of the flakes produces a higher lustre than when the amorphous graphite is used. Not infrequently both amorphous and crystalline flake graphite are mixed together to produce the desired results. With the amorphous graphite alone it is difficult to obtain a lustrous polish, while the crystalline flakes alone produce too light a colour, but the combination of the two varieties will yield a black polished surface with expenditure of little labour. The polish obtained with the flake graphite alone, or with the mixture of the two, lasts longer than the polish obtained with amorphous graphite alone." For polish making purity is not of importance, from 70 per cent to 80 per cent of carbon being usual.

The finishing step of the manufacture of gunpowder consists of polishing the grains with graphite. The powder is placed in a tumbling barrel with very fine flake graphite and thoroughly mixed and shaken for some time. The thin film of

[1] "Graphite Deposits of Pennsylvania," Topographic and Geologic Survey of Pennsylvania, Report No. 6, 1912.

graphite enveloping each grain acts as a protection against the absorption of moisture.

Graphite, on account of its extreme softness and unctuousness, is admirably suited for use as a lubricant. It is used in two manners; namely, dry, or mixed with oil or grease. In the accompanying tables, showing the consumption of minerals, graphite used in the manufacturing of these mixed lubricants is included, but only in a few cases record is made of the graphite used in the dry form as a lubricant. Flake graphite in various grades of fineness, from about 20 mesh to 200 mesh, is that employed and should be free from gritty matter.

Large quantities of graphite are used in the manufacturing of paints for special purposes, such as for covering structural steel work, iron and steel tanks, and steel stacks. It produces a good weather and fume resisting paint. For this purpose a very fine, air-floated flake graphite is used. It should be free from grit and sulphide minerals.

In the casting of iron, it is desirable to coat the inner surface of the mould with some material which will prevent the metal from coming into contact with the sand of which the mould is made, and at the same time give to the casting a smooth surface. Graphite possesses certain properties which suit it to this purpose, and large quantities are used by the foundrymen. A fine grain, flake graphite is used, either alone or mixed with talc or 'sea-coal.'

Lead pencils are made by encasing thin rods of prepared graphite in wood to give the necessary strength. These rods are formed by mixing very finely ground amorphous graphite with clay, which is then moulded into shape and baked. The hardness of the finished product depends upon the proportion of clay used and the temperature and duration of baking.

In electrical work graphite finds many uses on account of its conductivity, refractoriness, and softness. For different uses various grades are employed, in all of which a high degree of purity is required, especially for the making of dynamo and motor brushes, in which case it must contain no grit.

Graphite is used by electrotypers for giving an electro-conductive surface to the matrix on which the electrotype is

deposited. For this an extremely fine and pure grade of air-floated graphite is required. A very small quantity supplies the market.

Artificial Graphite.

Graphite is now being manufactured from amorphous carbon by means of the electric furnace. For certain purposes this artificial graphite is said to be superior to the natural material. Its principal application is in the manufacturing of electrical apparatus.

PRICES.

The price of graphite varies greatly according to purity, size, and suitability for certain purposes. The prices quoted by Canadian consumers range from $40 to $300 per ton. It is usually sold in barrels, containing about 500 pounds.

Amount of graphite used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	44	$12\frac{15}{20}$	$42\frac{6}{20}$
Quebec	52	$39\frac{17}{20}$	$295\frac{1}{20}$
Ontario	186	$113\frac{15}{20}$	$328\frac{2}{20}$
Prairie Provinces	26	$20\frac{5}{20}$	$41\frac{11}{20}$
British Columbia	27	$5\frac{0}{20}$	$50\frac{16}{20}$
Canada (Total)	335	$191\frac{8}{20}$	$757\frac{16}{20}$

The following imports are reported by the Department of Customs:—

	1910-1911	1911-1912	1912-1913
Plumbago, not ground or otherwise manufactured	$ 4,300	$ 6,163	$ 6,105
Plumbago, ground, and manufactures of, n.o.p.	43,850	39,945	57,787
Black lead	10,099	11,792	9,376

GYPSUM.

Gypsum is a soft, white mineral, composed of hydrated calcium sulphate ($CaSO_4 \cdot 2H_2O$). The names *terra alba* and *land plaster* are also applied to it. It occurs usually in beds, often of great thickness.

The transparent crystallized or foliated variety is called *selenite*, and the fine fibrous, opalescent variety, *satin spar*. When the massive variety is of very fine texture and translucent it is called *alabaster*.

Gypsum is frequently coloured by the presence of impurities, especially the massive varieties.

USES.

The principal use of gypsum is for the manufacture of *plaster of Paris*, which consists of partially dehydrated gypsum. On heating finely powdered gypsum, within certain limits of temperature, it gives off part of its water of crystallization but retains the power of again taking up a like quantity of water, and, at the same time, forming into a solid mass.[1] This property of the calcined gypsum or plaster of Paris finds for it many uses in the arts and trades. A partial list of the uses is as follows:—wall plaster and decorations, moulds and patterns for various purposes, casts of art objects, etc., surgical and dental purposes, and as a cement. It is also the base of alabastine, used for tinting walls.

In the manufacturing of portland cement, gypsum is introduced into the cement for the purpose of regulating the rapidity of setting when mixed with water. Some cement mills purchase the gypsum ground very finely, while others purchase it in lump form or crushed to ½ inch. As a rule a minimum of 36 per cent of sulphur trioxide (SO_3) is demanded.

Considerable quantities of ground gypsum and plaster of Paris are used by asbestos manufacturers in the manufacturing of pipe and boiler coverings, mill board, etc.

[1] For technology of Gypsum see "Gypsum in Canada", by L. H. Cole, No. 245, Mines Branch.

In the paint making industry gypsum is employed in the manufacturing of "cold water paints," in which it acts as the body or vehicle for the colour. It is also used to a lesser extent in the making of paints, mixed in oils. It should be pure white, very finely ground and free from grit.

Finely ground gypsum, when spread upon the soil, has the power of aiding in the decomposition of certain minerals and thus liberating plant-nourishing chemicals. It also plays a useful part when mixed with manure which later is to be used as a fertilizer. It is used, either in its crude state or mixed with plant-nourishing materials, to form certain artificial fertilizers.

In the textile industry, very finely ground, white gypsum is used to some extent as a filler for cotton goods.

PREPARATION.

Gypsum is usually won by open quarry methods, though in some cases underground mining, similar to that of coal mining, is the method employed. The material is hand cobbed to remove *anhydrite* (anhydrous calcium sulphate) and other objectionable materials. From the pits it goes to the mill, where it is crushed, and ground to the necessary degree of fineness.

The finished product is graded according to purity and colour.

The price of the uncalcined gypsum varies from $1.60 to $3.50 in Ontario and Quebec, while, in the west, the cost was reported as high as $7.50.

Amount of gypsum used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	3	1600	—
Quebec	8	29306$\frac{10}{20}$	180
Ontario	22	30592$\frac{10}{20}$	115
Prairie Provinces	6	8825	—
British Columbia	1	—	3000
Canada (Total)	40	70324	3295

Amount of plaster of Paris used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	2	$1\frac{10}{20}$	—
Quebec	9	268	$10\frac{5}{20}$
Ontario	16	$656\frac{6}{20}$	$5\frac{10}{20}$
Prairie Provinces	2	$17\frac{4}{20}$	—
British Columbia	4	16	$3\frac{10}{20}$
Canada (Total)	33	959	$19\frac{5}{20}$

The following imports are reported by the Department of Customs:—

	1910–1911		1911–1912		1912–1913	
	tons		tons		tons	
Gypsum crude	12,500	$22,872	2,147	$12,263	4,179	$18,994
" ground, not	brls.		brls.		brls.	
calcined	45,881	12,298	6,551	3,939	55,739	22,939
	cwt.		cwt.		cwt.	
Plaster of Paris	385,628	135,837	608,031	205,676	638,791	228,224

IRON OXIDES.

As a rule, the minerals which consist essentially of iron oxides are looked upon as iron ores. In this report they will not be treated as such, but in the light of those uses which do not depend upon the extraction of their metallic values.

Magnetite is a hard, black mineral of metallic lustre, composed of ferrous-ferric oxide ($FeO \cdot Fe_2O_3$, or Fe_3O_4). It gets its name from being strongly magnetic.

Hematite[1] consists of ferric oxide, or sesquioxide of iron (Fe_2O_3). It varies in colour from bright red to black, though, when ground to a fine powder, it is always red.

Limonite is the hydrated sesquioxide of iron ($2\,Fe_2O_3 \cdot 3\,H_2O$). It is known also as *brown hematite.* Its colour varies from yellowish brown to black.

Bog iron ore is a loose earthy variety of limonite occurring in bogs.

Ochre is the name applied to the earthy variety of limonite, usually highly argillaceous. Its colour varies from brilliant yellow to dull yellowish brown.

The presence of manganese oxides in ochre gives a brown or reddish colour. This manganiferous ochre is called *umber*, after Umbria, in Italy, where it was first utilized. *Sienna* is like umber in composition, but contains less of the oxides of manganese and is lighter in colour.

USES.

The principal uses of these ferruginous materials are in the paint industry, where they are employed as pigments. Trueness and depth of colour are the prime requisites. They should be very finely ground, and free from grit. They are used either raw or calcined, according to the colour desired.

The very finely ground raw hematite produces the colours known as Indian red and Venetian red, but the principal source of these colours is from the residue from pyrite burning.

In testing all these materials for their suitability as pigments, a carefully dried and finely ground sample should be mixed with oil and applied with a knife to a slip of clear glass.

[1] Hematite, calcined limonite and the residue from pyrite roasting are known, commercially, as "red oxide."

The colour as seen through the glass should be compared with similarly prepared samples of standard colours. Ochres, siennas and umbers should be tested raw and calcined.

In the case of some ochres, they must be washed to remove contained sand and grit. This is done by thoroughly mixing with water to a very thin sludge. The fine particles of the ochre are held in suspension, while the coarse sandy matter rapidly settles to the bottom. The sludge is then conveyed to settling tanks and the ochre allowed to settle. The water is drawn off and the ochre dried. It is then ready for the market, or it may first be calcined.

Besides the use of these materials for paint-making they are used to colour mineral floors, sand-lime brick, match heads, rubber goods, paper, and oilcloth.

Bog iron ore is used as a purifier of illuminating gas. It has the power of removing the sulphuretted hydrogen (H_2S), hydrocyanic acid (HCN), and hydrosulphocyanide (HSCN) from the gas. By exposing it to the air, after use, it becomes revivified and may be used again.

Iron oxide minerals are used as fluxes in the smelting of certain metals, and as desulphurizers and decarbonizers in open hearth steel making.

PRICES.

The value of these ferruginous materials is determined very largely by the trueness of colour, and its intensity, and their covering power when mixed as paint. The following table has been prepared from prices quoted by consumers and shows the variation in price, and also the average price of the material delivered in the eastern portion of Canada.

Manufacturers of	Material	High	Low	Average
Paint	Magnetite			$20.00
"	Red oxide	$150.00	$16.00	44.00
"	Ochre	35.00	16.00	26.00
"	Sienna and umber	140.00	45.00	82.50
Paper	Red oxide	30.00	17.00	22.50
"	Ochre	50.00	20.00	25.00
"	Sienna and umber			50.00
Sand-lime bricks	Red oxide	47.50	20.00	30.00
"	Ochre	27.00	16.00	20.00
Matches	Red oxide			40.00
Oilcloth	Ochre			18.00

Amount of yellow ochre used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	1	—	39 5/20
Quebec	15	125	764 10/20
Ontario	13	82	284
Prairie Provinces	1	—	37
British Columbia	4	—	117
Canada (Total)	34	207	1241 15/20

Amount of sienna and umber used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	1	—	2
Quebec	6	—	82 7/20
Ontario	6	—	45 8/20
Prairie Provinces	1	—	10
British Columbia	3	—	107 10/20
Canada (Total)	17	—	247 5/20

Amount of red oxide used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	2	19 8/20	156 15/20
Quebec	19	2113	354 10/20
Ontario	23	343 10/20	1198
Prairie Provinces	8	25	214
British Columbia	7	100	113 10/20
Canada (Total)	59	2600 18/20	2036 15/20

Amount of iron ores for flux and bog ore used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	1	20	—
Quebec	2	600	375
Ontario	3	2	1320
Prairie Provinces	1	150	—
British Columbia	—	—	—
Canada (Total)	7	772	1695

Amount of magnetite used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	—	—	—
Quebec	—	—	—
Ontario	1	187	—
Prairie Provinces	—	—	—
British Columbia	—	—	—
Canada (Total)	1	187	—

The following imports are reported by the Department of Customs:—

	1910–1911		1911–1912		1912–1913	
Ochres, ochrey earths, siennas, and umbers	lbs. 2,576,261	$31,736	lbs. 2,994,620	$33,013	lbs. 3,619,270	$43,634

MICA.

The name *mica* covers a class of minerals consisting of silicates of alumina and an alkali. The micas all belong to the monoclinic system, and are characterized by an eminently perfect basal cleavage, splitting, easily, into very thin sheets which are flexible and somewhat elastic. The varieties of most commercial importance are *muscovite* and *phlogopite.*

Muscovite, also known as *common mica*, *white mica*, and *potash mica*, is that in which potash is the main, or only alkali present. Though occasionally found colourless, it usually varies from yellowish to brown or green. It is of vitreous lustre, and in thin sheets is transparent.

Phlogopite, *amber mica*, or *magnesia mica* is a high magnesian mica. Its colour ranges from a light amber to a brownish red, and, in thin sheets, it is transparent or subtransparent.

Muscovite is liable to contain dendritic inclusions, stains or blotches of garnet, magnetite, and hematite, and, in common with the other micas, embedded between the laminæ flattened inclusions of quartz. Calcite and apatite, in addition to quartz, frequently occur embedded between the laminæ of phlogopite crystals.

USES.

Mica finds a number of uses in the electrical industry on account of its dielectric strength, the ease with which it may be split into thin, flexible sheets, and in some cases on account of its transparency.

The following is a partial list of its uses in this industry: Motor and dynamo winding—commutator ring and segment insulators; electric lights—discs for interior insulation of light sockets, covers for fuse boxes; telephones—long, narrow slips on which fuses are mounted; electric heaters—pieces on which the resistance wire is wound, forming the heating elements of toasters, sad irons, etc., etc., spark plugs—the insulation of some gasoline engine spark plugs is made of mica.

The mica is furnished to the consumers split to the necessary thinness and sometimes cut to shape. It must be free from

electrical defects; that is, free from electro-conductive inclusions and in perfect sheets.

For commutator insulation, amber mica is best, as it wears, under the action of brushes, at the same rate as the copper which composes the segments of the commutator. It must be free not only from electro-conductive inclusions, but also from quartz and garnet.

For electrical purposes *micanite* is being extensively used. It is made by cementing together very thin, small sheets of mica into large sheets. For this purpose much of the small mica is used, which otherwise would be discarded as useless or else ground to powder.

Mica, on account of its transparency and resistance to the action of heat, is admirably suited to use as glazing for stove doors, furnace peep-holes, and chimneys for lamps, lanterns, and gas burners. Muscovite is generally employed, though phlogopite is frequently used. Transparency and freedom from stain are the prime requisites for these purposes.

Finely ground mica, free from quartz and garnet, is mixed with a heavy grease for lubricating purposes.

In order to produce a scintillating surface on wall paper very finely ground white mica is employed. For this purpose the mica is ground under water. It should be from 100 to 150 mesh and as nearly uniform in size as possible.

Coarsely ground mica is used in the surfacing of certain prepared roofings. Cheapness is the main consideration in selecting this material. Any variety of mica may be used.

In addition to the above uses there are many others of lesser importance.

PREPARATION.

For full information regarding the mining and preparation of mica reference should be made to the report on mica by Mr. H. S. deSchmid.[1]

[1] Mica: Its Occurrence, Exploitation, and Uses. Second Edition. Report No. 118, Mines Branch.

PRICES.

The price of mica is liable to great fluctuation, according to the demands of the market. The following prices are only approximate: Sheet mica, one inch by one inch, seven cents, five inches by eight inches, two dollars per pound, ground white mica for wall paper manufacturing $70 to $85 per ton, roofing mica $5 per ton.

Amount of mica used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	6	215	175
Quebec	5	1315	—
Ontario	41	37205	27986
Prairie Provinces	—	—	—
British Columbia	1	—	10
Canada (Total)	53	38735	28171

Amount of ground mica used in the manufacturing industries as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	—	—	—
Quebec	2	10	50
Ontario	5	$45\frac{5}{20}$	50
Prairie Provinces	—	—	—
British Columbia	—	—	—
Canada (Total)	7	$55\frac{5}{20}$	100

MICA SCHIST.

Mica Schist is a rock composed largely of mica and quartz. The mica occurs in small scales all similarly oriented, thus giving the rock its typical structure, which is known as *schistose.* This foliation or schistose structure permits of easy cleavage along the planes parallel to the mica scales, while the rock is difficult to break in other directions.

The particular variety of this rock which is found to be best suited to the purpose described below is that in which *sericite* is the mica present. This variety is more definitely designated as *sericite schist.*

A sample of sericite schist furnished to the writer by a foundryman was tested by Dr. H. T. Kalmus at the School of Mining, Kingston, and its melting point determined to be 1629°C., or about 100° lower than that of pure kaolin.

Its composition is as follows[1]:—

SiO_2	88·00%
Al_2O_3	5·43%
FeO	·50%
Fe_2O_3	3·29%
CaO	·33%
MgO	·40%
TiO_2	·39%
K_2O	1·30%
Na_2O	·22%
H_2O (Combined)	·88%
	100·74

USES.

An increasing number of foundrymen are substituting mica schist for the firebrick used for lining cupolas. The rock is broken into convenient size and shape, about six or eight inches long, four or five inches wide and a couple of inches thick, and cemented into place with fireclay and fragments of the rock

[1] Analysis by Mr. H. A. Leverin, Mines Branch.

itself. It is reported that very good results have been obtained at a considerable saving over the cost of firebrick lining. It is used also to advantage in the patching of cupola linings, either on brick or schist.

Mica schist is used to some extent in boiler settings.

PREPARATION.

The material is sold in rough lumps as it comes from the quarry, the users dressing it to suit themselves.

PRICES.

The cost of mica schist delivered in Canada ranges from $9 to $15, the average price in Ontario being $10.50 per ton.

Amount of mica schist used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	2	—	105
Quebec	—	—	—
Ontario	9	—	730
Prairie Provinces	—	—	—
British Columbia	—	—	—
Canada (Total)	11	—	835

MINERAL PHOSPHATES.

Apatite is a mineral consisting essentially of tricalcic phosphate, $Ca_3P_2O_8$, or otherwise expressed $(CaO)_3P_2O_5$, with some calcium fluoride, CaF_2, or calcium chloride, $CaCl_2$. That containing the fluoride is known as *fluor-apatite*, and that containing the chloride, *chlor-apatite*. The Canadian apatite is of the former variety. It is generally green in colour and occurs as hexagonal crystals or crystalline masses, principally in pyroxenites. When pure, it contains 42·3 per cent phosphoric acid, P_2O_5, 55·5 per cent of lime and 3·8 per cent of fluorine.

At one time large quantities of this mineral were produced in Canada, but at present the production is very limited owing to the cheaper and more easily ground imported phosphates which supply the market. *Hard rock phosphate* and *pebble phosphate* are the two forms of mineral phosphate which are most extensively used to-day. They are imported from the southern United States.

The *hard rock phosphates* are of sedimentary character, as opposed to the crystalline phosphate of the apatite veins. They consist essentially of amorphous phosphatic material, of varying degrees of richness, and represent the natural concentration of the tricalcic phosphate content of percolating meteoric waters. These waters, by a process of leaching and precipitation, have caused local zones of phosphatic concentration in what was originally a calcareous rock containing a small percentage of phosphate.

The so-called *pebble phosphate* represents alluvial material derived principally from the *hard rock* deposits, and consists of water-worn fragments of phosphatic rock mixed with teeth, bones, and other similar organic remains.

Acid phosphate is the product resulting from the treatment of mineral phosphates with sulphuric acid, by which the tricalcic phosphate, $(CaO)_3P_2O_5$, is converted into the monocalcic phosphate, $CaO\cdot(H_2O)_2P_2O_5$.

USES.

The major use of mineral phosphates is in the manufacturing of fertilizer. Since the tricalcic phosphate, of which they are

composed, is only slightly soluble in water, it is customary to convert it into more readily soluble monocalcic phosphate, that it may be in a better condition to nourish plant growth. Some fertilizer manufacturers perform this operation themselves, while others prefer to purchase the material in the form of acid phosphate.

Phosphorus is manufactured from mineral phosphates by a process of reduction in an electric furnace. A considerable quantity of apatite and pebble phosphate is consumed in Canada for this purpose.

In order to enrich the phosphorus bearing basic slags from steel furnaces phosphates are occasionally added to the charge. Such slags are used as fertilizer ingredients.

A small quantity of apatite is used for making a high grade of acid phosphate, which is employed in the compounding of certain baking powders.

PRICES.

The price of mineral phosphate is calculated on the percentage of tricalcic phosphate contained. The cost, laid down in eastern Canada, is about 14 cents per ton for each per cent. Thus, for phosphate containing 75 per cent, the cost would be about $10.50 per ton.

The cost of acid phosphate per ton is calculated at about 65 cents for each per cent of water-soluble phosphoric acid. Thus, that containing 15 per cent would cost about $10.40 per ton.

Amount of mineral phosphate used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	1	—	200
Quebec	2	—	2500
Ontario	3	50	2000
Prairie Provinces	—	—	—
British Columbia	—	—	—
Canada (Total)	6	50	4700

Amount of acid phosphate used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	3	—	6500
Quebec	2	—	3000
Ontario	1	—	25
Prairie Provinces	1	—	$2\frac{10}{20}$
British Columbia	—	—	—
Canada (Total)	7	—	$9527\frac{10}{20}$

The following imports are reported by the Department of Customs:—

	1910–1911		1911–1912		1912–1913	
Phosphate rock		$62,512		$43,342		$24,137
	lbs.		lbs.		lbs.	
Acid phosphate	1,178,908	57,626	1,677,625	62,909	1,936,822	79,610

Note: There is at present under preparation a report on Mineral Phosphates, by Mr. H. S. de Schmid of the Mines Branch.

PEAT.

Peat, though not a mineral, is closely associated with the mineral industry inasmuch as in its winning it is dug from deposits in the ground.

It is a decomposition product of vegetable matter, especially mosses and other bog plants. These plants after maturing die, and on them new plants spring up. Thus layer on layer of dead leaves, stems, and roots accumulate until deposits of peat many feet in thickness are produced.

Peat litter is the undecomposed or only partly decomposed matter, and *humified peat* or *humus* is the fully decomposed, pulpy peat in which the structure of the original vegetation has been destroyed.

USES.

Aside from the use of peat as fuel, it is employed for several other purposes.

Owing to the potash and nitrogenous matter contained in it, peat makes a valuable fertilizer material. Humified peat is dried, ground, and mixed with chemical or artificial fertilizers as a "filler." It not only introduces nitrogenous matter and potash in a suitable form, but owing to certain physical properties which it possesses, it tends to beneficially modify the soil on which it is used, improving its texture, and in the case of light, sandy soil increases its retention of water.

Peat litter is used to absorb liquid manures, blood and wet tankage, after which it is dried, ground, and sold as fertilizer.

PREPARATION.

Peat as it is excavated from the bogs contains 85 per cent of water, or more. In order to suit it to its uses it must be dried to a very much lower content of water. For peat powder for fertilizer filler it is dried to about 10 or 15 per cent, and the peat litter to about 40 per cent. (After the litter has absorbed the manure or blood it must, of course, be dried to 10 or 15 per cent before grinding.)

The drying of peat is an operation requiring a careful study of local conditions, such as climate, and the cost of fuel and labour.

The first part of the drying is usually done by exposing the peat to the action of the sun and wind and is known as air-drying. The percentage of water is lowered to about 40 or 50. This is followed by drying by means of heated mechanical driers, or the process of air-drying may be allowed to continue until the peat is dried to the desired degree.

The drying of peat for fuel is usually done by air-drying alone.

There are a number of reports on peat, published by the Mines Branch, which contain much information on the preparation of peat, as well as reports on the available deposits of the country. Articles dealing with the use of peat for fertilizer purposes have appeared in the Journal of the American Peat Society.[1]

Amount of peat used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	—	—	—
Quebec	1	—	1000
Ontario	—	—	—
Prairie Provinces	—	—	—
British Columbia	—	—	—
Canada (Total)	1	—	1000

[1] President's address, Boston meeting, Vol. II, No. 4. Peat as a Fertilizer and some Methods of Drying and Preparing it, page 173, Vol. III, Nos. 3 and 4.

PEBBLES.

In the grinding of materials a certain type of machine is sometimes used, known as a pebble mill. The material to be pulverized is charged into the cylinder, which is rotated. The constant shifting of the pebbles contained grinds the material to a high degree of fineness. This type of mill is extensively used in the grinding of cement.

The pebbles used should be tough, hard, and not easily split or chipped.

Well rounded pebbles of flint, quartzite, and granite, measuring about four inches in diameter, are those usually used for the grinding of cement clinker.

The price varies from $8 to $12 per ton.

Amount of pebbles used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic and Imported
		Tons
Maritime Provinces	—	—
Quebec	1	725
Ontario	11	1030
Prairie Provinces	3	270
British Columbia	1	200
Canada (Total)	16	2225

PUMICE.

Pumice is a very porous variety of lava. In structure it resembles a sponge, containing innumerable small cavities or vesicles caused by the evolution of gases during cooling. The walls of these cavities, which are very thin, consist of glassy obsidian, in composition approximately that of feldspar.

Owing to the hardness and sharpness of this material, it is very valuable as a polishing agent. For some purposes it is used in the lump form, while for others the pumice is reduced to a very fine powder.

USES.

It is as a polishing material that pumice finds practically all its uses. In the finishing of fine furniture, pianos, carriages, etc., pumice is employed to smooth and polish the varnished surfaces. The finely ground and bolted pumice is generally used for this class of work, though occasionally the lump is used.

For the dressing of lithographic stones a small quantity of lump pumice is used.

In the polishing of pearl and bone buttons, celluloid goods, jewelry, and other fine metal work, the powdered material is used. It should be very carefully graded as to size of grains, the grades ranging to an almost impalpable powder.

Pumice powder is used in the polishing of plate glass, following beveling, etc. Freedom from large particles is essential.

In the manufacturing of scouring soaps, metal polishes, etc., finely ground pumice is used, and small quantities are used in toilet preparations, such as tooth and nail powders.

PRICES.

The price of pumice varies greatly according to the quantity purchased and to the grade.

Powdered pumice ranges in price from $27 to $60 when purchased in lots of one ton or over, the average price being about $40. The average price of selected lump in quarter ton lots is about 3 cents per pound.

Amount of pumice used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	11	—	$39\frac{1}{20}$
Quebec	22	—	$230\frac{10}{20}$
Ontario	132	—	$179\frac{17}{20}$
Prairie Provinces	12	—	$5\frac{9}{20}$
British Columbia	6	—	$3\frac{14}{20}$
Canada (Total)	183	—	$458\frac{11}{20}$

The following imports are reported by the Department of Customs:—

	1910-1911	1911-1912	1912-1913
Pumice and pumice stone, lava and calcareous tufa not further manufactured than ground[1]	$16,284	$19,527	$20,693

[1] This probably includes imports of volcanic ash, see page 108.

PYRITE.

Pyrite or *iron pyrites* is a yellow mineral of metallic lustre consisting of the disulphide of iron, FeS_2. It occurs in massive form or as crystals, usually of cubic or octahedral habit. When pure it contains 46·6 per cent of iron and 53·4 per cent of sulphur.

Pyrite is one of the most widely distributed minerals, occurring in rocks of every type and age. It is also a common vein mineral, in some cases constituting practically the entire vein matter.

USES.

The main use of pyrite is as a source of sulphur in the manufacturing of sulphuric acid. The mineral is roasted in an oxidizing atmosphere, in specially designed furnaces. The sulphur content burns to sulphur dioxide (SO_2), and the iron to ferric oxide (Fe_2O_3). The gaseous sulphur dioxide is further treated to convert it into the trioxide (SO_3), which on taking up water becomes sulphuric acid (H_2SO_4). The ferric oxide which is the solid product of the roasting process, often spoken of as *pyrite residue* or *cinder*, is of the same composition as hematite. It is frequently smelted for its iron content, or, if the original pyrite contained copper, gold or silver values, these metals may be extracted by smelting or some other metallurgical process. The pyrite residue is used also for making paint. It is a brilliant red and makes the pigment known as *red oxide* or *Indian red*. The residue from a well roasted pyrite contains about one-half a per cent of sulphur.

In his report on pyrites,[1] Dr. Wilson states that "pyrites suitable for acid making should contain as much sulphur as possible.....The greater number of acid makers demand a product containing not less than 42 per cent sulphur; there are,

[1] "Pyrites in Canada," by Dr. A. W. G. Wilson, Report No. 167, Mines Branch.
This report deals in detail with the subject of pyrite, its occurrence in Canada, the methods of exploitation, dressing, and its uses. There are chapters on sulphuric acid making and the use of pyrite in the pulp industry.

however, a few large consumers who purchase ore as low as 37 per cent sulphur. Many purchasers demand that the ore be free from arsenic, though in certain fertilizer works, ore otherwise desirable will be accepted if the arsenic content does not exceed one per cent. The presence of copper, zinc, and lead, antimony, calcium and magnesium, fluorine, chlorine, and selenium are undesirable. Ore containing pyrrhotite as well as pyrite is also undesirable, though it will be purchased by some consumers, if the sulphur content is not too low."

Sulphate of iron or copperas ($FeSO_4$) is manufactured by allowing water to trickle slowly through a bed of finely broken pyrite. In the presence of the water oxidation takes place, producing sulphate of iron which is taken into solution by the water. By evaporating the water the sulphate of iron is obtained in crystalline form.

Pyrite is used in the manufacturing of sulphite pulp from wood. The pyrite is roasted in the same manner as for sulphuric acid making, except that care is taken not to admit an excess of oxygen to the roasting furnace. The sulphur dioxide is used in preparing the bisulphite of lime and magnesia as described in the notes on limestone.

Note:—Pyrite is not used in Canada, so far as the writer is aware, in the sulphite pulp industry, though the process is said to give good results elsewhere. No figures can be given as to quantities of pyrite used in sulphuric acid making, since the manufacturers, for business reasons, refused to give the information.

PREPARATION

Dr. Wilson describes the preparation of pyrites as follows[1]:—"Pyrites ore, as it comes from the mine, is not generally in a condition in which it can at once be used in the furnace. It will usually contain a certain amount of waste rock from the mine, and in addition, much of the ore will be in lumps too large to be economically utilized in this condition. It must, therefore, be subjected to treatment which will remove the useless material as thoroughly as possible, thereby increasing the percentage

[1]"Pyrites in Canada," page 33.

sulphur content of the ore, and at the same time it must be reduced to a size suitable for the market. The amount of dressing and sizing to which an ore is subjected will vary greatly according to the nature and purity of the deposit and in accordance with contract requirements. Coarse waste rock can usually be left in the mine. At the surface, during the process of dressing, much waste can also be removed either by hand picking or by mechanical treatment. There does not appear to be any recognized standard scheme of sizing pyrites ores. 'Kiln' or 'lump' ore may vary from lumps that will not pass a 4″ ring down to material that is about 0·5 inches in diameter, while 'fines' or 'smalls' includes all below the minimum size given above. Many buyers purchase ore as *run of mine* and do their own sizing. Plants whose equipment is not adapted to handle all sizes of ore find it necessary to purchase ore suitable for their furnaces. A miner producing ore for the pyrites market will usually be governed by his contracts in the matter of the preparation of his ore. Where contracts call for 'lump' ore, a certain percentage of fines is permissible, and naturally, unless other contracts call for 'smalls', he will dispose of as much of his fine ore as possible in this way.

"The process of separating pyrites from the gangue material such as quartz, calcite, and fragments of country rock is a relatively simple one, owing to the difference of specific gravity between the ore and waste. Where pyrites is associated with copper, zinc or lead ores, the problem becomes much more complicated. In these cases the pyrites saved is usually the least valuable of the constituents, and a discussion of the methods of concentration belongs rather to the metallurgy of these ores. Ores from different mines differ greatly in character, and, where more than simple crushing and sizing is required, a scheme of treatment should in each case be designed to suit the particular ore which is to be treated. In general the scheme of treatment will be as follows:—

"1. Preliminary sizing over a grizzly, hand spalling and removal of some coarse waste.

2. Hand sorting on a table or belt.

3. Crushing to smaller sizes.

4. Screening.
5. Crushing, sizing, water concentration."

PRICES.

The price of pyrite is calculated upon the percentage of sulphur in it. "Mineral Industry" for 1912 gives the price as ranging from 8 cents to 13½ cents per unit per ton.

PYROLUSITE.

Pyrolusite is a dark grey to iron black mineral composed of manganese dioxide (MnO_2). It is also known as *black oxide of manganese*, or, less properly, as *black oxide*. Owing to the property it possesses of neutralizing the colour in glass due to silicate of iron, it is sometimes called *glass makers' soap*.

USES.

When manganese dioxide and potassium chlorate are mixed together and heated, oxygen is given off. This is one method adopted for producing oxygen for industrial purposes, but it is being superseded by the electrolytic and liquid air methods.

Pyrolusite is used in the manufacturing of electric dry batteries. It should analyse at least 85 per cent manganese dioxide and not over one-half of one per cent ferric oxide.

In the melting of bronzes, manganese dioxide is added to the crucible as a desulphurizer.

As referred to before, pyrolusite is used for counteracting the green colour of glass due to silicate of iron, introduced by impurities. Manganese dioxide when added to the glass mixture gives a purplish tint, this colour is complementary to the green and thus destroys it, producing a colourless glass. It is used for the same purpose in porcelain manufacturing and enamelling on sheet metal. For these purposes the mineral should be as free from iron as possible.

Pyrolusite is used extensively in the manufacturing of varnish. It acts as a drier. For this use it should be high grade, very finely ground, and free from siliceous impurities.

Prices range, according to purity and quantity purchased, from $17 to $80. The average price paid by glass manufacturers is $21 per ton.

Amount of pyrolusite used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	5	$16\frac{5}{20}$	$1\frac{3}{20}$
Quebec	10	—	237
Ontario	22	2	$901\frac{18}{20}$
Prairie Provinces	5	—	$199\frac{6}{20}$
British Columbia	2	—	6
Canada (Total)	44	$18\frac{5}{20}$	$1345\frac{7}{20}$

The following imports are reported by the Department of Customs:—

	1910–1911		1911–1912		1912–1913	
	lbs.		lbs.		lbs.	
Manganese, oxide of	1,471,462	$18,347	2,135,010	$24,381	2,800,529	$31,547

QUARTZ AND SAND.

Quartz, probably the most generally known mineral, consists of silica (SiO_2). It belongs to the hexagonal system of crystallization and has a hardness of 7 on Mohs' scale. It is colourless or white when pure, though often found tinted by impurities, such as manganese and carbonaceous matter. The varieties *amethyst*, *rose quartz*, and *smoky quartz* derive their typical colours from such impurities.

Quartz is an essential constituent of many rocks. In the case of *quartzite* and *sandstone*, these rocks may consist entirely of quartz. Quartz may exist in the form of veins, or as the filling of cavities, in all rocks.

Flint is a somewhat impure crypto-crystalline variety of quartz, which occurs in chalk deposits.

Sand is the granular material resulting from the weathering and disintegration of rocks. It usually consists principally of grains of quartz. This is largely due to the hardness of quartz and its chemical stability. This natural concentration is effected by the weathering out of the other minerals of the rock. When the sand contains only a few per cent of the minerals other than quartz it is called *silica sand* or *quartz sand*.

TRADE NAMES OF SANDS.

Most of the trade names of sands are descriptive of either their mode of occurrence or their uses.

River sand is the name applied to sand, of any grade, which is taken from the shores or beds of rivers. It is, as a rule, fairly free from impurities of a clay-like nature, though it may contain large percentages of feldspar, mica, hornblende, magnetite, etc.

Lake sand is that taken from the shores of lakes. This sand is similar in properties to the river sand, except that it is more likely to consist of rounded, rather than "sharp", or angular grains.

Bank sand or *pit sand* is that taken from deposits on land. It is liable to contain larger percentages of clay and loam than either river or lake sands.

Blast sand is that used for "sand-blasting." The properties making it suitable for this purpose depend upon the nature of the object on which it is to be used. The term is applied to natural sand and to crushed quartz.

Glass sand is a high silica sand employed in the making of glass. The term is applied to natural sand and to crushed sandstone, quartzite, or quartz.

Fire sand is a highly refractory sand.

Moulding sand is that used in forming the moulds in which iron, brass, and other metals are cast.

Silica sand, as pointed out before, is that consisting almost entirely of quartz.

Silver sand is a pure white, sharp, silica sand or crushed quartz. It is used for sand-blasting on glass and silver ware.

Finely ground quartz is very often spoken of as *silex*.

USES.

Smelting. In the smelting of some ores containing basic gangue, quartz is introduced into the furnace charge as a flux. The quartz used for this purpose may be vein quartz, quartzite, or sandstone. If it contains metallic values, it should be classed as an ore having desirable properties for mixing purposes; but if it is barren it must be considered merely as a flux. The quartz is delivered to the smelter as it comes from the quarry, or it may be crushed to any specified degree of fineness.

Crushed quartz is used as a material for lining certain metallurgical furnaces.

Foundries. A moulding sand should be of fairly uniform fineness and contain sufficient clay to give it body and strength to withstand the withdrawal of the patterns, the handling of the moulds, and the action of the molten metal. It should be sufficiently porous to allow the escape of the gases developed by the hot metal. It should be refractory, otherwise it would sinter, closing up its pores and thus preventing the escape of gases, as well as fusing to the surface of the metal causing ugly castings which would not machine easily. The presence of lime is objectionable, as it tends to lessen the refractoriness and

also gives off gas when brought into contact with the hot metal. Undecomposed feldspar also lessens the refractoriness, due largely to the contained alkalies. For heavy work a coarse, very porous and highly refractory sand is required, while for light castings of iron, and for brass, a finer sand is necessary.

The life of a moulding sand depends largely on the properties of the bonding material. When the bonding material is a good refractory clay, the sand may be used over and over again. If the clay loses its plasticity on heating, the sand deteriorates rapidly in use.

In order to determine the suitability of a sand for foundry purposes it is necessary to subject it to physical tests and finally to a test in actual foundry service. An ultimate chemical analysis is useful, inasmuch as it indicates the presence or absence of ingredients which would tend to lessen the refractoriness, but so far as alumina is concerned, the percentage is of doubtful value in determining the worth of the sand. The alumina is derived, not alone from the clay matter, but from the undecomposed feldspar, of which there may be a considerable quantity in the sand. Therefore the percentage of total alumina is not indicative of the proportion of clay matter to sand grains.

In general, a good moulding sand is one consisting of angular, or sharp grains of quartz (small quantities of other minerals are always present) which are covered with a thin film of clay. The clay should not be in excess of the quantity necessary to produce a firm bond between the particles of sand when rammed in a mould. The clay should be plastic and refractory.

The following table,[1] from a report on the moulding sands of Michigan, serves well to show the great variation in the composition of moulding sands.

CHEMICAL ANALYSES OF MOULDING SANDS.

No	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	K_2O	Na_2O	Ignition	Miscellaneous.
1	81·58	6·46	4·94	·14	·22	1·19	·59	1·63	Moisture 1·46 TiO_2 1·90
2	82·08	7·12	4·63	·36	·35	1·28	·41	1·66	Moisture 1·52 TiO_2 ·30
3	66·12	16·54	4·46	·40	·22	2·67	·35	4·90	Moisture 4·15 TiO_2 ·14
4	79·36	9·36	3·18	·44	·27	2·19	1·54	2·02	Moisture ·74 TiO_2 ·34
5	79·38	9·38	3·98	1·40	·54	1·80	1·04	2·50	Moisture ·80 TiO_2 ·44
6	70·40	3·80	14·94	·12	·15	1·95	·41	4·08	Moisture 3·77 TiO_2 ·70
7	84·40	7·56	2·52	·06	·21	1·29	·65	1·49	Moisture 1·76 TiO_2 ·44
8	85·04	5·90	3·18	·06	·14	1·65	·83	1·57	Moisture 1·11 TiO_2 ·78
9	70·24	16·62	3·94	·08	·09	1·41	·74	4·16	Moisture 2·42 TiO2 ·46
10	71·60	11·49	7·81	·65	·95	1·42	1·27	4·00	
11	81·45	7·30	4·10	·90	·68	1·40	1·38	2·50	
12	85·08	5·10	4·00	1·20	·25	1·28	·34	2·65	
13	86·80	3·05	5·32	·15	·65	·83	·04	3·25	
14	84·28	4·50	6·10	trace	·72	·91	·39	3·10	
15	87·00	6·70	3·20	.....	.....	·25	·65	2·20	
16	81·26	5·69	4·29	4·34	·36	·87	·38	2·81	
						By difference			
17	88·52	5·63	·88	1·20	·83	·29		2·65	
18	79·41	12·47	·80	·99	·81	1·56		3·96	
19	90·68	5·95	·48	·69	·44	·71		1·05	
20	57·63	10·03	·88	11·16	5·63	·01		†14·66	
21	44·24	11·89	1·44	13·71	5·90	4·33		†18·49	
22	80·35	11·57	1·04	1·33	·66	2·60		2·45	
23	87·47	6·59	·80	1·18	1·10	2·26		·60	

[1] "Report on Foundry Sands" by Heinrich Ries and J. A. Rosen, Report of Michigan Geological Survey, 1907, page 63.

† Includes CO_2

CHEMICAL ANALYSIS OF MOULDING SANDS. (*Continued*)

No	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	K_2O	Na_2O	Ignition	Miscellaneous.
24	79·61	11·21	2·48	·74	1·07	2·24		2·65	
25	81·50	9·88	3·14	1·04	·65	Undetermined		3·00	
26	84·86	7·03	2·18	·62	·98	Undetermined		2·20	
27	82·90	8·21	2·90	·62	·00	Undetermined		2·85	
28	79·8	10·00	4·44	·70	·88	Undetermined		2·89	
29	82·21	9·48	4·25	*·68	·32	·05	·09	2·64	Organic matter ·28
30	86·85	8·27	2·32	*·29 ·50	·81	·03	·10	1·08	Organic matter ·15
31	88·40	6·30	2·00	·78	·50	.....	.....	1·73	MnO.....·23 Org.....·04
32	78·86	7·89	5·45	*1·46 ·50	1·18	·09	·13	3·80	Org.....·64
33	81·57	11·52	2·74	1·49	·18	.....	.....	2·50	

1—2. Fine sand for light castings, Redford pits, Richmond, Va.
3. Coarse, gravelly sand for cores, Harbaugh's pit, Richmond, Va.
4. Albany sand for stove plate work, sampled from a foundry in Richmond, Va.
5. Same quality as 4, from Newport, Ky.
6. Sand for general casting work, Blandford pits, Petersburg, Va.
7. Sand for general work, Armstrong pits, Petersburg, Va.
8. Sand for general work, Griffin's pit, Fredericksburg, Va.
9. Sand for general work, Bottersea farm, Petersburg, Va.
Nos. 1–9 from Report on Mineral Resources of Virginia, by T. L. Watson.
10. "Philadelphia" brass sand.
11. Albany sand for brass work.
12. French statuary brass sand.
13. Mild Lumberton, N. J., brass sand.
14. Strong Lumberton, N. J., brass sand.
15. Millville, N. J., gravel.
16. Charlesville French brass sand.
Nos. 10-16, J. L. Jones, The Foundry, Feb. 1907.

* Carbonate.

17. Core sand, Miltmore quarry, Janesville, Wis.
18. Upper bed, Rockton, Ill.
19. Nos. 2 sand, White and Traugott, Berlin, Wis.
20. Lower bed, Rockton, Ill.
21. Brass sand, Pendleton's pit, Neenah, Wis.
22. Loamy sand, Menominee Hydraulic Pressed Brick Co., Menominee, Wis.
23. Lake sand for cores, Superior, Wis.
24. Fine sand, Albany, N. Y.

Nos. 17-24, Wis. Geol. and Nat. Hist. Surv., Bull. XV, p. 224, 1906.

25. Fine sand.
26. Sand for medium weight castings.
27. Coarse sand for heavy castings.
28. Sand for heavy machinery in dry sand moulds.

Nos. 25-28, W. Ferguson, Iron Age, Vol. LX, p. 16, 1897.

29. Sand for light iron work, Scott.
30. Sand for medium iron work, Scott
31. Sand for heavy iron work, Scott.
32. Sand for light brass work, Scott.

} From printed specifications of Case Company.

33. Sand for stove castings, Conneaut, Ohio."

Rational analyses of moulding sand are those indicating the percentage of the principal mineralogical constituents; *e.g.*, quartz, clay substance, and feldspar. Such analyses should prove more useful than ultimate analyses in the examination of sands for foundry purposes.

The following ultimate and rational analyses of two sands will show how misleading the percentage of alumina is as a guide to the estimation of clay substance in the sands.[1]

"Rational Analysis	I	II
Quartz	67·85	64·66
Clay	17·50	24·50
Feldspar	10·12	7·28
Iron oxide	4·53	3·56

[1] "Report on Foundry Sands," Heinrich Ries and J. A. Rosen. Report of Michigan Geological Survey, 1907, page 66.

Ultimate Analysis

	I	II
Silica	80·66	77·22
Alumina	9·30	9·26
Iron oxide	4·53	3·56

I. Sharp moulding sand.
II. Strong moulding sand."

Large quantities of river, or sharp bank sand are used in the making of cores for foundry moulds. It is the general practice to use available local sands for this purpose, without much regard for their suitability.

A core sand should be clean and made up of grains of suitable size for the work in hand. As in the case of moulding sands, a coarse grade should be used for heavy iron castings and a fine grade for light iron and brass castings. Especially for heavy iron castings, a sand should be selected which does not contain a large percentage of readily fusible or fluxing impurities, such as feldspar, lime, and iron oxide. A sharp sand is more desirable than one made up of rounded grains, for it bonds better and makes a stronger core.

For the casting of steel very refractory sands must be used for the making of moulds and cores. Very sharp sand of at least 95 per cent silica is usually specified. It must be free from fluxing impurities. In order to have a porous mould and yet give a smooth finish to the surface of the steel casting, a coarse sand is used to form the bulk of the mould, but a thin layer of very fine sand or ground quartz is placed in that part of the mould which will come in contact with the metal. This ground quartz is known as *silica flour*. It varies in fineness from 80 mesh to 150 mesh.

Fire sand is a highly refractory sand, 92 per cent silica or over, used in bedding the floors of re-heating furnaces and gas-fired forges.

The cleaning of castings is frequently accomplished by means of a sand blast. A fairly coarse sharp sand is used for removing the attached sand, while for cutting out cores from hollow castings a much coarser, but not necessarily sharp sand

is used. The more quartz there is in the sand the longer will be its life.

Ceramic industry. In the manufacturing of porcelain, enamel ware, and enamelled bricks, finely ground quartz is extensively used.

In the manufacturing of porcelain, finely ground quartz, feldspar and clay are mixed together to form the body of the ware. (In the trade the term *flint* is applied to the quartz used in this industry. True flint is very little used on this side of the Atlantic.) In many glazes for porcelain quartz enters into the mixture.

The mixture used in enamelling metal ware and bricks is made up of a number of chemicals and minerals, one of which is quartz.

The quartz used for enamelware and porcelain should be finely ground, and should be as free as possible from impurities which would tend to produce "off-colour" in the finished product. Iron oxide should not be in excess of one-half of one per cent.

Great care must be exercised in the grinding of the quartz, that little iron be introduced into it by abrasion from the machine through which it passes. It is usually ground to about 120 mesh.

Glass. Glass sand, the principal constituent of glass, is crushed sandstone, or a natural sand containing a very high percentage of quartz particles. As glass sand does not command a high price, it seldom pays to crush quartz or quartzite for this purpose. Owing to the hardness of these, there would be danger of introducing an undue amount of iron during the crushing, if ordinary methods were adopted.

As stated above, the usual material used is a natural, high silica sand, or a friable, easily crushed sandstone.

Glass sand should be very low in iron oxide, not exceeding one-half of one per cent for white flint glass. It should be free from clay, feldspar, and mica except in very small proportions. The sand should be of medium fineness, that is, between 20 mesh and 50 mesh, and should be fairly uniform

in grain size. Sharp sand is preferred to that made up of rounded grains.

The following table of analyses has been adapted from a report by Ernest F. Buchard.[1] It shows the composition of a number of good glass sands from the states of Indiana, Kentucky, and Ohio.

ANALYSES OF GLASS SANDS FROM INDIANA, KENTUCKY, AND OHIO.

Sample	Constituents						
	Silica (SiO_2)	Alumina (Al_2O_3)	Iron Oxide (Fe_2O_3)	Lime (CaO)	Magnesia MgO)	Other Items	Total
1	98·61	0·74	0·22	0·12	Tr.	Ign. 0·32	100·01
2 Selected	97·78	1·13	0·10	0·06	—	—	99·07
3 Crude	96·26	2·50	0·92	—	0·16	Na_2O &K_2O 0·13	99·97
4 Selected, washed	99·14	0·23	0·02	0·21	0·08	$CO_2 + H_2O$ 0·52	100·20
5 Selected	98·87	0·21	0·08	0·24	0·12	0·48	100·00
6 Crude	98·404	0·751		0·043	0·372	H_2O, 0·271	99·841
7	98·53	0·18	0·007	0·67	—	—	99·387
8	98·506	0·09		—	0·014	H_2O, 0·60	99·210
9 Prepared for glass	97·50	1·50	0·50	—	0·50	—	100·00
10 do. do.	98·611	0·123	0·033	0·130	Tr.	—	98·897
11 do. do.	99·60	—	0·02	0·23	—	Clay(?) 0·15	100·00
12	98·45	0·77	0·14	—	—	—	99·36
13	98·78	0·73	Tr.	0·12	0·04	Organic 0·33	100·00
14 First grade, washed	99·915	0·062	0·0019	0·021	Tr.	—	99·9999
15 First grade, not washed	98·09	0·75	0·03	None	0·16	Ign. 0·33	99·36
16 Second grade, not washed	97·10	2·35	0·14	0·10	Tr.	H_2O, 0·31	100·00

Samples 1 to 3, are from Indiana; 4 to 6, from Kentucky; and 7 to 16, from Ohio.
Samples 2 and 3 from same source.
" 4, 5 and 6 from same source.
" 14, 15 and 16 from same source.

Sand-lime brick. The strength of sand-lime brick depends upon a firm bonding of the sand grains through the agency of lime. A mixture of sand and lime is pressed into bricks, which are then subjected to the action of steam under pressure, for several hours. A chemical union takes place between the lime and the quartz of the sand, forming hydrated calcium silicate. The sand used should not be too coarse. That passing through a twenty mesh screen and composed of grains ranging in size down to minute particles is desirable. In other words, the sand grains should be so graded in size as to leave very

[1] "Glass Making Materials." Contributions to Economic Geology, 1906, Pt. I, Bulletin 315, U. S. Geological Survey, page 361.

little interstitial space. The strongest bricks are made from sharp sand which is free from inert minerals, such as clay, iron oxide, mica, etc. The clay and iron oxide are particularly objectionable since they are liable to mask the grains of quartz and thus prevent the union of the lime and quartz. Ten per cent of clay substance should be set as the extreme limit. Feldspar is less objectionable, but in large proportions is undesirable as it reduces the strength of the brick.

Artificial stone. In the making of artificial stone, common sharp sand is used in the mixture for the body of the stone and a white silica sand or crushed quartz for the face. The silica sand or quartz should be of about 20 mesh size.

Building and concrete purposes generally. Sand for these purposes should be sharp and free from clay matter, vegetable matter, etc.

Paint manufacture. Finely ground quartz (silex) is used as a base for the making of wood fillers. To some extent, this same material is used as an "extender" in mixed paints. It is claimed to improve paint for outside service.

Abrasives and polishes. Owing to its hardness and the sharpness of the fragments, crushed and ground quartz is valuable as an abrasive and polishing material.

Ground quartz carefully graded as to size is used in making sandpaper and for sanding "sand belts" for wood working. Very finely ground quartz is used for polishing pearl and bone buttons, and for the making of metal polishes and scouring soaps.

Sharp river sand and silica sand are used for grinding and beveling plate glass and for "frosting" it by means of the sand blast.

Rubber goods. Finely ground quartz is used to some extent as a loader for rubber goods.

Matches. In the manufacturing of matches very finely ground quartz enters into the composition of the match head. A coarser grade of quartz is used for preparing the sanded surface of the box on which the match is ignited.

Sweeping compound. Clean river sand is employed in large quantities in the making of so-called "sweeping compound."

Fused quartz. Special chemical and physical apparatus is made from quartz by fusing it in an electric furnace and casting or pressing it into shape. Such apparatus is unaffected by sudden extreme changes of temperature and is not attacked by the common acids. There is no manufacturer of such goods in Canada.

Filter plants. Sand is used as a filtering medium for water. The following specification, furnished by Mr. Rust, late city engineerf or Toronto, is that which was used in that city in the construction of their filtration plant. "The filter sand shall be clean sand, with either sharp or rounded grains. It shall be entirely free from clay, dust or organic impurities, and shall, if necessary, be washed to remove such materials from it. The grains shall, all of them be of hard material which will not disintegrate. The effective size shall not be less than 0·25 millimeter nor more than 0·35 millimeter. The uniformity coefficient shall not be more than 3·0. The sand shall be free from dust and shall not contain more than one per cent finer than 0·13 millimeter, and shall be entirely free from particles over five millimeters in diameter. In all other respects the sand shall be of a quality satisfactory to the Engineer."

GRINDING AND PREPARATION OF QUARTZ, ETC.

For many of its uses, sand is sold in the state that it comes from the pit. In some cases where clay matter is objectionable it is necessary to subject the sand to a washing treatment. A cheap and fairly efficient method is to wash it by means of a log-washer "in which rotating augers or screws move the sand up inclined troughs, rolling it over and over so that by attrition it is freed from a large portion of its impurities and stain, and the impurities are then readily removed by a stream of water playing down the troughs." This method is particularly useful in preparing glass sand for the market. It removes clay, mica, and the very fine grains of the sand which it is not desirable to introduce into the glass "pot". Following the washing, the sand is usually dried before shipping. From the washer the sand is delivered onto the draining floor where most of the water drains

away. The balance is removed by evaporation by means of some form of mechanical dryer, usually a rotating cylindrical dryer.

In the grinding of quartz for porcelain and enamelware great care must be exercised to avoid the introduction of particles of iron. A very good description of methods employed in the reduction, milling, and shipment of quartz is to be found in the Transactions of the American Ceramic Society.[1]

The grinding is done by the wet process or dry process.

In the wet process, the more expensive of the two, the quartz is first heated to a high temperature and then shattered by means of water. It is then given a first crushing by jaw crushers or in a chaser mill, the product of which is about 8 mesh. The final grinding to 120 mesh is carried on in a wet pan or drag mill. This wet pan is made of cypress wood and is about 10½ feet deep. It is lined with thick, flat slabs of quartz, over which boulders of quartz are dragged by means of four revolving arms. The product from this grinding is given a rough sizing by means of settling tanks. That which is too coarse for the market is returned to the wet pan, and the balance is dried and graded for the market by means of sifting and bolting.

In the dry process the grinding is done in pebble mills lined with quartz or some other silica stone. The process may be intermittent or continuous. The latter gives the better results.

If the product is to be used for abrasive purposes the grinding must be followed by very careful sizing by means of screens, revolving bolters, and either water or air floating.

PRICES.

(All prices are per ton, and unless otherwise stated, are for delivery in Ontario and Quebec.)

Quartz, ground to about 120 mesh, for ceramic purposes, when purchased in large quantities, from $7.15 to $11.75, average $10.

[1] "Methods employed in connection with the reduction, milling and shipment of quartz, flint rock or silica sand," by Harry F. Speir, page 326, Vol. XIII.

Quartz for match making, $7 to $14.

"Silica flour" for steel foundries, from $8 to $30, depending upon quality and quantity purchased, average $19.

Ground quartz for sand belts and sandpaper, $10 to $30, average $17.

"Silex" for polishing, soap making, etc., $9.50 to $30, average $15.

"Silex" for making wood filler, as purchased by paint manufacturers, and manufacturers of pianos and furniture, $18 to $30, average $24.

Glass sand, from $2.45 to $4, average $2.85.

Silica sand for artificial stone, glass finishing, manufacturing carborundum, etc., $2 to $6.50, average $4.25.

Fire sand, $2 to $6, average $4.

Common sand, 50 cents to $2.50, average $1.

Moulding sand:

	Quebec		Ontario		Prairie Prov.		B.C.	
	Dom.	Imp.	Dom.	Imp.	Dom.	Imp.	Dom.	Imp.
Low.....	$·60	$2·25	$·85	$2·50				
High.....	1·70	9·00	2·40	10·00				
Average....	1·15	3·65	1·70	3·55	$2·50	$4·50	$2·50	$4·75

Amount of river, lake, and bank sand used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces.....	22	1057	—
Quebec.....	31	21563 3/20	61
Ontario.....	114	150314 12/20	1702
Prairie Provinces.....	38	152437 1/20	25
British Columbia.....	28	18743 5/20	—
Canada (Total).....	233	344115	1788

Sand for sweeping compounds not included in above.

1 firm uses 200 tons.

1 " " 150 "

Building sand and that used in making concrete blocks not included in above.

Amount of blast sand used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	1	300	—
Quebec	1	—	150
Ontario	8	2000	3568
Prairie Provinces	—	—	—
British Columbia	—	—	—
Canada (Total)	10	2300	3718

Amount of fire sand used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	9	60	2415 10/20
Quebec	11	—	19589
Ontario	32	155	3850
Prairie Provinces	3	4	500
British Columbia	2	—	80
Canada (Total)	57	219	26434 10/20

Amount of glass sand used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	1	—	700
Quebec	3	—	14000
Ontario	4	—	17100
Prairie Provinces	1	2000	2000
British Columbia	—	—	—
Canada (Total)	9	2000	33800

Amount of moulding sand used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	46	845	21203
Quebec	53	7400	33738
Ontario	203	68678	16064
Prairie Provinces	25	1735	1675
British Columbia	26	2801	265
Canada (Total)	353	81459	72945

Amount of silica sand used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	2	—	4 $\frac{5}{20}$
Quebec	6	—	290 $\frac{10}{20}$
Ontario	20	4	3957 $\frac{14}{20}$
Prairie Provinces	3	—	1 $\frac{6}{20}$
British Columbia	3	—	30 $\frac{7}{20}$
Canada (Total)	34	4	4284 $\frac{2}{20}$

Amount of quartz used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	2	—	22
Quebec	8	703	1092
Ontario	19	57500	552 $\frac{14}{20}$
Prairie Provinces	2	—	20 $\frac{2}{20}$
British Columbia	1	—	20
Canada (Total)	32	58203	1706 $\frac{16}{20}$

Amount of silex and silica wash used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	3	—	50
Quebec	14	—	$921\frac{10}{20}$
Ontario	43	—	$399\frac{11}{20}$
Prairie Provinces	4	—	$14\frac{7}{20}$
British Columbia	3	—	24
Canada (Total)	67	—	$1409\frac{8}{20}$

The following imports are reported by the Department of Customs:—

	1910–1911		1911–1912		1912—1913	
Silex or crystallized quartz ground or unground	cwt. 11,348	$10,634	cwt. 7,445	$7,314	cwt. 14,497	$12,898
Flint and ground flint-stones[1]	68,953	32,362	74,061	49,481	72,937	47,956
Gravels and sand	tons 195,149	199,428	tons 263,971	258,438	tons 542,927	465,263

[1] This item probably includes flint pebbles, see page 67.

ROTTENSTONE.

Rottenstone is the name applied to a porous, light rock, consisting principally of very fine silica and iron oxide. It is the product of decomposition of siliceous, ferruginous limestone, the carbonate of lime having been leached out.

According to E. H. Williams[1] rottenstone is sometimes produced by the weathering of loose calcareous mica-schist, low in carbonate of lime and mica.

USES.

Rottenstone is used as a polishing material in the finishing of varnished surfaces of furniture, pianos, etc., and in polishing celluloid goods and plate glass.

Amount of rottenstone used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	2	—	$\frac{6}{20}$
Quebec	6	—	$\frac{15}{20}$
Ontario	53	—	$10\frac{19}{20}$
Prairie Provinces	1	—	$\frac{6}{20}$
British Columbia	3	—	$\frac{3}{20}$
Canada (Total)	65	—	12

[1] Manual of Lithology, page 302; John Wiley, New York.

SALT.

In general usage the terms *salt* and *common salt* refer to the chemical salt, *sodium chloride* (NaCl). This occurs in nature in large quantities in aqueous solution, as the brine of the ocean, salt lakes and springs, and also in the solid form, known mineralogically as *halite*. When it occurs in massive deposits it is called *rock salt*.

WINNING AND PREPARATION.

The salt of commerce is obtained both from brines and from rock salt deposits.

Rock salt. In some cases the deposits of salt lie at the surface of the ground with little or no overburden and may be excavated by ordinary open-cut methods. Where the overburden of soil and rock is too great to warrant stripping, underground methods may be used similar to those employed in coal mining, but if the overburden be very great, or if for other reasons it is advisable, the salt is won by dissolving it *in situ* and pumping the brine to the surface. The last method is the one employed in winning the salt in the Ontario salt district. A drill hole is sunk through the deposit and cased with an iron pipe down as far as the upper limit of the salt. An inner pipe of considerably smaller diameter extends from the surface to the bottom of the deposit. Fresh water is forced down, between the inner and the outer pipes, to the deposit where it comes into contact with the salt. The salt is dissolved, forming a very strong brine, which is pumped to the surface through the small inner pipe. The salt is obtained from the brine by evaporating the water.

In some cases the rock salt, mined by the first methods referred to above, contains impurities which render it unsuitable for many purposes. It must be purified to fit it for the market. This is done by dissolving it and then recrystallizing it by one of the methods given below. The brine produced in this process, as well as that resulting from the solution of rock salt *in situ*, referred to above, is called *artificial brine* in contrast to the *natural brine* of the ocean and salt springs.

Brines. Salt is recovered from brine by evaporation. The methods employed may be classed into two groups; first, evaporation by means of the wind and the heat of the sun, called *solar evaporation;* second, by means of artificial heat, *artificial evaporation.*

Natural brines are usually subjected to solar evaporation. This method is only economically applicable in localities where there are regular, continuous seasons of little or no rainfall. Solar evaporation may be used alone or simply for the purpose of concentrating the brine to a certain degree, to be followed by artificial evaporation as the last step in the recovery of the salt. This first concentration is sometimes accomplished by freezing. Ice is allowed to form on the surface of the brine and then broken and removed. Since the ice in forming releases the salt contained in that portion of the water it leaves the balance of the brine more nearly saturated. This method may be used in cold countries in preparing weak brines for artificial evaporation.

Artificial evaporation is accomplished by means of artificial heat either directly applied to the vessels containing the brine or indirectly by means of steam. In some processes the evaporation is effected in open vessels, while in other processes closed vessels are used and the evaporation aided by means of a partial vacuum.

The solar evaporation being the slowest, produces a very coarsely crystalline grade of salt, while the process involving the use of the partial vacuum is rapid and gives a very finely crystalline product.

Brines are very liable to contain impurities such as calcium sulphate and carbonate, magnesium chloride and sulphate, potassium chloride, as well as bromides and iodides, in such proportions as to render the salt unfit for many purposes unless means be taken to prevent them from being deposited from the brine along with the salt. This may be accomplished by taking advantage of the different degrees of solubility of these various compounds. The compounds having a lower degree of solubility than the salt will be precipitated first, then the salt, and finally the compounds of higher degrees of solubility. With

impure brines the evaporation is carried on in various steps. In the first, the evaporation is continued until the impurities of lower solubility are thrown out of solution. The brine then goes to other evaporators in which the pure salt is deposited. The liquor remaining is called *bittern*. It contains, besides salt, the more soluble impurities. It is either discarded or further evaporated to obtain these other compounds as by-products.[1]

USES.

The following is a list of the principal uses of salt in the Canadian industries, arranged roughly in order of the amount of salt consumed—preserving meats, fish[2], butter[2], and hides; making hydrochloric acid and other chemical compounds of either sodium or chlorine; in soap making; glazing drain tile, etc; refrigeration; and in certain metallurgical processes.

PRICES.

The price of salt ranges from about $4 per long ton to $20, when purchased in carload lots. This wide variation in price is due to the various grades of salt, as well as to the difference of freight rates to the points of consumption.

Amount of salt used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	16	40	416
Quebec	10	—	2305
Ontario	17	1000 3/20	475
Prairie Provinces	15	227	4115
British Columbia	4	—	1050
Canada (Total)	62	1267 3/20	8361

[1] For more detailed descriptions of the various methods outlined here, see the report on Salt, by L. H. Cole, to be published shortly by the Mines Branch, Report No. 325.

[2] No records of consumption are included in this report.

The following imports are reported by the Department of Customs:—

	1910–1911		1911–1912		1912–1913	
	cwt.		cwt.		cwt.	
Salt in bulk.....	279,705	$45,178	354,367	$55,089	429,907	$63,848
Salt, n.o.p. in bags and other coverings.....	113,398	49,329	146,116	61,002	178,412	73,321
Salt from United Kingdom or any British Possession or imported for the use of the sea and gulf fisheries.	2,057,847	330,251	2,125,522	332,554	2,188,523	362,755

SHALE AND SLATE.

Shale is a fine textured argillaceous rock of sedimentary origin. It splits into thin fragments parallel to its bedding.

Slate is also an argillaceous rock of fine texture. It has been subjected to lateral pressure which has developed cleavage planes at right angles to the direction along which the pressure acted, permitting it to be broken readily into thin slabs.

USES.

Soft shales are frequently ground and used for brick-making. Large quantities are used in a number of localities in Canada for this purpose. No record of quantities is available.

Slate is used as a roofing material. It is split into thin sheets and trimmed to convenient dimensions. There is only a small market in Canada for slate shingles, as they do not withstand the effect of our severe winters satisfactorily. It is also used to make electric switchboards, school slates, and blackboards.

Crushed slate or shale is used for making "ready roofing." For this purpose it is crushed to about one-eighth or one-quarter inch size.

When ground very finely these rocks are used as filler for wood. Paint manufacturers prepare wood-filler by mixing the ground material with oil.

PRICES.

The price of finely ground shale or slate ranges from $9 to $23 per ton.

Amount of ground slate and keystone used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	—	—	—
Quebec	2	—	$18\frac{10}{20}$
Ontario	8	—	221
Prairie Provinces	—	—	—
British Columbia	—	—	—
Canada (Total)	10	—	$239\frac{10}{20}$

The following imports are reported by the Department of Customs:—

	1910–1911		1911–1912		1912–1913	
	Squares (100 sq. ft.)		Squares (100 sq. ft.)		Squares (100 sq. ft.)	
Roofing slate.....	16,919	$68,728	20,213	$85,031	21,457	$95,222
School slates.....		33,598		35,863		43,389
Slate pencils.....		7,256		6,360		7,597
Slate and manufactures of n.o.p.		37,590		46,312		73,664

SULPHUR.

Sulphur is found in nature in combination with many other elements, and also uncombined, as *native sulphur*.

Sulphur may be produced by the decomposition of iron pyrites or other sulphur minerals, but at present, practically the world's supply is obtained from deposits of native sulphur.

PREPARATION.

The deposits of sulphur contain many impurities from which the sulphur must be extracted. This is accomplished in several ways. The "ore" may be heated to a temperature at which the sulphur will melt and drain from the gangue, or if a somewhat higher temperature is used the sulphur is volatilized and may be recovered by condensation. The former method is that usually employed. The sulphur thus prepared is called *brimstone*, or if cast into cylindrical sticks, *roll sulphur*. When the second method is employed the sulphur is obtained in a fine powder, called *flowers of sulphur*, or *sublimed sulphur*.

Another method of extracting the sulphur is to dissolve it out of the gangue by means of carbon disulphide, from which it may be recovered by distilling off the solvent.

In some cases the sulphur is won from deep deposits by melting it with high pressure steam and forcing the molten sulphur to the surface through bore holes. The sulphur thus obtained is said to be almost pure.

USES.

Sulphur is used in Canada principally in the manufacturing of sulphite pulp from wood.[1]

Sulphuric acid is made by burning sulphur and converting the sulphur dioxide to sulphur trioxide, which unites with water forming the acid.[2]

Sulphur is used to a considerable extent in the manufacture of gunpowder, matches, pharmaceutical preparations, rubber goods, and insulated electric cables, and to a lesser extent in tanning, bleaching of cotton goods, glue making, sugar refining, and for bleaching evaporated apples.

[1] See uses of Pyrite, page 70.
[2] See uses of Pyrite, page 70.

PRICES.

The price of sulphur laid down in the eastern portion of Canada and at the coast of British Columbia, when purchased in large quantities, varies from $20 per ton to $25. Roll sulphur in barrel lots costs as high as $2.50 per hundredweight.

Amount of sulphur used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	7	—	3032 2/20
Quebec	16	—	10807 3/20
Ontario	35	—	8351
Prairie Provinces	2	—	40
British Columbia	5	—	5450
Canada (Total)	65	—	27680 5/20

The following imports are reported by the Department of Customs:—

	1910-11	1911-12	1912-13
Brimstone, crude or in roll or flour, and sulphur in roll or flour	lbs. 50,562,547	lbs. 45,039,790	lbs. 72,716,339
	$524,473	$465,926	$759,585

TALC.

Talc is a very soft mineral consisting of acid metasilicate of magnesium ($H_2Mg_3Si_4O_{12}$ or otherwise expressed, $H_2O \cdot 3MgO \cdot 4SiO_2$). In colour it varies from white to greyish green, usually being pale apple green. This mineral is characterized by its softness and unctuousness. It occurs generally in foliated masses with a pearly lustre, sometimes granular or fibrous.

The massive granular or crypto-crystalline variety is known as *steatite*, while the fibrous variety is called *agalite*.

Soapstone is a rock consisting very largely of talc and gets its name from its soapy feeling. It is also called *potstone*.

In additon to the foregoing, the following names are applied to talc, by the trade: *asbestine*, *French chalk*, *mineral pulp*, *talclay*, and *verdolite*.

USES.

The particular properties of talc which makes it useful in the industries are its softness, slipperiness, refractoriness, non-conductivity of heat and electricity, and its resistance to the action of most chemicals.

The principal use of talc in this country is in the making of paper. For this purpose it should be very finely ground, free from grit, and as nearly white as possible for the better grades of book paper. It is used as a filler to be added to the pulp to produce a white, opaque paper and also in the coating of paper. Agalite, on account of its fibrous nature, is the variety most desired by the paper trade because of its greater "retention" and the somewhat stronger paper resulting from its use.

Powdered talc is used in large quantities in the manufacture of talcum powder and other toilet preparations, and also as a filler or loader in the cheaper grades of toilet soap. For toilet powders a very pure grade is employed. It should be white and very free from grit. For soap the colour is not so important a matter, but freedom from grit is insisted upon.

For filling and dressing cotton cloth white, grit-free powdered talc is largely used. It is also used in the preparation of cloth for window blinds, and to a lesser extent for other textile purposes.

A low grade of powdered talc is used as a foundry facing. That prepared from the foliated variety is best.

In the manufacturing of rubber goods talc finds two uses. In the preparation of the rubber, talc is added as a filler,[1] for which purpose it should be finely ground and free from grit. It is also used to dress the moulds used in forming the rubber goods to prevent sticking.

Very finely powdered talc is used in the making of enamel and other paints. In most cases pure white stock is specified.

Talc enters into the composition of magnesite flooring. For this the cheap grades are usually employed. Agalite, the fibrous variety, is sometimes specified.

In order to prevent "ready roofing" paper and felts from sticking when rolled for shipment and storage, some manufacturers dust the prepared surface with talc. The lowest grades may be used for this purpose.

Talc is used sometimes in the insulating composition for electric cables.

Among other lesser uses of powdered talc are the following:—dressing of fine leathers and kids, as a lubricant, and as a powder for gloves and shoes.

In the making of gas burners, slate pencils, tailor's chalk, and white pencils, pure grades of massive talc are used. Very little is used in Canada for these purposes.

Such soapstone as is used in Canada is purchased already manufactured into the desired sizes and shapes. Among the many articles which may be made from soapstone are the following:—electric switchboards, laboratory table tops, wash tubs, sanitary fittings, hot plates, griddles, stove linings, furnace linings, acid tanks and lining for causticizing chambers in sulphate pulp mills.

MINING AND PREPARATION.

The quarrying of soapstone is carried out by the usual open quarry methods, the material being cut out in solid blocks, which are later sawn into slabs of various dimensions.

[1] See Rubber Manufacturing under Barytes, page 8.

Talc which is later to be ground is won either by open-cut or underground methods. Underground methods are preferable for the reason that the product may be more easily kept clean. In open-cut work during rainy weather the surface drainage which finds its way into the workings carries much clay and dirt with it, staining the talc. There is less danger of this in underground mining.

From the pit the talc is sent to the mill to be prepared for the market. The stained and coloured material is sorted from that which would produce a white product and is discarded or set aside as low grade stock.

The lump talc is first crushed, by means of jaw, or gyratory crushers or rolls, to about one-quarter inch size. It is then very finely pulverized in a buhr mill, ball or tube mill, cyclone mill, or some such pulverizer. The pulverizing is carried on until a large percentage is reduced to 200 mesh size. The product is graded by size, by means of bolting, or air-floating, or a combination of the two methods.

PRICES.

The crude unground talc is worth about $2 per ton at the mine. The finely pulverized talc varies in price, according to grade and quantity purchased, and also according to the point of delivery, from $7 to $30 for domestic talc, and as high as $80 per ton for imported talc, purchased in quarter ton lots.

The price of talc used in paper making averages about $8.75 per ton. That used for foundry purposes, usually purchased in quarter ton lots, averages in price $22 per ton. The general average price for domestic talc is somewhat below $20.

Amount of talc used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	13	10/20	35 15/20
Quebec	28	2810 15/20	233 3/20
Ontario	118	1281 12/20	486 16/20
Prairie Provinces	10	82	3
British Columbia	2	50	10/20
Canada (Total)	171	4224 17/20	759 3/20

The following imports are reported by the Department of Customs:—

	1911–1912		1912–1913	
	cwt.	$	cwt.	$
Talc, bolted or precipitated, not for toilet use	7,920	9,527	5,573	6,421

TRIPOLITE.

Tripolite, or as it is also called *tripoli, infusorial earth, diatomaceous earth, fossil flour*, or *kieselguhr*, is an earthy material composed of the minute siliceous shells or frustules of diatoms. It usually contains such impurities as sand, clay, carbonate of lime, iron oxide, etc. The following analysis is from a sample of tripolite from New Brunswick.[1]

Silica (SiO_2)	80·487%
Alumina (Al_2O_3)	3·146%
Ferric oxide (Fe_2O_3)	·951%
Lime (CaO)	·342%
Magnesia (MgO)	·283%
Carbon dioxide (CO_2)	·011%
Water and organic matter	13·321%
	98·541

USES.

Owing to the finely divided and angular silica, which is the main constituent of tripolite, it is very useful as a polishing material for metal. For this purpose it is prepared in three forms:—

(1) Dry powder, to be moistened or otherwise prepared by the user.

(2) Mixed with about one-third its weight of tallow or other hard grease and moulded into bricks or sticks. This is used on buffing wheels.

(3) Mixed with some cleansing liquid in the form of the well known liquid metal polishes.

In those industries where there is much polishing of metal work large quantities of tripolite are used in the form of grease bricks. Much is imported into the country already manufactured and some manufactured here. In the returns, under the head "tripolite (grease brick)," all is recorded as imported. This is because the tripolite used even in the Canadian made bricks is imported.

[1] Page 22 S. Annual Report, Geological Survey, Vol. XV.

Among other uses of tripolite are the following:—as a filler for rubber goods, as a heat insulator for steam pipes, in the paint industry as a wood filler, for making water filters, and as a filling for the walls of safes.

In an article on tripolite, W. C. Phalen says[1] that of late this material has found a use in the manufacturing of records for talking machines. He says, also, that in Germany it is used as an absorbent for liquid manures in artificial fertilizers; in the manufacture of water glass, of various cements, of glazing for tiles, of artificial stone, of ultramarine and various pigments, of aniline and alizarine colours, of paper, sealing wax, fireworks, gutta-percha objects, Swedish matches, solidified bromine, scouring powders, papier-mâché, and many other articles, and that there is a large and steadily growing demand for it.

It is used in the United States[2] in making light terra cotta brick and in the beet sugar industry to assist in filtration.

Before the introduction of wood pulp as the absorbent for nitro-glycerine in the manufacturing of dynamite, tripolite was used for that purpose.

PREPARATION.

Tripolite usually occurs as a fairly pure bedded deposit at the bottom of lakes. The lakes may be drained and the tripolite dug, or it may be won by means of floating dredges. It is washed, dried, ground, and very carefully sized. The finest sizes are obtained by air-floating, the undersize from the last bolting.

The finished product is graded according to size. For the finer polishing grades and for some other purposes a pure white product is specified. The darker material finds a market principally for rubber filling, for which purpose careful sizing is not essential.

PRICES.

Tripolite when mixed with grease and moulded into bricks costs, on an average, about $65 a ton delivered in Ontario or Quebec.

[1] Page 693, Mineral Resources of the United States. part II, 1910.

[2] Page 39, "Notes on Mineral Wastes," by Charles L. Parsons. Bulletin 47, Bureau of Mines, Washington.

The price of the loose material varies with the grade and quantity purchased, to such an extent that it would be useless to quote the figures obtained.

Amount of tripolite (crude and in form of grease block containing about 75 per cent tripolite) used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Crude Tripolite			
Maritime Provinces	1	—	$\frac{7}{20}$
Quebec	4	—	$43\frac{10}{20}$
Ontario	8	—	$17\frac{5}{20}$
Prairie Provinces	1	—	35
British Columbia	—	—	—
Canada (Total)	14	—	$96\frac{2}{20}$

Location	No. of firms reporting consumption	Domestic	Imported	Equivalent amount of crude
		Tons	Tons	
Tripolite (grease brick)				
Maritime Provinces	14	—	$1\frac{2}{20}$	·8 tons
Quebec	12	—	$8\frac{16}{20}$	6·6 "
Ontario	102	—	$101\frac{3}{20}$	75·9 "
Prairie Provinces	10	—	$2\frac{10}{20}$	1·9 "
British Columbia	7	—	$2\frac{10}{20}$	1·6 "
Canada (Total)	145	—	$115\frac{13}{20}$	86·8 tons

VOLCANIC ASH.

Volcanic ash is a finely comminuted substance ejected by volcanos, similar in composition to pumice. In Nebraska and other western states of the United States and in the western part of Canada deposits of this are found extending over large areas and many feet in thickness. In many cases it is impure, being mixed with sand, silt, clay, etc., while in others the beds are very pure, white, and made up of decidedly angular grains fairly uniform in size.[1]

There is no record of any use having been made of the Canadian material except for local consumption, but the deposits of Nebraska have been extensively exploited.

At one time the name *geyserite* was incorrectly applied to this material. It is now generally spoken of as *volcanic ash, volcanic dust* or *native pumice.* For trade purposes other names have been adopted, such as *diamond polish* and *gibson grit.*

Though often occurring in a loose earthy state, volcanic ash is found also in a somewhat compact form, necessitating passing it between rolls to break up the lumps.

In many cases, where exact uniformity of size of grain is not demanded, the crude material, without any sifting or bolting, is found to be satisfactory.

USES.

The principal uses of volanic ash are for the making of scouring soap and soap powder, and metal polishes.

PRICES.

The price of the crude material for soap making purposes ranges from $6 to $20 per ton, the average price being $14.

[1] See "Notes on Deposits of Pumice," p. 623, Mineral Resources of the United States, part II, 1907, and "Volcanic Dust and its Present Production in Nebraska," page 828, Mineral Industry, 1907.

Amount of volcanic ash used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	—	—	—
Quebec	—	—	—
Ontario	1	—	1000
Prairie Provinces	3	—	97 10/20
British Columbia	1	—	50
Canada (Total)	5	—	1147 10/20

WITHERITE.

Witherite is composed of barium carbonate, ($BaCO_3$). It is usually found as a vein mineral or filling cavities in rocks. There is none produced in Canada.

USES.

The only use, according to the knowledge of the writer, to which this mineral is put in Canada is in the enamelling of metal ware. The finely ground material is mixed with other substances, applied to the metal, and then heated to the point of fusion.

In the manufacturing of chemicals, witherite is frequently used as a source of barium for barium compounds; for example, in the preparation of the barium peroxide used in making hydrogen peroxide (H_2O_2). It is used in some countries in the refining of beet sugar, but this use is decreasing.

Amount of witherite used in the manufacturing industries, as reported by the consumers:—

Location	No. of firms reporting consumption	Domestic	Imported
		Tons	Tons
Maritime Provinces	—	—	—
Quebec	—	—	—
Ontario	2	—	90
Prairie Provinces	—	—	—
British Columbia	—	—	—
Canada (Total)	2	—	90

TABLE I.

Manufacturers of Abrasive Wheels.

No. of firms visited..... 5
No. of firms using minerals..... 5

Mineral.....		Ball Clay	Fire Clay	Sagger Clay	Slip Clay	Stone Clay	Corundum	Emery	Feldspar	Quartz	Silica Sand
Ontario.											
No. of Users..	5	1	3	1	4	3	3	5	4	3	2
Domestic.....		—	—	—	—	—	130	—	—	—	—
Imported.....		5	121	60	42	30	—	850	57	30	8

(Quantities reported in net tons unless otherwise noted.)

TABLE II.

Manufacturers of Aerated Water and Carbon Dioxide.

No. of firms visited..... 33
No. of firms using minerals..... 2
No. of firms using none..... 31

Mineral.....		Magnesite	Whiting
Quebec and Ontario			
No. of Users.....	2	1	1
Domestic.....		750	..
Imported.....		750	30

(Quantities reported in net tons unless otherwise noted.)

TABLE III.

Manufacturers of Artificial Stone and Mineral Floors (not including concrete blocks and tiles).

No. of firms visited..... 20
No. of firms using minerals..... 17
No. of firms from whom no information was received..... 3

Mineral.....		Asbestos	China Clay	Feld-spar	Gyp-sum	Lime-stone	Mag-nesia	Marble (chips & dust)	Ochre	Red Oxide	River Sand	Silica Sand	Talc
Quebec													
No. of Users.....	6	2					3	2	2	3	3	1	
Domestic.....		240					—	150	—	—	450	—	
Imported.....		—					842½	—	3½	14½	—	15	
Ontario													
No. of Users.....	6	1	1	3		1	3	6			—	1	2
Domestic.....		210	120	30		1000	125	8005			Large	—	162½
Imported.....		—	—	540		—	350½	765			quan-tity	200	—
											—		
Prairie Provinces and British Columbia													
No. of Users.....	5	1			1		1	4	1	2	4		
Domestic.....		100			100		100	425	—	—	L.Q.		
Imported.....		—			—		100	—	5	15	—		

(Quantities reported in net tons unless otherwise noted.)

TABLE IV.

Manufacturers of Asbestos Products.

No. of firms visited..... 11
No. of firms using minerals..... 10
No. of firms from whom no information was received..... 1

Mineral.....		Asbestos	Clay	Graphite	Gypsum	Magnesia	Plaster of Paris
Quebec							
No. of Users.....	4	3	2				
Domestic.....		6040	—				
Imported.....		—	530				
Ontario							
No. of Users.....	4	4		1	1		2
Domestic.....		140 $\frac{5}{20}$		—	150		60
Imported.....		—		$\frac{3}{20}$	—		—
Prairie Provinces							
No. of Users.....	1	1			1		
Domestic.....		150			125		
Imported.....		—			—		
British Columbia							
No. of Users.....	1	1				1	
Domestic.....		100				—	
Imported.....		—				10	

(Quantities reported in net tons unless otherwise noted.)

TABLE V.

Manufacturers of Sand Lime Brick.

No. of firms visited..... 27
No. of firms using minerals..... 20
No. of firms from whom no information was received..... 7

Mineral.....		Lime	Red Oxide	Sand
Quebec and Ontario				
No. of Users.....	9	9	6	9
Domestic.....		2893	—	138,000
Imported.....		—	775	—
Prairie Provinces and British Columbia .				
No. of Users.....	11	11	7	11
Domestic.....		.3718	—	167,000
Imported.....		—	150	—

(Quantities reported in net tons unless otherwise noted.)

TABLE VI.

Manufacturers of Brick, Tile and Sewer Pipe.

Mineral.....		Brick Clay[1]	Fire Clay	Lime-stone	Pyro-lusite	Quartz	Salt	Whiting
Maritime Provinces								
No. of Users.....	1		1		1		1	
Domestic.....		Large quant.	15000		10		40[2]	
Imported.....			—		—		—	
Quebec								
No. of Users.....	3		2				1	1
Domestic.....		L.Q.	—				—	—
Imported.....			8000				120[2]	750
Ontario								
No. of Users.....	4		1	1	1	1	3	
Domestic.....		L.Q.	—	—	—	—	80[2]	
Imported.....			160	1000	$2\frac{10}{20}$	40	235[2]	

[1] Quantities of clay used by manufacturers of common brick not reported.
[2] Long tons.
(Quantities reported in net tons unless otherwise noted.)

TABLE VII.

Manufacturers of Buttons (Pearl and Bone).

No. of firms visited..... 6
No. of firms using minerals..... 6

Mineral....	—	Pipe Clay	Gypsum	Pumice	Silex	Tripoli[1]	Whiting
Ontario							
No. of Users....	6	1	1	6	3	1	2
Domestic.....	—	—	$2\frac{10}{20}$	—	—	—	—
Imported.....	—	1	—	21	$2\frac{5}{20}$	$\frac{6}{20}$	$1\frac{5}{20}$

[1] Prepared compound containing about 75% tripoli and 25% grease.
(Quantities reported in net tons unless otherwise noted.)

TABLE VIII.

Manufacturers of Carriages and Automobiles.

No. of firms visited..... 39
No. of firms using minerals..... 24
No. of firms using little or none..... 15

Minerals.....	—	Fire Clay	Emery	Graphite	Slate Powder (Keystone)	Pumice	Quartz (ground)	Rottenstone	Tripoli[2]
Maritime Provinces									
No. of Users	3					3		1	
Domestic.....						—		—	
Imported.....						$2\frac{2}{20}$		$\frac{5}{20}$	
Quebec									
No. of Users.....	2		1			2			
Domestic			—			—			
Imported.....			$\frac{7}{20}$			$\frac{7}{20}$			
Ontario and Prairie Provinces									
No. of Users	19	1	5	1	3	16	2	4	3
Domestic.....		—	—	—	—	—	—	—	—
Imported.....		2	$1\frac{4}{20}$	$\frac{3}{20}$	14	$14\frac{2}{20}$	$\frac{14}{20}$	1	$1\frac{1}{2}$

[2]Prepared compound containing about 75% tripoli and 25% grease.
(Quantities reported in net tons unless otherwise noted.)

TABLE IX.

Manufacturers of Celluloid Goods.

No. of firms visited..... 5
No. of firms using minerals..... 4
No. of firms using little or none..... 1

Minerals.....		Pumice	Rottenstone
Quebec			
No. of Users.....	2	1	2
Domestic.....		—	—
Imported.....		3	$\frac{2}{20}$
Ontario			
No. of Users.....	2		2
Domestic.....			—
Imported.....			$1\frac{1}{20}$

(Quantities reported as net tons unless otherwise noted.)

TABLE X.

Manufacturers of Cement.

No. of plants visited..... 27 (2 not working).
No. of plants using minerals..... 25

Mineral		Fire Clay	Gypsum	Lime	Pebbles[2]
Maritime Provinces, Quebec, Ont.					
No. of Users.....	20	19	19	1	19
Domestic.....		—	59500	[1]	1755
Imported.....		205	100		
Prairie Provinces and British Columbia					
No. of Users.....	5	5	5		5
Domestic.....		—	8600		470
Imported.....		30	3000		

[1] Several hundred tons of lime are used for slag cement. The amount cannot be stated as there is but one firm making this cement in Canada.
[2] About half of the pebbles used are imported.
(Quantities reported in net tons unless otherwise noted.)

TABLE XI.

Manufacturers of Chemicals (Electro and General) and Toilet Preparations. (See also Soap).

No. of firms visited..... 71
No. of firms using minerals..... 34
No. of firms using little or none.... 37

Mineral.....		China Clay	Fullers' Earth	Lime	Pumice	Pyrolusite	Salt	Silica Sand	Sulphur	Talc
Quebec										
No. of Users....	7			2			1			4
Domestic.....				7000			—			32
Imported.....				—			40[2]			21
Ontario										
No. of Users....	24	8	1	4	1		1	1	6	18
Domestic.....		—	—	14700	—		—	—	—	$74\frac{1}{20}$
Imported.....		$20\frac{14}{20}$	1	—	1		1200[2]	[1]	$613\frac{5}{20}$	$93\frac{8}{20}$
Prairie Provinces										
No. of Users....	3	1	1	1	1	1			1	1
Domestic.....		—	—	5	—	—			—	2
Imported.....		1	$\frac{10}{20}$	—	$1\frac{5}{20}$	$\frac{6}{20}$			20	2

[1] One company uses several thousand tons of silica sand in the making of carborundum The quantity cannot be given here as the figures were given in confidence. It is, however included in the table giving the total used. See page 90.

[2] Long tons.

(Quantities are reported in net tons unless otherwise noted.)

TABLE XII.

Manufacturers of Electrical Goods.

No. of firms visited..... 49
No. of firms using minerals..... 30
No. of firms using little or none..... 19

Mineral.....		Asbestos	Emery	Graphite	Lime	Marble (Dust)	Mica	Pyrolusite	Red Oxide	Silex	Slate (Ground)	Sulphur	Talc	Tripoli[3]	Whiting
Maritime Provinces															
No. of Users.....	1													1	
Domestic.....														—	
Imported.....														2/20	
Quebec															
No. of Users.....	5	1	1		1		3		1			1	1	1	1
Domestic.....		4 10/20	—		—		1300 lbs		—			—	10	—	—
Imported.....		—	5/20		10/20		—		5			67	—	10/20	150
Ontario and Prairie Provinces															
No. of Users.....	24	1		1		2	18	3[2]		1	1		1	3	2[2]
Domestic.....		100[1]		—		1	34600 lbs	—		—	—		125	—	—
Imported.....		—		4/20		3 15/20	27100 "	860		10	10		—	2 12/20	5 15/20

[1] Not all used in manufacturing, most sold to plasterers, etc.
[2] Includes returns of one firm in Manitoba.
[3] Prepared compound containing about 75% tripoli and 25% grease.
(Quantities reported in net tons unless otherwise noted.)

TABLE XIII.

Manufacturers of Explosives.

No. of firms visited	11
No. of firms using minerals	4
No. of firms using little or none	7

Mineral	Chalk	Graphite	Magnesia	Sulphur
All Canada				
No. of firms 4	1	2	1	3
Domestic	—	—	—	—
Imported	60	9	200	1350

(Quantities reported in net tons unless otherwise noted.)

TABLE XV.

Manufacturers of Furniture.

No. of firms visited..... 70
No. of firms using minerals..... 42
No. of firms using little or none..... 28

Minerals....		Asbestic	Emery	Pumice	Rottenstone	Silex	Tripoli[1]	Whiting
Quebec								
No. of Users....	3			3	1	1		
Domestic.....				—	—	—		
Imported.....				4 15/20	3/20	10/20		
Ontario								
No. of Users....	36	1	1	36	33	13	2	2
Domestic.....		10/20	—	—	—	—	—	—
Imported.....		—	1	21 5/20	5 15/20	10 3/20	1 3/20	1
British Columbia								
No. of Users....	3			3	3			
Domestic.....				—	—			
Imported.....				4/20	2/20			

[1] Prepared compound containing about 75% tripoli and 25% grease.
(Quantities reported in net tons unless otherwise noted.)

TABLE XVI.

Manufacturers of Glassware.

No. of plants manufacturing glass..... 9

Minerals.....		China Clay	Cryolite	Feldspar	Fluorspar	Lime	Pyrolusite	Glass Sand
Maritime Provinces								
No. of Users.....	1					1	1	1
Domestic.....						—	5	—
Imported.....						60	—	700
Quebec								
No. of Users.....	3					2	3	3
Domestic.....						—	—	—
Imported.....						3000	225	14000
Ontario								
No. of Users.....	4	1	1	1	1	4	4	4
Domestic.....		—	—	—	—	250	—	—
Imported.....		17 17/20	1 10/20	350	350	2450	179	17100
Prairie Provinces....								
No. of Users.....	1				1	1	1	1
Domestic.....					—	—	—	2000
Imported.....					1	400	30	2000

(Quantities reported in net tons unless otherwise noted.)

TABLE XIV.

Foundries.

No. of firms visited..... 381
No. of firms using minerals..... 365
No. of firms from whom no information was received.. 16

Minerals.....		Asbestos	Asbestic	Chromite	Clay	Fire Clay & Ganister	Corundum	Emery	Fluorspar	Graphite[1]	Infusorial Earth	Iron Oxide for Flux, etc.	Limestone and Dolomite	Magnesite	Mica	Mica Schist	Plaster of Paris	Pumice	Pyrolusite	Blast Sand	Fire Sand and Silica Sand	Moulding Sand	River Sand	Silica Wash	Talc	Tripoli[2]	
Maritime Provinces.																											
No. of Users.....	49	1			3	32	1	8		40			9		6	2		1		1	3	45	22		10	9	
Domestic.....		11			20	589 10/20	1/20	—		12 15/20			385		215 lbs.	—		—		300	60	845	1057		2 19/20	—	
Imported.....		—			—	254	—	6 1/20		39			—		175 lbs.	105		2/20		—	515	6203	—		2 19/20	17/20	
Quebec																											
No. of Users.....	54				12	32		2	1	41		1	9		2		2			1	10	53	29	5	9	4	
Domestic.....					624	—		—	—	4 7/20		—	1065		15 lbs.		1 5/20			—	—	7400	6563	—	6 15/20	—	
Imported.....					—	3392 4/20		3 1/20	1/20	98 10/20		375	—		—		—			150	19,089	33,738	61	636	5 3/20	6 9/20	
Ontario																											
No. of Users.....	210	7		1	17	119	10	50	7	143	1		19	1	22	9	4	14	2	8	2	203	98	3	70	29	
Domestic.....		7 7/20		—	2575	—	6 9/20	131 4/20	40 5/20	50 3/20	—		3819	—	2580 lbs.	—	390 5/20	—	1 11/20	2000	2	68,678	26,124	95 15/20	119 3/20	—	
Imported.....		5/20		50	—	9157	3	—	193 13/20	149	1		720	180	886 lbs.	730	—	11 1/20	1 11/20	3568	22	16,064	195	—	119	69 10/20	
Prairie Provinces																											
No. of Users.....	26				8	17		2		20			7						1		1	25	23		5	3	
Domestic.....					145	44		—		4 1/20			116						—		4	1735	1792		—	—	
Imported.....					—	228 10/20		7/20		32 15/20			—						6		—	1675	25		16/20	1 11/20	
British Columbia																											
No. of Users.....	26		1		9	22		3	2	23			7		1		2	1	1		2	26	25	1	1	4	
Domestic.....			15		200	151 10/20		—	—	5 9/20			88		—		3 1/20	—	1		—	2801	1743	—	—	—	
Imported.....			—		—	246 10/20		1/20	2 1/20	31 3/20			—		10 lbs.			7/20			80	265	—	4	1 12/20	1 5/20	

[1] Probably half of the graphite reported above is really a mixture prepared by facing manufacturers and probably contains much talc, etc.
[2] Prepared compound containing about 75% tripoli and 25% grease.
(Quantities reported in net tons unless otherwise noted.)

TABLE XVII.

Glass (cutting, beveling, silvering, etc.).

No. of firms visited..... 35
No. of firms using minerals..... 24
No. of firms using little or none..... 9
No. of firms from whom no information was received.. 2

Minerals.....		China Clay	Corundum	Emery	Fluorspa	Plaster of Paris	Pumice	Rottenstone	River Sand	Silica Sand	Tripoli[1]	Whiting
Maritime Provinces												
No. of Users.....	2			1		1	2			1		
Domestic.....				—		—	—			—		
Imported.....				$\frac{10}{20}$		1	$1\frac{10}{20}$			4		
Quebec												
No. of Users.....	4			3			4			3		
Domestic.....				—			—			—		
Imported.....				$5\frac{16}{20}$			9			175		
Ontario												
No. of Users.....	12	1	2	6	1		10	1	$\frac{52}{52}$	10	2	2
Domestic.....		—	5	—	—		—	—	1000	—	—	—
Imported.....		20	—	$19\frac{18}{20}$	Sm. q'nty.		$34\frac{5}{20}$	$\frac{5}{20}$	7	549	$\frac{9}{20}$	202
Prairie Provinces												
No. of Users.....	5		1	4		1	2		5			2
Domestic.....			$\frac{5}{20}$	—		17	—		645			—
Imported.....			—	$5\frac{17}{20}$		—	$1\frac{10}{20}$		—			$1\frac{1}{20}$
British Columbia												
No. of Users.....	1						1			1		
Domestic.....							—			—		
Imported.....							3			30		

[1] Prepared compound containing about 75% tripoli and 25% grease.
(Quantities reported in net tons unless otherwise noted.)

TABLE XVIII.

Manufacturers of Jewelry and Silverware.

No. of firms visited..... 68
No. of firms using minerals..... 53
No. of firms using little or none..... 15

Minerals.....		Emery	Pumice	River Sand	Silica Sand	Tripoli[1]	Whiting
Maritime Provinces.							
No. of Users.....	2					2	
Domestic.....						—	
Imported.....						1/20	
Quebec							
No. of Users.....	6	2	5	1	1	6	
Domestic.....		—	—	2/20	—	—	
Imported.....		2/20	3 2/20	—	10/20	115/20	
Ontario							
No. of Users.....	38	7	13	3	2	36	
Domestic.....		—	—	3012/20	—	—	
Imported.....		18 1/20	355/20	—	4/20	1810/20	
Prairie Provinces							
No. of Users.....	5	3	2	1	1	5	1
Domestic.....		—	—	1/20	—	—	—
Imported.....		2/20	5/20	—	1/20	3/20	1/20
British Columbia							
No. of Users.....	2			1	1	2	
Domestic.....				5/20	—	—	
Imported.....				—	1/20	1/20	

[1] Prepared compound containing about 75% tripoli and 25% grease.
(Quantities reported in net tons unless otherwise noted.)

TABLE XIX.

Manufacturers of Matches.

No. of firms visited..... 6
No. of firms using minerals..... 6

Mineral...		Asbestic	Magnesia	Plaster of Paris	Quartz (Ground)	Red Oxide	Sulphur	Whiting
All Canada								
No. of Users	6	1	1	4	4	5	6	6
Domestic....		10/20	—	10	—	2	—	—
Imported....		—	5	15 5/20	137	50	368	173

(Quantities reported in net tons unless otherwise noted.)

TABLE XX.

Meat Packers and Manufacturers of Fertilizers and Glue.

No. of firms visited..... 42
No. of firms using minerals..... 34

Mineral.....		Fullers' Earth	Gypsum	Lime	Peat Litter	Acid Phosphate	Mineral Phosphate	Salt	Sulphur
Maritime Provinces									
No. of Users.....	7	1	3			3	1	3	
Domestic		—	1600			—	—	—	
Imported.....		1	—			6500	200	155 [1]	
Quebec									
No. of Users.....	6	3		1	1	2	1	1	1
Domestic.....		—		240	—	—	—	—	—
Imported.....		160		—	1000	3000	500	600 [1]	30
Ontario									
No. of Users.....	13	9		1		1	2	3	
Domestic.....		—		35		—	50	450 [1]	
Imported.....		580 10/20		—		25	1000	130 [1]	
Prairie Provinces...									
No. of Users.....	7	6				1		7	
Domestic.....		—				—		202 [1]	
Imported.....		103				2 10/20		3420 [1]	
British Columbia									
No. of Users.....	1	1						1	
Domestic.....		—						—	
Imported.....		35						800 [1]	

[1] Long tons.
(Quantities reported in net tons unless otherwise noted.)

TABLE XXII.

Manufacturers of Musical Instruments (Pianos, Organs, etc.).

No. of firms visited..... 17

No. of firms using minerals..... 17

Mineral....		China Clay	Graph-ite	Pum-ice	Rotten stone	Sienna and Umber	Silex	Tri-poli[1]	Whit-ing
Quebec									
No. of Users...	3			2	2	1			
Domestic....				—	—	—			
Imported.....				$\frac{12}{20}$	$\frac{6}{20}$	$\frac{2}{20}$			
Ontario									
No.of Users ..	14	2	5	13	12	1	6	3	1
Domestic.....		—	—	—	—	—	—	—	—
Imported.....		$2\frac{10}{20}$	$\frac{1}{20}$	22	$2\frac{9}{20}$	$\frac{3}{20}$	$17\frac{9}{20}$	$\frac{5}{20}$	$\frac{7}{20}$

[1] Prepared compound containing about 75% tripoli and 25% grease

(Quantities reported in net tons unless otherwise noted.)

TABLE XXI.

Metal Workers.

No. of firms visited..... 197
No. of firms using minerals..... 56
No. of firms using little or none..... 141

Mineral.....		Asbestos	Chromi-tron	Fire Clay	Corundum	Emery	Garnet	Graphite	Mica	Plaster of Paris	Pumice	Pyrolusite	Rotten-stone	Fire Sand	Silica Sand	Sulphur	Talc	Tripoli[1]	Whitin
Maritime Provinces:																			
No. of Users.....	8			4		4					1	1		5				2	
Domestic.....				4		1 1/20					2/20	2/20		210 19/20				2/20	
Imported.....				53															
Quebec																			
No. of Users.....	9		1		2	4		1		3	2		1		1		1		
Domestic.....			1/20 lbs.		1 2/20	2		1/20		102 15/20	2/20		1/20		2/20		1/20		
Imported.....																			
Ontario																			
No. of Users.....	33	1		1	1	17	2	2	1		11			2			1	19	
Domestic.....		2/20		5	2/20	24 1/20	1/20	2/20	25 lbs.		5 1/20			10			1 1/20	6 2/20	
Imported.....														80					
Prairie Provinces																			
No. of Users.....	2	1				1				1	1							2	
Domestic.....		1 8/20				2/20				4/20	1/20							1/20	
Imported.....																			
British Columbia																			
No. of Users.....	4					4		5			1				1			1	1
Domestic.....						7/20		1/20			1/20				6/20			1 2/20	1/20
Imported.....																			

[1] Prepared compound containing about 75% tripoli and 25% grease.
(Quantities reported in net tons unless otherwise noted.)

TABLE XXI.

Metal Workers.

No. of firms visited..... 197
No. of firms using minerals..... 56
No. of firms using little or none..... 141

Mineral.....		Asbestos	Chromi-tron	Fire Clay	Corundum	Emery	Garnet	Graphite	Mica	Plaster of Paris	Pumice	Pyrolusite	Rotten-stone	Fire Sand	Silica Sand	Sulphur	Talc	Tripoli[1]	Whitin
Maritime Provinces:																			
No. of Users.....	8			4		4					1	1		5				2	
Domestic.....				4		1 14/20					1/20	3/20		210 13/20				2/20	
Imported.....				53															
Quebec																			
No. of Users.....	9		1		2	4		1		3	2		1		1		1		
Domestic.....			50 lbs.		1 2/20	2		1/20		102 15/20	1/20		1/20		3/20		2/20		
Imported.....																			
Ontario																			
No. of Users.....	33	1		1	1	17	2	2	1		11			2			1	19	
Domestic.....		1/20		5	5/20	24 13/20	17/20	4/20	25 lbs.		5 16/20			10			1 18/20	6 2/20	
Imported.....														80					
Prairie Provinces																			
No. of Users.....	2	1				1				1	1							2	
Domestic.....		1 18/20				5/20				4/20	1/20							15/20	
Imported.....																			
British Columbia																			
No. of Users.....	4					4		5			1				1			1	1
Domestic.....						7/20		1/20			3/20				6/20			10/20	15/20
Imported.....																			

[1] Prepared compound containing about 75% tripoli and 25% grease.
(Quantities reported in net tons unless otherwise noted.)

TABLE XXIII.

Refiners of Oil and Manufacturers of Lubricants.

No. of firms visited	31
No. of firms using minerals	16
No. of firms using little or none	11
No. of firms from whom no information was received	4

Mineral		Florida Clay	Fullers Earth	Graphite	Lime	Mica (Ground)	Sulphur	Talc.
Quebec								
No. of Users	1			1				
Domestic				—				
Imported				5/20				
Ontario								
No. of Users	10	1	3	8	2	2	1	1
Domestic		—	—	10/20	23	20 5/20	—	—
Imported		500	175	8	—	—	5	5/20
Prairie Provinces								
No. of Users	4			4				
Domestic				10/20				
Imported				8 15/20				
British Columbia								
No. of Users	1				1			
Domestic					8			
Imported					—			

(Quantities reported in net tons unless otherwise noted.)

TABLE XXV.

Manufacturers of Polishes (Stove and Metal).

No. of firms visited..... 19

No. of firms using minerals..... 19

Mineral....		Asbestos	Calcite	China Clay	Graphite	Infusorial Earth	Magnesia	Marble (Dust)	Plaster of Paris	Pumice	Red Oxide	Silex	Talc	Whiting
Maritime Provinces														
No. of Users	1				1	1				1			1	
Domestic.....					—	—				—			—	
Imported.....					1	$\frac{7}{20}$				5			2	
Quebec														
No. of Users.....	4				3	3	1			1		2		
Domestic.....					—	—	—			—		—		
Imported.....					141	$23\frac{10}{20}$	3			1		18		
Ontario														
No. of Users.....	13	1		2	8	6		1	1	2	1	6	2	1
Domestic.....		—		—	20	—		—	10	—	—	—	—	—
Imported.....		$\frac{3}{20}$		$1\frac{15}{20}$	$127\frac{10}{20}$	$11\frac{5}{20}$		4	—	8	$\frac{10}{20}$	$11\frac{13}{20}$	$5\frac{16}{20}$	3
Prairie Provinces														
No. of Users.....	1		1			1								
Domestic.....			65			—								
Imported.....			—			35								

(Quantities reported in net tons unless otherwise noted.)

. . 49
. . 35
. . 14
als.)

Mineral		Asbestos	Barytes	China Clay	P C	Ochre	Plaster of Paris	Pyrolusite	Red Oxide	Sienna and Umber	Silex	Slate (Ground)	Talc	Whiting
Maritime Provinces and Quebec														
No. of Users	12	2	12	5		9	2	8	8	4	4	2	3	9
Domestic		27	486	—		125	14 10/20	1 5/20	1,440 8/20	—	—	—	37	—
Imported		—	1,785	77 5/20		556 5/20	—	12	407 10/20	27 5/20	67	18 10/20	1 5/20	2,756
Ontario														
No. of Users	17	5	9	6		9	1	10	11	5	6	1	1	7
Domestic		35 4/20	—	—		82	15	2	343 10/20	—	—	—	—	—
Imported		33	675	125 15/20		273	—	13 17/20	404	45 5/20	90 10/20	75	4	658
Prairie Provinces and British Columbia														
No. of Users	6		3	3		4		2	5	4	3			4
Domestic			—	—		—		—	125	—	—			—
Imported			150	30		149		8	160 10/20	117 10/20	21			1,055

TABLE XXVI.

Manufacturers of Porcelain, Pottery and Enamelware.

No. of firms visited..... 15

No. of firms using minerals..... 15

Mineral.....		Calcite	Ball Clay	China Clay	Fire Clay	Pipe Clay	Sagger Clay	Slip Clay	Stone Clay	Feldspar	Fluorspar	Pyrolusite	Quartz	Salt	Whiting	Witherite
Maritime Provinces and Quebec:																
No. of Users.....	6	1	4	5		2	4	1	2	6	2	1	6		1	
Domestic.....		—	—	—		—	—	—	—	250	—	—	168		—	
Imported.....		20	810	491 10/20		61	1060	10	675	1130	70	1	1022		15/20	
Ontario, Prairie Provinces and British Columbia																
No. of Users.....	9	1	2	4	2	1	1		1	6	5	3	7	1		2
Domestic.....		—	—	—	—	—	—		—	100	—	—	—	—	—	—
Imported.....		20	70	1440	1500	60	125		600	728	342	5	471	100[1]		90

[1] Long tons.

(Quantities reported in net tons unless otherwise noted.)

TABLE XXVII.

Manufacturers of Pulp (Sulphite and Soda) and Paper.

No. of firms visited..... 47

No. of firms using minerals..... 47

Mineral.....		Asbestos	Clay	China Clay	Lime	Limestone	Magnesia	Ochre (Yellow)	Plaster of Paris	Red Oxide	Sienna & Umber	Sulphur	Talc	Whiting
Maritime Provinces														
No. of Users.....	3				2	1	1					2		
Domestic.....					1900	1000	600					—		
Imported.....					—	—	—					3000		
Quebec														
No. of Users.....	21		3	16	8	2		3		5	2	5	4	
Domestic.....			900	—	11095	60		—		690	—	—	1900	
Imported.....			—	8390	40	3000		40		35	57	9900	130	
Ontario														
No. of Users.....	20	1		15	6	3		3	1	2		4	7	1
Domestic.....		$\frac{10}{20}$		—	3890	5320		—	40	—		—	415	—
Imported.....		—		9325	5	8000		6	—	$6\frac{5}{20}$		7150	241	35
British Columbia														
No. of Users.....	3			1		3						3		
Domestic.....				—		5660						—		
Imported.....				200		—						4700		

(Quantities reported in net tons unless otherwise noted.)

TABLE XXVIII.

Manufacturers of Roofing.

No. of firms visited	14
No. of firms using minerals	7
No. of firms using little or none	6
No. of firms from whom no information was received	1

Mineral		Asbestos	Asbestic	Feldspar	Mica (Ground)	Slate (Crushed)	Talc
Quebec							
No. of Users	4	2	1		1		2
Domestic		225	3000		10		210
Imported		—	—		—		—
Ontario							
No. of Users	3		1	1	1	1	1
Domestic			25	—	25	—	—
Imported			—	50	—	20	15

(Quantities reported in net tons unless otherwise noted.)

TABLE XXIX.

Manufacturers of Rubber Goods.

No. of firms visited..... 12

No. of firms using minerals..... 12

Mineral.....		Asbestic	Barytes	China Clay	Graphite	Infusorial Earth	Lime	Magnesia	Magnesite	Red Oxide	Salt	Silex	Slate (Ground)	Sulphur	Talc	Whiting
Quebec																
No. of Users....	5		2			1	1			1				5	2	5
Domestic.....			—			—	—			—				—	20	—
Imported.....			120			20	40			1				260	22	600
Ontario																
No. of Users....	7	3	5	5	1		3	1	1	2	1	1	1	6	3	7
Domestic.....		18	30	—	7		4	—	—	—	$\frac{3}{20}$ [1]	—	—	—	$65\frac{10}{20}$	—
Imported.....		—	138	10	—		5	2	7	$4\frac{15}{20}$	—	$\frac{18}{20}$	2	103	—	1097

[1] Long tons

Quantities reported in net tons unless otherwise noted.)

TABLE XXX.

Manufacturers of Soap and Talcum.

No. of firms visited	30
No. of firms using minerals	22
No. of firms using little or none	6
No. of firms from whom no information was received	2

Mineral		China Clay	Pumice	Salt	Silex	Talc	Volcanic Ash
Maritime Provinces							
No. of Users	4		1	4	3	1	
Domestic			—	—	—	—	
Imported			30	60[1]	50	30	
Quebec							
No. of Users	6		3	4	2	2	
Domestic			—	—	—	115	
Imported			211 $\frac{5}{20}$	265[1]	200	35	
Ontario							
No. of Users	7			2	4	4	1
Domestic				105[1]	—	320	—
Imported				—	161	1 $\frac{5}{20}$	1000
Prairie Provinces							
No. of Users	3		3	3	3	4	3
Domestic			—	25[1]	—	80	—
Imported			2	185[1]	13 $\frac{7}{20}$	$\frac{5}{20}$	97 $\frac{10}{20}$
British Columbia							
No. of Users	2	1		2		1	1
Domestic		—		—		50	—
Imported		25		150[1]		—	50

[1] Long tons

(Quantities reported in net tons unless otherwise noted.)

TABLE XXXI.

Manufacturers of Sugar.

No. of firms visited..... 7
No. of firms using minerals..... 7

Mineral.....		Limestone	Lime	Sulphur
Maritime Provinces and Quebec				
No. of Users.....	3	1	2	
Domestic.....		10	70	
Imported.....		—	500	
Ontario, Prairie Provinces and British Columbia				
No. of Users.....	4	3	1	2
Domestic.....		7000	30	—
Imported.....		—	—	55

(Quantities reported in net tons unless otherwise noted.)

TABLE XXXII.

Smelters and Rolling Mills.

No. of firms visited..... 22
No. of firms using minerals..... 22

Mineral		Clay	Fire Clay and Ganister	Cryolite	Fluorspar	Lime	Limestone	Magnesia	Magnesite	Mineral Phosphate	Quartz	Fire Sand	Moulding Sand	Silica Sand
Maritime Provinces														
No. of Users....	3		3		2		2	2				3	3	
Domestic.....			645		—		425600	—				—	—	
Imported.....			2265		6890		—	1850				1690	15,000	
Quebec														
No. of Users....	4	1	2	1	1	1	2			1	1	1		1
Domestic.....		850	—	—	—	200	1,600			—	.500	—		—
Imported.....		—	120	242	15	—	—			2000	—	500		100
Ontario														
No. of Users....	11	2	5		3		7	1	1	1	3	5		1
Domestic.....		4000	—		—		234,795	—	—	—	57,500	120		—
Imported.....		—	12,770		2560		4300	120	600	1000	—	1505		200
Prairie Provinces														
No. of Users....	2		2									2		
Domestic.....			—									—		
Imported.....			290									500		
British Columbia														
No. of Users....	2		2				1							
Domestic.....			600				90,000							
Imported.....			—				—							

(Quantities reported in net tons unless otherwise noted.

TABLE XXXIII.

Tanners.

Mineral.....		Barytes	Lime	Salt	Sulphur	Talc
Maritime Provinces						
No. of Users.....	9		9	6	1	
Domestic.....			190	—	—	
Imported.....			—	165 [1]	1 15/20	
Quebec						
No. of Users.....	9		9	3		
Domestic.....			1154	—		
Imported.....			—	120 [1]		
Ontario						
No. of Users.....	10	2	10	5	1	1
Domestic.....		—	1638	360 [1]	—	5/20
Imported.....		17	—	30	10	—
Prairie Provinces						
No. of Users.....	5 [2]		4	5		
Domestic.....			77	—		
Imported.....			—	510 [1]		

[1] Long tons
[2] One hide shipper uses salt only.
(Quantities reported in net tons unless otherwise noted.)

TABLE XXXIV.

Manufacturers of Textiles (Cotton, Linen, Wool, Felt, Window Blinds, Oilcloth, and Rope.)

No. of firms visited..... 86
No. of firms using minerals..... 26
No. of firms using little or none..... 55
No. of firms from whom no information was received..... 5

Mineral.....		Barytes	China Clay	Graphite	Gypsum	Lime	Ochre (Yellow)	Plaster of Paris	Salt	Sulphur	Talc	Whiting
Maritime Provinces.....												
No. of Users.....	3			1					2	1		
Domestic.....				—					—	—		
Imported.....				$\frac{6}{20}$					36[1]	$\frac{2}{20}$		
Quebec												
No. of Users.....	4	1	3		1	1	—	2			2	
Domestic.....		—	—		100	120	—	—			480	
Imported.....		$\frac{10}{20}$	580		—	—	204	—			20	
Ontario												
No. of Users.....	19		8	1			1	1	1	9	1	1
Domestic.....			—	$\frac{2}{20}$			—	5	5[1]	—	$\frac{8}{20}$	—
Imported.....			$42\frac{15}{20}$	—			5	—	—	$34\frac{10}{20}$	—	$\frac{5}{20}$

[1] Long tons.
(Quantities reported in net tons unless otherwise noted.)

TABLE XXXV.

Manufacturers of Wall Paper.

No. of firms visited..... 4
No. of firms using minerals..... 4

Mineral.....		Barytes	China Clay	Mica (Ground)
Quebec				
No. of Users.....	2	1	2	2
Domestic.....		—	—	—
Imported.....		35	750	50
Ontario				
No. of Users.....	2		2	1
Domestic.....			—	—
Imported.....			1200	50

(Quantities reported in net tons unless otherwise noted.)

TABLE XXXVI.

Wood Workers (wheels, handles for axes, etc.).

No. of firms visited..... 21
No. of firms using minerals..... 4
No. of firms using little or none..... 17

Mineral....		Garnet	Plaster of Paris	Pumice	Quartz	Rottenstone
Ontario						
No. of Users...	4	2	1	1	2	1
Domestic.....		—	$\frac{10}{20}$	—	—	—
Imported.....		$3\frac{8}{20}$	—	$\frac{1}{20}$	$5\frac{10}{20}$	$\frac{2}{20}$

(Quantities reported in net tons unless otherwise noted.)

TABLE XXXVII.

Sundry (including manufacturers of Dental Supplies, Evaporated Fruit, Filters, Gaskets, Picture Moulding, Plasterstaff, Stove Cement, Whips, etc.).

Mineral....		Asbestos	Clay (Fire)	Clay (Modelling)	Emery	Feldspar	Graphite	Gypsum	Infusorial Earth	Plaster of Paris	Pumice	Quartz	Rotten-stone	Salt	Sand (River)	Slate (Ground)	Sulphur	Talc	Tripoli [2]	Whiting
All Canada																				
No. of Users...	34	6	2	2	4	1	3	1	1	5	4	3	1	1	1	1	6	3	4	3
Domestic.....		$43\frac{15}{20}$	—	$\frac{7}{20}$	—	$\frac{1}{20}$	$\frac{4}{20}$	20	—	$171\frac{19}{20}$	$1\frac{11}{20}$	$35\frac{13}{20}$	—	40 [1]	1,000	100	$12\frac{19}{20}$	5	$\frac{13}{20}$	54
Imported.....		—	60	$\frac{6}{20}$	$\frac{6}{20}$	$\frac{1}{20}$	$\frac{9}{20}$	—	5	$\frac{19}{20}$	$1\frac{11}{20}$	$\frac{13}{20}$	$\frac{6}{20}$	—	—	—	—	—	$\frac{13}{20}$	—

[1] Long tons.
[2] Prepared compound containing about 75% tripoli and 25% grease.
(Quantities reported in net tons unless otherwise noted,)

BIBLIOGRAPHY.

General.—

System of Mineralogy (book), by James Dwight Dana and Edward Salisbury Dana. John Wiley and Sons, New York.

Introduction to the Study of Minerals (book), by Austin Flint Rogers. McGraw-Hill.

The Non-Metallic Minerals; Their Occurrence and Uses (book), by George P. Merrill. John Wiley and Sons, New York. ($4). The best book covering the subject.

Mineral Industry (book), published annually. Statistics, prices and occasional articles on uses and milling of various minerals.

Economic Minerals and Mining Industry of Canada. Report No. 230, Mines Branch, French Translation, No. 231.

Notes on Mineral Wastes, by Charles L. Parsons. Bulletin 47, U. S. Bureau of Mines.

Contains references to the uses of several non-metallic minerals, including asbestos, infusorial earth, fullers' earth, and rare earths.

Abrasives.—

Corundum. Canadian Mining Review, Vol. XVII, p. 192.

Manufacture of Grinding Wheels (*Die Fabrikation der künstlichen Schleifscheiben*), by K. Vougt. Zeitschrift des Vereinrs Deutscher Ingenieure, Jan. 15, 1910.

Discusses raw materials, their preparation, and their manufacture into grinding wheels.

Garnet as an Abrasive Material, by F. C. Hooper. School of Mines Quarterly, Vol. XVI, p. 124.

Economic Geology of the Berea Sandstone Formation of Northern Ohio, by Wilbur Greeley Burroughs. Economic Geology, Aug., 1913, p. 469.

Describes the methods of quarrying and dressing grindstones.

Asbestos.—

Chrysotile-Asbestos: Its Occurrence, Exploitation and Uses. 2nd Edition, by Fritz Cirkel. Report No. 69, Mines Branch, French Translation, No. 81.

Asbestos and Asbestic: their Properties, Occurrence, and Use (book), by Robert H. Jones. London, 1897, pp. 368.

Barite.—

Barytes Deposits of Lake Ainslee and North Cheticamp, by H. S. Poole. Bulletin 953, Geological Survey of Canada, 1907.

Contains notes on the production, manufacture, and uses of barytes in Canada.

Barytes, by W. C. Phalen. Mineral Resources of the United States, for 1911, Part II, page 965. U. S. Geological Survey.

Nova Scotia Barite. Canadian Mining Journal, Sept. 15, 1912, pp. 661-662.

A Barytes Grinding Plant, by E. K. Judd. Engineering and Mining Journal, May 25, 1907, p. 996.

Barytes and its Preparation for the Market, by Edwin Higgins. Engineering News. Vol. 53, Feb. 23, 1905, p. 196.

Barytes: Occurrence and Methods of Preparation, by Schuyler Frazier. Chemical Engineer, Feb., 1911, p. 43.

Geology, Mining and Preparation of Barite in Washington County, Missouri, by A. A. Steel. Transactions of the American Institute of Mining Engineers, Vol. LI, 1909, pp. 711-743.

Manufacture of Barium Compounds in Germany. Engineering and Mining Journal, Aug. 9, 1913, p. 249.
Describes various methods of manufacturing barium compounds from barite and witherite.

Bauxite and Cryolite.—

Uses of Bauxite. Rock Products, Dec. 22, 1913, p. 37.

Bauxite and Cryolite. Mineral Industry, Vol. II, 1893, p. 57.

Cryolite and its Industrial Applications, by Alfred S. Holland. Mining World, April 1, 1911.

Chromite.—

Chrome Iron Ore Deposits of the Eastern Townships, by Fritz Cirkel. Report No. 29, Mines Branch, French Translation, No. 226.

Clay.—

Clays: Occurrence, Properties and Uses (book), by Heinrich Ries. Wiley and Sons, New York.

Clay and Shale Deposits of New Brunswick, by Joseph Keele. Memoir 44, Geological Survey.

Clay and Shale Deposits of the Western Provinces, by Heinrich Ries. Memoir 47, Geological Survey.

Technology of the Clay Industry, by Heinrich Ries. 16th Annual Report, Part 4, U. S. Geological Survey, p. 523, 1895. $1.20.

Bentonite Deposits of Wyoming, by C. A. Fisher. Bulletin 260, U. S. Geological Survey, p. 559, 1905. 40c.

Fireclays: What they are, where they are found and how to test them to find their value, by T. C. Hopkins. Mines and Minerals, Vol. XIX, p. 53.

Mining and Preparation of Kaolin, by T. C. Hopkins. Engineering and Mining Journal, Vol. LXVIII, p. 245.

Southern Soapstones, Kaolin, and Fire-Clays and their Uses, by P. H. Mell. Transactions of the American Institute of Mining Engineers, Vol. X, p. 318.

Manufacture of Crucibles, Scorifiers and Muffles, by A. F. Greaves-Walker. Transactions of American Ceramic Society, Vol. XII, p. 54.
Notes on clays and their preparation.

Requirements of Pottery Materials, by Harrison Everett Ashley. Transactions American Ceramic Society, Vol. XII, p. 433.

Clay and Kaolin Mining in Europe, by Arthur S. Watts. Transactions American Ceramic Society, Vol. XIII, p. 228.

Commercial Clays of Utah, by A. F. Greaves-Walker. Transactions American Ceramic Society, Vol. XIII, p. 277.
Contains numerous analyses and gives uses to which the clays are put.

Drying Defects in Some Cretaceous Clays of the Great Plains Region of Canada, by Joseph Keele. Transactions American Ceramic Society, Vol. XIV, p. 152.

Studies of Flint Clays and their Associates, by Sydney L. Galpin. Transactions American Ceramic Society, Vol. XIV, p. 301.

Kaolin Mining in the South Appalachian Mountains, by A. S. Watts. Transactions American Ceramic Society, Vol. XIV, p. 434.

Discusses methods of preparing kaolin for the market.

Testing of Paper Clays, by Charles S. Gwinn. Transactions American Ceramic Society, Vol. XIV, p. 571.

Gives in detail the important tests for clays for paper making.

Feldspar.—

Report on Feldspar, by Hugh S. de Schmid. Mines Branch. In course of preparation.

Feldspar. Mineral Resources of the United States, Part II, 1907, p. 856, U. S. Geological Survey.

Gives methods of grinding and notes on the uses.

Mining and Treatment of Feldspar and Kaolin in the Southern Appalachian Region, by A. S. Watts. Bulletin 53, Bureau of Mines, Washington.

The Production of Available Potash from Natural Silicates, by Allerton S. Cushman and George W. Caggeshall. Canadian Mining Journal, Jan. 1, 1913, p. 10.

(Read at the Eighth International Congress of Applied Chemistry.) Accounts of Patents and experiments.

Fluorspar.—

Fluorspar—Grades and Markets, by F. J. Fohs. Mining and Scientific Press, Nov. 27, 1909.

Flux.—

Fluxes and Mould Facings, by Walter J. May. Mechanical World, Dec. 3, 1909.

Fullers' Earth.—

Properties and Tests of Fullers' Earth, by J. T. Porter. In Contributions to Economic Geology: Bulletin 315 U. S. Geological Survey, p. 268. 1907. (50c).

Graphite.—

Graphite, by R. W. Ells. Bulletin No. 877, Geological Survey.

Graphite; Its Properties, Occurrence, Refining and Uses, by Fritz Cirkel. Report No. 18 Mines Branch (out of print), French Translation, No. 202.

Graphite, by G. O. Smith. In Mineral Resources of the United States, Part II, 1906, p. 1265, U. S. Geological Survey.

Describes the kinds of graphite best suited for crucibles and pencils.

Graphite Deposits of Pennsylvania, by Benjamin L. Miller. Topographic and Geologic Survey of Pennsylvania.

Contains chapters on milling, uses and prices of graphite.

Canadian Graphite, by H. P. H. Brumell. Journal Canadian Mining Institute, Vol. X, p. 85. 1907.

Graphite Concentration, by H. P. H. Brumell. Journal Canadian Mining Institute, Vol. XII, p. 205. 1909.

Graphic Mining and Milling in Quebec, by H. P. H. Brumell. Canadian Mining Journal, July 1, 1912, pp. 433-437.

The application of Graphite to the Production of Crucibles for Melting Metals, by A. Harning. Brass World, Vol. VII (1911), p. 307.

Describes the requisite qualities of graphite for crucible making.

The Flake Graphite Industry of the United States, by F. D. Chester. Engineering and Mining Journal, Vol. 88 (1909), pp. 785 and 824.

A Novel Graphite Washing Plant, by F. C. Nicholas. Mining World, Vol. 28 (1908), p. 18.

Gypsum.—

Gypsum in Canada: Its Occurrence, Exploitation and Technology, by L. H. Cole. Report No. 245, Mines Branch.

Gypsum Deposits of the United States, by G. I. Adams and others. Bulletin 223. U. S. Geological Survey.

The Gypsum of Michigan and the Plaster Industry, by G. P. Grimsley. Geological Survey of Michigan, Vol. IX, Part II.

Geology of Webster County, by Frank A. Wilder. Iowa Geological Survey, Vol. XII (1901).

Covers the gypsum industry of Iowa and gives brief account of that industry in Germany.

Infusorial Earth.—

Infusorial Earth, by T. C. Denis. Bulletin No. 857, Geological Survey.

Kieselguhr Industry, by Percy A. Boeck. Metallurgical and Chemical Engineer, Feb., 1914.
Describes material, origin, composition, mining and milling, and some uses.

Lime, etc.—

Cement, Lime and Plasters (book), by E. C. Eckel. John Wiley and Sons.

Manual of Lime and Cement (book), by A. H. Heath. London, 1893.

Lime and Cement Industries of New York. Bulletin 44. New York Geological Survey, 1901.

Lime, by Ernest F. Burchard. In Mineral Resources of the United States, Part II, 1911, p. 645. U. S. Geological Survey.

Limestone Resources and the Lime Industry in Ohio. Bulletin 4, Series IV. Ohio Geological Survey.

Valuation of Limestones for Calcination, by J. S. Grasty. Mining and Engineering World, Sept. 30, 1911.
Discusses the effect of impurities and the combinations formed on calcination.

Tests of Lime, by W. E. Emley. Transactions, National Lime Manufacturers Association, 1911, p. 196.

Lime: Its Properties and Uses. Circular 30. United States Bureau of Standards.
This is very complete and in detail.

Use of Lime in Tanneries, by R. W. Griffith. Rock Products, Sept. 22, 1911, p. 36.

Depreciation of Quicklime, by Wm. R. Copeland and Walter A. Sperry. Engineering Record, May 11, 1911.

Manufacturing and Properties of Hydrated Lime, by Richard K. Meade. Engineering News, May 11, 1911.

Methods of Manufacturing Hydrated Lime, by Ernest McCullough. Mining World, Dec. 3, 1910.

Modern Hydrated Lime Plant in the State of Washington, by Corwin D. Smith. Rock Products, Oct. 22, 1913, p. 34.

Burning Temperature of Limestones, by A. V. Bleininger and W. E. Emley. Transactions American Ceramic Society, Vol. XIII, p. 618.

Chemistry of Sand-Lime Brick, by T. R. Ernest. Transactions American Ceramic Society, Vol. XIII, p. 648.

Magnesite.—

Magnesite. Engineering and Mining Journal, Sept. 6, 1913, p. 438.

Making of Magnesia Crucibles, by Oliver P. Watts. Wisconsin Engineer, Nov., 1912.

Mica.—

Mica: Its Occurrence, Exploitation and Uses, by Hugh S. de Schmid. No. 118, Mines Branch. French translation, No. 264.

Occurrence, Production and Uses of Mica, by J. F. Springer. Cassier's Magazine, Nov., 1912, and Mining and Engineering World, Jan. 18, 1913, p. 105.

Mica and the Mica Industry, by G. W. Colles. Journal of Franklin Institute, Vol. CX-CXI.

Mineral Pigments.—

Raw Materials used in Paint and Colour Manufacture (book), by M. W. Jones. D. Van Nostrand Co., 1901.

Paint Technology and Tests (book), by H. A. Gardner. McGraw-Hill Book Co., New York, 1911. $3.

Mineral Pigments of Canada, by C. W. Willimott. Bulletin 913, Geological Survey of Canada, 1906.

Report on the Metallic Paint Ores along the Lehigh River, by Frank A. Hill. Annual Report 1886, Part 4, p. 1386. Pennsylvania Geological Survey.

Georgia Ochre Mining and Treatment, by W. S. McCallie. Mining World, Dec. 31, 1910.
Information concerning the deposits and methods of mining and preparing for market.

Slate for Pigment Use. Mines and Minerals, July, 1901, p. 537.

Mineral Phosphate.—

Report on Mineral Phosphates and their occurrence in Canada, by H. S. deSchmid. Mines Branch. To be published shortly.

Phosphate Mines of Canada, by H. B. Small. Transactions American Institute of Mining Engineers, Vol. XXI, p. 774.

Pyrite.—

Pyrites in Canada: Its Occurrence, Exploitation, Dressing, and Uses, by A. W. G. Wilson. Report No. 167, Mines Branch.

Commercial Pyrites; Its Sources, Grades and Uses, by W. C. Dumas. Mining and Engineering World, April 13, 1912.

Quartz.—

Methods Employed in Connection with the Reduction, Milling and Shipment of Quartz, Flint Rock or Silica Sand, by Harry F. Speir. Transactions American Ceramic Society, Vol. XIII, p. 326.

Refractories.—

Testing of Refactories, by A. V. Bleininger. Rock Products, July 22, 1913.

Salt.—

Salt Deposits of Canada, and the Salt Industry, by L. H. Cole. Mines Branch. To be published shortly.

Manufacture of Salt, by F. Ward. Journal of the Society of Arts, 1894.

Sand.—

Foundry Sands, by Heinrich Ries and J. A. Rosen. Michigan Geological Survey, 1908.

Moulding Sand: Its Uses, Properties and Occurrence, by Edwin C. Eckel. 21st Annual Report New York State Geologist, 1901, p. r. 91.

Moulding Sand Tests. Transactions of the American Foundrymen's Association, Vol. XXI, pp. 17-129.
Detailed accounts of very complete tests.

Testing and Valuing Moulding Sands, by C. Buderns. Giess-Zeitung, Oct. 15, 1912.

Testing of Moulding Sands, by Alfred B. Searle. Mechanical Engineer, Aug. 9, 1912.

Observations on Foundry Sands (*Observations sur les sables de fonderie*), by Henry Chatelier. Revue de Métallurgie, Dec., 1909.
Discusses the composition of various natural and artificial sands in use in France with a view to finding a satisfactory basis of selection.

On the Mechanical Treatment of Moulding Sand, by Walter Bagshaw. Institute of Mechanical Engineers of England, 1891, p. 94.

Glass Sand, Other Sand and Gravel, by Ernest F. Burchard. In Mineral Resources of the United States, Part II, 1911, p. 585, U.S. Geological Survey.

Glass Sand Industry of Indiana, Kentucky and Ohio, by Ernest F. Burchard. In Contributions to Economic Geology; Bulletin 315, U.S. Geological Survey, 1907, p. 361.
This contains accounts of various plants where sandstone is crushed and washed.

Some Fallacies and Facts Pertaining to Glass Making, by R. L. Frink. Transactions American Ceramic Society, Vol. XI, p. 297.
Deals with glass sand, and lime.

Washing Sand and Gravel. Engineering Record, Nov. 13, 1909, p. 551.

Model Washing Plant of the Indianapolis Gravel and Sand Company. Rock Products, Dec. 22, 1913, p. 39.

The Largest Glass Sand Plant in the Country. (U.S.A.). Rock Products and Building Materials, April 7, 1914, p. 36.

Economical Sand and Gravel Plant. Engineering News, May 22, 1913, p. 1066.

Compact Sand and Gravel Washing Plant. Engineering News, March 13, 1913, p. 514.

Talc.—

Talc as a Body Material (for Ceramic Purposes), by C. W. Parmalee and G. H. Baldwin. Transactions American Ceramic Society, Vol. XV, p. 532.

Use of Talcum in Paper Manufacture (*Verwendung und Begutachtung von Talkum in der Papierfabrikation*), by Wittel and Welwart. Moutan-Zeitung, June 15, 1912, p. 222.

Pyrophyllite in North Carolina, by Claud Hafer. Engineering and Mining Journal, Oct. 4, 1913, p. 623.

(Pyrophyllite is used as a substitite for talc.)

This paper describes several mills for grinding pyrophyllite and talc.

APPENDIX I.

List of Canadian Manufacturers who use Minerals.

APPENDIX I.

List of Canadian Manufacturers who use Minerals.

Abrasive Wheels.

Brantford Emery Wheel Co., Ltd. ..... Brantford, Ont.
Adamite Wheel and Manufacturing Co., ... Hamilton "
Canadian Hart Wheels, Ltd., ... " "
Dominion Abrasive Wheel Co., Ltd., ... New Toronto, Ont.
Prescott Emery Wheel Co., Ltd., ... Prescott, Ont.

Artificial Stone and Mineral Floorings.

Canada Floors, Ltd., ... Montreal, Que.
Dominion Floor and Wall Co., Ltd., ... " "
Dutch Flooring Co. of Canada, Ltd., ... " "
Leduc, H. ..... " "
Monarch Stone Co., Ltd., ... " "
Terrano Flooring Co. of Canada, Ltd., ... " "
Corinthian Stone Co., ... Guelph Ont.
Spartan Stone Co., ... " "
Canada Glass Mantles and Tiles, Ltd., ... Toronto, Ont.
Canadian Art Stone Co., ... " "
Cement Products, Ltd., ... " "
Chemical Floor and Tile Co., Ltd., ... " "
Roman Stone Co., Ltd., ... " "
Sanitary Floor Co. of Toronto ..... " "
Canadian Flexotile Co., ... Winnipeg, Manitoba.
Hackney Tile and Supply Co., ... " "
Hooper's Marble and Granite Co., Ltd., ... " "
Interior Construction Co., Ltd., ... " "
Saskatchewan Marble and Construction Co., ... Saskatoon, Sask.
Dominion Glazed Cement Pipe Co., Ltd., ... Vancouver, B. C.
Canada Mosaic Tile Co., Ltd., ... Victoria, "

Asbestos Goods.

Johns Manville Co., ... Danville, Que.
Asbestos Manufacturing Co., Ltd., ... Lachine, "
Asbestos Products Co. of Canada, Ltd., ... Montreal "
Canadian Asbestos Co., ... " "
Cunningham, James ..... " "
Railway Asbestos Packing Co., Ltd., ... Sherbrooke, Que.

Hamilton Engine Packing Co.,.....Hamilton, Ont.
Grenville Asbestos Co.,.....Thorold, "
Eureka Mineral Wool and Asbestos Co.,.....Toronto, Ont.
Hygienic Button Co.,..... " "
Philip Carey Co.,.....Winnipeg, Man.
Asbestos Manufacturing Co.,.....Vancouver, B.C.

Brick (Sand-Lime).

Canada Brick Co., Ltd.,.....Montreal, Que.
John Mann Brick Co., Ltd.,.....Brantford, Ont.
Schultz Bros. Co., Ltd.,..... " "
International Sand-Lime Brick Co.,.....Guelph, "
Rideau Silicate Co., Ltd.,.....Ottawa, "
Silicate Brick Co. of Ottawa, Ltd.,..... " "
Peterborough Sandstone Brick Co., Ltd.,.....Peterborough, Ont.
Port Arthur Sand-Lime Brick Co.,.....Port Arthur, "
Canada Sand-Lime Pressed Brick Co.,.....Toronto, "
Harbour Brick Co., Ltd.,..... " "
Toronto Brick Co., Ltd.,..... " "
Wilcox Lake Brick Co., Ltd.,..... " "
York Sandstone Brick Co., Ltd.,..... " "
Brandon Sandstone Brick Co., Ltd.,.....Brandon, Man.
Birds Hill Sandstone Brick Co., Ltd.,.....Winnipeg, "
Manitoba Pressed Brick Co., Ltd.,..... " "
Winnipeg Sandstone Brick Co.,..... " "
Moose Jaw Pressed Brick Co.,.....Moose Jaw, Sask.
Interocean Pressed Brick Co.,.....Regina, "
Saskatoon Brick and Supply Co., Ltd.,.....Saskatoon, "
Calgary Silicate Pressed Brick Co., Ltd.,.....Calgary, Alta.
Konnick System Sandstone Co.,..... " "
Alsip Brick and Supply Co., Ltd.,.....Edmonton, Alta.
Hardstone Brick Co., Ltd.,..... " "
Prince Albert Sandstone Brick Co.,.....Prince Albert, Alta.
B. C. Pressed Brick Co., Ltd.,.....Vancouver, B. C.
Modern Finance Co.,..... " "
Vancouver Pressed Brick and Stone, Ltd.,..... " "
Victoria-Vancouver Lime and Brick Co., Ltd.,.....Victoria "

Buttons (Pearl and Bone).

Berlin Button Works, Ltd.,.....Berlin, Ont.
Dominion Button Manufacturers, Ltd.,..... " "
Ontario Button Co.,..... " "
Canadian Pearl Button Co.,.....Trenton, Ont.
Roschman, Richard and Bro.,.....Waterloo, "
Windsor Pearl Button Co., Ltd.,.....Windsor, "

Carriages, Automobiles and Cars.

Canadian Car and Foundry Co., Ltd.,.....Amherst, N.S.
Nova Scotia Car Works.....Halifax, "
" " Carriage and Motor Car Co., Ltd.,.....Kentville, "
Truro Carriage Co.,.....Truro, "
Intercolonial Railway of Canada.....Moncton, N.B.
Campbell, Geo., and Sons, Ltd.,.....Sackville, "
Granby Carriage Co.,.....Granby, Que.
Bonhomme, Jos.,.....Montreal, Que.
Heney Carriage and Harness Co.,..... " "
Lariviere, A. C., Co.,..... " "
Ledoux Carriage Co., Ltd.,..... " "
Montreal Carriage Works,..... " "
Munro and McIntosh Carriage Co., Ltd.,.....Alexandria, Ont.
Barrie Carriage Co.,.....Barrie, "
Brantford Carriage Co., Ltd.,.....Brantford, "
Simpson, I., Mfg. Co.,..... " "
Canada Carriage Co.,.....Brockville, "
Gray, Wm., Son & Co.,.....Chatham, "
Milner, Robt.,.....Chatham, Ont.
Crossen Car Mfg. Co.,.....Cobourg, "
Rathbun Co.,.....Deseronto, "
O'Neill, J. N.,.....Georgetown, "
Armstrong, J. B., Mfg. Co.,.....Guelph, "
Guelph Carriage Top Co.,..... " "
Baynes Carriage Co., Ltd.,.....Hamilton, "
Mitchell and Co.,.....Ingersoll, "
Greer, A. B.,.....London, "
Finkle Carriage Factory,.....Newburg, "
Tudhope Carriage Co., Ltd.,.....Orillia, "
McLaughlin Motor Car Co., Ltd.,.....Oshawa, Ont.
Ottawa Car Mfg. Co., Ltd.,.....Ottawa, Ont.
Watson Carriage Co., Ltd.,..... " "
Shanahan Carriage Co.,.....Penetanguishene, Ont.
McKie, R., Buggy Co.,.....Plattsville, "
Port Arthur Wagon Wks. Co., Ltd.,.....Port Arthur, "
Preston Car and Coach Co., Ltd.,.....Preston, "
Ries Motor Car Co. of Canada, Ltd.,.....St. Catharines, "
Conboy Carriage Co., Ltd.,.....Toronto, "
Crow, T. A.,..... " "
Hutchison and Son,..... " "
Canada Cycle and Motor Co., Ltd.,.....West Toronto, "
Dominion Carriage Co., Ltd.,..... " " "
American Auto Trimming Co., Ltd.,.....Walkerville, "
E. M. F. Co. of Canada, Ltd..... " "

Ford Motor Co. of Canada, Ltd.,.....Walkerville, Ont.
New Dominion Motors, Ltd.,..... " "
Regal Motor Car Co. of Canada, Ltd.,..... ..... " "
Hupp Motor Car Co.,.....Windsor, "
Ackland, D., and Son,.....Winnipeg, Man.
Wilson Bros and Allen,.....Calgary, Alta.

Celluloid Goods.

Granby Mfg. Co., Ltd.,.....Granby, Que.
McComiskey, R. B. and Co.,..... " "
Advertising Novelty Mfg. Co., Ltd.,..... .....Toronto, Ont.
Arlington Co. of Canada, Ltd.,..... " "
Smith D'Entrement Co., Ltd.,..... " "

Cement.

Sydney Cement Co., Ltd., (Slag Cement).....Sydney, N. S.
Canada Cement Co., Ltd.,.....Montreal, Que.
Mills at Longue Pointe, Pointe aux Trembles, and Hull, Que.; Shallow Lake, Belleville, Lakefield, Marlbank, and Port Colborne, Ont.; Exshaw, and Calgary, Alta.
Ontario Portland Cement Co., Ltd.,.....Brantford, Ont.
National " " " " .....Durham, "
Hanover Portland Cement Co., Ltd.,.....Hanover, "
Kirkfield Portland Cement Co., Ltd.,.....Kirkfield, "
Maple Leaf Portland Cement Co., Ltd.,.....Listowel, "
Superior Portland Cement Co., Ltd.,.....Orangeville, "
Doric Portland Cement Co., Ltd.,.....Owen Sound, Ont.
Imperial Cement Co., Ltd.,..... " " "
St. Mary's Portland Cement Co., Ltd.,.....St. Marys, "
Crown Portland Cement Co., Ltd.,.....Wiarton, "
Commercial Cement Co., Ltd.,.....Winnipeg, Man.
Rocky Mountain Cement Co., Ltd.,.....Blairmore, Alta.
Edmonton Portland Cement Co., Ltd.,.....Dandurand, "
British Columbia Portland Cement Co., Ltd.....Princeton, B.C.
Vancouver Portland Cement Co., Ltd.,.....Tod Inlet, "

Chemicals (Electro).

Electric Reduction Co., Ltd.,.....Buckingham, Que.
Shawinigan Carbide Co., Ltd.,.....Shawinigan Falls, Que.
Norton Co.,.....Chippawa, Ont.
American Cyanamid Co.,.....Niagara Falls, Ont.
Willson Carbide Co., Ltd.,.....St. Catharines, Ont.

Chemicals (General and Toilet Preparations).

Allen Mfg. Co.,	Montreal, Que.
Davis & Lawrence Co., Ltd	" "
Denver Chemical Mfg. Co.,	" "
Laurentian Chemical Co., Ltd.,	" "
Lymans, Ltd.,	" "
National Drug and Chemical Co. of Canada, Ltd.,	" "
Nichols Chemical Co. of Canada, Ltd.,	" "
Victorine, Ltd.,	" "
Grasselli Chemical Co., Ltd.,	Hamilton, Ont.
Parke and Parke	" "
Polson, N. C., and Co.,	Kingston, "
Canada Pharmacal Co.,	London, "
Jenkins, W. A., Mfg. Co	" "
Saunders, W. E., and Co.,	" "
Wampole, H. K., and Co. Ltd.,	Perth "
Chemical Laboratories, Ltd.,	Toronto, "
Ingram and Bell, Ltd.,	" "
Lyman Bros. and Co., Ltd.,	" "
Moyes Chemical Laboratory Co., Ltd.,	" "
Shuttleworth, E. B., Chemical Co., Ltd.,	" "
Sovereign Perfumes, Ltd.,	" "
Toronto Chemical Works	" "
Toronto Pharmacal Co., Ltd.,	" "
Wood Products Co. of Canada, Ltd.,	" "
Parke Davis and Co.,	Walkerville, Ont.
Misner Mfg. Co.,	Windsor, "
Seely Mfg. Co., Ltd.,	" "
Shoop Family Medicine Co.,	" "
Stearns, Fred., and Co. of Canada, Ltd.,	Windsor, Ont.
Martin Bole and Wynne Co.,	Winnipeg, Man.
Henderson Bros., Ltd.,	Vancouver, B. C.
Victoria Chemical Co., Ltd.,	Victoria, B. C.

Clay Sewer Pipe.

Standard Clay Products, Ltd.,	New Glasgow, N.S.
" " " "	St. Johns, Que.
Ontario Sewer Pipe Co.,	Mimico, Ont.
Dominion " " "	Swansea, "
Hamilton and Toronto Sewer Pipe Co., Ltd.,	Waterdown, Ont.
Alberta Sewer Pipe Co., Ltd.,	Calgary, Alta.
" Clay Products, Ltd.,	Medicine Hat, Alta.
Sandstone Brick and Sewer Pipe Co.,	Sandstone, "
Clayburn Co., Ltd.,	Clayburn, B. C.

Dominion Shale Brick and Sewer Pipe Co., Ltd.,	Gabriola Id., B.C.
Kilgard Fire Clay Co., Ltd.,	Kilgard, "
Baker Brick and Tile Co.,	Victoria, "
B. C. Pottery Co., Ltd.,	" "

Dental Goods.

Dental Mfg. Co.,	Toronto, Ont.
Monarch Dental Laboratory Co.,	" "

Electric Goods.

Starr, John, Son and Co., Ltd.,	Halifax, N. S.
Allis-Chalmers-Bullock, Ltd.,	Montreal, Que.
Devoe Electric Switch Co.,	" "
Economy Fuse and Mfg. C. of Canada, Ltd.,	" "
Hill Electric Switch and Mfg. Co., Ltd.,	" "
Northern Electric and Mfg. Co., Ltd.,	" "
Wire and Cable Co.,	" "
Stabler and Baker, Ltd.,	Gananoque, Ont.
Buskard, S. G.,	Hamilton, "
Canadian Tungsten Lamp Co., Ltd.,	" "
Canadian Westinghouse Co., Ltd.,	" "
Toronto and Hamilton Electric Co.,	" "
Electrical Construction Co. of London, Ltd.,	London, "
Ideal Electric Mfg. Co.,	" "
Dominion Electric Co., Ltd.,	Ottawa, "
Canadian Crocker Wheeler Co., Ltd.,	St. Catharines, Ont.
Packard Electric Co., Ltd.,	" "
Canadian Carbon Co., Ltd.,	Toronto, "
Canadian Electrical and Motor Co., Ltd.,	" "
Canadian General Electric Co., Ltd.,	" "
Canadian National Carbon Co., Ltd.,	" "
Consolidated Electric Co., Ltd.,	" "
Ferrante, Ltd.,	" "
Jones and Moore Electric Co., Ltd.,	" "
Leighton-Jackes Mfg. Co., Ltd.,	" "
Sunbeam Incandescent Lamp Co., Ltd.,	" "
Turnbull Elevator Mfg. Co.,	" "
Turner, John and Son	" "
Dominion Telephone Mfg. Co., Ltd.,	Waterford, "
Molony Electric Co.,	Windsor, "

Foundries.

Stewart Bruce and Co.,	Charlottetown, P.E.I.
Summerside Foundry,	Summerside, "
Amherst Foundry Co., Ltd.,	Amherst, N. S.
Canadian Car and Foundry Co., Ltd.,	" "
Robb Engineering Co., Ltd.,	" "
Douglas and Margeson,	Berwick, "
Bridgetown Foundry Co., Ltd.,	Bridgetown, "
Reeves, Wm.,	Bridgewater, "
Atlantic Foundry,	Dartmouth, "
Dartmouth Iron Foundry Co.,	" "
Hillis and Sons, Ltd.,	Halifax, "
Huxtable and Courtney,	" "
McDonald and Co., Ltd.,	" "
Nova Scotia Car Works,	" "
Lloyd Mfg. Co.,	Kentville, "
Liverpool Iron Foundry,	Liverpool, "
Montreal Pipe Foundry,	Londonderry, "
Lunenburg Foundry Co., Ltd.,	Lunenburg, "
Lunenburg Machine Co., Ltd.,	" "
Fraser Machine and Motor Co., Ltd.,	New Glasgow, N.S.
Matheson, I., and Co., Ltd.,	" "
Thompson and Sutherland, Ltd.,	North Sydney, "
Oxford Foundry and Machine Co., Ltd.,	Oxford, "
Pictou Foundry and Machine Co.,	Pictou, "
Shaw and Mason, Ltd.,	Sydney, "
Brown Machine Co., Ltd.,	Trenton, "
Truro Foundry and Machine Co.,	Truro, "
Windsor Foundry and Machine Co., Ltd.,	Windsor, "
Milton Iron Foundry,	Yarmouth, "
New Burrell-Johnson Iron Co., Ltd.,	" "
McLennan Foundry and Machine Wks.,	Campbellton, N. B.
Miramichi Foundry Co.,	Chatham, "
Maritime Foundry and Machine Wks., Ltd.,	" "
Smith Foundry Co., Ltd.,	Fredericton, "
Abram's John, Sons,	Moncton, "
Intercolonial Railway of Canada,	" "
Record Foundry and Machine Co.,	" "
Fleming, Jas	St. John, "
McAvity, T., and Sons, Ltd.,	" "
McLean, Holt and Co.,	" "
Robertson, Jas., Co., Ltd.,	" "
St. John Iron Works, Ltd.,	" "
Union Foundry and Machine Works,	" "

Enterprise Foundry Co.,	Sackville, N.B.
Fawcett, Chas., Mfg. Co., Ltd.,	" "
Sussex Mfg. Co., Ltd.,	Sussex, "
Connell Bros., Ltd.,	Woodstock, "
Dunbar Engine and Foundry Co., Ltd.,	" "
Beauceville, Founderie de la	Beauceville East, Que.
Bordeaux Foundry Co.,	Bordeau, "
Gosselin, J. A., La Cie.,	Drummondville, "
Fonderie de Fraserville,	Fraserville, "
Sanitary Plumbing Mfg. Co.,	Granby, "
Joliette Steel and Iron Foundry, Ltd.,	Joliette, "
Vassot, S., & Co.,	" "
Railway Signal Co., of Canada, Ltd.,	Lachine, "
Charlebois, C.,	Lachute, "
McQuat and Son,	" "
Canadian General Shoe Machine Co., Ltd.,	Levis, "
Standard Foundry and Machinery Co., Ltd.,	Longueuil, "
Belanger, Amable,	Montmagny "
Price Bros.,	Montmagny, Que.
Montmagny, La Cie Mfe. de,	" "
Allis-Chalmers-Bullock, Ltd.,	Montreal, Que.
Amesse, P.,	" "
Antipack Valve Co., Ltd.,	" "
Beaupre et Fils,	" "
Canada Car and Foundry Co., Ltd.,	" "
Canada Iron Corporation, Ltd.,	" "
Canadian Bronze Co., Ltd.,	" "
Canadian Rand Co., Ltd.,	" "
Canadian Steel Foundries, Ltd.,	" "
Clark, C. O. and Bro.,	" "
Cuthbert, W. R., and Co.,	" "
Empire Brass Foundry	" "
Garth Co.,	" "
Jenkins Bros.,	" "
Lafrance Improved Pipe Joints Co., Ltd.,	" "
Lymburner, Ltd.,	" "
McDougall, John, Caledonia Iron Wks. Co., Ltd.,	" "
Mitchell, Robt., Co., Ltd.,	" "
Montreal Locomotive Works, Ltd.,	" "
Mount Royal Foundry Co.,	" "
Parker Foundry Co., Ltd.,	" "
St. Lawrence Iron Foundry Co., Ltd.,	" "
Warden King, Ltd.,	" "
Watson, John, and Son of Montreal, Ltd.,	" "
Williams Mfg. Co., Ltd.,	" "

Plessisville, La Fonderie de,	Plessisville, Que.
Fairbanks, E. and F., and Co., Ltd.,	Sherbrooke, "
Jenckes Machine Co., Ltd.,	" "
Sherbrooke Iron Works,	" "
Beauchemin et Fils, Lte.,	Sorel, "
Pontbriand, La Cie, Lte.,	" "
Bertrand, Cie. Manufacturiere,	St. Hyacinthe, Que.
Singer Manufacturing Co.,	St. Johns, "
Drolet, J. A.,	Quebec, "
Drolet, F. X.,	" "
Hazel, Jas	" "
Lepage, La Cie, Lte.,	" "
Picard, Eusèbe,	" "
Terreau et Racine,	" "
Desjardins, La Cie.,	St. Andre de Kamouraska, Que.
Bellefeuille et Frère,	Three Rivers, "
Asbestos Foundry Co., Inc.,	Thetford, "
Valleyfield Iron Works,	Valleyfield, "
Victoriaville Foundry Co.,	Victoriaville, "
Schell Foundry and Mach. Co., Ltd.,	Alexandria, Ont.
Mississippi Iron Works,	Almonte, "
Fleury's J. Sons,	Aurora, "
Canada Producer and Gas Eng. Co., Ltd.,	Barrie, "
Belleville Hardware and Lock Mfg. Co., Ltd.,	Belleville, "
Burrell Rock Drill Co., Ltd.,	" "
Marsh and Henthorn, Ltd.,	" "
Springer Lock Mfg. Co., Ltd.,	" "
Walker Foundry Co.,	" "
Forwell Foundry, Ltd.,	Berlin, "
Gies, Philip	" "
Jackson and Cochrane	" "
Bowmanville Foundry Co., Ltd.,	Bowmanville, "
Muskoka Foundry Co.,	Bracebridge, "
American Radiator Co.,	Brantford, "
Buck, Wm., Stove Co., Ltd.,	" "
Cockshutt Plow Co., Ltd.,	" "
Crown Electrical Mfg. Co.,	" "
Goold, Shapley and Muir Co., Ltd.,	" "
Hartley Foundry Co.,	" "
Pratt and Letchworth Co.,	Brantford, "
Verity Plow Co., Ltd.,	" "
Watrous Engine Works Co., Ltd.,	" "
National Mfg. Co., Ltd.,	Brockville, "
Smart, James, Mfg. Co., Ltd.,	" "

Dickson Bridge Wks. Co., Ltd.,	Campbellford,	Ont.
Findlay Bros. Co., Ltd.,	Carleton Place,	"
Canadian Wolverine Co., Ltd.,	Chatham,	"
McKeough and Trotter, Ltd.,	"	"
Parke Bros.,	"	"
Swift Motor Car Co.,	"	"
Crossen Car Mfg. Co.,	Cobourg,	"
Dixon Mfg. Co.,	Collingwood,	"
Bertram, John and Sons,	Dundas,	"
Canadian-American Gas and Gasoline Eng. Co., Ltd.,	Dunnville,	"
Canada Iron Corp.,	Fort William,	"
Copp, W. J., Son and Co.,	"	"
Northern Engineering and Supply Co., Ltd.,	"	"
Canadian Brass Co., Ltd.,	Galt,	"
Canadian Machinery Corporation, Ltd.,	"	"
Cowan and Co.,	"	"
Down Draft Furnace Co., Ltd.,	"	"
Galt Brass Works.,	"	"
Galt Foundry Co.,	"	"
Galt Malleable Iron Co., Ltd.,	"	"
Goldie, McCulloch Co., Ltd.,	"	"
Katie Foundry Co.,	"	"
McDougall, R. Co.,	"	"
Sheldons, Ltd.,	"	"
Shurley Dietrich Co., Ltd.,	"	"
Stevens Co. of Galt, Ltd.,	"	"
Skinner Co., Ltd.,	Gananoque,	"
Spring and Axle Co.,	"	"
Wilson, J. C., and Co.,	Glenora,	"
Doty Engine Works, Co., Ltd.,	Goderich,	"
Mowry and Sons,	Gravenhurst,	"
Hall, Zeyd Foundry Co., Ltd.,	Grimsby,	"
Specialty Mfg. Co.,	"	"
Crow's Iron Works,	Guelph,	"
Gilson Mfg. Co., Ltd.,	"	"
Griffin, Thos.,	"	"
Guelph Stove Co., Ltd.,	"	"
Raymond Mfg. Co.,	"	"
Taylor-Forbes Co., Ltd.,	"	"
Bowes, Jamison and Co.,	Hamilton,	"
Burrow, Stewart and Milne Co., Ltd.,	"	"
Canadian Westinghouse Co., Ltd.,	"	"
Chadwick Bros.,	"	"
City Brass Works,	"	"
Gartshore, Thomson Pipe and Foundry Co., Ltd.,	"	"

Hamilton Brass Mfg. Co., Ltd.,	Hamilton,	Ont.
Hamilton Foundry Co.,	"	"
Hamilton Stove and Heater Co., Ltd.,	"	"
International Harvester Co. of Canada, Ltd.,	"	"
Kerr and Coombes Foundry Co., Ltd.,	"	"
Oliver Chilled Plow Works of Canada, Ltd.,	"	"
Sawyer Massey Co., Ltd.,	"	"
Tallman Brass and Metal Co.,	"	"
Harriston Stove Co., Ltd.,	Harriston,	"
Huntsville Engine Works Co., Ltd.,	Huntsville,	"
Noxon Co., Ltd.,	Ingersoll,	"
Johnson Foundry Co.,	Kemptville,	"
Canadian Locomotive Works, Ltd.,	Kingston,	"
Selley and Youlden, Ltd.,	"	"
McRae, John,	Lindsay,	"
Williams, Madison, Mfg. Co., Ltd.,	"	"
Listowel Drilling Mach'y Co., Ltd.,	Listowel,	"
Dennis Wire and Iron Works Co.,	London,	"
Empire Mfg. Co., Ltd.,	"	"
Leonard, E. and Sons,	"	"
London Brass Works Co.,	"	"
London Foundry Co.,	"	"
McClary Mfg. Co.,	"	"
Miller, Ltd.,	"	"
Vulcan Co., Ltd.,	"	"
White, Geo., and Sons Co., Ltd.,	"	"
Wortman and Ward Co., Ltd.,	"	"
Barber, Chas. and Sons,	Meaford,	"
Golley and Finley Iron Works Co.,	Merlin,	"
Kyle, P., Estate of,	Merrickville,	"
Percival Plow and Stove Co., Ltd.,	"	"
Midland Engine Works Co.,	Midland,	"
Davis, J. D., Foundry,	Morrisburg,	"
Dominion Rock Drill Co.,	Napanee,	"
Hahn Brass Co., Ltd.,	New Hamburg,	"
New Hamburg Mfg. Co., Ltd.,	"	"
Carriage Mountings Co., Ltd.,	Niagara Falls,	"
Niagara Falls Machine and Foundry Co., Ltd.,	"	"
North Bay Iron, Wire and General Metal Works,	North Bay,	"
Long, E., Mfg. Co., Ltd.,	Orillia,	"
National Hardware Co., Ltd.,	"	"
Tudhope Anderson Co., Ltd.,	"	"
Butterworth Foundry, Ltd.,	Ottawa,	"
Chaudière Machine and Foundry Co.,	"	"
Coplan, A. H., Co.,	"	"

Davidson and Crooks,	Ottawa,	Ont.
Fleck, Alex., Ltd.,	"	"
Laurentian Foundry,	"	"
Law, Gordon, (Caledonia Foundry),	"	"
Lawson, F., and Sons, Ltd.,	"	"
McFarlane, F. D., and Son,	"	"
National Mfg. Co., Ltd.,	"	"
Victoria Foundry Co.,	"	"
Vulcan Iron Works, Ltd.,	"	"
Westport Mfg. and Plating Co., Ltd.,	"	"
Domer and Park,	Oshawa,	"
Fittings, Ltd.,	"	"
Canadian Heating and Ventilating Co., Ltd.,	Owen Sound,	Ont.
Corbet Foundry and Machine Co.,	"	"
Kennedy, Wm., and Sons, Ltd.,	"	"
Owen Sound Iron Works Co., Ltd.,	"	"
Lee Mfg. Co., Ltd.,	Pembroke,	"
Tremblay Bros.,	"	"
Dominion Stove and Foundry Co., Ltd.,	Penetanguishene,	Ont.
Payette and Co.,	"	"
James Bros.,	Perth,	"
Green, G. Walter, Co., Ltd.,	Peterborough,	"
Hall, Adam and Co.,	"	"
Hamilton, Peter,	"	"
Hamilton, Wm., Co., Ltd.,	"	"
Peterborough Lock Mfg. Co.,	"	"
Barker, D. J., and Co.,	Picton,	"
Port Arthur Iron Works	Port Arthur,	"
Hayden, Thos., and Son,	Port Hope,	"
Helm, J. H.,	"	"
Standard Ideal Co., Ltd.,	"	"
Clare Bros. and Co., Ltd.,	Preston,	"
Shantz, P. E.	"	"
Imbleau, H., and Sons,	Renfrew,	"
Renfrew Machinery Co.,	"	"
Doherty Mfg. Co., Ltd.,	Sarnia,	"
Goodison, John, Thresher Co., Ltd.,	"	"
Algoma Iron Works, Ltd.,	Sault Ste. Marie,	"
Northern Foundry and Machine Co., Ltd.,	"	"
Bell, Robt., Engine and Thresher Co.,	Seaforth,	"
Frost and Wood,	Smiths Falls,	"
Smiths Falls Malleable Castings Co., Ltd.,	"	"
St. Catharines Brass Works	St. Catharines,	"
McKinnon Dash and Hardware Co.,	"	"
Bell and Son Co., Ltd.,	St. George,	"

Maxwell, David, and Sons, Ltd.,	St. Marys,	Ont.
Richardson, C., and Co.,	"	"
Kemp, W. I., Co., Ltd.,	Stratford,	"
McDonald Mfg. Co	"	"
Stratford Mill Building Co.,	"	"
Erie Iron Works, Ltd.,	St. Thomas,	"
Norsworthy, C., and Co.,	"	"
St. Thomas Brass Co., Ltd.,	"	"
Sudbury Construction and Mach'y Co., Ltd.,	Sudbury,	"
Thessalon Foundry and Machine Works,	Thessalon,	"
Manson Co.,	Thorold,	"
Darrow, J. A.,	Tillsonburg,	"
Gaskell, W., and Co.,	"	"
American Abell Engine and Thresher Co.,	Toronto,	"
Anthes Foundry Ltd.,	"	"
Beaver Lock and Machine Works	"	"
Bigley, R., Mfg. Co.,	"	"
Booth-Coulter Copper and Brass Co., Ltd.,	"	"
Brooks Mfg. Co.,	"	"
Canada Foundry Co., Ltd.,	"	"
Canada Metal Co., Ltd.,	"	"
Dominion Radiator Co., Ltd.,	"	"
Don Foundry Co.,	"	"
Expanded Metal and Fire-Proofing Co., Ltd.,	"	"
Fairbanks, Morse Canadian Mfg. Co., Ltd.,	"	"
Galloway, Taylor Co.,	"	"
Gurney Foundry Co., Ltd.,	"	"
Inglis, John, Co., Ltd.,	"	"
Jones Bros.,	"	"
Keith and Fitzsimmons Co., Ltd.,	"	"
King Radiator Co., Ltd.,	"	"
Lumen Bearing Co.,	"	"
Massey-Harris Co., Ltd.,	"	"
Moffat Stove Co., Ltd.,	Weston,	"
Morrison, James, Brass Mfg. Co., Ltd.,	"	"
National Iron Works	"	"
Ontario Brass and Copper Co.,	"	"
Ontario Wind Engine and Pump Co., Ltd.,	"	"
Pease Foundry Co., Ltd.,	"	"
Queen City Brass Foundry	"	"
Queen City Foundry, Ltd.,	"	"
Reid and Brown,	"	"
Russell Motor Car Co., Ltd.,	"	"
St. Clair Foundry Co.,	"	"
Standard Foundry Co.,	"	"

Standard Sanitary Mfg. Co., Ltd.,	Toronto, Ont.
Taylor, J. and J., Toronto Safe Works,	" "
Toronto Brass Mfg. Co.,	" "
Toronto Hardware Mfg. Co.,	" "
Trelvar, Blashford and Co.,	" "
United Brass and Lead, Ltd.,	" "
Wilkinson Plow Co., Ltd.,	" "
Wilson and Cousins,	" "
Waddell, Robt., (Waddell Bridge Works.)	Trenton, Ont.
Kerr Engine Co., Ltd.,	Walkerville, Ont.
Mitchell, Chas.,	" "
Wallaceburg Brass and Iron Mfg. Co., Ltd.,	Wallaceburg, "
Waterloo Mfg. Co., Ltd.,	Waterloo, "
Beatty, M., and Sons, Ltd.,	Welland, "
Canadian Steel Foundries, Ltd.,	" "
Supreme Heating Co., Ltd.,	" "
Beach Foundry Co., Ltd.,	Winchester, "
Canadian Detroit Lubricator Co., Ltd.,	Windsor, "
Ideal Mfg. Co.,	" "
Penberthy Injector Co.,	" "
Whittaker Stove Works	" "
Western Foundry Co., Ltd.,	Wingham, "
Stewart, Jas., Mfg. Co., Ltd.,	Woodstock, "
Whitelaw, Robert,	" "
Woodstock Wind Motor Co., Ltd.,	" "
Brandon Machine and Imp. Works,	Brandon, Man.
Manitoba Engines, Ltd.,	" "
Alaska Bedding Co., Ltd.,	Winnipeg, "
Anthes Foundry Co.,	" "
Cummings Brass Co.,	" "
Elmwood Brass Foundry,	" "
Manitoba Brass Foundry	" "
Manitoba Bridge and Iron Works, Ltd.,	" "
North Western Brass Co.,	" "
Peterson Bros. Iron Works	" "
Vulcan Iron Works., Ltd.,	" "
Western Steel and Iron Co., Ltd.,	" "
Winnipeg Foundry Co., Ltd.,	" "
Saskatchewan Bridge and Iron Works,	Moose Jaw, Sask.
Regina Foundry, Ltd.,	Regina, "
East, John A., Foundry,	Saskatoon, "
Northern Foundry and Machine Works	" "
Western Foundry and Machine Co., Ltd.,	" "
Alberta Iron Works, Ltd.,	Calgary, Alta.
Calgary Iron Works, Ltd.,	" "
Union Iron Works	" "

Clark-Saulpaugh Foundry Co.,.....Edmonton, Alta.
Edmonton Iron Works, Ltd.,..... " "
Jackson Bros.,..... " "
Lethbridge Iron Works, Ltd.,.....Lethbridge, "
Alberta Foundry and Mach. Co. Ltd.,.....Medicine Hat, Alta.
Cranbrook Foundry,.....Cranbrook, B. C.
British Columbia Foundry and Engine Works,.....Esquimault, "
Fernie Iron Works,.....Fernie, "
Boundary Iron Works, Ltd.,.....Grand Forks,"
Dobeson, Thos,.....Nanaimo, "
Nelson Iron Works, Ltd.,.....Nelson, "
B. C. Brass Co., Ltd.,.....New Westminster, B.C.
Westminister Foundry Co.,..... " " "
Schaake Machine Works, Ltd.,..... " " "
Columbia Foundry Co.,.....Vancouver, "
Empire Mfg. Co.,..... " "
Homewood Bros.,..... " "
Letson and Burpee, Ltd.,..... " "
Mainland Iron Works,..... " "
New West Mfg. Co.,..... " "
Ross and Howard Iron Works Co., Ltd.,..... " "
Terminal City Iron Works,..... " "
Vancouver Engineering Works, Ltd.,..... " "
Vancouver Pipe and Foundry Co., Ltd.,..... " "
Vancouver Stove Works,..... " "
Vivian Gas Engine Works..... " "
Wilson Brass Foundry,..... " "
Albion Stove Works,.....Victoria, "
Hutchison Bros. and Co., Ltd.,..... " "
Marine Iron Works,..... " "
Victoria Machinery Depot Co., Ltd.,..... " "

Foundry Supplies.

Hyde, Francis, and Co.,.....Montreal, Que.
Bruce, Robt. G., Co., Ltd.,.....Toronto, Ont.
Dominion Foundry Supply Co., Ltd.,..... " "
Stevens, Frederick B.,..... " "
Hamilton Facing Mill Co., Ltd.,.....Hamilton, "

Furniture.

Kilgour, J. W., and Co.,.....Beauharnois, Que.
Lake Megantic Furniture Co.,.....Lake Megantic,"
Castle and Son,.....Montreal, "

Williams Mfg. Co., Ltd.,	Montreal,	Que.
Singer Mfg. Co.,	St. Johns,	"
Dominion Furniture Mfg. Co.,	Ste. Therese,	"
Victoriaville Furniture Co.,	Victoriaville,	"
Schell, J. T., Co.,	Alexandria,	Ont.
Baetz Bros. and Co.,	Berlin,	"
Berlin Furniture Co., Ltd.,	"	"
Berlin Table Manufacturing Co.,	"	"
Hibner, D., Furniture Co., Ltd.,	"	"
Krug Furniture Co., Ltd.,	"	"
Lippert Furniture Co., Ltd.,	"	"
Lippert, Geo. J., Table Co.,	"	"
Wunder Furniture Mfg. Co., Ltd.,	"	"
Krug Bros. Co., Ltd.,	Chesley,	"
Beach Furniture Co.,	Cornwall,	"
Jones Bros. and Co.,	Dundas,	"
Elmira Furniture Co., Ltd.,	Elmira,	"
Mundell, John C., and Co.,	Goderich,	"
Burton and Baldwin Mfg. Co., Ltd.,	Hamilton,	"
Malcolm and Souter Furniture Co., Ltd.,	"	"
Knechtel Furniture Co., Ltd.,	Hanover,	"
Harriston Furniture Mfg. Co., Ltd.,	Harriston,	"
Hespeler Furniture Co., Ltd.,	Hespeler,	"
Ellis Furniture Co.,	Ingersoll,	"
Coombe and Watson,	Kincardine,	"
Malcolm, A., Furniture Co.,	Listowel,	"
Meaford Mfg. Co.,	Meaford,	"
Gibbard Furniture Co. of Napanee, Ltd.,	Napanee,	"
Schierholtz Furniture Co., Ltd.,	New Hamburg,	"
Eclipse Mfg. Co., Ltd.,	Ottawa,	"
Library Bureau of Canada, Ltd.,	"	"
Oliver, J., and Sons, Ltd.,	"	"
North American Bent Chair Co., Ltd.,	Owen Sound,	"
North American Furniture Co., Ltd.	"	"
Canada Office and School Furniture Co.,	Preston,	"
Crown Furniture Co.,	"	"
Preston Furniture Co., Ltd.,	"	"
Barnet Mfg. Co., Ltd.,	Renfrew,	"
Globe-Wernicke Co., Ltd.,	Stratford,	"
Imperial Rattan Co., Ltd.,	"	"
McLagan, Geo., Furniture Co., Ltd.,	"	"
Stratford Chair Co., Ltd.,	"	"
Rogers, Chas., and Sons Co., Ltd.,	Toronto,	"
Toronto Furniture Co., Ltd.,	"	"
Snider, J. B., and Co., Ltd.,	Waterloo,	"
Waterloo Furniture Co., Ltd.,	"	"

Walker and Clegg,	Wingham, Ont.
Canada Furniture Manufacturers, Ltd.,	Woodstock, "
Coast Mfg. Co.	Vancouver, B.C.
Hallward's Ltd.,	Victoria, "
Weiler Bros.,	" "

Glass Makers.

Humphrey Glass Co.,	Trenton, N.S.
Canadian Glass Mfg. Co., Ltd.,	Montreal, Que.
Diamond Flint Glass Co., Ltd.,	" "
Langwell, Geo., and Son,	" "
Diamond Flint Glass Co., Ltd.,	Hamilton, Ont.
Diamond Flint Glass Co., Ltd.,	Toronto, "
Independent Glass Producers, Ltd.,	" "
Sydenham Glass Co. of Wallaceburg, Ltd.,	Wallaceburg, "
Manitoba Glass Mfg. Co., Ltd.,	Beausejour, Man.

Glass Cutters, Bevellers, and Silverers.

Roche, David,	Halifax, N. S.
Maritime Art Glass Works, Ltd.,	St. John, N. B.
Canada Optical Co., Ltd.,	Montreal, Que.
Phillips, Geo. F., and Co.,	" "
Pilkington Bros., Ltd.,	" "
Ramsay, A. Frank., and Co.,	" "
Sharpe, C. A.,	" "
Berlin Plate Glass and Mirror Co.,	Berlin, Ont.
Hamilton Mirror Plate Co., Ltd.,	Hamilton, "
Hobbs Mfg. Co., Ltd.,	London, "
Ottawa Cut Glass Co., Ltd.,	Ottawa, "
Consolidated Optical Co., Ltd.,	Toronto, "
Consolidated Plate Glass Co. of Canada, Ltd.,	" "
Dominion Stained Glass Co.,	" "
Gowans, Kent and Co., Ltd.,	" "
Gundy-Clapperton Co., Ltd.,	" "
Imperial Glass Works,	" "
Phillips Mfg. Co., Ltd.,	" "
Toronto Plate Glass Importing Co., Ltd.,	" "
Alward and McCormick Glass Co., Ltd.,	Winnipeg, Man.
Consolidated Plate Glass Co., Ltd.,	" "
Hobbs Mfg. Co., Ltd.,	" "
Prairie Glass Co.,	" "
Winnipeg Paint and Glass Co., Ltd.,	" "

Alberta Mirror Plate Works, Ltd.,.....Calgary, Alta.
Calgary Paint and Glass Co., Ltd.,..... " "
Pilkington Bros., Ltd.,.....Vancouver, B. C.

Jewelers and Electro Platers.

Brown, M. S., and Co.,.....Halifax, N. S.
Cormack, Stephen F.,..... " "
Dunn, J. A., and Co.,..... " "
Grondines, J.,.....St. John, N. B.
Thorne, W. H., and Co., Ltd.,..... " "
Birks, Henry, and Sons, Ltd.,.....Montreal, Que.
Canadian Jewellers, Ltd.,..... " "
Caron Bros.,..... " "
Hemsley Mfg. Co.,..... " "
Peace, Henry,..... " "
Royal Silver Plate Co.,..... " "
Rubenstein Bros.,..... " "
Peerless Jewelry Co., Ltd.,.....Sherbrooke, Que.
Onward Mfg. Co.,.....Berlin, Ont.
Brantford Plating Co.,.....Brantford, Ont.
Wade Mfg. Co.,.....Dundas, "
Lees, Geo. H., and Co., Ltd.,.....Hamilton, "
Levy Bros. Co., Ltd.,..... " "
McLaren, Gordon,..... " "
Meriden Brittania Co., Ltd.,..... " "
Allport, E. H.,.....London, "
Avey and Jones,..... " "
Stevenson Bros. and Baker,..... " "
Robertson, P. L., Mfg. Co., Ltd.,.....Milton West, "
McGlashan, Clarke and Co., Ltd.,.....Niagara Falls, Ont.
Ontario Silver Co., Ltd.,..... " "
Rogers, Wm., Mfg. Co..... " "
Breadner Mfg. Co., Ltd.,.....Ottawa, "
Cragg, Herbert, and Co.,..... " "
McFarlane, T. D., and Son,..... " "
Vogel-Moffatt,..... " "
Windeler, W. T., and Co.,..... " "
Adams, J. R., and Co.,.....Toronto, Ont.
American Watch Case Co. of Toronto, Ltd.,..... " "
Burgess, A. E., and Co.,..... " "
Capp, T. W., Co.,..... " "
Cope, C. H.,..... " "
Crescent Silver Co., Ltd.,..... " "
Dominion Jewelry Mfg. Co.,..... " "

Elliott, W. J.,.....Toronto, Ont.
Ellis, Geo. E., and Co., Ltd.,..... " "
Ellis, P. W., and Co., Ltd.,..... " "
Freunes, S., and Co.,..... " "
Goldstein, Bernard,..... " "
Imperial Jewelry Co.,..... " "
Kleiser, Albert, and Co.,..... " "
Lackie, Milton,..... " "
Nolan and Strachan,..... " "
Orr Plating and Mfg. Co., Ltd.,..... " "
Riexinger and Heintz Co.,..... " "
Roden Bros.,..... " "
Roy Co., Ltd.,..... " "
Ryrie Bros., Ltd.,..... " "
Saunders, H. and A.,..... " "
Saunders, Lorie and Co.,..... " "
Simpson, Hall, Miller and Co.,..... " "
Standard Silver Co., Ltd.,..... " "
Toronto Silver Plate Co., Ltd.,..... " "
Wanless, John and Co.,..... " "
Wells, W. W.,..... " "
Whaley, Royce and Co., Ltd.,..... " "
White, T. and Son, (Lapidary)..... " "
Zock, J. J. and Co., Ltd.,..... " "
Imperial Silver Plate Co.,.....Windsor, "
Campbell, W. R., and Co.,.....Winnipeg, Man.
Dingwall, D. R., Ltd.,..... " "
Winnipeg Silver Plate Co.,..... " "
Wheatley Bros.,.....Regina, Sask.
Black, David E.,.....Calgary, Alta.
Allan, Alex.,.....Edmonton, "
Jacoby Bros.,.....Vancouver, B. C.
Pearsall, Chas.,..... " "

Matches.

Eureka Match Factory,.....Halifax, N. S.
Flewelling, G. and G., Co., Ltd.,.....Hampton, N. B.
Canada Match Co.,.....Drummondville, Que.
Eddy, E. B. Co., Ltd.,.....Hull, "
Dominion Match Co.,.....Deseronto, Ont.
Dominion Match Co.,.....Vancouver, B. C.

Meat Packers: Fertilizer, and Glue Manufacturers.

Davis and Fraser,.....Halifax, N. S.
Nova Scotia Fertilizer Co.,..... " "

Cross Fertilizer Co., Ltd.,	Sydney, N. S.
Colonial Fertilizer Co.,	Windsor, "
Provincial Chemical Fertilizer Co., Ltd.,	St. John, N. B.
Williams, F. E., Co., Ltd.,	" "
Dominion Fertilizer Co., Ltd.,	St. Stephen, N. B.
Sussex Packing Co., Ltd.,	Sussex, "
Imperial Packing Co., Ltd.,	Woodstock, "
Capelton Chemical and Fertilizer Co., Ltd.,	Buckingham, Que.
Matthews-Laing, Ltd.,	Hull, "
Clark, Wm.,	Montreal, "
Laing Packing and Provision Co., Ltd.,	" "
Lesage Packing and Fertilizer Co., Ltd.,	" "
Martin, D. B., Co., Ltd.,	" "
Marquis (dit Canac) F.,	Quebec, "
Canada Glue Co., Ltd.,	Brantford, Ont.
Collingwood Packing Co., Ltd.,	Collingwood, "
Fearman, W. F., Co., Ltd.,	Hamilton, "
Fowler's Canadian Co., Ltd.,	" "
Freeman, W. A., Co., Ltd.,	" "
Ingersoll Packing Co., Ltd.,	Ingersoll, "
Jones Packing and Provision Co.,	Smiths Falls, "
Standard Fertilizer Co., Ltd.,	" "
Tillsonburg Packing Co.,	Tillsonburg, "
Davies, W., Co., Ltd.,	Toronto, "
Gunns, Ltd.,	" "
Harris Abattoir Co., Ltd.,	" "
Harris, W., and Co.,	" "
Park-Blackwell Co., Ltd.,	" "
Stone, Wm., Sons, Ltd.,	Woodstock, Ont.
Gallagher, Holman, Lafrance Co.,	Winnipeg, Man.
Gordon, Ironside and Fares Co., Ltd.,	" "
Swift Canadian Co., Ltd.,	" "
Western Packing Co. of Canada, Ltd.,	" "
Burns, P., and Co.,	Calgary, Alta.
Gainers, Ltd.,	Edmonton, "
Swift, Canadian Co., Ltd.,	" "
Burns, P., and Co. Ltd.,	Vancouver, B. C.
Korenaga,	" "

Metal Workers (General).

Starr Mfg. Co., Ltd.	Dartmouth, N. S.
Bailey Underwood Co., Ltd.,	New Glasgow, "
Canada Tool and Specialty Co., Ltd.,	" "
Fowler, Josiah, Co., Ltd.,	St. John, N. B.

Myers, W. F. and J. W.	St. John, N. B.
Wilson, Walter, and Son,	" "
Maritime Edge Tool Co.,	St. Stephen, "
Walters, H. and Son,	Hull, Que.
Ahearn Safe Co., Ltd.,	Montreal, "
De Leval Mfg. Co.,	" "
Gilette Safety Razor Co. of Canada, Ltd.,	" "
Hutchison and Sticht,	" "
Magnolia Metal Co.,	" "
Walker and Campbell,	" "
Ross Rifle Co. of Canada,	Quebec, "
St. Lawrence Saw and Steel Works Co., Ltd.,	Sorel, "
Imperial Steel and Wire Co., Ltd.,	Collingwood, Ont.
Galt Electrical Gas Fixtures Co., Ltd.,	Galt, "
Hay, Peter, Co., Ltd.,	" "
Hills, Allan,	" "
Jones Mfg. Co.,	Gananoque, "
Atkins, E. C., and Co., Ltd.,	Hamilton, "
Ontario Lantern and Lamp Co., Ltd.,	" "
Dennis Wire and Iron Works Co., Ltd.,	London, "
London Gas Power Co., Ltd.,	" "
Canada Malleable and Steel Range Mfg. Co., Ltd.,	Oshawa, "
Lockeberg, Iverson and Co.,	Ottawa, "
Renfrew Scale Co.,	Renfrew, "
Maple Leaf Harvest Tool Co.,	Tillsonburg, "
Aluminium and Crown Stopper Co.,	Toronto, "
Bowman Gas Range Mfg. Co.,	" "
Canada Brass Mfg. Co.,	Toronto, Ont.
Clatworthy and Son,	" "
Dymond Gas and Engine Co., Ltd.,	" "
Keith and Fitzsimons Co., Ltd., The Toronto,	" "
Meadows, Geo. B., Toronto Wire Iron and Brass Wks. Co., Ltd.,	" "
Monarch Brass Mfg. Co., Ltd.,	" "
Patterson and Heward.,	" "
Toronto Steel Clad Bath and Metal Co.,	" "
United Incandescent Light Co.,	" "
Wilkinson, J. E., Co., Ltd.,	" "
Worth, Martin Co., Ltd.,	" "
Seagrave, W. E. and Co.,	Walkerville, Ont.
Canada Forge Co., Ltd.,	Welland, "
Lufkin Rule Co.,	Windsor, "
Eureka Planter Co., Ltd.,	Woodstock, "
Tobin Arms Mfg. Co., Ltd.,	" "
Garry Mfg. Co.,	Winnipeg, Man.
Winnipeg Brass Fixture Co.,	" "

Burton, A. J., Co., Ltd.,	Vancouver,	B.C.
Cascade Gas and Electric Fixtures,	"	"
Standard Iron Works.,	"	"
British Columbia Marine Railway Co., Ltd.,	Victoria,	"

Musical Instruments.

Berliner Gramaphone Co. of Canada, Ltd.,	Montreal,	Que.
Craig Piano Co.,	"	"
Gingras et Freres,	"	"
Pratt, L. E. N.,	"	"
Shaw, J. W. and Co.,	"	"
Casavant Freres,	St. Hyacinthe,	Que.
Senecal et Quidez,	Ste. Therese,	"
Willis Piano Co., Ltd.,	"	"
Foster, Armstrong Co.,	Berlin,	Ont.
Dominion Organ and Piano Co. Ltd.,	Bowmanville,	"
Brown, Edwin.,	Brantford,	"
Doherty Piano and Organ Co.,	Clinton,	"
Goderich Organ Co., Ltd.,	Goderich,	"
Bell Piano and Organ Mfg. Co., Ltd.,	Guelph,	"
Evan Bros. Piano Mfg. Co., Ltd.,	Ingersoll,	"
Wormwith Piano Co., Ltd.,	Kingston,	"
Sherlock, Manning Organ Co.,	London,	"
Williams Piano Co.,	Oshawa,	"
Martin-Orme Piano Co.,	Ottawa,	"
Bennewitz Mfg. Co.,	Stratford,	"
Barthelmes, A. A., and Co., Ltd.,	Toronto,	"
Blundall Piano Co.,	"	"
Gourlay-Winter and Leeming,	"	"
Heintzman and Co., Ltd.,	"	"
Heintzman, Gerhard, Ltd.,	"	"
Higel, Otto, Co., Ltd.,	"	"
Loose, J. M., and Sons, Ltd.,	"	"
Lye, Edward, and Sons,	"	"
Mason and Risch Piano Co., Ltd.,	"	"
Matthews Church Organ Co.,	"	"
McCormack and Carrol,	"	"
Mendelssohn Piano Co.,	"	"
Mitchell, Thos.,	"	"
Newcombe Piano Co., Ltd.,	"	"
Nordheimer Piano and Music Co., Ltd.,	"	"
Reid Bros. Mfg. Co.,	"	"
Stanley, Frank,	"	"
Whaley, Royce Co., Ltd.,	"	"

Uxbridge Piano and Organ Co.,.....Uxbridge, Ont.
Grinell Bros.,.....Windsor, "
Hay and Co.,.....Woodstock, "
Karn-Morris Piano and Organ Co., Ltd.,..... " "
Thomas Organ and Piano Co.,..... " "

Oils and Lubricants.

Canadian Economic Lubricant Co., Ltd.,.....Montreal, Que.
Electric Boiler Compound Co., Ltd.,.....Guelph, Ont.
Crescent Oil Co.,.....Hamilton, "
Crown Oil Refining Co., Ltd.,..... " "
Canadian Oil Refining Co., Ltd.,.....Petrolia, "
Imperial Oil Co., Ltd.,.....Sarnia, "
Superior Oil Co.,.....Sault Ste. Marie, Ont.
British American Oil Co., Ltd.,.....Toronto, Ont.
Economical Mfg. and Supply Co., Ltd.,..... " "
Grant, G. W., and Co.,..... " "
Empire Refining Co., Ltd.,.....Wallaceburg, "
Continental Oil Co., Ltd.,.....Winnipeg, Man.
Prairie City Oil Co., ... " "
Winnipeg Oil Co., Ltd.,..... " "
Snowdon, C. C., ...Calgary, Alta.
Segur Oil Refineries, Ltd.,.....Vancouver, B.C.

Paints and Varnish.

Dominion Paint Co., ...Dartmouth, N.S.
Eastern Paint Co., Ltd.,..... " "
Brandram-Henderson, Ltd.,.....Halifax, "
Allan-Munro Colour Co.,.....Montreal, Que.
Brandram-Henderson, Ltd.,..... " "
Canada Paint Co., Ltd.,..... " "
Dougall Varnish Co., Ltd.,..... " "
Jamieson, R. C., and Co., Ltd., ... " "
Martin-Senor Co., Ltd.,..... " "
Montreal Rolling Mills Co.,..... " "
Mount Royal Colour and Varnish Co., Ltd.,..... " "
Ramsay, A., and Son Co.,..... " "
Sherwin-Williams Co. of Canada, Ltd.,..... " "
Wearwell Paint and Colour Wks.,.....St. Lambert, Que.
Champlain Oxide Co., ...Three Rivers, "
Scarfe and Co.,.....Brantford, Ont.
Crescent Oil Co., ...Hamilton, "
Ottawa Paint Wks.,.....Ottawa, "

Northern Varnish Co.,	Owen Sound, Ont.
Canadian Oil Companies, Ltd.,	Toronto, "
Glidden Varnishes Co.,	" "
Harland, Wm., and Son,	" "
Imperial Varnish and Colour Co., Ltd.,	" "
International Varnish Co., Ltd.,	" "
Langmuir and Co., Ltd.,	" "
McColl, Bros. and Co.,	" "
Moore, Benjamin, and Co., Ltd.,	" "
Muirhead, A., Co., Ltd.,	" "
Pinchin, Johnson Co., Ltd.,	" "
Reynolds and Co.,	" "
Robertson, Jas., Co., Ltd.,	" "
Berry Bros., Ltd.,	Walkerville, "
Dominion Paint Wks.,	" "
Standard Paint and Varnish Wks. Co., Ltd.,	Windsor, "
Stephens, G. F., and Co., Ltd.,	Winnipeg, Man.
Snowdon, C. C.,	Calgary, Alta.
Vancouver Paint and Refining Co., Ltd.,	Vancouver, B.C.
British American Paint Co.,	Victoria, "
Staneland Co., Ltd.,	" "

Polishes (Stove and Metal).

Blacking and Mercantile Co., Ltd.,	Amherst, N.S.
American Dressing and Sundry Co., Ltd.,	Montreal, Que.
Royal Polishes Co.,	" "
Sultana Mfg. Co.,	" "
Tellier, Rothwell and Co.,	" "
Alpha Chemical Co.,	Berlin, Ont.
Crescent Oil Co.,	Hamilton, "
Dalley, F. F., Co. of Hamilton,	" "
Domestic Specialty Co., Ltd.,	" "
Ralston, Robt., and Co.,	" "
McClary Mfg. Co.,	London, "
Beaver Oils and Polishes, Ltd.,	Toronto, "
Hawes, Edward, and Co.,	" "
Lloyd, H. S.,	" "
Nonsuch Mfg. Co., Ltd.,	" "
Reynolds and Co.,	" "
Soclean, Ltd.,	" "
Nickel Plate Stove Polish Co.,	Windsor, "
Snowdon, C. C.,	Calgary, Alta.

Porcelain, Stoneware, and Enamelware.

Amherst Foundry Co., Ltd.,	Amherst, N.S.
Foley, Jas. W., and Co.,	St. John, N.B.
Canada Pottery Co., Ltd.,	Iberville, Que.
Davidson, Thos., Mfg. Co., Ltd.,	Montreal, "
Canadian Trenton Potteries, Ltd.,	St. Johns, "
Dominion Sanitary Pottery Co.,	" "
Belleville Pottery Co.,	Belleville, Ont.
Campbell's R., Sons .,	Hamilton, "
McClary Mfg. Co.,	London, "
Standard Ideal Co., Ltd.,	Port Hope, "
Canadian General Electric Co., Ltd.,	Toronto, "
Kemp Mfg. Co ,	" "
Standard Sanitary Mfg. Co.,	" "
Medicine Hat Pottery Co., Ltd.,	Medicine Hat, Alta.
B. C. Pottery Co.,	Victoria, B.C.

Pulp and Paper.

Dominion Pulp Co., Ltd.,	Chatham, N.B.
New Brunswick Pulp and Paper Co., Ltd.,	Millerton, "
Partington, Ed., Pulp and Paper Co.,	St. John, "
Crabtree, Edwin, and Sons, Ltd.,	Crabtree Mills, Que.
Brompton Pulp and Paper Co.,	East Angus, "
Laurentide Paper Co., Ltd.,	Grande Mere, "
Booth, J. R.,	Hull, "
Eddy, E. B., Co., Ltd.,	" "
McArthur, Alex., and Co., Ltd.,	Joliette, "
Jonquieres Pulp Co.,	Jonquieres, "
Dominion Paper Co.,	Kingsey Falls, "
Consolidated Lithographing and Mfg. Co., Ltd.,	Montreal, "
Riordon Paper Co., Ltd.,	" "
Smith, Howard, Paper Mills, Ltd.,	" "
Bird, F. W., and Son.,	Pont Rouge, "
Ford, J., and Co.,	Portneuf Station, "
Ford, Rowland, and Son,	" " "
Belgo-Canadian Pulp and Paper Co., Ltd.,	Shawenegan Falls, "
Northern Mills Co.,	Ste. Adele, "
Eastern Paper Co.,	Ste. Basile Station, "
Rolland Paper Co., Ltd.,	St. Jerome, "
News Pulp and Paper Co., Ltd.,	St. Raymond, "
Wayagamack Pulp and Paper Co., Ltd.,	Three Rivers, "
Canada Paper Co., Ltd.,	Windsor Mills, "
Toronto Paper Mfg. Co., Ltd.,	Cornwall, Ont.

Fisher, John, and Son, Ltd.,	Dundas,	Ont.
Dryden Timber and Power Co., Ltd.,	Dryden,	"
Spanish River Pulp and Paper Co., Ltd.,	Espanola,	"
Trent River Paper Co., Ltd.,	Frankford,	"
Barber, William, and Bros.,	Georgetown,	"
Canada Coating Mills, Ltd.,	"	"
Georgetown Coated Paper Mills.,	"	"
Bird, F. W., and Son,	Hamilton,	"
Lincoln Paper Mills Co., Ltd.,	Merritton,	"
Riordon Paper Co., Ltd.,	"	"
St. Lawrence Paper Mills, Ltd.,	Mille Roches,	"
Lake Superior Paper Co., Ltd.,	Sault Ste. Marie,	Ont.
Kinleith Paper Co., Ltd.,	St. Catharines,	"
Strathcona Paper Co.,	Strathcona,	"
Spanish River Pulp and Paper Co., Ltd.,	Sturgeon Falls,	"
Grenville Board and Pulp Co.,	Thorold,	"
Montrose Paper Mills, Ltd.,	"	"
Don Valley Paper Co., Ltd.,	Toronto,	"
Ritchie and Ramsay, Ltd.,	"	"
Swanson Bay Forests, Wood-Pulp and Lumber Mills, Ltd.,	Swanson Bay,	B.C.
B. C. Sulphate Fibre Co., Ltd.,	Vancouver,	"
Powell River Paper Co., Ltd.,	"	"

Roofing Felts ("Ready Roofing").

Paterson Mfg. Co., Ltd.,	Montreal,	Que.
Reed, Geo. W., and Co., Ltd.,	"	"
Sparham Roofing Cement Co.,	"	"
Brantford Roofing Co., Ltd.,	Brantford,	Ont.
Bird, F. W., and Son.,	Hamilton,	"
Hamilton Mica Roofing Co., Ltd.,	"	"

Rubber Goods.

Miner Rubber Co.,	Granby,	Que.
Walpole Rubber Co., Ltd.,	"	"
Canadian Rubber Co. of Montreal, Ltd	Montreal,	"
Corona Rubber Co.,	"	"
Dominion Rubber Co., Ltd.,	St. Jerome,	"
Canadian Consolidated Rubber Co.,	Berlin,	Ont.
Kaufman Rubber Co., Ltd.,	"	"
Goodyear Tire and Rubber Co. of Canada, Ltd.,	Bowmanville,	"
Independent Rubber Co., Ltd.,	Merritton,	"
Maple Leaf Rubber Co., Ltd.,	Port Dalhousie,	"
Dunlop Tire and Rubber Goods Co., Ltd.,	Toronto,	"
Gutta Percha and Rubber Mfg. Co. of Toronto, Ltd.,	"	"

Smelters and Rolling Mills.

Dartmouth Rolling Mills,	Dartmouth, N.S.
Dominion Iron and Steel Co.,	Sydney, "
Nova Scotia Steel and Coal Co., Ltd.,	Sydney Mines,"
Portland Rolling Mills, Ltd.,	St. John, N.B.
Electric Reduction Co.,	Buckingham, Que.
Canada Iron Corporation, Ltd.,	Montreal, "
Grand Trunk Railway Rolling Mills.,	" "
Montreal Rolling Mills, Ltd.,	" "
Peck Rolling Mills, Ltd.,	" "
Northern Aluminium Co.,	Shawenegan Falls, Que.
Tivani Electric Steel Co., Ltd.,	Belleville, Ont.
Toronto and Belleville Rolling Mills, Ltd.,	" "
Provincial Steel Co., Ltd.,	Cobourg, "
Mond Nickel Co.,	Coniston, "
Canadian Copper Co., Ltd.,	Copper Cliff, "
Deloro Mining and Reduction Co.,	Deloro, "
Standard Iron Co. of Canada, Ltd.,	Deseronto, "
Page-Hersey Iron and Tube Co., Ltd.,	Guelph, "
Steel Co. of Canada, Ltd.,	Hamilton, "
Buffalo and Ontario Smelting Co.,	Kingston, "
North American Smelting Co.,	" "
Dominion Refineries, Ltd.,	North Bay, "
Canada Refining and Smelting Co., Ltd.,	Orillia, "
Atikokan Iron Co., Ltd.,	Port Arthur, "
Canadian Furnace Co.,	Port Colborne, "
Algoma Steel Corporation,	Sault Ste. Marie, "
Coniagas Reduction Co.,	St. Catharines, "
Moffat Irving Steel Wks., Ltd.,	Toronto, "
Electro Metals, Ltd.,	Welland, "
Metals Chemical Co., Ltd.,	" "
Manitoba Rolling Mills Co., Ltd.,	Winnipeg, Man.
Alberta Rolling Mills Co., Ltd.,	Medicine Hat, Alta.
Granby Consolidated Mining, Smelting and Power Co., Ltd.,	Grand Forks, B.C.
British Columbia Copper Co., Ltd.,	Greenwood, "
Tyee Copper Co., Ltd.,	Ladysmith, "
Consolidated Mining and Smelting Co. of Canada, Ltd.	Trail, "

Soap and Toilet Powders.

P. E. Island Soap Wks., Ltd	Charlottetown, P.E.I.
Mott, John P., and Co.,	Halifax, N.S.
Asepto Soap Co.,	St. John, N.B.
St. Croix Soap Mfg. Co.,	St. Stephen, "

Albert Soaps, Ltd.,	Montreal, Que.
Barsalon, J., and Co., Ltd.,	" "
Darling and Brady.,	" "
Gilmour Co.,	" "
United Soap Co. of Canada.,	" "
Maheux, Alp.,	Quebec, "
Maheux, F.-X.,	" "
Zip Mfg. Co.,	Sutton, "
London Soap Co.,	London, Ont.
Cudahy Packing Co.,	Toronto, "
Lever Bros., Ltd.,	" "
McColl, Bros. and Co., Ltd.,	" "
Morton, David, and Sons, Ltd.,	" "
Taylor, John, and Co., Ltd.,	" "
Tiger Mfg. Co.,	Walkerville, "
Richards Pure Soap Co., Ltd.,	Woodstock, "
Beaver Soap Co., Ltd.,	Winnipeg, Man.
Clean-Em Hand Soap Co., Ltd.,	" "
Royal Crown Soaps, Ltd.,	" "
Young-Thomas Soap Co., Ltd.,	Regina, Sask.
Royal Crown Soaps, Ltd.,	Calgary, Alta.
Royal Crown Soaps, Ltd.,	Vancouver, B.C.
Pendray, W. J., and Co., Ltd.,	Victoria, "

Steam Packings.

Garlock Packing Co.,	Hamilton, Ont.
Hamilton Engine Packing Co.,	" "
Asbestos and Rubber Goods Co.,	Toronto, "

Sugar.

Acadia Sugar Refining Co., Ltd.,	Halifax, N.S.
Canada Sugar Refining Co., Ltd.,	Montreal, Que.
St. Lawrence Sugar Refining Co., Ltd.,	" "
Dominion Sugar Co., Ltd.,	Berlin, Ont.
Dominion Sugar Co. Ltd.,	Wallaceburg, "
Knight Sugar Co., Ltd.,	Raymond, Alta.
British Columbia Sugar Refining Co., Ltd.,	Vancouver, B.C.

Tanners.

Boyles Tannery,	Charlottetown, P.E.I.
Kensington Tannery,	" "
Waterman Tanning Co.,	Bridgewater, N.S.

McLean, J. J.,	New Glasgow,	N. S.
Parker, W. Allen,	Shubenacadie,	"
Palmer, John, and Co.,	Fredericton,	N.B.
Higgins, L., and Co.,	Moncton,	"
Kimball, J., and Son.,	St. John,	"
Peters, C. H., and Sons.,	"	"
Dickinson, J. D., and Sons, Ltd.,	Woodstock,	"
Garant et Blouin.,	La Beauce,	Que.
Daly and Morin.,	Lachine,	"
Bonnar Leather Co.,	Montreal,	"
Daoust, Lalonde and Co.,	"	"
Fenlin Leather Co.,	"	"
Fisk, Ltd.,	"	"
Galibert, C., and Son, Co.,	"	"
Galibert, Paul,	"	"
Gauthier, Provost et Frere,	"	"
Sadler and Haworth,	"	"
Victoria Leather Co	"	"
Borne, Lucien,	Quebec,	"
Contin, Wilfred,	"	"
Falardeau, P.E., and Co.,	"	"
Fortier, Nazaire,	"	"
Guay, J., et Fils,	"	"
Pion, A., et Cie,	"	"
Poliquin, J. H. D.,	"	"
Pouliot, A., et Cie,	"	"
Pouliot, J. et S., Frere	"	"
Valliere, Michel,	"	"
Duclos et Payan	St. Hyacinthe,	Que.
Julien, E.,	St. Roque,	"
Duguay, J. O. J.,	Terrebonne,	"
Phaneuf, Loisell et Cie.,	Upton,	"
Tourigny, Paul.,	Victoriaville,	"
Beardmore and Co.,	Acton,	Ont.
Chapman, W. J.,	Acton West,	"
Barrie Tanning Co., Ltd.,	Barrie,	"
Knees, Chas.,	Belleville,	"
Breithaupt Leather Co., Ltd.,	Berlin,	"
Lang Tanning Co., Ltd.,	"	"
Anglo-Canadian Leather Co., Ltd.,	Bracebridge,	"
Tobey, C. W.,	Collingwood,	"
Newton Tanning Co., Ltd.,	Elgin Mills,	"
Hamilton Oak Tanning Co.,	Hamilton,	"
Anglo-Canadian Leather Co., Ltd.,	Huntsville,	"
Davis, A. and Son,	Kingston,	"

Beal, R. M., Leather Co., Ltd.,	Lindsay, Ont.
Arscott Bros.,	London, "
Steel and Reid,	Meaford, "
Todd, A. C.,	" "
Davis Leather Co., Ltd.	Newmarket, "
Marlatt and Armstrong Co., Ltd.	Oakville, "
Lamb, John J.,	Omemee, "
Miller, C. J., and Son,	Orillia, "
Robson Leather Co., Ltd.,	Oshawa, "
McQuay Tanning Co., Ltd.,	Owen Sound, Ont.
Quinn Bros.,	" "
Taylor, W. H., and Son,	Parry Sound, "
Simcoe Tanning and Fur Dressing Co.,	Simcoe, "
Zinkan, H. N., and Son.,	Southampton, "
Wood Bros.,	St. Catharines, "
Wickett and Craig, Ltd.,	Toronto, "
Scott, M. W., and Son.,	Westport, "
Brandon Tannery.,	Brandon, Man.
Winnipeg Tanning Co., Ltd.,	Winnipeg, "
Regina Tanning Wks.,	Regina, Sask.
Great Northern Tannery, Ltd.,	Edmonton, Alta.
Fraser River Tannery, Ltd.,	New Westminster, B.C.

Textiles and Cordage.

Hewson Pure Wool Textile Co., Ltd.,	Amherst, N.S.
Consumers Cordage Co., Ltd.,	Dartmouth, "
Cornwall and York Cotton Mills Co., Ltd.,	St. John, N.B.
Daly and Morin.,	Montreal, Que.
Dominion Oilcloth Co., Ltd.,	" "
Dominion Textile Co., Ltd.,	" "
Magog Woollen Mills,	Sherbrooke, "
Montreal Cotton Co.,	Valleyfield, "
Alton Knitting Mills,	Alton, Ont.
Dominion Linen Mfg. Co.,	Bracebridge, "
Brantford Cordage Co.,	Brantford, "
Slingsby Mfg. Co.,	" "
Wolthausen Hat Co., Ltd.,	Brockville, "
Bates and Innis,	Carleton Place, "
Brown, John,	" "
Canadian Cottons, Ltd.,	Cornwall, "
Clark Blanket Co., Ltd.	Dundas, "
Crown Hat Co., Ltd.,	Galt, "
Galt Knitting Mills, Ltd.,	" "
Turnbull, C., Co. of Galt, Ltd.,	" "

Glen Woollen Mills, Ltd.,.....Georgetown, Ont.
Guelph Carpet Mills, Ltd.,.....Guelph, "
Penman's, Ltd.,.....Paris, "
Crean, Robt., and Co., Ltd.,.....Toronto, "
Cotton Mfg. Co.,..... " "
Dovercourt Twine Mills Co.,..... " "
Hayhoe, Henry E., and Co.,..... " "
Soper, Fred G., Co.,..... " "

Wall Paper.

McArthur, Colin and Co., Ltd.,.....Montreal, Que.
Watson, Foster Co., Ltd.,..... " "
Boxer, Reg. N., Co., Ltd.,.....Toronto, Ont.
Stauntons, Ltd.,..... " "

Wheels (Carriage).

Chaplin Wheel Co., Ltd.,.....Chatham, Ont.
McVean, O. and W.,.....Dresden, "
Victoria Wheel Works,.....Galt, "
Ontario Wheel Co.,.....Gananoque, "
Armstrong, J. B., Mfg. Co., Ltd.,.....Guelph, "
Dominion Wheel Co., Ltd.,.....Lindsay, "
Finlay, J., and Sons Co.,.....Norwood, "
Benjamin Mfg. Co. of Yarker, Ltd.,.....Yarker, "

Whips.

Lay Whip Co.,.....Rock Island, Que.
Brown, John E.,.....Hamilton, Ont.
Hamilton Whip Co., Ltd.,..... " "
Toronto Whip Co.,.....Toronto, "
Trees, Samuel, and Co., Ltd.,..... " "

APPENDIX II.

Lists of Producers of Non-Metallic Minerals.

APPENDIX II.

Lists of Producers of Non-Metallic Minerals.

The following selected lists of Canadian mine operators have been supplied by the Division of Mineral Resources and Statistics of the Mines Branch, and may be of interest to readers of this report. More complete lists of metal mines, coal mines, quarry operators, clay manufacturers, etc., may be obtained on application to the Department.

Abrasives:—

Corundum:—

The Manufacturers Corundum Co., Ltd., 712 Traders Bank Building, Toronto, Ont.

Grindstone:—

Mohawk Grindstone Co., Woodburn, N.S.
J. L. Knowles, Clifton, N.B.
The Read Stone Co., Ltd., Stonehaven, N.B., and Sackville, N.B.
Miramichi Quarry Co., Ltd., 10 Richmond Square, Montreal, or Quarryville, N.B.

Tripolite:—

Oxford Tripoli Co., Ltd. Oxford, N.S.
Premier (Victoria) Tripolite Co., 159 Maiden Lane, New York, N.Y.

Actinolite:—

The Actinolite Mining Co., care of W. D. Washburn, Bloomfield, N.J.

Asbestos:—

Asbestos and Asbestic Co., Ltd., Asbestos, Que.
Asbestos Corporation of Canada, Ltd., 263 St. James St., Montreal, Que.
Black Lake Chrome and Asbestos Co., 60 Victoria, Toronto, Ont.
The B. and A. Asbestos Co., Robertsonville, Que.
The Jacobs Asbestos Mining Co. of Thetford, Ltd., 282 St. Catherine W., Montreal, Que.
Frontenac Asbestos Co., Ltd., 92 St. Peter St., Quebec, Que.
The Bell Asbestos Mines, Thetford Mines, Que.
Johnson's Asbestos Co., Thetford Mines, Que.
The Martin-Bennett Asbestos Mines, Ltd., Thetford Mines, Que.

Chromite:—

Dominion Chrome Co., 120 St. James St., Montreal, Que.
Black Lake Chrome and Asbestos Co., 60 Victoria St., Toronto, Ont.

Feldspar:—

Kingston Feldspar and Mining Co., Kingston, Ont.
Messrs. O'Brien and Fowler, Hope Building, Ottawa, Ont.
Dominion Improvement and Development Co., Box 26, Perth, Ont.
Dominion Feldspar, Ltd., 425 Roxton Rd., Toronto, Ont. (Mill).

Fluorspar:—

Stephen Wellington, Box 63, Madoc, Ont.

Graphite:—

The Bell Graphite Co., Ltd., Buckingham, Que. (Mill).
The Quebec Graphite Co., Ltd., Box 262, Buckingham, Que. (Mill).
Graphite Limited, 800 Mullen St., Montreal, Que. (Mill).
Black Donald Graphite Co., Ltd., Calabogie, Ont., (Mill).
The Globe Refining Co., Ltd., 32 Adelaide St. E., Toronto, Ont. (Mill).
Tonkin-Dupont Graphite Co., Ltd., Wilberforce, Ont. (Mill).
Peerless Graphite Co., 32 Thorndale Terrace, Rochester, N.Y.
Matthews and Foster, 18 Toronto St., Toronto, Ont.

Graphite (artificial):—

The International Acheson Graphite Co., Niagara Falls, Ont.

Grinding Pebbles:—

The Canada Pebble Co., Ltd., Port Arthur, Ont.

Gypsum:—

Maritime Gypsum Co., Ltd., 381 Fourth Ave., New York, N.Y.
Newark Plaster Co., McKinnons Harbour, N.S.
Noel Plaster Co., Noel, N.S.
Victoria Gypsum Mining and Mfg. Co., St. Anns, N.S.
Iona Gypsum Co., Ltd., 309 Charlotte St., Sydney, N.S.
Albert Parsons, Walton, N.S.
Wentworth Gypsum Co., Ltd., Windsor, N.S.
Newport Plaster Mining and Mfg. Co., Box 225, Windsor, N.S.
Windsor Gypsum Co., Newport Sta., N.S.

Cheticamp Gypsum and Plaster Co., Ltd., 137 McGill, Montreal, Que. (Mill).
Windsor Plaster Co., Ltd., Box 94, Windsor, N.S. (Mill).
The Albert Manufacturing Co., Hillsboro, N.B. (Mill).
Hillsboro Plaster Co., Hillsboro, N.B., care of J. Blight.
The New Brunswick Gypsum Co., Hillsboro, N.B.
The Stinson-Reeb Supply Co., E. T. Bk. Bldg., Montreal, Que.
Jno. E. Stewart, Andover, N.B.
The Crown Gypsum Co., Ltd., Lythemore, Ont. (Mill).
Alabastine Co. of Paris, Ltd., Paris, Ont. (Mill).
Dominion Gypsum Co., Ltd., Box 537, Winnipeg, Man. (Mill).
Manitoba Gypsum Co., Ltd., 504 Trust and Loan Bldg., Winnipeg, Man. (Mill).
E. P. Gailliac, Spokane, Washington Ter.

Magnesite:—

The Canadian Magnesite Co., E. T. Bk. Bldg., Montreal, Que.

Manganese:—

The Nova Scotia Manganese Co., Ltd., Windsor, N.S.
The New Ross Manganese Co., Ltd., 60 Brooks St., West Medford, Mass.
W. N. McDonald, Sydney, N.S.

Mica:—

Wm. Cleland, Bouchette, Que.
John Burns, Buckingham, Que.
J. B. Gauthier, Box 226, Buckingham, Que.
J. B. Gorman, Box 166, Buckingham, Que.
W. L. Parker, Buckingham, Que.
Brown Bros., Cantley, Que.
Wilson and Cross, Cascades, Que.
Henry T. Flynn, Hull, Que.
W. Argall, Laurel, Que.
The Mica Co. of Canada, Box 2324, Montreal, Que.
Ernest Schock, Schwartz, Que.
Baldwin and N. Stevenson, East Templeton, Que.
R. J. McGlashan, Wilsons Corners, Que.
J. B. Tett and Bro., Bedford Mills, Ont.
Kingston Feldspar and Mining Co., Ltd., Kingston, Ont.
Kent Bros. and J. Stoness, Kingston, Ont.

American Mica and Phosphate Co., 242 Temple Court, Minneapolis, Minn.
Stoness-Anglin-Gilbert Mica Mfg. Co., Ltd., 1 Bay St., Kingston, Ont.
Sewell and Smith, Perth, R. R. No. 3, Ont.
The Birch Lake Mining Co., 115 York St., Ottawa, Ont.
Blackburn Bros., Ottawa, Ont.
The Capital Mica Co., Ltd., Ottawa, Ont.
Laurentide Mica Co., Ltd., Rockland, Ont.
R. McConnell, 32 Adelaide St. E., Toronto, Ont.
O'Brien and Fowler (B. Winning), Hope Bldg., Ottawa, Ont.
Progressive Mining Co., 124 Rideau St., Ottawa, Ont.
Vavasour Mining Association, 22 Metcalfe, Ottawa, Ont.
Wallingford Mica and Mining Co., 41 Vaughn St., Ottawa, Ont.
Jno. H. Adams and Co., Perth, Ont.
Dominion Improvement and Development Co., Box 26, Perth, Ont.
W. L. McLaren, Nevis Cottage, Perth, Ont.
S. H. Orser, Perth Road, Ont.
John Mahon, Rideau Ferry, Ont.
Dominion Mineral Exploration Syndicate, Box 148, Sydenham, Ont.
The Loughborough Mining Co., Ltd., Sydenham, Ont.
Scriven and Whyte, Sydenham, Ont.
J. W. Trousdale, Sydenham, Ont.
Big Bend Mica Mines, Ltd., 818 7th Ave. Calgary, Alta.
Canadian Muscovite Mica Co., 503 Bower Bldg., Vancouver, B.C.

FACTORIES.

H. T. Flynn, Hull, Que.
General Electric Co., Sorel, Que.
Kent Bros., Brock St., Kingston, Ont.
Blackburn Bros., 134 Wellington St., Ottawa, Ont.
S. O. Fillion, Duke St., Ottawa, Ont.
R. Macdonald (Dominion Mica Works), 534 Wellington St., Ottawa.
Rinaldo McConnell, 32 Adelaide St. E., Toronto, Ont.
Eugene Munsell Co., 400 Wellington St., Ottawa.
O'Brien and Fowler, Hope Building, Ottawa, Ont.
Wallingford Mica and Mining Co., Ottawa, Ont.
Webster and Co., 274 Stewart St., Ottawa, Ont.
Loughborough Mining Co., Sydenham, Ont.

Mineral Pigments:—

Barytes Limited, 54 Barrington St., Halifax, N.S.
The Canada Paint Co., Ltd., Red Mill, Que.
Argall's Oxide Mines, Three Rivers, Que.
The Champlain Oxide Co., Three Rivers, Que.
Ontario Mineral Paint Works, Campbellville, Ont.

Phosphate (Apatite):—

R. J. McGlashan, Wilsons Corners, Que.
Blackburn Bros., 134 Wellington St., Ottawa, Ont.
Messrs. O'Brien and Fowler, Hope Bldg., Ottawa, Ont.
W. L. McLaren, Nevis Cottage, Perth, Ont.

Pyrites:—

La Mine Cuivre et Or, St. Gerard, Que.
Eustis Mining Co., Eustis, Que.
East Canada Smelting Co., Ltd., Weeden, Que., or 49 Wall St., New York, N. Y.
Algoma Steel Corporation, Ltd., Sault Ste. Marie, Ont.
Canadian Sulphur Ore Co., Ltd., 404 Lumsden Bldg., Toronto, Ont.
Sulphide Chemical Co., Ltd., Sulphide, Ont.
Nichols Chemical Co., Ltd., 25 Broad St., New York, N. Y.
Northern Pyrites Co., 25 Broad St., New York, N. Y.

Quartz:—

Canadian China Clay Co., Ltd., 99 St. James St., Montreal, Que.
J. B. Gorman, Box 166, Buckingham, Que.
Kingston Feldspar and Mining Co., Kingston, Ont.
Algoma Steel Corporation, Ltd., Sault Ste. Marie, Ont.
Willmott and Co., 404 Lumsden Bldg., Toronto, Ont.
The Mond Nickel Co., Coniston, Ont.
Canadian Copper Co., 43 Exchange Place, New York, N.Y.

Salt:—

New Brunswick Salt Works, Plumweseep, N. B., W. Walker, Mgr.
North American Chemical Co. (J. Ransford), Box 29, Clinton, Ont.
The Western Salt Co., Ltd., Courtright, Ont.
The Western Salt Co., Ltd., (Mooretown Branch), Courtright, Ont.
Exeter Salt Works Co., Exeter, Ont.
Western Canada Flour Mills Co., Ltd., Goderich, Ont.
The Elarton Salt Works, Co., Ltd., Hyde Park Corner, Ont.
Ontario People's Salt and Soda Co., Ltd., Kincardine, Ont.
Parkhill Salt Co., Parkhill, Ont.
Jas. H. Kittermaster, 175 Christie St. S., Sarnia, Ont.
Dominion Salt Co., Ltd., Sarnia, Ont.
The Canadian Salt Co., Ltd., 147 Victoria Ave., Windsor, Ont.
The Canadian Salt Co., Ltd. (Sandwich Branch), 147 Victoria Ave., Windsor, Ont
Grey, Young and Sparling Co., of Ont., Ltd., Wingham, Ont.
Stewart and Mobley, Prince Rupert, B. C. (developing).

Talc:—

Eldorite, Limited, Eldorado, Ont.
Messrs. Cross and Wellington, Madoc, Ont.

INDEX

A

B

C

D

E

F

G

H

I

K

L

M

N

O

P

Q

R

S

T

CANADA

DEPARTMENT OF MINES

HON. LOUIS CODERRE, MINISTER; R. W. BROCK, DEPUTY MINISTER.

MINES BRANCH

EUGÈNE HAANEL, PH. D., DIRECTOR.

REPORTS AND MAPS

PUBLISHED BY THE

MINES BRANCH

REPORTS.

1. Mining Conditions in the Klondike, Yukon. Report on—by Eugène Haanel, Ph. D., 1902.

†2. Great Landslide at Frank, Alta. Report on—by R. G. McConnell, B.A., and R. W. Brock, M.A., 1903.

†3. Investigation of the different electro-thermic processes for the smelting of iron ores, and the making of steel, in operation in Europe. Report of Special Commission—by Eugene Haanel, Ph.D., 1904.

†4. Rapport de la Commission nommée pour étudier les divers procédés électro-thermiques pour la réduction des minerais de fer et la fabrication de l'acier employés en Europe—by Eugene Haanel, Ph.D. (French Edition), 1905.

5. On the location and examination of magnetic ore deposits by magnetometric measurements—by Eugene Haanel, Ph.D., 1904.

†7. Limestones and the Lime Industry of Manitoba. Preliminary Report on—by J. W. Wells, M.A., 1905.

†8. Clays and Shales of Manitoba: Their Industrial Value. Preliminary Report on—by J. W. Wells, M.A., 1905.

†9. Hydraulic Cements (Raw Materials) in Manitoba: Manufacture and Uses of. Preliminary Report on—by J. W. Wells, M.A., 1905.

---

†Publications marked thus † are out of print.

†10. Mica: Its Occurrence, Exploitation, and Uses—by Fritz Cirkel, M.E., 1905. (See No. 118.)

†11. Asbestos: Its Occurrence, Exploitation, and Uses—by Fritz Cirkel, M.E., 1905. (See No. 69.)

†12. Zinc Resources of British Columbia, and the Conditions affecting their Exploitation. Report of the Commission appointed to investigate—by W. R. Ingalls, M.E., 1905.

†16. *Experiments made at Sault Ste. Marie, under Government auspices, in the smelting of Canadian iron ores by the electro-thermic process. Final Report on—by Eugene Haanel, Ph.D., 1907.

†17. Mines of the Silver-Cobalt Ores of the Cobalt district: Their Present and Prospective Output. Report on—by Eugene Haanel, Ph.D., 1907.

†18. Graphite: Its Properties, Occurrence, Refining, and Uses—by Fritz Cirkel, M.E., 1907.

†19. Peat and Lignite: Their Manufacture and Uses in Europe—by Erik Nystrom, M.E., 1908.

†20. Iron Ore Deposits of Nova Scotia. Report on (Part 1)—by J. E. Woodman, D.Sc.

†21. Summary Report of Mines Branch, 1907-8.

22. Iron Ore Deposits of Thunder Bay and Rainy River districts. Report on—by F. Hille, M.E.

†23. Iron Ore Deposits along the Ottawa (Quebec side), and Gatineau rivers. Report on—by Fritz Cirkel, M.E.

24. General Report on the Mining and Metallurgical Industries of Canada, 1907-8.

25. The Tungsten Ores of Canada. Report on—by T. L. Walker, Ph.D.

26. The Mineral Production of Canada, 1906. Annual Report on—by John McLeish, B.A.

26a. French Translation: The Mineral Production of Canada, 1906. Annual Report on—by John McLeish, B.A.

---

*A few copies of the Preliminary Report 1906, are still available.
†Publications marked thus † are out of print.

27. The Mineral Production of Canada, 1907. Preliminary Report on—by John McLeish, B.A.

†27a. The Mineral Production of Canada, 1908. Preliminary Report on—by John McLeish, B.A.

†28. Summary Report of Mines Branch, 1908.

†28a. French translation: Summary Report of Mines Branch, 1908.

29. Chrome Iron Ore Deposits of the Eastern Townships. Monograph on—by Fritz Cirkel, M.E. (Supplementary Section: Experiments with Chromite at McGill University—by J. B. Porter, E.M., D.Sc.

30. Investigation of the Peat Bogs and Peat Fuel Industry of Canada, 1908. Bulletin No. 1—by Erik Nystrom, M.E., and A. Anrep, Peat Expert.

32. Investigation of Electric Shaft Furnace, Sweden. Report on—by Eugene Haanel, Ph.D.

47. Iron Ore Deposits of Vancouver and Texada Islands. Report on—by Einar Lindeman, M.E.

†55. Report on the Bituminous, or Oil-shales of New Brunswick and Nova Scotia; also on the Oil-shale industry of Scotland—by R. W. Ells, LL.D.

56. French translation: Bituminous or Oil-shales of New Brunswick and Nova Scotia: also on the Oil-shale Industry of Scotland. Report on—by R. W. Ells, LL.D.

58. The Mineral Production of Canada, 1907 and 1908. Annual Report on —by John McLeish, B.A.

NOTE.—*The following parts were separately printed and issued in advance of the Annual Report for 1907-8:—*

†31. Production of Cement in Canada, 1908.
42. Production of Iron and Steel in Canada during the Calendar Years 1907 and 1908.
43. Production of Chromite in Canada during the Calendar Years 1907 and 1908.

†Publications marked thus † are out of print.

44. Production of Asbestos in Canada during the Calendar Years 1907 and 1908.

†45. Production of Coal, Coke, and Peat in Canada during the Calendar Years 1907 and 1908.

46. Production of Natural Gas and Petroleum in Canada during the Calendar Years 1907 and 1908.

59. Chemical Analyses of Special Economic Importance made in the Laboratories of the Department of Mines, 1906-7-8. Report on—by F. G. Wait, M.A., F.C.S. (With Appendix on the Commercial Methods and Apparatus for the Analyses of Oil Shales—by H. A. Leverin, Ch. E.)

Schedule of Charges for Chemical Analyses and Assays.

†62. Mineral Production of Canada, 1909. Preliminary Report on—by John McLeish, B.A.

63. Summary Report of Mines Branch, 1909.

67. Iron Ore Deposits of the Bristol Mine, Pontiac county, Quebec. Bulletin No. 2—by Einar Lindeman, M.E., and Geo. C. Mackenzie, B.Sc.

†68. Recent Advance in the Construction of Electric Furnaces for the Production of Pig Iron, Steel, and Zinc. Bulletin No. 3—by Eugene Haanel, Ph.D.

69. Chrysotile-Asbestos: Its Occurrence, Exploitation, Milling, and Uses. Reports on—by Fritz Cirkel, M.E. (Second Edition, enlarged.)

†71. Investigation of the Peat Bogs and Peat Industry of Canada, 1909-10; to which is appended Mr. Alf. Larson's Paper on Dr. M. Ekenberg's Wet-Carbonizing Process; from Teknisk Tidskrift, No. 12, December 26, 1908—translation by Mr. A. v. Anrep, Jr.; also a translation of Lieut. Ekelund's Pamphlet entitled 'A Solution of the Peat Problem', 1909, describing the Ekelund Process for the Manufacture of Peat Powder, by Harold A. Leverin, Ch. E. Bulletin No. 4—by A. v. Anrep (Second Edition, enlarged.)

81. French Translation: Chrysotile-Asbestos: Its Occurrence, Exploitation, Milling, and Uses. Report on—by Fritz Cirkel, M.E.

82. Magnetic Concentration Experiments. Bulletin No. 5—by Geo. C. Mackenzie, B.Sc.

---

†Publications marked thus † are out of print.

83. An investigation of the Coals of Canada with reference to their Economic Qualities as conducted at McGill University under the authority of the Dominion Government. Report on—by J. B. Porter, E. M., D.Sc., R. J. Durley, Ma.E., and others—
    Vol. I—Coal Washing and Coking Tests.
    Vol. II—Boiler and Gas Producer Tests.
    Vol. III—
      Appendix I
        Coal Washing Tests and Diagrams.
    Vol. IV—
      Appendix II
        Boiler Tests and Diagrams.
    Vol. V—
      Appendix III
        Producer Tests and Diagrams.
    Vol. VI—
      Appendix IV
        Coking Tests.
      Appendix V
        Chemical Tests.

†84. Gypsum Deposits of the Maritime Provinces of Canada—including the Magdalen Islands. Report on—by W. F. Jennison, M.E. (See No. 245.)

88. The Mineral Production of Canada, 1909. Annual Report on—by John McLeish, B.A.

NOTE.—*The following parts were separately printed and issued in advance of the Annual Report for 1909.*

†79. Production of Iron and Steel in Canada during the Calendar Year, 1909.

†80. Production of Coal and Coke in Canada during the Calendar Year, 1909.

85. Production of Cement, Lime, Clay Products, Stone, and other Structural Materials during the Calendar Year, 1909.

89. Reprint of Presidential address delivered before the American Peat Society at Ottawa, July 25, 1910. By Eugene Haanel, Ph.D.

90. Proceedings of Conference on Explosives.

92. Investigation of the Explosives Industry in the Dominion of Canada, 1910. Report on—by Capt. Arthur Desborough. (Second Edition.)

†Publications marked thus † are out of print.

93. Molybdenum Ores of Canada. Report on—by Professor T. L. Walker, Ph. D.

100. The Building and Ornamental Stones of Canada. Report on—by Professor W. A. Parks, Ph. D.

100a. French Translation: The Building and Ornamental Stones of Canada. Report on—by W. A. Parks.

102. Mineral Production of Canada, 1910. Preliminary Report on—by John McLeish, B.A.

†103. Summary Report of Mines Branch, 1910.

104. Catalogue of Publications of Mines Branch, from 1902 to 1911; containing Tables of Contents and list of Maps, etc.

105. Austin Brook Iron-bearing district, Report on—by E. Lindeman, M.E.

110. Western Portion of Torbrook Iron Ore Deposits, Annapolis county, N.S. Bulletin No. 7—by Howells Fréchette, M.Sc.

111. Diamond Drilling at Point Mamainse, Ont. Bulletin No. 6—by A. C. Lane, Ph.D., with Introductory by A. W. G. Wilson. Ph.D.

118. Mica: Its Occurrence, Exploitation, and Uses. Report on—by Hugh S. de Schmid, M.E.

142. Summary Report of Mines Branch, 1911.

143. The Mineral Production of Canada, 1910. Annual Report on—by John McLeish, B.A.

NOTE.—*The following parts were separately printed and issued in advance of the Annual Report for 1910.*

†114. Production of Cement, Lime, Clay Products, Stone and other Structural Materials in Canada, 1910.

†115. Production of Iron and Steel in Canada during the Calendar Year 1910.

†116. Production of Coal and Coke in Canada during the Calendar Year 1910.

†Publications marked thus † are out of print.

†Publications marked thus † are out of print.

196. French translation: Investigation of the Peat Bogs and Peat Industry of Canada, 1909-10; to which is appended Mr. Alf. Larson's paper on Dr. Ekenburg's Wet Carbonizing Process: from Teknisk Tidskrift, No. 12, December 26, 1908—translation by Mr. A. v. Anrep; also translation of Lieut. Ekelund's Pamphlet entitled "A solution of the Peat Problem," 1909, describing the Ekelund Process for the Manufacture of Peat Powder, by Harold A. Leverin, Ch.E. Bulletin No. 4—by A. v. Anrep, Peat Expert. (Second Edition, enlarged.)

197. French translation: Molybdenum Ores of Canada. Report on—by Professor T. L. Walker, Ph.D.

198. French translation: Peat and Lignite: Their Manufacture and Uses in Europe—by Erik Nystrom, M.E., 1908.

201. The Mineral Production of Canada during the Calendar Year 1911. Annual Report on—by John McLeish, B.A.

NOTE.—*The following parts were separately printed and issued in advance of the Annual Report for 1911.*

181. Production of Cement, Lime, Clay Products, Stone, and other Structural Materials in Canada during the Calendar Year 1911. Bulletin on—by John McLeish, B.A.

†182. Production of Iron and Steel in Canada during the Calendar Year 1911. Bulletin on—by John McLeish, B.A.

183. General Summary of the Mineral Production in Canada during the Calendar Year 1911. Bulletin on—by John McLeish, B.A.

†199. Production of Copper, Gold, Lead, Nickel, Silver, Zinc, and other Metals of Canada, during the Calendar Year 1911. Bulletin on—by C. T. Cartwright, B.Sc.

†200. The Production of Coal and Coke in Canada during the Calendar Year 1911. Bulletin on—by John McLeish, B.A.

202. French translation: Graphite: Its Properties, Occurrence, Refining, and Uses—by Fritz Cirkel, M.E., 1907.

203. Building Stones of Canada—Vol. II: Building and Ornamental Stones of the Maritime Provinces. Report on—by Professor W. A. Parks, Ph.D.

209. The Copper Smelting Industry of Canada. Report on—by A. W. G. Wilson, Ph.D.

---

†Publications marked thus † are out of print.

216. Mineral Production of Canada, 1912. Preliminary Report on—by John McLeish, B.A.

219. French translation: Austin Brook Iron-bearing district. Report on—by E. Lindeman, M.E.

222. Lode Mining in Yukon: An investigation of the Quartz Deposits of the Klondike Division. Report on—by T. A. MacLean, B.Sc.

224. Summary Report of the Mines Branch, 1912.

226. French translation: Chrome Iron Ore Deposits of the Eastern Townships. Monograph on—by Fritz Cirkel, M.E. (Supplementary Section: Experiments with Chromite at McGill University—by Professor J. B. Porter, E.M., D.Sc.)

227. Sections of the Sydney Coal Field—by J. G. S. Hudson.

†229. Summary Report of the Petroleum and Natural Gas Resources of Canada, 1912—by F. G. Clapp, A.M. See. No. 224.)

230. Economic Minerals and the Mining Industries of Canada.

231. French translation: Economic Minerals and the Mining Industries of Canada.

233. French translation: Gypsum Deposits of the Maritime Provinces of Canada—including the Magdalen Islands. Report on—by W. F. Jennison, M.E.

245. Gypsum in Canada: Its Occurrence, Exploitation, and Technology. Report on—by L. H. Cole, B.Sc.

254. Calabogie Iron-Bearing District. Report on—by E. Lindeman, M.E.

259. Preparation of Metallic Cobalt by Reduction of the Oxide. Report on —by Professor H. T. Kalmus, B.Sc., Ph.D.

262. The Mineral Production of Canada during the Calendar Year 1912. Annual Report on—by John McLeish, B.A.

NOTE.—*The following parts were separately printed and issued in advance of the Annual Report for 1912.*

238. General Summary of the Mineral Production of Canada, during the Calendar Year 1912. Bulletin on—by John McLeish, B.A.

†247. Production of Iron and Steel in Canada during the Calendar Year 1912. Bulletin on—by John McLeish, B.A.

†Publications marked thus † are out of print.

†256. Production of Copper, Gold, Lead Nickel, Silver, Zinc, and other Metals of Canada, during the Calendar Year 1912 —by C. T. Cartwright, B.Sc.

257. Production of Cement, Clay Products, stone, and other Structural Materials during the Calendar Year 1912. Report on—by John McLeish, B.A.

†258. Production of Coal and Coke in Canada, during the Calendar Year 1912. Bulletin on—by John McLeish, B.A.

263. French translation: Recent Advances in the Construction of Electric Furnaces for the Production of Pig Iron, Steel, and Zinc. Bulletin No. 3—by Eugene Haanel, Ph.D.

264. French translation: Mica: Its Occurrence, Exploitation, and Uses. Report on—by Hugh S. de Schmid, M.E.

265. French translation: Annual Mineral Production of Canada, 1911. Report on—by John McLeish, B.A.

266. Investigation of the Peat Bogs and Peat Industry of Canada, 1911 and 1912. Bulletin No. 9—by A. v. Anrep, Peat Expert.

279. Building and Ornamental Stones of Canada—Vol. III. Report on—by Professor W. A. Parks, Ph.D.

281. The Bituminous Sands of Northern Alberta. Report on—by S. C. Ells, M.E.

283. Mineral Production of Canada, 1913. Preliminary report on—by J. McLeish, B.A.

288. French translation: Production of Coal and Coke in Canada during the Calendar Year 1912. Bulletin on—by John McLeish, B.A.

290. French translation: Production of Copper, Gold, Lead, Nickel, Silver, Zinc, and Other Metals of Canada, during the Calendar Year 1912. Bulletin on—by C. T. Cartwright, B.Sc.

299. Peat, Lignite, and Coal: Their Value as Fuels for the Production of Gas and Power in the By-product Recovery Producer. Report on —by B. F. Haanel, B.Sc.

303. Moose Mountain Iron-Bearing District. Report on—by E. Lindeman, M.E.

305. Non-metallic minerals used in the Canadian Manufacturing Industries. Report on—by H. Frechette, M.Sc.

†Publications marked thus † are out of print.

309. The Physical Properties of the Metal Cobalt, Part II. Report on—by H. T. Kalmus, B.Sc., Ph.D.

315. The Production of Iron and Steel during the Calendar Year 1913. Bulletin on—by John McLeish, B.A.

316. The Production of Coal and Coke during the Calendar Year 1913. Bulletin on—by John McLeish, B.A.

317. The Production of Copper, Gold, Lead, Nickel, Silver, Zinc, and other Metals, during the Calendar Year 1913. Bulletin on—by C. T. Cartwright, B.Sc.

318. The Production of Cement, Lime, Clay Products, Stone, and other Structural Materials in Canada, during the Calendar Year, 1913. By J. McLeish, B.A.

319. A General Summary of the Mineral Production in Canada during the Calendar Year 1913. Bulletin on—by J. McLeish, B.A.

322. Economic Minerals and Mining Industries of Canada. (Revised Edition, for Panama-Pacific Exposition.)

NOTE.—*The Division of Mineral Resources and Statistics has prepared the following lists of mine, smelter, and quarry operators: Metal mines and smelters, Coal mines, Stone quarry operators, Manufacturers of clay products and Manufacturers of lime; copies of the lists may be obtained on application.*

IN THE PRESS.

179. French translation: The Nickel Industry: with Special Reference to the Sudbury region. Report on—by Prof. A. P. Coleman, Ph.D.

204. French translation: Building Stones of Canada—Vol. II: Building and Ornamental Stones of the Maritime Provinces. Report on—by W. A. Parks, Ph.D.

285. Summary Report of Mines Branch, 1913.

287. French translation: Production of Iron and Steel in Canada during the Calendar Year 1912. Bulletin on—by John McLeish, B.A.

289. French translation: Production of Cement, Lime, Clay Products, Stone, and Other Structural Materials during the Calendar Year 1912. Bulletin on—by John McLeish, B.A.

291. Petroleum and Natural Gas Resources of Canada. Report on—by F. G. Clapp, A.M., and others.

308. French translation: An investigation of the Coals of Canada with reference to their Economic Qualities: as conducted at McGill University under the authority of the Dominion Government. Report on—by J. B. Porter, E.M., D.Sc., R. J. Durley, Ma.E., and others

Vol. I—Coal Washing and Coking Tests.
Vol. II—Boiler and Gas Producer Tests.
Vol. III—
Appendix I
Coal Washing Tests and Diagrams.
Vol. IV—
Appendix II
Boiler Tests and Diagrams.

314. French translation: Iron Ore Deposits, Bristol Mine, Pontiac county, Quebec. Report on—by E. Lindeman, M.E.

320. The Mineral Production of Canada, 1913. Annual Report on—by John McLeish, B.A.

MAPS.

†6. Magnetometric Survey, Vertical Intensity: Calabogie Mine, Bagot township, Renfrew county, Ontario—by E. Nystrom, 1904. Scale 60 feet to 1 inch. Summary report, 1905. (See Map No. 249.)

†13. Magnetometric Survey of the Belmont Iron Mines, Belmont township, Peterborough county, Ontario—by B. F. Haanel, 1905. Scale 60 feet to 1 inch. Summary report, 1905. (See Map. No. 186).

†14. Magnetometric Survey of the Wilbur Mine, Lavant township, Lanark county, Ontario—by B. F. Haanel, 1905. Scale 60 feet to 1 inch. Summary report, 1905.

†33. Magnetometric Survey, Vertical Intensity: Lot 1, Concession VI, Mayo township, Hastings county, Ontario—by Howells Fréchette, 1909. Scale 60 feet to 1 inch.

†34. Magnetometric Survey, Vertical Intensity: Lots 2 and 3, Concession VI, Mayo township, Hastings county, Ontario—by Howells Fréchette, 1909. Scale 60 feet to 1 inch.

NOTE.—1. Maps marked thus * are to be found only in reports.
2. Maps marked thus † have been printed independently of reports, hence can be procured separately by applicants.

†35. Magnetometric Survey, Vertical Intensity: Lots 10, 11, and 12, Concession IX, and Lots 11 and 12, Concession VIII, Mayo township, Hastings county, Ontario—by Howells Fréchette, 1909. Scale 60 feet to 1 inch.

*36. Survey of Mer Bleue Peat Bog, Gloucester township, Carleton county, and Cumberland township, Russell county, Ontario—by Erik Nystrom, and A. v. Anrep. (Accompanying report No. 30.)

*37. Survey of Alfred Peat Bog, Alfred and Caledonia townships, Prescott county, Ontario—by Erik Nystrom, and A. v. Anrep. (Accompanying report No. 30.)

*38. Survey of Welland Peat Bog, Wainfleet and Humberstone townships, Welland county, Ontario—by Erik Nystrom and A. v. Anrep. (Accompanying report No. 30.)

*39. Survey of Newington Peat Bog, Osnabruck, Roxborough, and Cornwall townships, Stormont county, Ontario—by Erik Nystrom and A. v. Anrep. (Accompanying report No. 30.)

*40. Survey of Perth Peat Bog, Drummond township, Lanark county, Ontario—by Erik Nystrom and A. v. Anrep. (Accompanying report No. 30.)

*41. Survey of Victoria Road Peat Bog, Bexley and Carden townships, Victoria county, Ontario—by Erik Nystrom and A. v. Anrep. (Accompanying report No. 30.)

*48. Magnetometric Survey of Iron Crown claim at Nimpkish (Klaanch) river, Vancouver island, B.C.—by E. Lindeman. Scale 60 feet to 1 inch. (Accompanying report No. 47.)

*49. Magnetometric Survey of Western Steel Iron claim, at Sechart, Vancouver Island, B.C.—by E. Lindeman. Scale 60 feet to 1 inch. (Accompanying report No. 47.)

*53. Iron Ore Occurrences, Ottawa and Pontiac counties, Quebec, 1908—by J. White and Fritz Cirkel. (Accompanying report No. 23.)

*54. Iron Ore Occurrences, Argenteuil county, Quebec, 1908—by Fritz Cirkel. (Accompanying report No. 23.) Out of print.

*57. The Productive Chrome Iron Ore District of Quebec—by Fritz Cirkel. (Accompanying report No. 29.)

NOTE.—1. Maps marked thus * are to be found only in reports.
2. Maps marked thus † have been printed independently of reports, hence can be procured separately by applicants.

†60. Magnetometric Survey of the Bristol Mine, Pontiac county, Quebec—by E. Lindeman. Scale 200 feet to 1 inch. (Accompanying report No. 67.)

†61. Topographical Map of Bristol Mine, Pontiac county, Quebec—by E. Lindeman. Scale 200 feet to 1 inch. (Accompanying report No. 67.)

†64. Index Map of Nova Scotia: Gypsum—by W. F. Jennison.
†65. Index Map of New Brunswick: Gypsum—by W. F. Jennison
†66. Map of Magdalen Islands: Gypsum—by W. F. Jennison.
(Accompanying report No. 84)

†70. Magnetometric Survey of Northeast Arm Iron Range, Lake Timagami, Nipissing district, Ontario—by E. Lindeman. Scale 200 feet = 1 inch. (Accompanying report No. 63.)

†72. Brunner Peat Bog, Ontario—by A. v. Anrep.
†73. Komoka Peat Bog, Ontario—by A. v. Anrep.
(Accompanying report No 71)
74. Brockville Peat Bog, Ontario—by A. v. Anrep.
75. Rondeau Peat Bog, Ontario—by A. v. Anrep.
Out of print.
†76. Alfred Peat Bog, Ontario—by A. v. Anrep.
†77. Alfred Peat Bog, Ontario: Main Ditch profile—by A. v. Anrep.

†78. Map of Asbestos Region, Province of Quebec, 1910—by Fritz Cirkel. Scale 1 mile to 1 inch. (Accompanying report No. 69.)

†94. Map showing Cobalt, Gowganda, Shiningtree, and Porcupine districts —by L. H. Cole. (Accompanying Summary report, 1910.)

†95. General Map of Canada, showing Coal Fields. (Accompanying report No. 83—by Dr. J. B. Porter.)

†96. General Map of Coal Fields of Nova Scotia and New Brunswick. (Accompanying report No. 83—by Dr. J. B. Porter.)

†97. General Map showing Coal Fields in Alberta, Saskatchewan, and Manitoba. (Accompanying report No. 83—by Dr. J. B. Porter.)

NOTE.—1. Maps marked thus * are to be found only in reports.
2. Maps marked thus † have been printed independently of reports, hence can be procured separately by applicants.

†98. General Map of Coal Fields in British Columbia. (Accompanying report No. 83—by Dr. J. B. Porter.)

†99. General Map of Coal Field in Yukon Territory. (Accompanying report No. 83—by Dr. J. B. Porter.)

†106. Geological Map of Austin Brook Iron Bearing district, Bathurst township, Gloucester county, N.B.—by E. Lindeman. Scale 400 feet to 1 inch. (Accompanying report No. 105.)

†107. Magnetometric Survey, Vertical Intensity: Austin Brook Iron Bearing District—by E. Lindeman. Scale 400 feet to 1 inch. (Accompanying report No. 105.)

†108. Index Map showing Iron Bearing Area at Austin Brook—by E. Lindeman. (Accompanying report No. 105.)

*112. Sketch plan showing Geology of Point Mamainse, Ont.—by Professor A. C. Lane. Scale, 4,000 feet to 1 inch. (Accompanying report No. 111.)

†113. Holland Peat Bog, Ontario—by A. v. Anrep. (Accompanying report No. 151.)

*119–137. Mica: Township maps, Ontario and Quebec—by Hugh S. de Schmid. (Accompanying report No. 118.)

†138. Mica: Showing Location of Principal Mines and Occurrences in the Quebec Mica Area—by Hugh S. de Schmid. Scale 3.95 miles to 1 inch. (Accompanying report No. 118.)

†139. Mica: Showing Location of Principal Mines and Occurrences in the Ontario Mica Area—by Hugh S. de Schmid. Scale 3.95 miles to 1 inch. (Accompanying report No. 118.)

†140. Mica: Showing Distribution of the Principal Mica Occurrences in the Dominion of Canada—by Hugh S. de Schmid. Scale 3.95 miles to 1 inch. (Accompanying report No. 118.)

†141. Torbrook Iron Bearing District, Annapolis county, N.S.—by Howells Fréchette. Scale 400 feet to 1 inch. (Accompanying report No. 110.)

†146. Distribution of Iron Ore Sands of the Iron Ore Deposits on the North Shore of the River and Gulf of St. Lawrence, Canada—by Geo. C. Mackenzie. Scale 100 miles to 1 inch. (Accompanying report No. 145.)

NOTE.—1. Maps marked thus * are to be found only in reports.
2. Maps marked thus † have been printed independently of reports, hence can be procured separately by applicants.

†147. Magnetic Iron Sand Deposits in relation to Natashkwan harbour and Great Natashkwan river, Que. (Index Map)—by Geo. C. Mackenzie. Scale 40 chains to 1 inch. (Accompanying report No. 145.)

†148. Natashkwan Magnetic Iron Sand Deposits, Saguenay county, Que.—by Geo. C. Mackenzie. Scale 1,000 feet to 1 inch. (Accompanying report No. 145.)

†152. Map showing the Location of Peat Bogs investigated in Ontario—by A. v. Anrep.

†153. Map Showing the Location of Peat Bogs investigated in Manitoba—by A. v. Anrep.

†157. Lac du Bonnet Peat Bog, Manitoba—by A. v. Anrep.

†158. Transmission Peat Bog, Manitoba—by A. v. Anrep.

†159. Corduroy Peat Bog, Manitoba—by A. v. Anrep.

†160. Boggy Creek Peat Bog, Manitoba—by A. v. Anrep.

†161. Rice Lake Peat Bog, Manitoba—by A. v. Anrep.

†162. Mud Lake Peat Bog, Manitoba—by A. v. Anrep.

†163. Litter Peat Bog, Manitoba—by A. v. Anrep.

(Accompanying report No. 151)

†164. Julius Peat Litter Bog, Manitoba—by A. v. Anrep.

†165. Fort Francis Peat Bog, Ontario—by A. v. Anrep.

(Accompanying report No. 151.)

*166. Magnetometric Map of Mine No. 3, Lot 7, Concessions V and VI McKim township, Sudbury district, Ont.—by E. Lindeman. (Accompanying Summary Report, 1911.)

†168. Map showing Pyrites Mines and Prospects in Eastern Canada, and their relation to the United States Market—by A. W. G. Wilson. Scale 125 miles to 1 inch. (Accompanying report No. 167.)

†171. Geological Map of Sudbury Nickel region, Ont.—by Prof. A. P. Coleman. Scale 1 mile to 1 inch. (Accompanying report No. 170.)

NOTE.—1. Maps marked thus * are to be found only in reports.
2. Maps marked thus † have been printed independently of reports, hence can be procured separately by applicants.

†172. Geological Map of Victoria mine—by Prof. A. P. Coleman.

†173. Geological Map of Crean Hill mine—by Prof. A. P. Coleman. } (Accompanying report No. 170.)

†174. Geological Map of Creighton mine—by Prof. A. P. Coleman.

†175. Geological Map showing contact of Norite and Laurentian in vicinity of Creighton mine—by Prof. A. P. Coleman. (Accompanying report No. 170.)

†176. " " of Copper Cliff offset—by Prof. A. P. Coleman. (Accompanying report No. 170.)

†177. " " No. 3 Mine—by Prof. A. P. Coleman. (Accompanying report No. 170.)

†178. " " showing vicinity of Stobie and No. 3 mines—by Prof. A. P. Coleman. (Accompanying report No. 170.)

†185. Magnetometric Survey, Vertical Intensity: Blairton iron mine, Belmont township, Peterborough county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 184.)

†185a. Geological Map, Blairton iron mine, Belmont township, Peterborough county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 184.)

†186. Magnetometric Survey, Belmont iron mine, Belmont township, Peterborough county, Ont.—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 184.)

†186a. Geological Map, Belmont iron mine, Belmont township, Peterborough county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 184.)

†187. Magnetometric Survey, Vertical Intensity: St. Charles mine, Tudor township, Hastings county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 184.)

†187a. Geological Map, St. Charles mine, Tudor township, Hastings county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 184.)

NOTE.—1. Maps marked thus * are to be found only in reports.
2. Maps marked thus † have been printed independently of reports, hence can be procured separately by applicants.

†188. Magnetometric Survey, Vertical Intensity: Baker mine, Tudor township, Hastings county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 184.)

†188a. Geological Map, Baker mine, Tudor township, Hastings county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 184.)

†189. Magnetometric Survey, Vertical Intensity: Ridge iron ore deposits, Wollaston township, Hastings county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 184.)

†190. Magnetometric Survey, Vertical Intensity: Coehill and Jenkins mines, Wollaston township, Hastings county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 184.)

†190a. Geological Map, Coehill and Jenkins mines, Wollaston township, Hastings county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 184).

†191. Magnetometric Survey, Vertical Intensity: Bessemer iron ore deposits, Mayo township, Hastings county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 184.)

†191a. Geological Map, Bessemer iron ore deposits, Mayo township, Hastings county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 184.)

†192. Magnetometric Survey, Vertical Intensity: Rankin, Childs, and Stevens mines, Mayo township, Hastings county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 184.)

†192a. Geological Map, Rankin, Childs, and Stevens mines, Mayo township, Hastings county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 184.)

†193. Magnetometric Survey, Vertical Intensity: Kennedy property, Carlow township, Hastings county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 184.)

†193a. Geological Map, Kennedy property, Carlow township, Hastings county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 184.)

NOTE.—1. Maps marked thus * are to be found only in reports.
2. Maps marked thus † have been printed independently of reports, hence can be procured separately by applicants.

†194. Magnetometric Survey, Vertical Intensity: Bow Lake iron ore occurrences, Faraday township. Hastings county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 184.)

†204. Index Map, Magnetic occurrences along the Central Ontario Railway —by E. Lindeman, 1911. (Accompanying report No. 184.)

†205. Magnetometric Map, Moose Mountain iron-bearing district, Sudbury district, Ontario: Deposits Nos. 1, 2, 3, 4, 5, 6, and 7—by E. Lindeman, 1911. (Accompanying report No. 303.)

†205a. Geological Map, Moose Mountain iron-bearing district, Sudbury district, Ontario. Deposits Nos. 1, 2, 3, 4, 5, 6, and 7—by E. Lindeman. (Accompanying report No. 303.)

†206. Magnetometric Survey of Moose Mountain iron-bearing district, Sudbury district, Ontario: Northern part of Deposit No. 2—by E. Lindeman, 1912. Scale 200 feet to 1 inch. (Accompanying report No. 303.)

†207. Magnetometric Survey of Moose Mountain iron-bearing district, Sudbury district, Ontario: Deposits Nos. 8, 9, and 9A—by E. Lindeman, 1912. Scale 200 feet to 1 inch. (Accompanying report No. 303.)

†208. Magnetometric Survey of Moose Mountain iron-bearing district, Sudbury district, Ontario: Deposit No. 10—by E. Lindeman, 1912. Scale 200 feet to 1 inch. (Accompanying report No. 303.)

†208a. Magnetometric Survey, Moose Mountain iron-bearing district, Sudbury district, Ontario: Eastern portion of Deposit No. 11—by E. Lindeman, 1912. Scale 200 feet to 1 inch. (Accompanying report No. 303.)

†208b. Magnetometric Survey, Moose Mountain iron-bearing district, Sudbury district, Ontario: Western portion of Deposit No. 11—by E. Lindeman, 1912. Scale 200 feet to 1 inch. (Accompanying report No. 303.)

†208c. General Geological Map, Moose Mountain iron-bearing district, Sudbury district, Ontario—by E. Lindeman, 1912. Scale, 800 feet to 1 inch. (Accompanying report No. 303.)

†210. Location of Copper Smelters in Canada—by A. W. G. Wilson. Scale 197·3 miles to 1 inch. (Accompanying report No. 209.)

NOTE.—1. Maps marked thus * are to be found only in reports.
2. Maps marked thus † have been printed independently of reports, hence can be procured separately by applicants.

†215. Province of Alberta: Showing properties from which samples of coal were taken for gas producer tests, Fuel Testing Division, Ottawa. (Accompanying Summary Report 1912.)

†220. Mining Districts, Yukon. Scale 35 miles to 1 inch—by T. A. MacLean. (Accompanying report No. 222.)

†221. Dawson Mining District, Yukon. Scale 2 miles to 1 inch—by T. A. MacLean. (Accompanying report No. 222.)

*228. Index Map of the Sydney Coal Field, Cape Breton, N.S. (Accompanying report No. 227.)

†232. Mineral Map of Canada. Scale 100 miles to 1 inch. (Accompanying report No. 230.)

†239. Index Map of Canada, showing gypsum occurrences. (Accompanying report No. 245.)

†240. Map showing Lower Carboniferous formation in which gypsum occurs. Scale 100 miles to 1 inch. (Accompanying report No. 245.)

†241. Map showing relation of gypsum deposits in Northern Ontario to railway lines. Scale 100 miles to 1 inch. (Accompanying report No. 245.)

†242. Map, Grand River gypsum deposits, Ontario. Scale 4 miles to 1 inch. (Accompanying report No. 245.)

†243. Plan of Manitoba Gypsum Co.'s properties. (Accompanying report No. 245.)

†244. Map showing relation of gypsum deposits in British Columbia to railway lines and market. Scales 35 miles to 1 inch. (Accompanying report No. 245.

†249. Magnetometric Survey, Caldwell and Campbell mines, Calabogie disc trict, Renfrew county, Ontario—by E. Lindeman, 1911. Sale-200 feet to 1 inch. (Accompanying report No. 254.)

†250. Magnetometric Survey, Black Bay or Williams mine, Calabogie district, Renfrew county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 254.)

NOTE.—1. Maps marked thus * are to be found only in reports.
2. Maps marked thus † have been printed independently of reports, hence can be procured separately by applicants.

†251. Magnetometric Survey, Bluff Point iron mine, Calabogie district, Renfrew county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 254.)

†252. Magnetometric Survey, Culhane mine, Calabogie district, Renfrew county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 254.)

†253. Magnetometric Survey, Martel or Wilson iron mine, Calabogie district, Renfrew county, Ontario—by E. Lindeman, 1911. Scale 200 feet to 1 inch. (Accompanying report No. 254).

†261. Magnetometric Survey, Northeast Arm iron range, Lot 339 E. T. W. Lake Timagami, Nipissing district, Ontario—by E. Nystrom, 1903. Scale 200 feet to 1 inch.

†268. Map of Peat Bogs Investigated in Quebec—by A. v. Anrep, 1912.

†269. Large Tea Field Peat Bog, Quebec " "

†270. Small Tea Field Peat Bog, Quebec " "

†271. Lanorie Peat Bog, Quebec " "

†272. St. Hyacinthe Peat Bog, Quebec " "

†273. Rivière du Loup Peat Bog " "

†274. Cacouna Peat Bog " "

†275. Le Parc Peat Bog, Quebec " "

†276. St. Denis Peat Bog, Quebec " "

†277. Rivière Ouelle Peat Bog, Quebec " "

†278. Moose Mountain Peat Bog, Quebec " "

†284. Map of northern portion of Alberta, showing position of outcrops of bituminous sand. Scale 12½ miles to 1 inch. (Accompanying report No. 281.)

†293. Map of Dominion of Canada, showing the occurrences of oil, gas, and tar sands. Scale 197 miles to 1 inch. (Accompanying report No. 291.)

NOTE.—1. Maps marked thus * are to be found only in reports.
2. Maps marked thus † have been printed independently of reports, hence can be procured separately by applicants.

2†94. Reconnaissance Map of part of Albert and Westmorland counties, New Brunswick. Scale 1 mile to 1 inch. (Accompanying report No. 291.)

†295. Sketch plan of Gaspe oil fields, Quebec, showing location of wells. Scale 2 miles to 1 inch. (Accompanying report No. 291.)

†296. Map showing gas and oil fields and pipe-lines in Southwestern Ontario. Scale 4 miles to 1 inch. (Accompanying report No. 291.)

†297. Geological Map of Alberta, Saskatchewan and Manitoba. Scale 35 miles to 1 inch. (Accompanying report No. 291.)

†298. Map, Geology of the forty-ninth parallel, 0.9864 miles to 1 inch. (Accompanying report No. 291.)

†302. Map showing location of main gas line, Bow Island-Calgary. Scale 12½ miles to 1 inch. (Accompanying report No. 291.)

†311. Magnetometric Map, McPherson mine, Barachois, Cape Breton county, Nova Scotia. Scale 200 feet to 1 inch.

†312. Magnetometric Map, iron ore deposits at Upper Glencoe, Inverness county, Nova Scotia. Scale 200 feet to 1 inch.

†313. Magnetometric Map, iron ore deposits at Grand Mira, Cape Breton county, Nova Scotia. Scale 200 feet to 1 inch.

Address all communications to—

DIRECTOR MINES BRANCH,
DEPARTMENT OF MINES,
SUSSEX STREET, OTTAWA.

NOTE.—1. Maps marked thus * are to be found only in reports.
2. Maps marked thus † have been printed independently of reports, hence can be procured separately by applicants.