CANADIAN MINING JOURNAL

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MINES BRANCH

Recent Publications

Results of forty-one Steaming Tests conducted at the Fuel Testing Station, by John Blizard and E. S. Malloch.

The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.

Building and Ornamental Stones of Canada (British Columbia). Vol. V., by W. A. Parks, Ph.D.

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.

Annual Mineral Production Reports, by J. McLeish, B.A.

The Coal-fields and Coal Industry of Eastern Canada, by F. W. Gray.

The Value of Peat Fuel for the Generation of Steam, by J. Blizard, B.Sc.

Analyses of Canadian Fuels. Parts I to V, by E. Stansfield, M.Sc., and J. H. H. Nicolls, M.Sc.

Graphite, by H. S. Spence.

Summary Report of the Mines Branch, 1918.

The Helium Sources of the British Empire, by D. J. McLennan and others.

The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the development of the general mining industries of Canada:—

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Structural Materials Laboratory.—Experimental work on sands, cements and limes is also undertaken.

Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to **The Director, Mines Branch, Department of Mines, Ottawa.**

GEOLOGICAL SURVEY

Recent Publications

Summary Report. The annual Summary Report of the Geological Survey is now printed in parts. Applicants should therefore, state what particular geologist's report is required, or what subjects they are interested in.

Memoir 105. Amisk-Athapapuskow Lake district, by E. L. Bruce.

Memoir 108. The Mackenzie River basin, by Charles Camsell and Wyatt Malcolm.

Memoir 110. Preliminary report on the economic geology of Hazelton district, British Columbia, by J. J. O'Neill.

Memoir 111. The Silurian geology and faunas of Ontario peninsula and Manitoulin and adjacent islands, by M. Y. Williams.

Memoir 113. Geology and mineral deposits on a part of Amherst township, Quebec, by M. E. Wilson.

Memoir 114. Road material surveys in the city and district of Montreal, Quebec, by Henri Gauthier.

Memoir 115. Geology of Matachewan district, Northern Ontario, by H. C. Cooke.

Memoir 116. Investigations in the gas and oil fields of Alberta, Saskatchewan and Manitoba, by D. B. Dowling, S. E. Slipper and F. H. McLearn.

Memoir 117. Geology and ore deposits of Ainsworth mining camp, British Columbia, by S. J. Schofield.

Museum Bulletin 30. Gabbros of East Sooke and Rocky Point, by H. C. Cooke.

Map 164A. St. John, New Brunswick. Topography.

Map 183A. Harricanaw-Turgeon basin; Abitibi, Timiskaming and Pontiac, Que. Geology.

Map 185A. Sandon (Slocan and Ainsworth Mining Divisions). Topography.

Map 1584. Blairmore, Alberta. Geology.

Map 1691. Buckingham, Hull and Labelle counties, Quebec. Geology.

Map 1705. Thetford-Black Lake area, Quebec. Topography.

Map 1707. New Glasgow, Pictou county, N.S. Topography.

May 1712. Foothills of Southern Alberta, St. Mary river to Highwood river. Geology.

Map 1724. Sheep River, Alberta. Geology.

Map 1726. Athapapuskow Lake region. Geology.

Map 1739. Portions of Bristol, Onslow, McNab, Fitzroy and Torbolton townships, Quebec and Ontario. Geology.

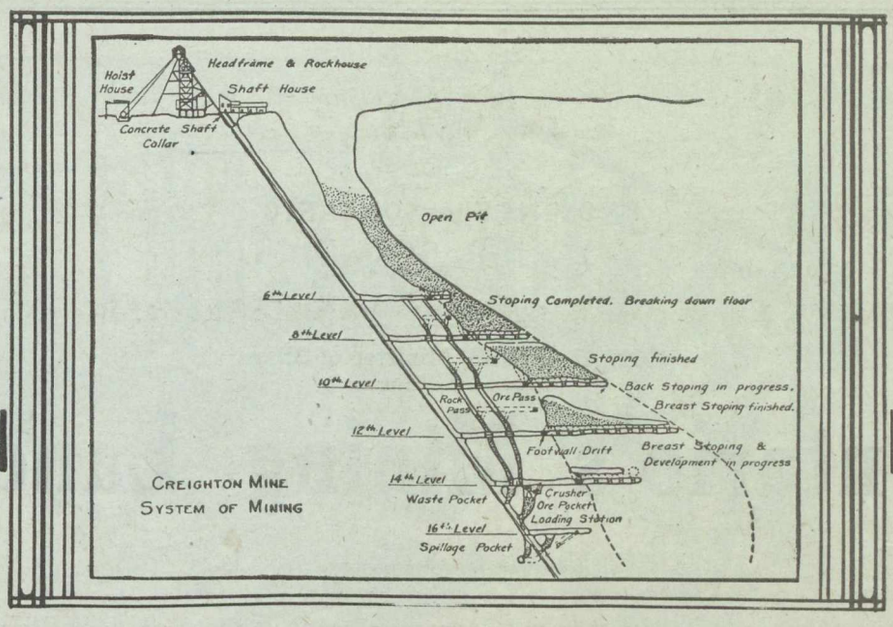
Map 1742. Ainsworth, Kootenay district, B.C. Geology.

Map 1793. Matachewan, Timiskaming district, Ontario. Geology.

Applicants for publications not listed above should mention the precise area concerning which information is desired.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon.

Communications should be addressed to **The Director, Geological Survey, Ottawa.**



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Dividends and bonuses paid to the end of 1918 amounted to $13,359,210 for gold mining companies, and $74,810,521 for silver mining companies, or a total of $88,169,733.

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EDITORIAL

THE NICKEL INDUSTRY.

At the sixth annual meeting of the Mond Nickel Company held in London towards the end of July, Mr. Robert Mond, the Chairman of the Company set forth the Company's position with regard to the excess profits tax imposed on British incorporations, and among other things said :

"I do not think that any of the shareholders realise "how difficult and complicated taxation has be- " come during the war for a business like ours, which " is carried on not only in this country, but also in " Canada. Our profits are subject to taxation in this " country, in the Dominion of Canada, and in the Pro- " vince of Ontario, and as a matter of fact, we have to " deal with the following taxes: Income tax, excess " profits, and now the corporation tax in the United " Kingdom, Dominion Income tax and business pro- " fits war tax in the Dominion of Canada; and mining " tax in the Province of Ontario."

This is a formidable list of taxes, and would suggest that the Mond Nickel Company, at any rate, has undergone very considerable "investigation" if the tax-collectors have run true to form.

It is encouraging to know that the cumulative imposts that large mining companies with international interests have now to face does not discourage the enterprise of those who have the direction of business policies, and it is interesting to note Mr. Mond's announcement of the purchase of the firm of Henry Wiggin & Company of Birmingham, England, the oldest established firm of nickel and nickel-silver manufacturers in that country. This Company owns three works in Birmingham, well equipped with rolling mills, wire-drawing plant, refining plant, and other machinery. The Chairman stated that there was an increase of over half a million dollars in nickel stocks in the Company's possession, and that production had been curtailed owing to lack of outlet. The Company was doing everything possible to increase the industrial uses of nickel by making such goods as sheets, nickel coin, wire, and blanks, the purchase of the Birmingham firm being a part of this policy.

The continued demand for nickel will depend, as has been the experience of asbestos, upon the creation of a variety of uses, and one of the most encouraging signs of the times in regard to the nickel industry is the already long list of new applications of nickel, and metals of the nickel group, to everyday implements that is being daily added to by the enterprise of the nickel companies.

MANUFACTURING IN WESTERN CANADA.

Elsewhere in this issue is an excerpt from the monthly Bulletin of the C. P. R. which deals interestingly with the expansion of manufacturing in the West. A single statement is sufficiently remarkable to attract wide attention, namely that since 1900 the value of the produce of western manufacturies has increased from 34 million dollars to over 400 million dollars, or by twelve times. Astonishing as this rapid growth may seem, it may be very confidently predicted that it is but small compared to that which the near future holds for the West.

The value of the manufactured articles of Canada to that of the value of field crops was in 1919 about as three is to one. Up to the present time the ratio between agriculture and manufactures has in the West been disproportionately in favor of agriculture, and has not conformed to the general average of the country. This has in large measure accounted for the traditional attitude of the west towards protective tariffs in aid of domestic industries. We venture to predict that the time is coming when the ratio of manufactures to agricultural production will be more pronounced in favor of manufactures in the West than in the case of the general Canadian average, for the reason that the West possesses the essentials for manufacturing on a scale that the East does not—and in particular it possesses an abundant supply of that indispensable and destiny-disposing material which is the basis of all manufactures—coal.

The possibility of the presence of oil in the Canadian West is one that properly excites much interest, and some justifiable hopes, but we would point out that in its coalfields the West has a more permanent supply of motor-spirit than can ever be looked for from the unknown sources that produce petroleum.

BRITISH COAL MINERS THREATEN STRIKE AS POLITICAL WEAPON.

The threatend coal strike in Britain, the possibility of which has been before the country since before the appointment of the Sankey Commission, will shortly assume a menacing aspect. It seems certain that the miners have voted for a strike, and it seems if anything more certain that the Cabinet will resist the demands of the miners' leaders, so there is every likelihood that a long-deferred issue is about to be fought out.

The disguise of a demand for higher wages, and the other familiar accompaniments of a labor dispute, has

been attempted in this the latest stage of the campaign for "nationalization" of key industries, but this disguise has recently been virtually discarded, and the real objective of the miners' leaders is admitted—both by those who favor and those who do not favor it—to be political rather than primarily connected with a desire for higher wages and shorter hours of labor.

"Nationalization" is one of those mysterious words that mislead the public while concealing the aims of those who invented the term. It is an example of the nickname in politics, used to gain approval instead of opprobium. It is much to be doubted whether any but a small and selected group of the mine workers understand what nationalization of coal mines means in the interpretation of the miners' leaders. Their objective is to destroy private ownership, of every nature, substituting the apparent ownership of the State, but always with the proviso that the worker shall comprise the State.

As controlling the workers in the most essential industry of a modern state, the industry without which continued existence of such a state is unthinkable and quite impossible, the coal miners accepted, at their international convention at Geneva, the leadership of that school of thought which advocates the destruction of private ownership, and the employment of "direct action" to bring about its most speedy consummation.

The strength of the miners, and their selection to lead the frontal attack upon society as it now exists, arises from the absolutely essential and entirely irreplaceable nature of the commodity which they produce, a circumstance that gives to united action of coal miners a greater importance than their numbers would entitle them to under the most representative form of government that could be designed.

It is not, therefore, the legitimate political representation to which coal miners as members of the state are entitled, that they purpose to use, but their control of a necessity of human existence. This is the feature of the miners' policy that will bring their whole strategy into disrepute, and will marshall public opinion so strongly against it, that, if a strike occurs, the probability is it will meet with the failure it deserves.

The policy of the miners is to translate into actuality the principle embodied in the preamble to the constitution of the United Mine Workers of America, namely: "All wealth belongs to the producer." Their demand at this time is that all the apparent profit made in the coal mining industry in Britain shall be absorbed in the payment of increased wages to the miner and by a reduction of the selling price to the domestic consumer. That is to say, it is proposed the industry shall break even, and that coal mining shall show no aparent profit to any person, or to any constituted body—the State not excepted. The accuracy of the bookkeeping of the miners' advisers is not admitted, nor have these advisers suggested what should be done in the not unlikely event of the industry showing a net loss on operations. Presumably the State would be asked to absorb this.

To discuss the rectitude or otherwise of this doctrine would require a re-statement of the science of political economy, and will not be attempted here. Suffice it to say that the granting of the miners' demands would mean admission of the principle that the State can decree abolition of private property rights with discriminatory application to a selected section of its citizens. A further admission would be necessary, namely, that the political power of any group in the State must be measured, not by voting power, but by the industrial importance of the product of a selected group of workers.

It would probably also be admitted by the leaders of the miners that there is no industry in Britain to which the same arguments for "nationalization" cannot be applied.

The miners are presumably counting upon the assistance of the transport workers and other trades union bodies in Britain, but the financial loss and physical suffering which a prolonged strike will occasion to all classes of workers, makes it unlikely that such support will be forthcoming.

It is apparent to all that the paper profits of the industry cannot be absorbed by increased wages to the miners without depleting the revenues of the State—thereby requiring additional revenue. If on the other hand State revenues are to stand undiminished, a further increase in the cost of coal will be required—thereby increasing once more the cost of living to the general public. The idea that any industry can be continued with a profit accruing to some person, or some association of persons, is one that is unlikely to find general acceptance in Britain.

If it becomes generally realised—as seems fairly likely—that the miners are acting as the vanguard of Communism, under orders from a central organization, and assisted by undertakings for an international coal strike, the British Government is certain to be supported in resisting the use of the strike weapon to enforce a political theory that has not received the approval of the nation through the ordinary channels of the ballot.

The British public is unlikely to concede to the miners as a class the preferential treatment they demand, not—and they are quite frank about this—as an inherent right, but because they believe they possess the power to enforce this essentially selfish demand.

BRITISH MINERS ASK PREFERENTIAL TREATMENT.

The demand of the British coal miners is for an increase of two shillings a day in wages, with lesser graded increases to junior workmen, to be accompanied by a decrease of approximately $3.50 per ton in the selling price of domestic coal. That is to say the

miners ask for the establishment of a condition that will simultaneously increase wages and decrease revenue.

The cost of producing a ton of coal in Britain was (using an approximate Canadian equivalent) $1.52 per ton in 1913, and in May 1920 had reached $5.45 per ton, an increase of 218 per cent.

The rate of production is now twenty per cent below that of 1913, notwithstanding that some 73,000 additional persons are now employed in the industry when compared with 1913.

The wages of mineworkers have increased since 1913 by 155 per cent, the increase in the cost of living being estimated by the British "Labor Gazette" at 152 per cent. The wages now earned by the miner remunerate him for seven-eighths of the daily period of labor, and for four-fifths of the daily product of his labor before the war.

The exports of coal from Britain for the period of six months ending June 1913 totalled 37,048,000 tons. Those for the corresponding period of 1920 totalled 16,493,000 tons, a falling-off of 57 per cent. In the meantime coal from other countries is displacing former British markets, such as Norway, Sweden, South America, Spain and the Levant. Britain must continue to import heavy tonnages of iron ore from Spain and grain from the Argentine, and the lack of coal to make an outward cargo is responsible in large measure for the high delivered prices of these essential commodities.

During the war coal proved more potent than gold to maintain the parity of British exchange abroad. The tardiness of the recovery of sterling exchange, and its failure to fulfill confident expectations of renewed strength is largely due to the non-availibility of British coal for export to countries which have an adverse balance against Britain.

A most potent weapon to reduce living costs and deflate currencies would be the increased production of coal. The policy pursued by the leaders of the British miners is a major factor in keeping up the cost of living, and an increase on present rates of wages would have the effect of reducing production and increasing living costs.

In the earlier part of the campaign for nationalization, the leaders of the miners expressed themselves as strongly opposed to working for private profit, which was a fairly understandable viewpoint. Now they express themselves as opposed to working for the profit of the Government, notwithstanding that any surplus of profit is applied to the relief of general taxation. It is not so very long since the miners in South Wales threatened a strike if they were asked to pay income tax as other citizens are.

The miners at this time possesses the following advantages over his position in 1913, namely: shorter hours of labor, a greater margin between his income and his necessary expenditure than ever previously, a larger say in the management of the industry and undiminished extent of the privileges as to free or cheaper coal and house rentals.

As a result of all these concessions to the miner, the country at large pays more for coal and gets less than ever before; the cost of commodities is increased directly as a result of increased wages, and indirectly as a result of decreased exports of coal.

Now the miner asks for a further intensification of these contrasted advantages to himself and the disadvantages to his neighbour.

Meanwhile, production in the United States is increasing. In 1913 the British exports of coal were five times those of the United States. Now the export of coal from the United States far exceeds that of Britain.

The miners are prominent in that group of laborites that desires to direct the foreign policy of Britain, and are offering gratuitous advice, commingled with dire threats, to a Cabinet that does not contain the meanest intellects in Europe. They are amusing themselves passing resolutions regarding state policies, and announcing new and untried theories of political economy and representative government, while rapidly and surely the foundation of Britain's political and military strength is being taken away. No one knows better than the coal miner the national importance of coal, or realises what a powerful weapon he controls as the producer of coal, but, unfortunately for Britain, and in flat defiance of his ostensible desire to save the pockets of the domestic consumer, the miner prefers to put first of all his own sectional desires, and asks for preferential treatment.

It would be desperately unfair to impute such unworthy motives to the individuals amongst the miners, because they number some of the best citizens of Britain. The war record of the miners' regiments is an inspiration, and a source of enduring praise, and is probably the best index to the real worth and ideals of the miner. Unfortunately for Britain, the men who carried the miners' banner in less opulent and more conservative times, and laboriously laid the foundations of the existing power of the miners' unions, have been superseded by men who are using that power with less wisdom and less rectitude than their predecessors.

THE ONTARIO MINING ASSOCIATION.

The Ontario Mining Association held its first Annual Meeting at Sudbury from the 17th to 19th of August. This association of operators is a necessary and logical outcome of the scattered and diversified nature of mining operations in Ontario, a province of Canada that lacks only coal to give it the most all-round importance in mineral production in Canada.

The temporary dominance of agrarian interests in Ontario was probably the deciding factor in bringing

about the formation of the Association, but, in any case, it is a necessary body, and properly directed, it cannot fail to be beneficial to the mining industry, and a potent force in preventing misapprehensions among the general public, for doubtless it will be the policy of the Association to undertake the dissemination of accurate information. There is nothing that the mining industry in Ontario requires so much as accurate and first hand information regarding the industry, which is, and has for many years, been the plaything of ill-informed and interested propagandists.

The first meeting was of a "get-together" character, and entertainment and business were combined through the hospitality of the International Nickel Corporation, whose guests the members of the Association were for the first two days. Visits were made to the Creighton Mine, to High Falls, the Eddy Dam and Copper Cliff. On the concluding day of the meeting the visitors were shown over the British-America Nickel Corporation's mines and smelter at Nickelton.

Among the most important business discussed during the meeting was the unsatisfactory position of Canada as a producer of iron ore, in which respect this country has gone from bad to worse during the past decade.

A Commission was appointed, composed of Colonel R. W. Leonard, Mr. A. J. Young and Mr. G. S. Cowie, to assist the Ontario and Federal Governments in any enquiry they may set on foot into the improvement of Canada's position as a producer of iron ore.

The case for the iron ore industry in Ontario has been given much attention in the columns of the "Journal" during the past year, particularly the question of beneficiation, to which attention has been drawn from time to time by our Port Arthur correspondent, Mr. J. J. O'Connor. Of equal significance to the stand taken by the Association in regard to iron ore, is the belief expressed by the members that Alberta coal could be used as a fuel in metallurgical processes.

The Ontario Mining Association is to be congratulated on dealing at its first session with the weakest link in the industrial position of Canada, namely this country's dependence on outside sources for coal and iron.

PEACE RIVER PETROLEUMS, LIMITED.

In an advertisement of the stock offering of Peace River Petroleums, Limited, which appears in a Sudbury newspaper, there is quoted an article from the Toronto "Star" of August 7th, written by Dr. Sven Lawrence of Copenhagen, described as formerly a geologist and operator in the oilfields of Baku, on the Caspian Sea. This article contains some statements regarding oil occurrences in Canada that are new to this journal, and seem to have escaped the attention of Dominion geologists engaged on elucidation of the economic geology of oil in Canada. With regard to Alberta it is stated : " The tales of its trappers and prospectors sound like fairy tales." (Perhaps they are). "Oil is oozing out of the ground, natural gas wells supply the fuel for their tea kettles, (a weak beverage for such a country) and burning mountains that have been ablaze for perhaps centuries, roll their pall of smoke down the valley of one of the tributaries to the Peace River."

This imaginative writer proceeds to state that in Canada "we have twenty times the oil-bearing area of " Mexico; that is, the third largest oil producer in the " world, and a larger area than the United States, and " still thousands of unknown square miles to explore."

All of this is the purest presumption. Western Canada has not yet been proved to be an oil-bearing country comparable with either Mexican or United States oil regions. All that can as yet be stated with accuracy regarding the oil prospects of western and north-western Canada is that there is a fair presumption that oil is present, and that scientifically directed search with the drill may be rewarded by the discovery of oil in commercially payable quantities. Such search is now being made. The presence of oil has been revealed in the Peace River country and north of the Great Slave Lake, but nothing in the nature of a gusher has yet been encountered.

Mr. H. E. Cunningham Craig, whose opinion is quoted as being a fairly independent one, says : "Con- " sidering the whole subject it may be said that the " verdict at present must be "not proven". There is " no doubt whatever about there being a vast volume " of oil in the country; the only question is—can it be " found sufficiently concentrated under favorable " conditions for development ? " * This opinion corroborates the best informed opinion of Canadian geologists, and in particular the conclusions of Dr. Dowling as set forth in our issue of April 9th last.

Peace River Petroleum, Limited, advertises that it has a paying flow of oil in one well, and it offers shares at fifty cents each in what its advertisement states to be "the best Canadian proposition ever offered the Investing Public". This may be all true, and again it may be quite untrue. The project is the purest gamble. Be this as it may, the promoters do not add to the attractiveness of the offer made by quoting such imaginative and misleading accounts of the oil possibilities of the Canadian West as that of the Copenhagen geologist referred to. The quotation of this article, with apparent approval, is in itself an indication of ignorance of essentials in the advertisers that does not recommend them as guides to safe investment in oil mining.

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* See page 668, issue August 13th.

CORRESPONDENCE

14 Place Royale,
Montreal, Canada.
August, 14th, 1920.

The Editor,
Canadian Mining Journal.
Dear Sir,—

In your issue of the 13th. inst. I note with interest Mr. E. H. Cunningham Craig's "The Search for Petroleum" in Western Canada, being a copy from the "Petroleum Times."

Man is apparently quite as capable of a change of mind as the fairer sex. If Mr. Craig had inculcated into his reports and papers during 1913 and 1914 such information and conservatism he would not have gained the reputation of trying to out-do the writers of the dime novels, and much money would have been saved and a great deal more honest development work would have been performed.

The exploiting of the Southern Alberta Oil Fields during the years mentioned by boomers backed up by engineers of reputation should be a lesson to Canadian engineers in the future. Engineer's reports should be above all honest and not in any way influenced by possibility of material gain.

We should welcome sincerely such changes of opinion and the courage to in black and white record the change.

Yours faithfully,
G. M. Ponton.

The Editor of the "Canadian Mining Journal."
Sir,

This characteristic titbit has been given extended space on both sides of the Atlantic :

London, Aug., 20.—(By Canadian Associated Press.) —The Daily Mail's financial editor, discussing the possibility of the introduction of more Canadian mining shares on the London market soon, remarks that it can hardly be claimed that such investment up to the present, have proved so satisfactory that there is likely to be any great rush for new schemes. The writer says that the Canadians seem to have kept for themselves the best of the mines or let Americans finance them."

The verities were not outraged when that was put into the types.

Had the writer reasoned introspectively, he could have been more interesting—and instructive—and might have explained why "the London market" ought not to be indiscriminate—and how it is that Canadians either have "kept for themselves the best of the mines, or let Americans finance them."

The paragraph is opportune in that "more Canadian mining shares" are about to be introduced "on the London market." Presumably some of those are suspect. Perhaps they are unfit for London consumption. If so, then London should not attempt their "introduction", since it is perfectly true that "Canadians" do not have to go so far afield with "the best" of their mines. Really there is force in the intimation that "Canadians", or "Americans" are sufficiently absorbtive for immediate requirements; because "London" is preoccupied.

In rare instances "the London market" has been sought with deserving mining propositions. As rarely has "the London market" participated in what promised profits. As a rule, the preference is for the sovereign rather than the "almighty" dollar—and yet the experience has been that London was wedded to its ritual—it has "left undone those things" it "ought to have done"—and "done those things" it "ought not to have done."

Homilies, however, will not rectify errors of commission or omission—on either side of the Atlantic. "London" waited too long, was unresponsive—or entertained propositions in which "jobbers" had precedence. At Porcupine, "London" did not rise to the occasion. At Kirkland Lake, the cooperation of "London" was involved in discredit and litigation. Excepting the Townsite property "London" never got nearer than the fag ends of the real Cobalt situation. "London" could have had a larger share of the Nickel Country and defaulted. The "Flin Flon" was preferred to "London" and New York got it to be joined later by the British-Canadian Mining Corporation. The Consolidated Mining and Smelting corporation commands the British Columbia position—but "London" would rather take on something more speculative.

"Canadians" welcome the "Daily Mail's" remarks —if they will serve as the introductory to a more intelligent, active interest in our "best" mines—or prospects. "London" mining financiers thoroughly comprehend the economics of Mining. Whey they are more in touch with the actualities of Canada—when their representatives "on the spot"—and not catchpenny promoters—are authorized to deal—instead of having to await the termination of the grouse season, "London" will get more that is worth having. "Canadians" greatly prefer "London" co-operation in the "best" mining speculative ventures.

ALEXANDER GRAY.

Montreal, 23 August 1920.

PERSONALS.

Mr. J. W. D. Moodie, general manager of Britania Mines, Howe Sound, B.C., has resigned. He is succeeded by Mr. B. B. Nieding.

Mr. John Stirling has gone to Scotland. Mr. Stirling, who is Chief Inspector of Mines of Alberta was seriously ill this summer and he will take a much needed rest before returning.

Messrs. Ross and Cassie, Limited, with offices in Sudbury, Cobalt and Timmins, have been appointed Northern Ontario representatives for the Federal Engineering Co., Ltd., handling their conveyor and transmission belting

Mr. Charles Camsell, Deputy Minister of Mines has arrived in Ottawa, bringing his family with him from Vancouver.

Mr. John McLeish of the Mines Branch, Ottawa, has been called to Toronto by the illness of his father.

Mr. J. T. Kerr, of Detroit, is in Toronto making arrangements for doing some work on the property of the Golden Summit Mining Co., at Sesekinika.

T. J. BROWN LEAVES NOVA SCOTIA STEEL AND COAL CO.

Mr. T. J. Brown, for many years Superintendent of the Sydney Mines operations of the Nova Scotia Steel and Coal Company, has resigned that position and becomes General Manager of the Inverness Collieries, Limited, a Company recently organized to work the properties formerly belonging to the Inverness Coal and Railway Co. at Inverness, Cape Breton.

British and Colonial Petroleum Resources

A Review of the Present Oil Situation

By HENRY B. MILNER, M.A., F.G.S.
Oil Technology Dept., Royal School of Mines.
(From "Discovery" for August)

Nowadays, when public attention is so easily attracted by any matter in the slightest degree sensational, or by one which promises to provide something out of the ordinary for popular diversion, it is not difficult to appreciate the cause of a certain liveliness in that particular section of the daily Press which exists solely for the purpose of supplying its readers with articles calculated to inspire the requisite feelings of satisfaction or apprehension. No matter what the subject under discussion, exaggeration and imagination are called into play in the production of the most misleading paragraphs, and the resulting distortion of fact is only equalled in magnitude by the shameless extent to which scientific or economic principles are ignored.

Quite apart from the complexity of international politics (which surely provide food enough for the most insatiate literary appetite), since the Armistice we have had a succession of Press " scares, " some with a foundation of fact, but most without any. The varied aspects of the present shortage of many of the necessary commodities of everyday life can be attributed, reasonably enough, to one of the more disagreeable legacies of the War; but the startling predictions of a world-famine in such vital essentials as wheat, coal, water, and oil—to cite only a few examples—require a somewhat closer scrutiny of their "bona fides" than the prophets of these disasters would be willing to admit. Articles of this kind, so long as they are confined to the requirements of advertisement or enhanced sales, are harmless enough, for the reader who allows himself to be influenced by their purpose assuredly deserves all he gets. It is only when they are written with the calculated intent of disturbing international relations that they assume a dangerous character; and in such circumstances, no amount of comment and censure should be spared which may proclaim or deny the validity of a particular case.

In the present oil situation we have a cogent example of Press propaganda of the very worst type, whose ulterior object is not so much the creation of an alleged oil famine scare, as the possibility of disturbing our political and economic relations with other countries; in particular the United States. It will have been apparent to those who follow carefully the happenings in the oil world, that the present agitation for a definite Imperial oil policy, to conserve our resources and relieve the tension of possible famine, is but a cloak to hide an attack on American tactics, rather than an honest attempt to review a situation which may or may not have arisen. Briefly, the arguments may be summarised as follows. On the one hand, we are told that the United States, knowing that we are very largely dependent on her for the bulk of our oil-supply, is adopting somewhat the attitude of a "profiteer" in making us pay extremely high prices for a commodity which she could easily afford to sell for less . Against this, we in turn are accused of adopting a "dog-in-the-manger" policy in other fields in which we are interested, especially in Persia and Mesopotamia, our aim being, it is alleged, the elimination of American capital and interest in future developments in those countries. And so as to bring the whole matter to the point of ebullition, the " experts " responsible for these indictments have dexterously juggled with statistics in order to demonstrate a universal decrease in oil output, an ever-increasing demand, and, in consequence, an ultimate famine in what has now become a vital asset to modern civilised life.

It is with the object of inquiring into the true state of affairs that these paragraphs have been written: and, without endeavouring to solve any of the recondite problems of British and foreign politics, it is proposed to present the reader with a survey of the position of our Imperial Oil Resources as it appeals to the petroleum technologist. This entails, among other things, an inquiry into the nature and extent of those resources and the possibilities of future development. If this be achieved, it can safely be left to individual intelligence to decide how far a political and economical impasse may or may not have been reached, and what precisely are the probabilities of an oil famine in the near or distant future.

In order to appreciate the first disturbing element in the matter, it is necessary to gain some idea of the present position of the oil resources of the United States. Writing in 1916 on the subject, Arnold, in the "Annual Report of the Smithsonian Institution," adduced important statistical evidence showing that the total consumption of oil in the United States per year amounted approximately to 265,000,000 barrels. After surveying the possibilities of further development in the principal oilfields, he estimated the probable future supply at about 5,763,100,000 barrels, from which it is evident that in about twenty-two years from that date the United States production of oil would be exhausted . This is a somewhat pessimistic view to take of the situation, and it would seem that he has allowed the barest minimum of supply for unprospected areas in Texas, Wyoming, and other fields. If the bulk of the land to be prospected, not only in the Mid-continent but in the Gulf, Rocky Mountain, and other large fields, is only half as productive as that already proven in those fields, then his estimate of future supply falls short of the probable one by several thousand million barrels. This makes no allowance whatever for possible developments in such States as Alabama and Mississippi, which are regarded favourably in some quarters as potential oil-producers. But even admitting Arnold's figures, he himself states that the estimated supply would probably "spread over a period of from fifty to seventy-five years", mainly on account of the restricted use of petroleum as a fuel, and the gradual rise in price of a commodity of which the supply fails to satisfy the demand. Further, that before the supply of natural petroleum was exhausted, the Colorado, Utah, and Californian oil shales would be fully utilised, and artificial substitutes would largely take the place of petro-

leum as a fuel. From which it is seen that, while there is no need for immediate alarm in connection with the United States oil resources, there is every need of some national scheme of conservation whereby the internal resources of the country may be utilised to the greatest possible efficiency.

The appreciation of these eventualities has led to a good deal of agitation for the introduction of a scheme of this nature, and the Press has, with its customary zeal, seized upon the opportunity to spread the news of famine in furtherance of its own particular propaganda. This, together with the unsettled state of international commerce, has been sufficient to create the feeling of tension in the oil world to which we have alluded.

Whatever the issue, it is obvious that to any policy which America may feel it necessary to adopt ultimately, having for its aim the preservation of her natural oil resources, no sane person can take exception. We have to realise that, like ourselves, America has received an enormous impetus to her motor and aeroplane industry as a direct consequence of the War, and the demand for oil fuel was never so great as at present. To meet this demand she has, perforce, to call on her own resources to a greater extent than before; and consequently, if the limit of wise output be reached, her export trade is the first to suffer, with corresponding effect on those countries mostly dependent on her for their oil-supplies. This possibility constitutes the true danger of the position, and in foreseeing it, it is only reasonable that England should be prepared to meet such a contingency with a policy calculated to relieve any strain to which the British oil industry might suddenly be subjected.

It is common knowledge that we are largely dependent on United States oil for our requirements; and in view of the fact that that country is responsible for nearly 70 per cent. of the world's supply of crude oil, and that we at present only control about 4 per cent., the possibility of the cutting down of American supplies is one to be guarded against. Fortunately, on this occasion at least, we are not content to await eventualities; and although a definite Imperial oil policy has so far not been made manifest, a movement in one direction has resulted; namely, the immediate development of our colonial oil resources. To these must be added our interests in Persia and our ultimate policy in Mesopotamia, concerning which our own Government has been consistently vague. In a contemplation of these possibilities, then, our petroleum experts have been and are being employed, and already some highly interesting data have been forthcoming. For our present purpose, it will help in the understanding of the position if we review the progress made in the past and the developments possible in the future, in the various productive areas within the Imperial Dominions. And for reasons quite apart from natural precedent, it is convenient to deal with the British Isles first.

In selecting our own country as an "oil-producing area", we at once take rather an anomalous step, since although, as mother-country, England must form the ultimate political and economic keystone binding our colonies into one united whole, as a crude oil-producing centre she is sadly insignificant, a statement which will doubtless meet with severe criticism from many quarters. It must be evident, however, even to the non-technical public, that the results of the recent boring operations in Derbyshire and elsewhere have not so far justified the flowery statements of confidence which characterised the scheme in the first stages of its initiation last year. "Hardstoft" is scarcely the great success which it was destined to be, a few tons of crude oil per day (according to the latest reports) being the usual rather meagre yield. Doubtless, with more powerful plant and greater pumping this yield could be raised somewhat, but even then the result could not possibly justify the outlay of capital necessary.

Little good could be served by reiterating the text of the several warnings uttered by expert geologists, both before and after the Derbyshire enterprise was commenced last year. It a very able article dealing with the geological reasons which render it unlikely that England will ever furnish a commercial supply of oil, Mr. V. C. Illing discussed this aspect of the question in the "Geological Magazine" of July 1919, to which the reader is accordingly referred. Writing just a year later, we have to admit that his admonitory predictions have not only been fully justified, but that the search for subterranean oil-pools not only in the Midlands, but in the whole of the British Isles, is a policy only dictated by those for whom scientific principles have little or no meaning.

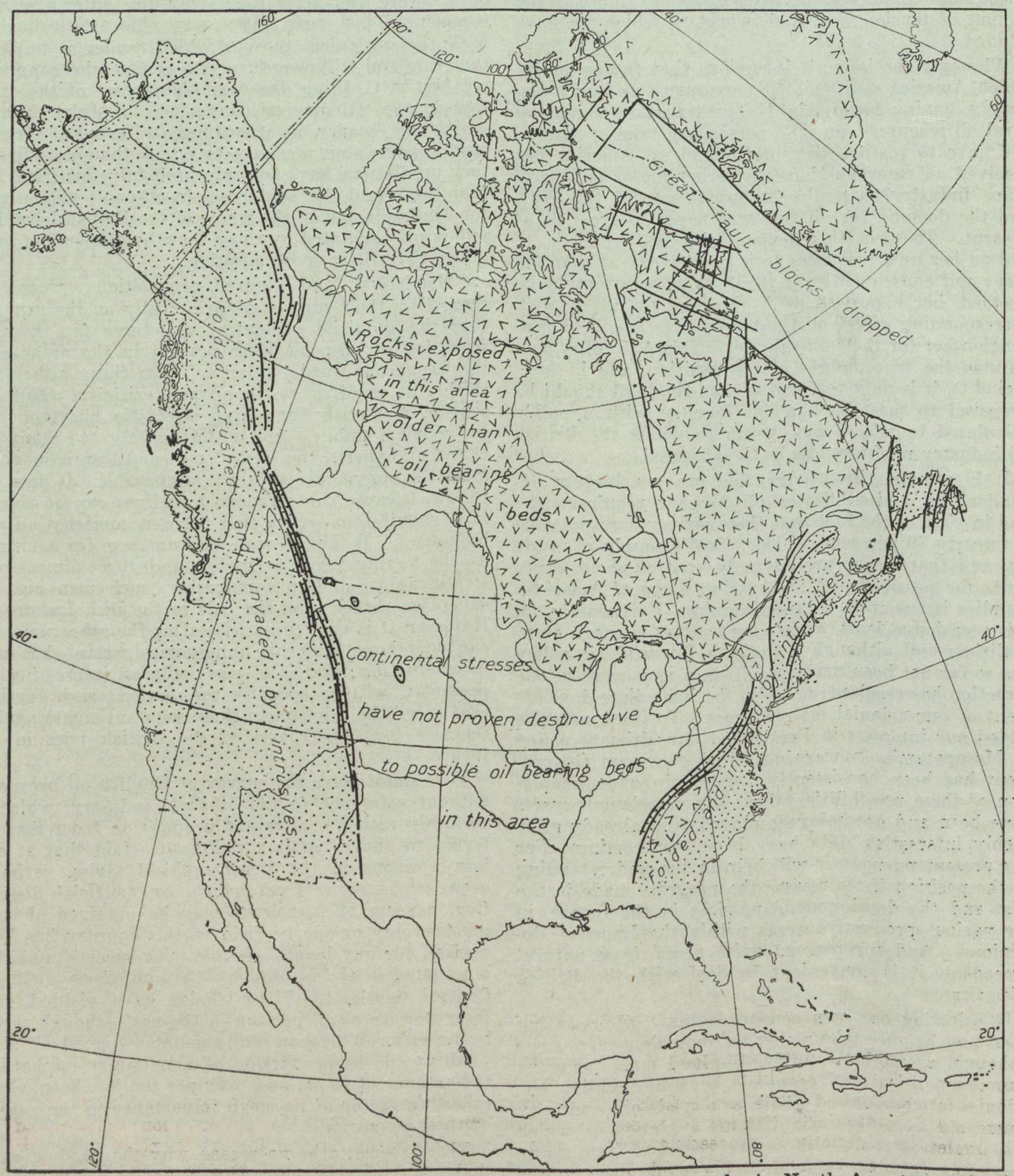
"Hardstoft" and kindred propositions were defended by their supporters principally on the grounds that the requisite geological structures for the preservation of oil-pools were present in the areas, and the dangerous word "anticline" was flung hither and thither as an offset to the adverse criticism which the scheme met with from high scientific quarters. To the general public, and unfortunately to many so-called oil experts, the terms "oil" and "anticline" are almost synonymous, certainly inseparable. It does not follow, because subterranean anticlines can be proved in Carboniferous strata, that there, necessarily, oil will be located. It takes a man with an "eye for country" as the saying goes, to understand three-dimensional stratigraphy; and, unfortunately, such men are the exception rather than the rule in the technical world. However, it is easy to be wise after the event, and one can only hope that this unnecessary waste of money, in conducting what is at most only an interesting experiment, will be speedily terminated; and, further, that it will be a lesson to those who anticipate similar schemes for other parts of the British Isles in the future.

We cannot leave the survey of English oil prospects without reference to the oil-shale industry, which is certainly rather a different proposition from that referred to above. It is a well-known fact that at certain horizons in the stratigraphical series, carbonaceous rocks occur from which, by artificial distillation, a form of petroleum may be obtained; but at present only one large field in this country has been worked for any length of time with success, and that is situated in the Midlothian Carboniferous field of Central Scotland. These shales have yielded over forty gallons of oil per ton in the past—though this is by no means a phenomenal amount for good oil shale—whilst the by-production of ammonium sulphate to the amount of 50 lb. and over per ton has been a contributing factor of no small importance to the success of these operations.

There seems to be no reason why the production of shale oil from this centre should not be a standard industry for many years to come, as the deposits are by no means exhausted. On the contrary, further ex-

tensions of the field should be possible within the confines of the main tectonic trough in which the Calciferous Sandstone series lie in this region. While, on account of certain complexities of structure, there may be an element of risk in putting down trial boreholes for the location of deeper seams, it would not be anything like so hazardous an undertaking as that to which the country gave almost tacit assent last year in Derbyshire.

Another field has come under the public eye of late, and one which promises to afford interesting results; namely, the Norfolk oil-shale field. Very little information has been forthcoming in connection with the development here, though the reader is referred to Dr. Forbes Leslie's paper, read before the Institute of Petroleum Technologists in January 1917, for general details. Geologically, this subterranean occurrence in Norfolk is of great interest, though in the present writer's opinion the structures are difficult of elucidation without adequate borehole data, and Dr. Forbes Leslie's explanations thereof do not always seem to him conclusive. Apart from that, it is certainly a possible field, and as such, a potential asset to our home oil industry.



Map prepared by Mr. D. B. Dowling, showing how possible oil-bearing rocks in North America have been affected by continental stresses.

Other occurrences of oil shale, such as those of Kimeridge in Dorset, the so-called "Kimeridge Coal", have been worked in the past with intermittent success. The Kimeridge shale yielded at times as much as 70 gallons of crude oil per ton, with a rather small amount of by-products. The extent of the shales, however, is extremely limited, and any mining of them would necessitate working thin and probably discontinuous seams over a wide area, a process which is seldom a profitable one.

For the rest, small oil-pools probably will be met with from time to time in various parts of the country during boring operations, particularly in Carboniferous formations; but the public would be well advised to receive such reports with the scepticism, they deserve, and to realise once and for all that oil, in sufficient quantity to make it a commercial proposition, is certainly not one of the many blessings which Nature has seen fit to bestow upon us.

Crossing the Channel into the main continent of Eurasia, the oilfields can be divided into two main groups for present purposes: those in which we have financial interest, and those in which we have or may have both financial and administrative interests. With the former group we are not here concerned; it includes the important fields in Russia, Roumania, and Galicia, and so long as political and economic conditions allow, constitutes an open market from which we, in common with other countries, may draw large quantities of oil for home consumption. The other group includes our own colonies in Asia and the East Indies, and our interests in Persia and Mesopotamia.

In the countries of Burma and Assam occur probably the most valuable oil resources that we possess, the Upper Burma fields being already famous for their oil-production, while the Assam fields only await development on a large scale. The comparatively recent prominence of the Burma fields is largely due to the progress made in overcoming difficulties of transport, which formerly necessitated conveyance of the crude oil for over 300 miles via the Irrawaddy River to Rangoon. With the installation of pipelines, the production has anturally increased and further developments may confidently be expected, particularly in the Minbu and Yenangyat districts. The Assam fields have yet to be fully prospected, but no doubt exists as to the great possibilities of the Tertiary deposits of the Brahmaputra and Surma basins. The petroliferous beds are here often associated with coal seams, and are located along a belt of country stretching from Chittagong approximately N.N.E. for a distance of over 800 miles. At present the Digboi field, near Debrugarh, on the Brahmaputra, is the best-known region actually working; but the results of geological survey at various points along this belt have shown most favourable indications for the location of new sites, though in some places the structures are exceedingly complex, owing to the disturbed character of the strata.

Of the Malay Archipelago, British North Borneo, Brunei, Labuan Island, Sarawak, and British New Guinea (Papua), all show indications of oil to a greater or lesser extent, though little is at present known of the commercial possibilities of the fields. North Borneo and Sarawak are perhaps the most important countries, and drilling is proceeding with a view to locating further supplies. In Papua, petroleum has been found along the same line of earth movement on which are situted the oil-bearing horizons of Java and Sumatra, and Dr. Wade has shown that the oil indications are extremely good, though conditions of climate and native labour have hitherto prevented prospecting on a large scale. Reported occurrences of oil in many parts of the Malay Peninsula have engaged the attention of geologists from time to time; but in the writer's opinion, the knowledge that we have of the geology of this region points to unfavourable conditions for the location of oil in quantity, although certain horizons in the restricted Tertiary formations may give a small yield from time to time.

The economic and political problems with which the future of the Persian and Mesopotamian oilfields is bound up still remain to be solved, and until conditions settle down from the present deplorable state of flux resulting from the War, it is a little premature to venture upon any suggestions as to developments of the petroleum resources of this part of Western Asia. Whatever our future policy with regard to these countries may or may not achieve, once the fields are better known and more widely prospected, the resulting influence on the world's supply of oil fuel will be far-reaching. Our knowledge of the Mesopatamian possibilities is largely based on reports and opinions gained during the War, and, geologically, on analogy of structure and conditions to those obtaining in the better-known Persian field to the east. Here the petroleum deposits lie along a belt of country extending from the Persian Gulf to some miles north of Baghdad, in a direction running parallel to the Turko-Persian frontier. The best-known field is that of Maidan-i-Naphthun on the River Karun. Other districts include Dalika, Zohab, and Loristan, all of which show great promise.

Passing now to the continent of Africa, our most important field is that of Egypt, where on the coast of the Gulf of Suez, at Jebel-Zeit and at Gemsah, a few miles to the south, operations are in active progress. The oil is chiefly found in the Miocene deposits, which are still undergoing energetic examination with a view to locating further pools. Latterly, the lower limestone horizons of the Miocene series have been the subject of detailed investigation, but so far no definite results have been forthcoming. Prospecting is also in progress to the east, in the Sinai Peninsula, where geological conditions are somewhat similar to those of the main Egyptian fields, while one or two islands in the Red Sea have been surveyed, but with negative results from a commercial standpoint. Other regions in Africa have from time to time been searched for oil, notably the Ivory Coast, Gold Coast, Nigeria, and Somaliland, but in all cases the results were extremely poor and unimportant. In Central Cape Colony there have been several petroleum indications in the past, connected with the carbonaceous Karroo shales, and owing their origin to the destructive distillation of those rocks as a consequence of igneous intrusion. In Northern Cape Colony similar occurrences are found in the Dwyka series, while carbonaceous shales, with occasional show of oil, are known from the Orange River Colony and in several other regions of South Africa. A great deal of prospecting has been done in these areas, but, as far as present knowledge goes, the geological conditions are entirely unfavourable to the preservation of oil, and it is unlikely that any important supplies will ever be obtained from this part of the world. There are still large areas in Africa unknown to us geographically, geologically, and economically; and though in mineral

resources she is probably one of the richest countries in the world, the prospects of locating large oilfields are, from geotectonic considerations, essentially remote. Africa, like India, is a fragment of a "lost continent", in which we find no indications whatever of those great post-Carboniferous orogenic movements which have so fundamentally affected the continental mass of Eurasia; in it we are unable to trace the results of such tangential earth stresses as were responsible for the production of structures similar to those obtaining in the important Eurasian fields.

It is otherwise with the American continent, however, where in Canada, and particularly in the West Indies, our resources are considerable. Of the Eastern Canadian fields, in New Brunswick, Quebec, and Ontario, the latter is the most important oil-producing centre. Here the fields are located on what is known as the Cincinnati anticline, a fold extending northwards from Tennessee through Western Ohio to the Province of Ontario, and on which in the States some of the richest oilfields of Ohio and Indiana are situated. The most important fields in the Province are those of Petrolia and Oil Springs in Lambton County, where oil occurs in the Onondaga Limestone series of Devonian age. It is accompanied by large quantities of natural gas, of which the most productive is the Essex-Kent field. In New-Brunswick a great deal of boring has been carried out for oil and gas which has only met with indifferent results, though the oil, when met with, has been found to be of a high grade. The fluctuations in output are largely due to the selection of poor sites for boring, and to lack of penetration to sufficient depth. The exploitation of oil in this province is an example of the dangers attending promiscuous boring for petroleum without regard for anything more than doubtful surface indications. In Albert County, oilshale deposits have been investigated which have yielded up to fifty gallons of oil per ton on distillation: these deposits have been surveyed in several areas within this region, with promising results. In Quebec, on the other hand, the results of exploration have proved unsatisfactory, both for oil and gas. One field (that of Gaspé) has yielded oil, but only in small amount, and the possibility of extensive supply is remote. The "Geological Survey" definitely advised against any further drilling within the province (1915), though this opinion has not met with general credence. In Nova Scotia, Prince Edward Island, and Newfoundland, bituminous shale deposits occur which have of late received attention; those of Nova Scotia are said to be as important as those of Scotland, and richer in hydrocarbon content. The Western Canadian fields embrace certain regions in the Yukon and Northwest Territories, Alberta, Manitoba, Saskatchewan, and British Columbia, of which the Province of Alberta and the Mackenzie Territory seem to offer the best chances of future success. Prospecting in these areas has in the past been rather of a speculative nature, but with the increased data to hand furnished by the admirable work of the Canadian Geological Surveys, coupled with the experience already gained from some of the more promising ventures, future operations should meet with a considerable amount of success.

The oil potentialities of the West Indies have long been regarded as favourable, and of the five islands which have recently received attention in this respect, Trinidad and Barbados have both justified the initial work carried out. The Barbados petroleum deposits are much less important than those of Trinidad at the present juncture; they are mainly confined to the Scotland region of the island, where the oil is associated with Miocene sandstone and shale. The curious desiccated tar product "Manjak" occurs here, which has been mined considerably in the past. The Trinidad oilfields have been much more systematically developed than those of Barbados, and operations are proceeding on an ever-increasing scale. Petroleum indications are mostly confined to the southern part of the island, where the well-known fields of Tabaquite, Guayaguayare, and Barrackpore, yielding very high-grade products, are located. A great deal of prospecting yet remains to be carried out before all the resources of this island are tapped, and, with the increased facilities of transport and the installation of further pipeline systems, rapid development may confidently be expected.

There remain for our consideration the countries of New Zealand and Australia. In New Zealand there are three principal districts from which oil seepages have been known, the most important being that of Moturoa, near New Plymouth, in North Island. From this source small quantities of oil have been obtained intermittently, while the other two fields at Waitangi Hill and Kotuku are at present insignificant, and some doubt exists as to whether these localities will ever yield a commercial supply. The oil shales of the Orepuki region are generally known, but attempts to work them profitably have so far proved abortive. Borings near Greymouth, on the west coast of South Island, have met with little success, though the area between this and Brunnei inland will probably pay further prospecting. In Australia oil has been reported from many places on many occasions, but so far no results of commercial importance have been forthcoming. Dr. Wade has investigated certain supposed oil-bearing areas in South Australia, but concluded that the prospects were not encouraging. West Australia and Victoria have shown small oil seepages in several parts, but nothing has been discovered which would warrant extensive prospecting. In New South Wales, Queensland, and Tasmania, there are oil-shale deposits which have been worked on a large scale, and it must be admitted that the petroleum prospects of the continent, as a whole, seem to be largely centred in these occurences.

This brings our brief survey of the British and Colonial oil resources to a close. It is significant, at all events from a geophysical point of view, that our most productive fields (and, at the same time, those which offer the best possibilities of successful development in the future) are confined to the zone between latitudes 0 deg., and 30 deg., N.; and from what has already been said, it will be apparent that to the West Indies, India, and possibly the East Indies, we have to look for future resources. While we may not hope to discover fields of anything like the magnitude of those of the United States, there are at least equal chances that our own fields, and others as yet unknown, will yield to the prospector supplies of oil which, together with that obtainable from extraneous sources, would be sufficient to carry us through for many a long year. We must not forget that there are enormous possibilities of development in other parts of the world—such as Mexico, the Gulf States, South America (particularly on the north coast), Russia, and possibly Japan. The ultimate location of a productive field in any one of these regions wuld be quite sufficient to postpone a critical situation, if such were likely to arise. Each new well drilled, each new area sur-

veyed, providing the essential principles of the science be kept in view throughout, brings the chance of further supply nearer. And each addition to the world's market must tend to alleviate any suggestion of famine that may be made. At present there is no oil famine, and in the writer's opinion there is not likely to be one for several generations. Every day, almost, a new wonder is proclaimed from the realms of experimental science, and synthetical productions are ever taking the place of natural resources. The question of substitutes for petroleum as a fuel is engaging the attention of experts all the world over, and if past success is any indication of the future, we cannot justifiably regard the prospects of their work other than with complete optimism. Economy in use of existing supplies, careful prospecting on scientific lines, greater development of the world's oil-shale deposits, and the use of substitutes for petroleum wherever possible, are arguments which collectively must tell in the long-run. We have not yet exhausted Nature's resources of coal, water, or oil; we may not see a generation's supply ahead, but that does not prevent us from continuing the search.

Coal Prices

Toronto, Aug. 25.—Very little coal is coming through, although dealers report a keen demand for steam-sized coal in the Eastern States. Prices remain unchanged from those of last week, namely mine run, $14.25 to $14.50 f.o.b Toronto: smokeless coal, $14.50 to $15.00: hard coal $8.00 to $11.50 gross tons at mines, American funds.

Toronto, Sept. 2.—Stocks of coal are low and, according to the dealers here no one wants to buy any coal in the present unsettled state of the market. The Great Lake district and the New England States are getting most of the coal and very little is coming through Ontario points. According to dealers there is practically no market for coal and last week's quotations prevail with an additional 75 cents on bituminous and $1.25 on hard coal, due to the increased freight rates.

The advance in railway rates will cause an increase of $1.10 per ton in the delivered price of anthracite at Winnipeg after 1st September. This will make the retail cost of anthracite $22.60 per ton.

In Montreal dealers report inability to obtain consignments of coal from the bituminous mines at less than $10.50 per gross ton, American funds. Freight rates, as increased September first, add an additional $5.25 per ton. Bituminous coal is selling at $18.00 per ton delivered in cellars in Montreal. Anthracite is selling at the same price.

SECOND ANNUAL WESTERN MEETING OF THE CANADIAN INSTITUTE OF MINING AND METALLURGY.

Winnipeg, October 25th, 2th and 627th.

The Second Annual Western Meeting of the C. I. M. & M. is to be held at the Hotel Fort Garry, Winnipeg, on October 25th, 26th and 27th.

The Secretary of the Local Committee is Mr. W. W. Berridge, and all members who desire hotel accomodation are requested to let Mr. Berridge know at once.

It is understood the Local Committee has succeeded in interesting local bodies and enterprises to a very considerable extent in the forthcoming meeting.

So far only a sketch of the programme is possible, but it is understood the Institute will be the guests of the Manitoba Government, the City of Winnipeg and the Winnipeg oBard of Trade at luncheons on the three days of the meeting. Special attention is to be paid in the papers to the coal trade in the West and the possibilities of an iron and steel industry in Western Canada.

TORONTO MINING STOCKS.

Toronto, Sept. 2.—The mining market during the past week has been dull with practically no speculating buying going on. The ups and downs of the market were caused by investment orders but generally speaking the market declined somewhat although not to any great extent. Silver reached 99 1-4 and this brought in a small selling of some stocks. Nipissing Consolidated was strong from 9.75 to 10.75, due to a declaration of a five per cent. bonus. It was also stated that Nipissing had acquired some oil properties and it remains to be seen what effect this will have on the stock. In many cases shareholders do not like to see the companies going out of their regular lines.

Following are the average quotations for gold, silver and miscellaneous stocks on the Standard Stock Exchange, Toronto, for week ending August 28th, 1920.

Silver	High	Low	Last
Adanac Silver Mines, Ltd.	2	2	2
Bailey	5	4	4½
Beaver Consolidated	44	41	41
Chambers-Ferland	6	6	6
Cobalt Provincial	43	40	43
Coniagas	2.50	2.50	2.50
Crown Reserve	23½	20	22
Gifford	1 3-8	1 1-8	1 1-8
Hargraves	1½	1½	1½
La Rose	35	33½	35
Lorrain Con. M. Ltd.	7½	2	2
McKin.-Dar.-Savage	59	57	59
Mining Corp. of Canada	1.80	1.80	1.80
Nipissing	10.75	9.75	10.75
Ophir	2 5-8	2	2
Peterson Lake	13 3-4	13	13½
Temiskaming	35	32	32
Trethewey	28½	26½	27
Gold.			
Dome Extension	38¼	35 1-4	38
Dome Lake	3 7-8	3 3-4	3 7-8
Dome Mines	12.25	12.25	12.25
Gold Reef	3 1-8	3	3
Hollinger Cons.	5.70	5.60	5.70
Hunton Kirkl'd G.M.	12	11 3-4	12
Keora	17½	17	17
Kirkland Lake	57	53	53
McIntyre	2.02	1.96	1.96
Moneta	11½	11	11
Porcupine Crown	25½	23	23
Porcupine V.N.T.	24.6	23	23
Preston East Dome	2¼	2 1-4	2 1-4
Schumacher	19	18½	18½
Thompson Krist	8½	8¼	8
West Dome	7	7	7
West Tree Mines Ltd.	6	5	5
Wasapika Gold Mines Ltd.	16	14½	14
Miscellaneous.			
Rockwood Oil, Gas	3¼	3	3
Vacuum G.	26	25	26

METAL QUOTATIONS.

Fair prices for Ingot Metals in Montreal Sept. 1st 1920. (In less than carload lots).

	Cents per lb.
Copper, electro	24
Copper castings	23½
Tin	54½
Lead	9½
Zinc	10½
Aluminum	35
Antimony	8¾

ASBESTOS FIBRE OF CANADIAN ORIGIN SUPPLIED TO JAPAN BY UNITED STATES EXPORTERS.

At the recent meeting of the Canadian Manufacturers' Association held in Vancouver, Mr. A. E. Bryan, Canadian Trade Commissioner, had prepared for presentation to the delegates a comprehensive account of possible trade openings for Canadian goods in Japan, but owing to lack of time Mr. Bryan was unable to deliver his remarks in full.

With regard to asbestos, after detailing the figures of United States' exports of asbestos fibre to Japan, Mr. Bryan said:

Where do you suppose the United States is getting all the asbestos she sells to Japan? Canada prides herself on the assertion that she supplies 85 per cent of the total world's output. From investigations made I find that nearly all this asbestos is purchased from brokers in New York. That is, American firms are handling the sales of our natural products, and are thus taking the cream of the profits for themselves. Gentlemen, it is time we became a little more independent of our southern neighbours. Let us be up and doing! We should handle our own natural products from the time that it is taken from its natural state until it is landed in the various foreign markets of the world. We must have our own export houses, good substantial firms with their own branches in all overseas countries where our goods can be sold. These offices must be manned by good live Canadians who are full of pep and tenacity and who will push their lines against keen competitors. Why should we be dependent on foreign commission houses for the sale of our products abroad? Just before coming away I wrote to seventeen of the largest users of asbestos in Japan. As a result of enquiries made, I found out that in nearly every case they were buying "American Asbestos"—they did not realise that what they were using originated in Canada. But in nearly every case they asked me to have Canadian shippers write to them sending prices and samples. They were all keen to buy from Canada direct.

This asbestos is used in Japan for making all kinds of asbestos products—slates, shingles, corrugated plates, yarns, clothes, packing, jointings, rope, in fact just about everything in the asbestos line. There is a fair demand for imported manufactures, such as millboard, cement, etc., but by far the greatest market is for fibre.

The Government encourages this industry, and is encourages almost all industries in Japan. No asbestos goods of foreign manufacture can be sold to Government factories, arsenals, shipyards, railways, etc., which are of course the largest users. They always specify home manufactured goods.

OIL IN MACKENZIE RIVER BASIN.

The discovery of oil at Fort Norman is considered to be an event of importance. The oil is said to be of good quality and the significant feature of the discovery is that there are hundreds of square miles of the country in which the oil formation occurs. Mr. Chas. Camsell, Deputy Minister of Mines, regards the discovery as one of the most notable events in recent mineral exploration work. Mr. Camsell knows the country well and he is well pleased to learn that its resources are being explored with such good results.

BELCHER ISLAND IRON ORES.

In the Engineering and Mining Journal August 28 number, Mr. E. S. Moore, who examined iron ore deposits of Belcher Islands in 1916 says that: "The maximum thickness of the iron formation is 275 feet, but the great bulk of the formation is hard, highly siliceous jasper with bands of slate or greywacke, the whole averaging less than 30 per cent. iron. One band 35 feet thick, measured in the best portion of the formation and carefully sampled, averaged 30.1 per cent. iron, with 37.97 per cent. silica, 0.039 per cent. phosphorous, and a trace of sulphur. There are considerable bodies of this low grade material close to tidewater. The highest grade sample taken and analyzed ran 50.7 per cent. iron.....There has been much discussion as to whether the iron deposits of the Belchers are of economic value. It is my opinion that they are so lean, and the climate conditions are so unfavorable, that they cannot be worked at present. Electric smelting, with power developed on the falls on the numerous rivers entering the east coast of Hudson Bay might be employed, but even then the conditions do not seem promising."

Some of those who have examined the Belcher Island iron ore deposits during the past few years are much more favorably impressed with them than Dr. Moore. No report of the recent examinations is, however, available for publication.—R.E.H.

SALT MINING AT MALAGASH, NOVA SCOTIA.

Mr. Cavanagh, who is in charge of the unique Canadien rock-salt mine at Malagash, Nova Scotia, recently passed through Montreal. He states that the product of the mine is finding a wide distribution, and is well spoken of by all users. The deposit, which pitches vertically, has an undetermined width, but drilling has disclosed that it is at least over 300 feet. The centre of the vein contains salt of great whiteness and excellent quality.

The potash-bearing streak which was noticed at a point not distant from the surface showed evident signs of leaching by surface waters and replacement by earthy substances, but there is much reason to hope that when a point is reached in the vein, that has not been subjected to surface conditions, potash may be found in greater purity of concentration.

The discovery of this salt deposit was accidental, having occurred through the sinking of a well for water. It promises to prove of great economic importance in Nova Scoita. About twenty tons of salt daily is now being produced, and is finding a ready market.

TORONTO NOTES.

The appointment of a Commission to enquire into the administration of the provincial mining resources of Ontario, which was announced some time ago, has not yet been made. It is thought that the enquiry will not commence until the timber probe is over. Judges Riddell and Latchford will probably have charge of it.

The Height of Land Mining Syndicate, Limited, has been granted incorporation by Ontario letters patent. The syndicate is empowered to engage in a general mining business and carries a capitalization of fifty thousand dollars. The head office is in Toronto and the following are the provisional directors: John Callahan, Frank Regan, Edward Murphy, Glen Sullivan and Loretto Dugan.

Northern Ontario Letter

THE GOLD MINES

The Porcupine District

While no official confirmation has been given by the management of the Hollinger Mine of the report that a diamond drill has shown the presence of gold-bearing ore at a depth of 2,500 feet, evidence is accumulating that the Porcupine gold-bearing rocks are very deep, and that operations up to the present time can only be regarded as preliminary development. Favorable reports regarding the extent of the Hollinger reposit justify optimism regarding other mines in that area, namely the McIntyre Porcupine, the Dome Mines, Porcupine V. N. T., North Crown and Schumacher.

In producing upwards of 37 million dollars, the Hollinger mine has only been extensively developed to a depth of 425 feet. From that depth to the 800 ft. level a moderate amount of development has been done, while the 800 ft. level to the deepest workings at a depth of 1,250 feet only a very limited amount of work has been done. As a result of the work so far done, nearly eighty million dollars in gold has been brought into sight, the reserves now being upwards of forty million. From these facts, and taking into account the likelihood of these enormous bodies extending to great depth, perhaps deeper than it may be found possible to mine, the size of the Hollinger Consolidated mine stirs the imagination.

On the McIntyre-Porcupine which is carrying on the greater part of its operations at its lower levels, ranging from 800 to 1,375 feet in depth, gold values have actually been found to increase, and is another factor which adds to the potentialities of the future of all other producing mines in this field. With such official data forming the basis of calculation, the most conservative mining men are found to be numbered among these who believe the Porcupine field, together with the other gold-bearing sections of Northern Ontario is destined to be a close rival of the world-renowned Rand, of South Africa.

The plan outlined a few weeks ago in these columns, relative to the exploration of a large number of mining claims situated in the township of Mountjoy, and lying just a short distance west from the Hollinger mine, is progressing satisfactorily, and the work in progress. This is perhaps the most interesting exploration scheme under way at the present time in the Porcupine gold area. The work is financed by English interests, and is being supervised by Ernest Loring, of Haileybury. Two diamond-drilling machines have been engaged and are in operation. The area to be explored is made up entirely of level country, commonly referred to as sand plains. The bedrock lies considerable distance below the surface, and the present scheme is to determine the nature of the rock formation and ta also explore for possible deposits of ore. Already some favorable information has been secured, the first hole having entered a formation of porphyry and schist, showing resemblance to the formation of the producing area of Porcupine. The work is being done on the theory that the gold-bearing formations of Porcupine extend farther west than the territory being developed in the proven area.

The Kirkland Lake District.

The producing mines of the Kirkland Lake district are increasing their output. This includes the Lake Shore, Kirkland Lake Gold and the Teck-Hughes. In the meantime, the Wright-Hargreaves is making rapid progress in the work of installing its big new mill, while the Tough-Oakes is also likely to join the producing list before the end of the current year.

The Lake Shore production is now running at the rate of close to $17,000 every twenty-four hours, and is treating an average of sixty tons of ore daily. Mill heads have recently averaged around $28 to the ton, and the mine is easily maintaining the right to lay claims to being the highest-grade producing gold-mine in Canada.

Development work on the 200 ft. level of the Argonaut Gold Mines has been sufficiently favorable as to encourage the operators to decide to continue the work to a depth of 500 feet. This work will be commenced at once. It is learned that provided this work proves to be as satisfactory as in that section now developed, the company will be prepared to instal a large mill. The plan followed heretofore has been to operate the small test mill now on the property and in this way test the ore coming from development work as well as produce sufficient gold to offset the cost of current work.

On the Wood-Kirkland property, in the township of Lebel, work is going ahead at a satisfactory rate. The first test pit has reached a depth of 25 feet, and the mineralization is said to continue heavy. A small steam plant is being taken in, and will furnish power for operations pending the installation of a large mining plant.

At the Bidgood property the main shaft is down 300 feet and crosscutting toward the main vein is underway at that point. A large amount of crosscutting and drifting will be carried on at this level.

The Outlying Fields

According to official advice, the Lightning River Gold Mines will soon issue a report on its property situated in the township of Egan, lying to the west of the Porcupine district. The report will also deal with the water power which this company owns.

The final cash payment for the Murray-Mogridge property is due but at the time of writting it has been announced whether or not it will be made. Rumors have been current that an extension might be requested, while it is understood the vendors are not prepared to grant such an extension. It is believed, however, in view of the fact that a large amount of stock has been sold, that the purchasers will find some way of arranging for the payment or for a compromise.

The Sesekinika Lake Mining Syndicate has been organized for the purpose of exploring and developing a large number of mining claims situated in the Sesekinika Lake and Bourke's gold areas. Eight of these claims are located on an island in Sesekinika Lake, while eight are situated at the corner of the three townships, Benoit, Melba and Maisonville. Camps are to be erected on both groups, a force of men already being on the ground.

THE SILVER MINES

The Cobalt Field

Much added prosperity comes to the silver producing mines of Northern Ontario as a result of the higher price of silver as shown during the past week or so. It is obvious that the higher quotations are due to purchases under the Pittman Act completely absorbing

the output of the United States, and that not only does this relieve the market of the American output, but makes it necessary for the parts of the United States to go into the already depleted world market for requirements.

The present price of close to a dollar an ounce compares with a low of 80 cents an ounce on June 18th and an average of only 90.95 for the whole of June.

At the time of writing, the mines of Cobalt are able to market their silver at around a dollar an ounce in New York, and receive the benefit of a premium of about 12 per cent. on New York funds. Thus, in a market which offers about $1.12 an ounce to these Canadian producers, the hoarding which has gone on for several months appears to have been justified.

While the hoarding commenced at a time when silver had declined to around $1.25 an ounce from a high of $1.37, the slump was so rapid as to make it quite difficult to market silver, and in all probability had the product of the mines been sold "at market", the value received would not have exceeded that of the present.

In this connection, leading producing mines like the Nipissing are now in a position to work off their hoarded supply of the white metal on a market stabilized by steady demand, and it is believed the present strong market will be of long duration, with not a little likelihood of another upward move.

Continued favorable developments are reported on the Lumsden property, an encouraging amount of high grade ore having recently been opened up. It is perhaps too early to estimate the likelihood of steady production but developments hold out promise of such being achieved.

Arrangements have been made to diamond drill the the Crown Reserve mine for the purpose of securing detailed data relative to the diabase sill on the property. A contract for 5,000 feet of drilling has been let, and it is understoods this work will be commenced very shortly, the drilling to be carried in from the fifth level.

A uniform output is reported from the McKinley-Darrah, from 55,000 to 60,000 ounces of silver being produced every thirty days. While costs have advanced several points above the average for last year, the recent increase in the price of silver removes the danger of net profits falling below dividend requirements at the present rate of 3 per cent. quarterly.

On the Beaver Consolidated, as well as the Temiskaming mine, it is learned the present rate of output is quite satisfactory. As regards the Temiskaming Mining Company, a matter of considerable importance has to be dealt with at a very early date. It has to do with the proposal by the company's president, J. P. Bickell, that the Temiskaming Mining Company join the McIntyre-Porcupine Mines in taking over important coal lands in Alberta. The proposal is believed likely to receive favorable consideration due to the possibility of the plan offering an opportunity for the Temiskaming to use its treasury surplus of approximately a million dollars. As regards this, of course, opinion among the shareholders is so far divided, some of those vitally involved believing it would be the better part of wisdom to reward the shareholders by at least a moderate rate of dividend disbursments, rather than entering too extensively into the coal business. However, until such time as a full report is available, outlining the proposed scheme in detail with estimates of expenditure, etc., it will not be possible to weigh the merit or de-merit of criticism or commendation so far offered.

The Gowganda District

Mining enterprise in the Gowganda field still suffers from quite unsatisfactory transportation facilities. The Canadian Light Railway Corpany does not appear to be certain of carrying its proposed construction scheme through, although in the mean time the Ontario Government, following a hasty decision, discontinued the construction of a macadam road. The present uncertainty surround the projected light narowgauge railway seems to justify the very pointed criticism which has been directed at the Ontario Government in connection with its lack of intelligent action in regard to the Gowganda transportation problem.

A scheme is on foot to finance the construction of a power plant at Indian Chutes on the Montreal River. The project is being promoted by Hugh Sutherland, of the brokerage firm of F. C. Sutherland & Company of Toronto. A recent meeting was held, at which were Sutcliffe and Neelands, surveyors who are interested in the ownership as well as being engineers engaged in laying out the development scheme, as well as Hugh Sutherland.

From available information, while the financing of the scheme is still more or less uncertain, there are at least fair prospects of all arrangements being ultimately successfully made. It is believed the Gowganda field as well as Fort Matachewan would furnish a demand for the full 5,000 h.p., which the engineers estimate could be developed.

SILICA PRODUCTS COMPANY TO OPERATE IN CAPE BRETON ISLAND.

For some years a proposal has been mooted to develop the large areas of silica rock which exist in the neighbourhood of Orangedale and Whycocomagh, Cape Breton Island, and it is understood that Canadian letters of incorporation are being sought for a company to be known as the Empire Silica Company. The promoter of the enterprise is Major Burton of New York who is said to have associated with him a number of reputable United States capitalists.

The new company proposes to employ in full operation some one thousand workmen, and contemplates the manufacture of firebrick, cement and lime products.

Railway Branch Suggested for Frontenac Co. Felspar Mines, Ontario

A proposal is mooted to extend the Canadian National Railway from Westport, Ont. into the township of Bedford, Frontenac County, for the benefit of the felspar mines.

Beer, Sondheimer & Co., Inc., has taken legal steps to change the name of the firm to "International Minerals and Metals Corporation. The circular announcing this change states: "The active business management of the corporation and its relationship to its affiliated and subsidiary companies has in no way been affected and will continue as heretofore."

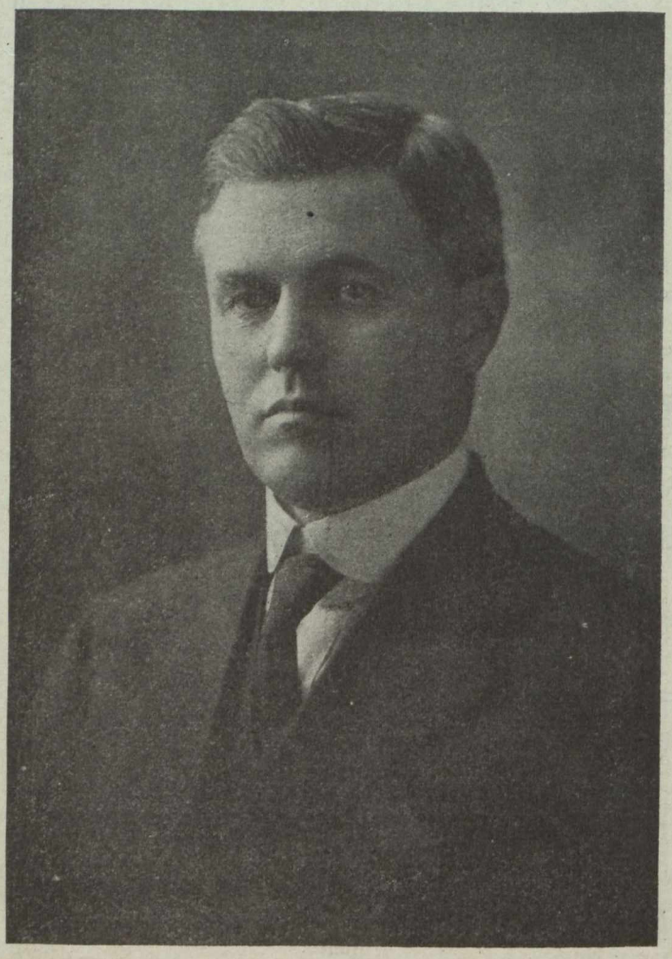
DOMINION STEEL CORPORATION CREATES OFFICE OF SUPERINTENDENT OF INDUSTRIAL RELATIONS.

The Dominion Steel Corporation have appointed Mr. Angus W. Macdonald as Superintendent of Industrial Relations, having charge of the work of this department as it effects all the operations of the Corporation in Cape Breton, Springhill, Newfoundland and other points.

Mr. A. W. Macdonald has had a unique training for this responsible position. He has been continuously in the service of the Dominion companies since the formation of the Coal Company in 1893, having previously worked for the predecessors of the Dominion Coal Company. Since 1900, with an interval during which he was Superintendent of the Black Diamond Coal Company at Lethbridge, Alt., Mr. Macdonald has been the Employment Agent of the Dominion companies, and has been required to visit Europe on several occasions in connection with the recruiting of labor.

The new department will have three divisions, namely, the work of employment, employees service and safety and first aid work.

The employment division will be charged with the development of sources of labor supply, the selection and placing of workmen, and supervision of the "turnover" of labor, with a view to retaining every employee possible and reducing discharges and notices to quit to a minimum.



A. W. MACDONALD,
Supt. of Industrial Relations, Dominion Steel Corporation.

The employees' service division will have charge of housing plans, sick benefit and pension schemes and general social welfare of employees. The plans of this division contemplate district nurses, hospitals, garden plots, Company's farm, employees' clubs, athletic, musical and dramatic societies, employees magazine, boarding camps, cafeterias, restaurants and the accomodation for single-men boarders.

The safety first division will endeavor to organize safety committees and first-aid work, the compilation of accident statistics, communal sanitation and cleanliness, water supplies, and educational bulletin service.

The assistants which the new Superintendent of Industrial Relations has been assigned are all men of competence and long experience.

There is a widespread and pressing necessity for just such activities as are contemplated in the programme of organization of the Steel Corporation's new department. Many sporadic attempts at improvement of living conditions and the environment of the colliery towns and steel districts have been made, but they have never been co-ordinated, and their continuity has been affected by changes in control and management, periods of trade depression, and, to a large extent, by non-realization of the necessity for a department of corporate industrial activity that is not, as is sometimes supposed, philanthropy or paternalism, but just ordinary common sense and good business.

It is not to be expected that all the various activities contemplated will at once assume full shape, as the new Superintendent will have to overcome a good

deal of inertia and incredulity, and he may not inconceivably meet actual opposition, but in appointing Mr. Macdonald to a position that will be in its initial stages an experimental one, the Corporation have acted very wisely, as Mr. Macdonald possesses just those qualifications of patient persistence and ability to impress his views upon others, combined with a unique complete knowledge of the labor situation in the Corporation's works and mines, that will make success probable, given sincere backing by the operating heads.

The paper on "Labor Turnover of Industrial Plants" read by Mr. Macdonald before the Mining Society of Nova Scotia, which appeared in our issue of May 21st, was a convincing presentation of the loss that occurs through unnecessary changes in working personnel, and a strong plea for its minimization.

MANUFACTURING IN WESTERN CANADA.

The western provinces of Canada are generally considered as forming a purely agricultural area, and in the occurrences of new land settlement, increased cultivation and bumper yields, the progress of this region in industry and manufacture is often lost sight of. Nevertheless, the west is making phenomenal strides in manufacture and each week sees recorded the establishment of new industral concerns n the progressive towns of the western provinces.

Remarkable Extension.

An indication of the progress which the west holds in common with the rest of the Dominion is the remarkable enlistment of the last decade in the ranks of the Canadian Manufacturers' Association. The Dominion membership, which in 1910 numbered 2,600 now totals more than 4,100. In 1919 there were in the province of Manitoba 102 members; there are now 343. Alberta and Saskatchewan a decade ago had but 16 members between them; they now have 173. British Columbia's membership, n the ten years, has grown from 113 to 162. Whilst in the decade, the Dominion increase was 1,500 or approximately 58 per cent., the four western provinces combined have, in the same period, increased their membership by 447 or 190 per cent.

The rapid development that has taken place in Western Canada during the past two decades is well illustrated by the records of progress made n the various manufacturing industries, the value of whose products in 1900 was but $34,330,000, whereas in 1917 it was $405,557,000. The following is a comparative statement of capital invested, wages paid, and the value of products covering a perod of 17 years.

Capital Invested in Industries.

	1900	1910	1917
	$	$	$
Alberta	Not given	29,518,346	63,215,444
Saskatchewan .	1,689,870	7,019,951	33,114,630
Manitoba	7,539,691	47,941,540	101,145,033
British Columbia	22,901,892	123,027,521	221,436,100
	$32,131,453	$207,507,358	0418,911,207

Wages Paid.

	$	$	$
Alberta	465,763	4,365,661	10,387,379
Saskatchewan .	No figures	1,936,284	7,007,073
Manitoba	2,419,549	10,912,866	19,599,051
Brtish Columbia	5,456,538	17,204,670	38,269,366
	$8,341,850	$34,455,481	$75,262,869

Value of Production.

	$	$	$
Alberta	.....	18,788,826	71,669,423
Saskatchewan . .	1,964,987	6,332,132	40,657,740
Manitoba	12,927,439	53,673,609	112,804,881
British Columbia	19,447,778	65,204,236	171,425,616
	$34,340,204	$143,998,803	$406,557,660

BOOK REVIEW.

THE IRON ORES OF LAKE SUPERIOR. Crowell and Murray, Chemists and Metallurgists, Cleveland, Ohio. Published by the Penton Press, Cleveland, 1920, 6 by 9 inches, Buckram Boards.

This standard reference work on the Lake Superior Iron Ores and all that appertains thereto is issued in a fourth revised addition. New chapters have been introduced, presenting the average analyses of all the iron ores of the Lake Superior district since 1902. The statistical part of the volume has been added to in order to bring all figures up to date of 1920 from the last edition of 1917.

An interesting chapter is that which describes the method pursued at the loading docks to ensure a uniform analysis of the ore contents of a given pocket. By the addition of one or more cars of ore of known content, known as the adjusting or balancing cars, to a partially filled pocket of ore, the average grade of which is also known, the average grade of the ore in each of the selected pockets is brought up to precisely the analysis specified.

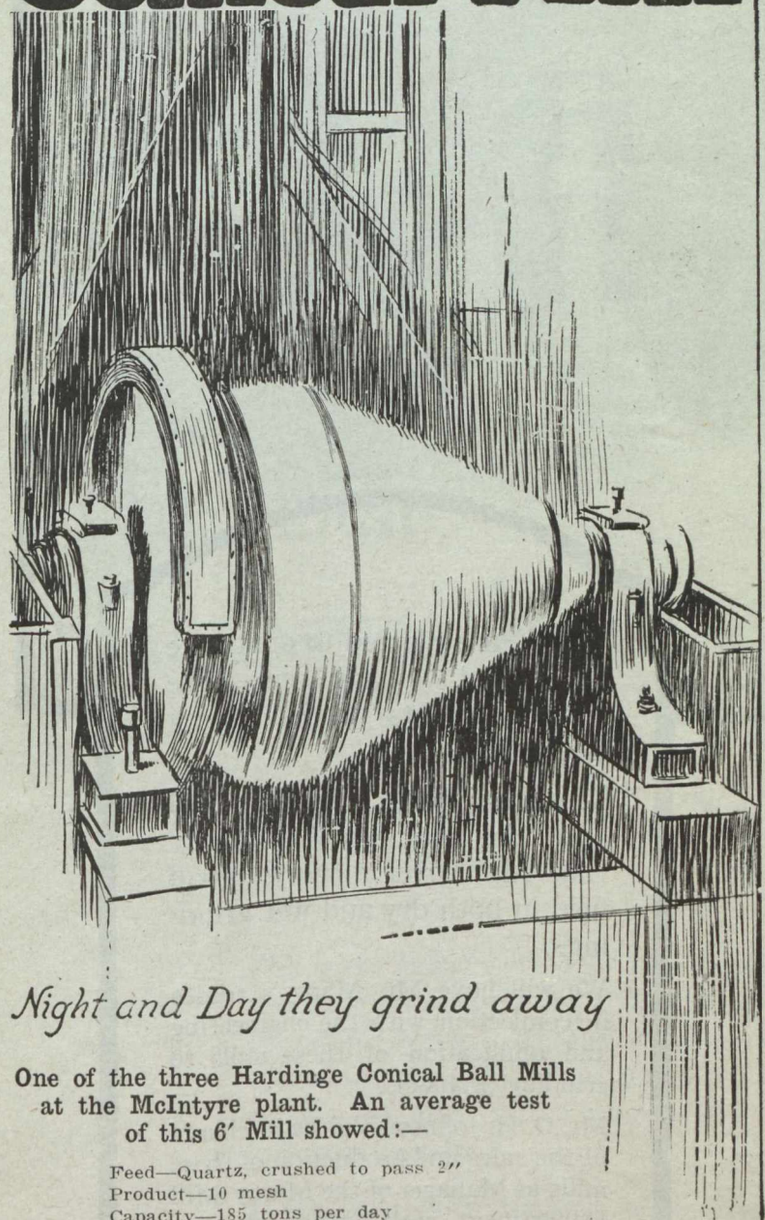
A concisely summarised account of the progress of beneficiating the Superior iron ores is given in Chapter Six.

The following account of the Canadian extension of the Lake Superior deposits is accurate, and we could wish it were more promising. The possibilities of beneficiation, however, allow a more cheerful view to be taken of the future of iron-ore mining in the Lake Superior ranges in Canada than has hitherto been possible.

With regard to the Canadian deposits, the volume states:

"On the Canadian shore of Lake Superior, and in the adjacent territory, there are large areas of iron-bearing formation similar to those found on the American side, but as yet most of the exploration in these areas has been disappointing. The oldest productive range in Canada, and the largest shipper, is the Michipicoten Range, which is lies on the north-eastern shore of Lake Superior northeast from Michipicoten Island. This range was first opened up in 1897, as a gold mining district, but soon became far more valuable as an iron range. The Helen Mine has been a shipper from this range since 1900. The only other producing mine on the range, the Magpie Mine, made its first shipment in 1913. The Moose Mountain District is located about 30 miles north of Sudbury, Ontario. It was first opened up in 1902. The only mine at present on this range is the Moose Mountain Mine, which began shipping in 1908."

HARDINGE Conical Mill



Night and Day they grind away

One of the three Hardinge Conical Ball Mills at the McIntyre plant. An average test of this 6′ Mill showed:—

Feed—Quartz, crushed to pass 2″
Product—10 mesh
Capacity—185 tons per day
Power required—38 H.P.
Ball consumption—0.5 lbs. per ton

They helped McIntyre Porcupine reduce milling costs and increase tonnage

WHEN the McIntyre Porcupine Mill was re-built to reduce production costs and increase tonnage, one of the most important changes made was the substitution of Hardinge Conical Ball Mills for previous equipment of stamps and Chile Mills.

The installation, made after competitive tests, was successful in every detail and is typical of experience at scores of other plants.

The way to secure the lowest possible grinding costs is to install Hardinge Mills.

Whether you are planning a new plant or, like McIntyre-Porcupine, re-building an old one, you should know the possibilities of the Hardinge Mill. Send for "Grinding Data" and specific information.

See our Exhibit at the Sixth National Exposition of Chemical Industries, Booth No. 60, Grand Central Palace, New York, week of Sept. 20.

HARDINGE COMPANY

PO BROADWAY NEW YORK

WORKS
YORK, PENNA.
DENVER, COLO.
ERITH, ENG.

BRANCH OFFICES
DENVER, COLO., FIRST NATIONAL BANK BUILDING
SPOKANE, WASH., OLD NATIONAL BANK BUILDING
SALT LAKE CITY, UTAH, NEWHOUSE BUILDING
LONDON, ENGLAND, SALISBURY HOUSE

CABLE ADDRESS
"HARDINGMIL NEW YORK"

GOODYEAR
MADE IN CANADA

For Outside Drives—

KLINGTITE—an All-Weather Belt

The service given on outside drives by Goodyear Klingtite Belting (formerly Extra Power) is unusual enough to be of interest to every belt user.

Not because there are a great number of outside drives—but because the outside drive is just about the ultimate test of a belt's ability.

The specially designed fabric of Goodyear Belting gives it the strength to withstand brutal outside service.

But the best of cotton will rot and whip to pieces outdoors if not protected.

So we have forced generous quantities of high-grade rubber through and through the plies of Goodyear Klingtite Belting, forming one solid unit, proof against weather and ply separation, yet flexible, pulley-hugging, efficient.

The special friction surface on Goodyear Klingtite Belts (formerly Extra Power) grips through dust or moisture and prevents slipping.

How well these belts serve is evidenced by this letter from the Beaver River Lumber Co. regarding their Extra Power Belt (now Klingtite). At last report (June, 1920) **this belt was still in service after 32 months' use,** when this mill was burned recently.

In their letter the Beaver River Lumber Co. say : " The belt driving the conveyor runs direct from a small engine to the conveyor drive. It is subject to steam and heat in the engine room and to cold and dampness on the outside. Under these conditions, there is no sign of deterioration and there is no slippage. "

The same testimony is advanced by hundreds of farmers and threshermen who bought Goodyear Klingtite Belts (under their old name of Extra Power) for severe outside service on the farm.

If you have an outside drive, by all means investigate Goodyear Klingtite Belts. If you have **any** transmission drive, let a Goodyear Belting man show you how Goodyear Belts, which are good enough for outside service, will render heaping value on inside work. Phone, wire or write the nearest Goodyear Branch and a man will call without obligation to you.

The Goodyear Tire & Rubber Co. of Canada, Limited

Halifax, St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, London, Winnipeg, Saskatoon, Regina, Calgary, Edmonton, Vancouver.

KLINGTITE BELT

The Canadian Miners' Buying Directory.

Acetylene Gas:
Canada Carbide Company, Ltd.
Canadian Fairbanks-Morse.
Prest-O-Lite Co. of Canada, Ltd.

A.C. Units:
MacGovern & Co.

Agitators:
The Dorr Co.

Air Hoists:
Canadian Ingersoll-Rand Co., Ltd
Mussens, Limited.

Alloy and Carbon Tool Steel:
H. A. Drury Co., Ltd.
International High Speed Steel Co., Rockaway, N.J.

Alternators:
MacGovern & Co.

Spielman Agencies, Regd.
Aluminium:

Amalgamators:
Northern Canada Supply Co.
Mine and Smelter Supply Co
Wabi Iron Works.

Antimony:
Canada Metal Co.
Antimonial Lead:
Pennsylvania Smelting Co.
Arrester, Locomotive Spark:
Hendrick Manufacturing Co.
Arsenic White Lead:
Coniagas Reduction Co.
Assayers' and Chemists' Supplies:
Dominion Engineering & Inspe tion Co
Lymans, Limited
Mine & Smelter Supply Co.
Pennsylvania Smelting Co.
Stanley, W. F. & Co., Ltd.
Ash Conveyors:
Canadian Link-Belt Company
Ashes Handling Machinery:
Canadian Mead-Morrison Co., Limited
Canadian Link-Belt Co., Ltd.

Assayers and Chemists:
Milton L. Hersey Co., Ltd.
Campbell & Deyell
Ledoux & Co.
Thos. Heys & Son
C. L. Constant Co.
Asbestos:
Everitt & Co.

Balls:
Canadian Foundries and Forgings, Ltd
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries, Ltd.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
The Wabi Iron Works.
The Hardinge Conical Mill Co.

Ball Mills:
Hardinge Conical Mill Co.
Hull Iron & Steel Foundries, Ltd.
Mine and Smelter Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
The Wabi Iron Works.
Balances—Heusser:
Canadian Fairbanks-Morse Co., Ltd.
Mine and Smelter Supply Co.

Babbit Metals:
Canada Metal Co.
Canadian Fairbanks-Morse Co., Ltd.
Hoyt Metal Co.

Ball Mill Feeders:
Fraser & Chalmers of Canada, Ltd.
Hardinge Conical Mill Co.
Hull Iron & Steel Foundries, Ltd.

Ball Mill Linings:
Hardinge Conical Mill Co.
Hull Iron & Steel Foundries, Ltd.
Belting—Leather, Rubber and Cotton:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Link-Belt Co., Ltd.
The Mine & Smelter Supply Co.
Northern Canada Supply Co.
Jones & Glasco.

Belting:
R. T. Gilman & Co
Gutta Percha & Rubber, Ltd.

Belting—Silent Chain:
Canadian Link-Belt Co., Ltd.
Hans Renold of Canada, Limited, Montreal, Que.
Jones & Glassco (Regd.)

Belting (Transmission):
Goodyear Tire & Rubber Co

Belting (Elevator):
Goodyear Tire & Rubber Co

Belting (Conveyor):

Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.

Blasting Batteries and Supplies:

Canadian Ingersoll-Rand Co., Ltd
Mussens, Ltd.
Northern Canada Supply Co.
Canadian Explosives, Ltd.
Giant Powder Co. of Canada, Ltd.

Bluestone:

The Consolidated Mining & Smelting Co

Blowers:
Canadian Fairbanks-Morse Co., Ltd.
MacGovern & Co., Inc.
Northern Canada Supply Co.
Fraser & Chalmers of Canada, Ltd.

Boilers:
Northern Canada Supply Co.
Canadian Ingersoll-Rand Co., Ltd.
Marsh Engineering Works
MacGovern & Co., Inc.
R. T. Gilman & Co.
Fraser & Chalmers of Canada, Ltd.
The John Inglis Company
Wabi Iron Works.

Blue Vitriol (Coniagas Bed):
Canadian Fairbanks-Morse Co., Ltd.

Bortz and Carbons:
Diamond Drill Carbon Co.

Boxes, Cable Junction:
Standard Underground Cable Co. of Canada, Ltd.
Northern Electric Co., Ltd.

Brazilian Rough Diamonds:
Diamond Drill Carbon Co.

Brazilian Mica:
Diamond Drill Carbon Co.

Buggies, Mine Car (Steel)
Hendrick Manufacturing Co

Brazilian Ballas:
Diamond Drill Carbon Co.

Brazilian Rock Crystal:
Diamond Drill Carbon Co.

Brazilian Tourmalines:
Diamond Drill Carbon Co.

Brazilian Aquamarines:
Diamond Drill Carbon Co.

Bridges—Man Trolley and Rope Operated—Material Handling:
Canadian Mead-Morrison Co., Limited

Bronz., Manganese, Perforated and Plain:
Hendrick Manufacturing Co.

Buckets:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Mead-Morrison Co., Limited
The Electric Steel & Metals Co.
R. T. Gilman & Co.
Hendrick Manufacturing Co.
Canadian Link-Belt Co., Ltd.
Marsh Engineering Works
Mussens, Ltd.
MacKinnon Steel Co., Ltd.
Northern Canada Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works
Buckets, Elevator:
Canadian Link-Belt Co., Ltd.
Hendrick Mfg. Co.

Cable—Aerial and Underground:
Canada Wire & Cable Co.
Northern Canada Supply Co.
Standard Underground Cable Co. of Canada, Ltd.

Cableways:
Canadian Mead-Morrison Co., Limited
Fraser & Chalmers of Canada, Ltd.
Mussens, Ltd.
The Wabi Iron Works
R. T. Gilman & Co.
Cages:
Canadian Ingersoll-Rand Co., Ltd., Montreal, Que
Northern Canada Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
The Mine & Smelter Supply Co.
Mussens, Ltd.
The Wabi Iron Works

PROVINCE OF QUEBEC

MINES BRANCH

Department of Colonization, Mines and Fisheries

The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, etc.

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

MINERS' CERTIFICATES. First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is **Fifty Cents an acre per year, and a fee of $10.00 on issue.** It is valid for one year and is renewable on the same terms on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $5 an acre for SUPERIOR METALS, and $3 an acre for INFERIOR MINERALS

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

PROVINCIAL LABORATORY. Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

HONOURABLE J. E. PERRAULT,
MINISTER OF COLONIZATION, MINES AND FISHERIES, QUEBEC.

BRITISH COLUMBIA

The Mineral Province of Western Canada

Has produced Minerals valued as follows: Placer Gold, $75,722,603; Lode Gold, $100,272,431 ; Silver, $50,432,304; Lead, $43,821,106; Copper, $153,680,965; Zinc, $16,818,487 ; Coal and Coke, $199,123,323; Building Stone, Brick, Cement, etc., $29,991,757; Miscellaneous Minerals, $786,918; making its mineral production to the end of 1919 show an

Aggregate Value of $670,649,894

The substantial progress of the Mining Industry of this Province is strikingly exhibited in the following figures, which show the value of production for successive five-year periods : For all years to 1895, inclusive. $94,547,241; for five years, 1896-1900, $57,605,967; for five years, 1901-1905, $96,509,968; for five years, 1906-1910, $125,534,474; for five years, 1911-1915, $142,072,603; for the year 1916, $42,290,462; for the year 1917, $37,010,392; for the year 1918, $41,782,474; for the year 1919, $33,296,313.

Production During last ten years, $322,829,310

Lode-mining has only been in progress for about twenty-five years, and not 20 per cent. of the Province has been even prospected ; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those of any other Province in the Dominion, or any Colony in the British Empire.

Mineral locations are granted to discoverers for nominal fees.

Absolute Titles are obtained by developing such properties, the security of which is guaranteed by Crown Grants.

Full information, together with Mining Reports and Maps, may be obtained gratis by addressing

THE HON. THE MINISTER OF MINES
VICTORIA, British Columbia.

Canadian Miners' Buying Directory.—(Continued)

Cables—Wire:
Standard Underground Cable Co. of Canada, Ltd.
Canada Wire & Cable Co.
Fraser & Chalmers of Canada, Ltd.
Northern Electric Co., Ltd.
Osborn, Sam'l (Canada) Limited.
R. T. Gilman & Co.

Cable Railway Systems:
Canada Wire & Cable Co.
Canadian Mead-Morrison Co., Limited.

Cam Shafts:
Canada Foundries & Forgings, Ltd.
Hull Iron & Steel Foundries, Ltd.

Car Dumps:
Sullivan Machinery Co.
R. T Gilman & Co.
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co., Limited.

Carbide of Calcium:
Canada Carbide Company, Ltd.

Cars:
Canadian Foundries and Forgings, Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co., Limited.
John J. Gartshore
MacKinnon Steel Co., Ltd.
The Electric Steel & Metals Co.
Northern Canada Supply Co.
Osborn, Sam'l (Canada) Limited.
Marsh Engineering Works
Mine and Smelter Supply Co.
Fraser & Chalmers of Canada, Ltd.
Mussens, Limited
R. T. Gilman & Co.
The Wabi Iron Works

Car Wheels and Axles:
Canadian Car Foundry Co., Ltd.
Burnett & Crampton
Hull Iron & Steel Foundries, Ltd.
John J. Gartshore
Marsh Engineering Works, Ltd.
Osborn, Sam'l (Canada) Limited.
The Electric Steel & Metals Co.
The Wabi Iron Works

Carriers (Gravity):
Jones & Glassco

Castings—Brass
The Canada Metal Co., Ltd.

Castings (Iron and Steel)
Burnett & Crampton
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries, Ltd.
Osborn, Sam'l (Canada) Limited.
The Electric Steel & Metals Co.
The Wabi Iron Works

Cement and Concrete Waterproofing:
Spielman Agencies, Regd.

Cement Machinery:
Northern Canada Supply Co.
Hadfields, Limited
Hull Iron & Steel Foundries, Ltd.
Osborn, Sam'l (Canada) Limited.
Fraser & Chalmers of Canada, Ltd.
Canadian Fairbanks-Morse Co., Ltd.
The Electric Steel & Metals Co.
R. T Gilman & Co.
Burnett & Crampton

Chains:
Jones & Glassco
Northern Canada Supply Co.
Canadian Fairbanks-Morse Co., Ltd
Canadian Link-Belt Co., Ltd.
Greening, B., Wire Co., Ltd.

Chain Drives:
Jones & Glassco (Regd.)

Chain Drives—Silent and Steel Roller:
Canadian Link-Belt Co., Ltd.
Hans Renold of Canada, Limited, Montreal, Que.

Chemical Apparatus:
Mine and Smelter Supply Co.

Chemists:
Canadian Laboratories
Campbell & Deyell
Thos. Heyes & Sons
Milton Hersey Co.
Ledoux & Co.
Constant, C. L. Company

Chrome Ore:
The Electric Steel & Metals Co.
Everett & Co.

Classifiers:
Mine and Smelter Supply Co.
Mussens, Limited
Fraser & Chalmers of Canada, Ltd
The Wabi Iron Works
R. T. Gilman & Co.
The Dorr Company

Clutches:
Canadian Link-Belt Co., Ltd.
Hans Renold of Canada, Limited, Montreal, Que.

Coal:
Dominoion Coal Co.
Nova Scotia Steel & Coal Co.

Coal Cutters:
Osborn, Sam'l (Canada) Limited.
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.

Coal Crushers:
Canadian Mead-Morrison Co., Limited
Canadian Link-Belt Co., Ltd.

Coal Mining Explosives:
Canadian Explosives, Ltd.
Giant Powder Company of Canada, Ltd.

Coal Mining Machinery:
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd
Osborn, Sam'l (Canada) Limited.
Canadian Ingersoll-Rand Co., Ltd.
Sullivan Machinery Co.
Marsh Engineering Works
Hadfields, Ltd.
Hendrick Mfg. Co.
Fraser & Chalmers of Canada, Limited
Mussens, Limited
R. T. Gilman & Co.

Coal and Coke Handling Machinery
Canadian Mead-Morrison Co., Limited.
Canadian Link-Belt Co., Ltd.

Coal Pockets:
Canadian Mead-Morrison Co., Limited.

Coal Pick Machines:
Sullivan Machinery Co.

Coal Screening Plants:
Canadian Link-Belt Co., Ltd.
Canadian Mead-Morrison Co., Limited.

Cobalt Oxide:
Coniagas Reduction Co.
Everitt & Co.

Compressors—Air:
Canadian Fairbanks-Morse Co., Ltd.
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.
MacGovern & Co., Inc.
R. T. Gilman & Co.
Fraser & Chalmers of Canada, Ltd.
Mussens, Limited
The Mine & Smelter Supply Co.

Concrete Mixers:
Canadian Fairbanks-Morse Co., Ltd.
Northern Canada Supply Co.
Gould, Shapley & Muir Co., Ltd.
MacGovern & Co., Inc
Mussens, Limited
R. T. Gilman & Co.

Condensers:
Canadian Fairbanks-Morse Co., Ltd.
Smart-Turner Machine Co.
Northern Canada Supply Co.
MacGovern & Co., Inc.

Concentrating Tables:
The Mine & Smelter Supply Co.
Deister Concentrator Co.
The Wabi Iron Works

Converters:
Northern Canada Supply Co.
MacGovern & Co., Inc.

Conveyors—McCaslin Gravity Bucket:
Canadian Mead-Morrison Co., Limited.

Contractors' Supplies:
Canadian Fairbanks-Morse Co., Ltd.

Consulters and Engineers:
Hersey Milton Co., Ltd.

Conveyors:
Canadian Link-Belt Co., Ltd.
The Mine & Smelter Supply Co.
Jones & Glassco (Regd.)

Conveyor Belts:
Gutta Percha & Rubber, Ltd.

Conveyor Flights:
Canadian Link-Belt Co., Ltd.
Hendrick Mfg. Co., Ltd.

Conveyor—Trough—Belt:
Canadian Fairbanks-Morse Co., Ltd
Canadian Link-Belt Co., Ltd.
Hendrick Mfg. Co.
Mussens, Limited
Jones & Glassco (Roller, Belt and Chain)
Hendrick Mfg. Co.
The Wabi Iron Works

Conical Mills:
Hardinge Conical Mill Co.

Copper:
The Canada Metal Co., Ltd.
Consolidated Mining & Smelting Co.

Couplings:
Hans Renold of Canada, Limited, Montreal, Que.

Cranes:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co., Limited.
Canadian Link-Belt Company
R. T. Gilman & Co.
Smart-Turner Machine Co.

Crane Ropes:
Allan Whyte & Co.
Canada Wire & Cable Co.
Greening, B., Wire Co., Ltd.

Crucibles:
Canadian Fairbanks-Morse Co., Ltd.
The Mine & Smelter Supply Co.

Crusher Balls:
Canada Foundries & Forgings, Ltd.
Hull Iron & Steel Foundries, Limited, Hull, Que.
Osborn, Sam'l (Canada) Limited.

Swedish Steel & Importing Co., Ltd.

Crushers:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries, Ltd.
Hardinge Conical Mill Co.
Osborn, Sam'l (Canada) Limited.
The Electric Steel & Metals Co., Ltd.
R. T. Gilman & Co.
Lymans, Ltd.
Mussens, Limited

Canadian Miners' Buying Directory.—(Continued)

The Mine & Smelter Supply Co.
Hadfields, Limited
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works

Cut Gears:
Hans Renold of Canada, Limited, Montreal, Que.

Cyanide:
American Cyanamid Company.

Cyanide Plant Equipment:
The Dorr Co.
The Mine & Smelter Supply Co.

D. C. Units:
MacGovern Co.

Derricks:
Smart-Turner Machine Co.
Canadian Mead-Morrison Co., Limited.
Marsh Engineering Works
R. T. Gilman & Co.
Canadian Fairbanks-Morse Co., Ltd
Mussens, Limited

Diamond Drill Contractors:
Diamond Drill Contracting Co
E. J. Longyear Company
Smith & Travers
Sullivan Machinery Co.

Diamond Tools:
Diamond Drill Carbon Co.

Diamond Importers:
Diamond Drill Carbon Co.

Digesters:
Canadian Chicago Bridge and Iron Works

Dies:
Canada Foundries & Forgings, Ltd.
Hull Iron & Steel Foundries, Ltd.

Dredger Pins:
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries, Ltd
The Electric Steel & Metals Co.
Hadfields, Limited

Dredging Machinery:
Canadian Steel Foundries, Ltd.
Canadian Mead-Morrison Co., Limited.
Hadfields, Limited
Hull Iron & Steel Foundries, Ltd.
R. T. Gilman & Co.

Dredging Ropes:
Allan, Whyte & Co.
Greening, B., Wire Co., Ltd.
R. T. Gilman & Co.

Drills, Air and Hammer:
Canadian Ingersoll-Rand Co., Ltd
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Sullivan Machinery Co.
Northern Canada Supply Co.
Osborn, Sam'l (Canada) Limited.
The Mine & Smelter Supply Co.
Mussens, Limited

Drills—Core:
Canadian Ingersoll-Rand Co., Ltd
E. J. Longyear Company
Standard Diamond Drill Co.
Sullivan Machinery Co

Drills—Diamond:
Sullivan Machinery Co.
Northern Canada Supply Co.
E. J. Longyear Company

Drill Steel—Mining:
H. A. Drury Co., Ltd.
Hadfields, Limited
International High Speed Steel Co., Rockaway
Osborn, Sam'l (Canada) Limited.
Mussens, Limited
Swedish Steel & Importing Co., Ltd

Drill Steel Sharpeners:
Canadian Ingersoll-Rand Co., Ltd
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Northern Canada Supply Co.
Sullivan Machinery Co.
Osborn, Sam'l (Canada) Limited.
The Wabi Iron Works

Drills—Electric:
Canadian Fairbanks-Morse Co., Ltd
Sullivan Machinery Co.
Northern Electric Co., Ltd.

Drills—High Speed and Carbon:
Canadian Fairbanks-Morse Co., Ltd
Osborn, Sam'l (Canada) Limited.
H. A. Drury Co., Ltd.
Hadfields, Limited

Dynamite:
Canadian Explosives
Giant Powder Company of Canada, Ltd.
Northern Canada Supply Co

Dynamos:
Canadian Fairbanks-Morse Co., Ltd.
MacGovern & Company

Ejectors:
Canadian Fairbanks-Morse Co. Ltd
Canadian Ingersoll-Rand Co., Ltd
Northern Canada Supply Co

Elevators:
Canadian Mead-Morrison Co., Limited.
Canadian Link-Belt Co., Ltd.
Sullivan Machinery Co.
Northern Canada Supply Co.
Hadfields, Limited
Fraser & Chalmers of Canada, Ltd.
Jones & Glassco (Regd.)
Mussens, Limited
The Wabi Iron Works

Engineering Instruments:
C. L. Berger & Sons

Engines—Automatic:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co., Limited.
Fraser & Chalmers of Canada, Ltd.

Engines—Gas and Gasoline:
Canadian Fairbanks-Morse Co., Ltd.
Alex. Fleck
Fraser & Chalmers of Canada, Ltd.
Osborn, Sam'l (Canada) Limited.
Sullivan Machinery Co.
Gould, Shapley & Muir Co., Ltd.
MacGovern & Co., Inc.
The Mine & Smelter Supply Co

Engines—Haulage:
Canadian Ingersoll-Rand Co., Ltd., Montreal.
Canadian Mead-Morrison Co., Limited.
Marsh Engineering Works
Fraser & Chalmers of Canada, Ltd.

Engines—Marine:
Canadian Fairbanks-Morse Co., Ltd.
MacGovern & Co., Inc.
Swedish Steel & Importing Co., Ltd.

Engines—Steam:
Canadian Fairbanks-Morse Co., Ltd
Canadian Mead-Morrison Co., Limited.
R. T. Gilman & Co.
MacGovern & Co., Inc.
Fraser & Chalmers of Canada, Ltd.

Engines—Stationery:
Swedish Steel & Importing Co., Ltd.

Engineers:
General Engineering Co., New York
The Dorr Co.

Ferro-Alloys (all Classes):
Everitt & Co.

Feed Water Heaters:
MacGovern & Co.

Fire Fighting Supplies:
Gutta Percha & Rubber, Ltd.

Flashlights—Electric:
Spielman Agencies, Regd

Flood Lamps:
Northern Electric Co., Ltd

Flourspar:
The Consolidated Mining & Smelting Co.
Everitt & Co.

Forges:
Canadian Fairbanks-Morse Co., Ltd
Northern Canada Supply Co.

Forging:
Canadian Mead-Morrison Co., Limited.
Canadian Foundries and Forgings, Ltd
Hull Iron & Steel Foundries, Ltd.
Smart-Turner Machine Co.
Hadfields, Limited
Fraser & Chalmers of Canada, Ltd.

Frogs:
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries, Ltd.
John J. Gartshore

Frequency Changers:
MacGovern & Co., Inc.

Furnaces—Assay:
Canadian Fairbanks-Morse Co., Ltd
Lymans, Limited
Mine & Smelter Supply Co

Fuse:
Canadian Explosives
Giant Powder Company of Canada, Ltd.
Northern Canada Supply Co

Gaskets:
Gutta Percha & Rubber, Ltd.

Gears:
Hans Renold of Canada, Limited, Montreal, Que.
Jones & Glassco (Regd.)

Gears (Cast):
Hull Iron & Steel Foundries, Ltd.
Canadian Link-Belt Co., Ltd.

Gears, Machine Cut:
Canadian Fairbanks-Morse Co., Ltd
Canadian Steel Foundries, Ltd.
The Electric Steel & Metals Co.
The Hamilton Gear & Machine Co
Fraser & Chalmers of Canada, Ltd
The Wabi Iron Works

Granulators:
Hardinge Conical Mill Co.

Grinding Wheels:
Canadian Fairbanks-Morse Co., Ltd

Gold Refiners
Goldsmith Bros

Canadian Miners' Buying Directory.—(Continued)

Gold Trays:
Canada Chicago Bridge & Iron Works
Hose (Air Drill):
Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.
Hose (Fire):
Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.
Hose (Packings)
Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.
Hose (Suction):
Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.
Hose (Steam):
Goodyear Tire & Rubber Co
Gutta Percha & Rubber, Ltd.
Hose (Water):
Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.
Hammer Rock Drills:
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Osborn, Sam'l. (Canada) Limited.
Mussens, Limited
The Mine & Smelter Supply Co.
Hangers and Cable:
Standard Underground Cable Co. of Canada, Lt
High Speed Steel:
Canadian Fairbanks-Morse Co. Ltd.
H. A. Drury Co., Ltd.
Osborn, Sam'l (Canada) Limited.
Hadfields, Limited
International High Speed Steel Co., Rockaway,
High Speed Steel Twist Drills:
Canadian Fairbanks-Morse Co., Ltd.
H. A. Drury Co., Ltd.
Northern Canada Supply Co.
Osborn, Sam'l (Canada) Limited.
Hoists—Air, Electric and Steam:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd,
Jones & Glassco
Canadian Mead-Morrison Co., Limited.
Marsh Engineering Works
Northern Canada Supply Co.
Mine & Smelter Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
The Wabi Iron Works
R. T. Gilman & Co.
Mussens, Limited
Canadian Link-Belt Co., Ltd.
Hoisting Engines:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
The Electric Steel & Metals Co.
Mussens, Limited
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.
Canadian Mead-Morrison Co., Limited
Marsh Engineering Works
Fraser & Chalmers of Canada, Ltd.
The Mine & Smelter Supply Co.
Hoisting Towers:
Canadian Mead-Morrison Co., Limited.
Hose:
Canadian Fairbanks-Morse Co., Ltd.
Gutta Percha & Rubber, Ltd
Northern Canada Supply Co
Hose (Steam, Air, Water):
Gutta Percha & Rubber, Ltd.
Hydraulic Machinery:
Canadian Fairbanks-Morse Co., Ltd.
Hadfields, Limited
MacGovern & Co., Inc.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works
Industrial Chemists:
Hersey, M. & Co., Ltd.
Ingot Copper:
Canada Metal Co., Ltd.
Hoyt Metal Co.
Insulating Compounds:
Standard Underground Cable Co. of Canada, Ltd.
Inspection and Testing:
Dominion Engineering & Inspection Co
Inspectors:
Hersey, M. & Co., Ltd.
Jacks:
Canadian Fairbanks-Morse Co., Ltd
Can. Brakeshoe Co., Ltd.
Northern Canada Supply Co
R. T. Gilman & Co.
Mussens, Limited
Jack Screws:
Canadian Foundries and Forgings, Ltd
Laboratory Machinery:
Mine & Smelter Supply Co.
Lamps—Acetylene:
Dewar Manufacturing Co., Inc.
Lamps—Carbide:
Dewar Manufacturing Co., Inc.
Lamps—Miners:
Canada Carbide Company, Limited
Canadian Fairbanks-Morse Co., Ltd
Dewar Manufacturing Co., Inc.
Northern Electric Co., Ltd.
Mussens, Limited
Lamps:
Dewar Manufacturing Co., Inc.
Lanterns—Electric:
Spielman Agencies, Regd.
Lead (Pig):
The Canada Metal Co., Ltd.
Consolidated Mining & Smelting Co.
Hoyt Metal Company.
Levels:
C. L. Berger & Sons
Locomotives (Steam, Compressed Air and Storage Ste:
Canadian Fairbanks-Morse Co., Ltd.
H. K. Porter Company
R T. Gilman & Co
Fraser & Chalmers of Canada, Ltd.
Mussens, Limited
Link Belt
Canadian Fairbanks-Morse Co. Ltd.
Canadian Link-Belt Co., Ltd.
Northern Canada Supply Co.
Jones & Glassco
Machinists:
Burnett & Crampton
Machinery—Repair Shop:
Canadian Fairbanks-Morse Co., Ltd.
Machine Shop Supplies:
Canadian Fairbanks-Morse Co., Ltd.
Magnesium Metal:
Everitt & Co.
Hull Iron & Steel Foundries, Ltd.
Manganese Steel:
Canadian Steel Foundries, Ltd.
The Electric Steel & Metals Co.
Hadfields, Limited
Osborn, Sam'l (Canada) Limited.
Hull Iron & Steel Foundries, Ltd.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works
Metal Marking Machinery:
Canadian Fairbanks-Morse Co., Ltd.
Metal Merchants:
Henry Bath & Son
Geo. G. Blackwell, Sons & Co.
Coniagas Reduction Co.
Consolidated Mining & Smelting Co. of Canad:
Canada Metal Co.
C. L. Constant Co.
Everitt & Co
Hoyt Metal Company.
Metallurgical Engineers:
General Engineering Co., New York
The Dorr Co.
Metallurgical Machinery:
General Engineering Co., New York
The Dorr Co.
The Mine & Smelter Supply Co.
Metal Work, Heavy Plates:
Canada Chicago Bridge & Iron Works
Mica:
Everitt & Co.
Diamond Drill Carbon Co.
Mining Engineers:
Hersey, M. Co., Ltd.
Mining Drill Steel:
H. A. Drury Co., Ltd.
Osborn, Sam'l (Canada) Limited.
International High Speed Steel Co., Rockaway, N
Mining Requisites:
Canadian Steel Foundries, Ltd.
Dominion Wire Rope Co., Ltd.
Hadfields, Limited
Osborn, Sam'l (Canada) Limited.
Hull Iron & Steel Foundries, Ltd.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
The Wabi Iron Works
Mining Ropes:
Dominion Wire Rope Co., Ltd
Mine Surveying Instruments:
C. L. Berger & Sons
Molybdenite:
Everitt & Co.
Monel Metal (Wire, Rod, Sheet and Foundry Metal):
International Nickel Co.
Motors:
Canadian Fairbanks-Morse Co., Ltd.
R. T. Gilman & Co.
MacGovern & Co.
The Mine & Smelter Supply Co.
The Wabi Iron Works

Canadian Miners' Buying Directory.—(Continued)

Motor Generator Sets—A.C. and D.C
MacGovern & Co.

Nails:
Canada Metal Co.

Nickel:
International Nickel Co.
Coniagas Reduction Co.
The Mond Nickel Co., Ltd.

Nickel Anodes:
The Mond Nickel Co., Ltd.

Nickel Salts:
The Mond Nickel Co., Ltd.

Nickel Sheets:
The International Nickel Co. of Canada
The Mond Nickel Co., Ltd.

Nickel Wire:
The Mond Nickel Co., Ltd
The International Nickel Co. of Canada

Oil Analysts:
Constant, C. L. Co.

Ore Handling Equipment:
Canadian Mead-Morrison Co., Limited.
Canadian Link-Belt Co., Ltd.

Ore Sacks:
Northern Canada Supply Co.

Ore Testing Works:
Ledoux & Co.
Can. Laboratories
Milton Hersey Co.
Campbell & Deyell
General Engineering Co., New York
Hoyt Metal Co.

Ores and Metals—Buyers and Sellers of:
C. L. Constant Co.
Geo. G. Blackwell
Consolidated Mining and Smelting Co. of Canada
Oxford Copper Co.
Canada Metal Co.
Hoyt Metal Co.
Everitt & Co.
Pennsylvania Smelting Co

Packing:
Canadian Fairbanks-Morse Co., Ltd.
Gutta Percha & Rubber, Ltd.

Paints—Special:
Spielman Agencies, Regd.

Perforated Metals:
Northern Canada Supply Co.
Hendrick Mfg. Co.
Canada Wire and Iron Goods Company.
Greening, B., Wire Co.

Permissible Explosives:
Giant Powder Company of Canada, Ltd.

Pig Tin:
Canada Metal Co., Ltd.
Hoyt Metal Co.

Pig Lead:
Canada Metal Co., Ltd.
Hoyt Metal Co.
Pennsylvania Manufacturing Co.

Pillow Blocks:
Canadian Link-Belt Company

Pipes:
Canadian Fairbanks-Morse Co., Ltd
Canada Metal Co., Ltd.
Consolidated M. & S. Co.
Northern Canada Supply Co.
R. T. Gilman & Co.

Pipe Fittings:
Canadian Fairbanks-Morse Co., Ltd.

Pipe—Wood Stave:
Pacific Coast Pipe Co.
Mine & Smelter Supply Co.

Piston Rock Drills:
Mussens, Limited
Mine & Smelter Supply Co.

Plate Works:
John Inglis Co., Ltd.
Hendrick Mfg. Co.
The Wabi Iron Works
MacKinnon Steel Co., Ltd.

Platinum Refiners:
Goldsmith Bros.

Pneumatic Tools:
Canadian Ingersoll-Rand Co., Ltd
R. T. Gilman & Co.

Powder:
Giant Powder Company of Canada, Ltd.

Prospecting Mills and Machinery:
The Electric Steel & Metals Co.
E. J. Longyear Company
Standard Diamond Drill Co.
Mine & Smelter Supply Co.
Fraser & Chalmers of Canada, L
The Wabi Iron Works

Pumps—Pneumatic:
Canadian Fairbanks-Morse Co., Ltd.
Smart-Turner Machine Co.
Sullivan Machinery Co.

Pumps—Steam:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
The Electric Steel & Metals Co.
The Mine & Smelter Supply Co.
Mussens, Limited
Northern Canada Supply Co.
Smart-Turner Machine Co.
R. T. Gilman & Co.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works

Pumps—Turbine:
Canadian Fairbanks-Morse Co., Ltd.
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co., Ltd.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works

Pumps—Vacuum:
Canadian Fairbanks-Morse Co., Ltd
Smart-Turner Machine Co.
The Wabi Iron Works

Pumps—Valves:
Canadian Fairbanks-Morse Co., Ltd.

Pulleys, Shaftings and Hangings:
Northern Canada Supply Co.
Canadian Fairbanks-Morse Co., Ltd.
The Wabi Iron Works

Pulverizers—Laboratory:
Mine & Smelter Supply Co.
The Wabi Iron Works
Hardinge Conical Mill Co.

Pumps—Boiler Feed:
Smart-Turner Machine Co.
Northern Canada Supply Co.
Canadian Fairbanks-Morse Co., Ltd.
Fraser & Chalmers of Canada, Ltd.
Mussens, Limited
Mine & Smelter Supply Co.

Pumps—Centrifugal:
Canadian Fairbanks-Morse Co., Ltd.
The Electric Steel & Metals Co.
Smart-Turner Machine Co.
Canadian Mead-Morrison Co., Limited.
Canadian Ingersoll-Rand Co., Ltd.
Mine & Smelter Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works

Pumps—Diaphragm
The Dorr Company

Pumps—Electric
Canadian Fairbanks-Morse Co., Ltd.
Fraser & Chalmers of Canada, Ltd.
Mussens, Limited
Smart-Turner Machine Co.

Pumps—Sand and Slime:
Canadian Fairbanks-Morse Co., Ltd.
Fraser & Chalmers of Canada, Ltd.
Mine & Smelter Supply Co.
The Electric Steel & Metals Co.
The Wabi Iron Works
Smart-Turner Machine Co.

Quarrying Machinery:
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.
Hadfields, Limited
Mussens, Limited
R. T. Gilman Co.

Rails:
Hadfields, Limited
John J. Gartshore
R. T. Gilman & Co.
Mussens, Limited

Railway Supplies:
Canadian Fairbanks-Morse Co., Ltd.

Refiners:
Goldsmith Bros.

Riddles:
Hendrick Mfg. Co.

Roller Chain:
Hans Renold of Canada, Limited, Montreal, Que.
Canadian Link-Belt Co., Ltd.

Roofing:
Canadian Fairbanks-Morse Co., Ltd.
Northern Canada Supply Co.

Rope—Manilla:
Osborn, Sam'l (Canada) Limited.
Mussens, Limited

Rope—Manilla and Jute:
Jones & Glassco
Northern Canada Supply Co
Osborn, Sam'l (Canada) Limited.
Allan, Whyte & Co.

Canadian Miners' Buying Directory.—(Continued)

Rope—Wire:
Allan, Whyte & Co.
Canada Wire & Cable Co.
Dominion Wire Rope Co., Ltd.
Greening, B. Wire Co.
Northern Canada Supply Co.
Mussens, Limited

Rolls—Crushing
Canadian Steel Foundries, Ltd.
Fraser & Chalmers of Canada, Ltd.
Hull Iron & Steel Foundries, Ltd.
Osborn, Sam'l (Canada) Limited.
Hadfields, Limited
The Electric Steel & Metals Co.
Mussens, Limited
The Wabi Iron Works

Samplers:
Fraser & Chalmers of Canada, Ltd.
C. L. Constant Co.
Ledoux & Co.
Milton Hersey Co.
Thos. Heyes & Son
Mine & Smelter Supply Co
Mussens, Limited

Scales—(all kinds):
Canadian Fairbanks-Morse Co., Ltd.

Screens:
Greening, B. Wire Co.
Hendrick Mfg. Co.
Mine & Smelter Supply Co.
Canada Wire and Iron Goods Company.
Canadian Link-Belt Co., Ltd.

Screens—Cross Patent Flanged Lip:
Hendrick Mfg. Co.

Screens—Perforated Metal:
Hendrick Mfg. Co.

Screens—Shaking:
Canadian Link-Belt Co., Ltd.
Hendrick Mfg. Co.

Screens—Revolving:
Canadian Link-Belt Co., Ltd.
Hendrick Mfg. Co.

Scheelite:
Everitt & Co.

Separators:
Canadian Fairbanks-Morse Co., Ltd
Smart-Turner Machine Co.
Mine & Smelter Supply Co.

Shaft Contractors:
Hendrick Mfg. Co.

Sheet Metal Work:
Hendrick Mfg. Co.

Sheets—Genuine Manganese Bronze:
Hendrick Mfg. Co.

Shoes and Dies:
Canadian Foundries and Forgings, Ltd
H. A. Drury Co., Ltd.
Fraser & Chalmers of Canada, Ltd.
Hull Iron & Steel Foundries, Ltd.
The Electric Steel & Metals Co.
The Wabi Iron Works

Shovels—Steam:
Canadian Foundries and Forgings, Ltd
Canadian Mead-Morrison Co., Limited.
Osborn, Sam'l (Canada) Limited.
R. T. Gilman & Co.

Ship Bunkering Equipment:
Canadian Mead-Morrison Co., Limited.

Silent Chain:
Canadian Link-Belt Co., Ltd.
Hans Renold of Canada, Limited, Montreal, Que

Silent and Steel Roller:
Canadian Link-Belt Co., Ltd.
Jones & Glassco (Regd.)

Siline:
Coniagas Reduction Co.

Saline Refiners:
Goldsmith Bros.

Smelters:
Goldsmith Bros.

Sledges:
Canada Foundries & Forgings, Ltd

Smoke Stacks:
Hendrick Mfg. Co.
MacKinnon Steel Co., Ltd.
Marsh Engineering Works
The Wabi Iron Works

Solder—Bar and Wire:
Hoyt Metal Company.

Special Machinery:
John Inglis Co., Ltd.

Spelter:
The Canada Metal Co., Ltd.
Consolidated Mining & Smelting Co

Sprockets:
Hans Renold of Canada, Limited, Montreal, Que.
Canadian Link-Belt Co., Ltd.
Jones & Glassco (Regd.)

Spring Coil and Clips Electrico:
Canadian Steel Foundries, Ltd

Steel Barrels:
Smart-Turner Machine Co.
Fraser & Chalmers of Canada, Ltd

Stamp Forgings:
Canada Foundries & Forgings, Ltd
Hull Iron & Steel Foundries, Ltd.

Steel Castings:
Canadian Brakeshoe Co., Ltd.
Canadian Steel Foundries, Ltd.
Fraser & Chalmers of Canada, Ltd.
Osborn, Sam'l (Canada) Limited.
Hull Iron & Steel Foundries, Ltd.
The Electric Steel & Metals Co.
Hadfields, Limited
The Wabi Iron Works

Steel Drills:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Sullivan Machinery Co.
Northen Canada Supply Co.
The Electric Steel & Metals Co.
Osborn, Sam'l (Canada) Limited.
Canadian Ingersoll-Rand Co., Ltd.
Mussens, Limited
Swedish Steel & Importing Co., Ltd.

Steel Drums:
Smart-Turner Machine Co.

Steel—Tool:
Canadian Fairbanks-Morse Co., Ltd.
H. A. Drury Co., Ltd.
N. S. Steel & Coal Co.
Osborn, Sam'l (Canada) Limited.
Hadfields, Limited
Swedish Steel & Importing Co., Ltd.

Structural Steel Work (Light):
Hendrick Mfg. Co.

Stone Breakers:
Hadfields, Limited
Fraser & Chalmers of Canada, Ltd
The Electric Steel & Metals Co.
Osborn, Sam'l (Canada) Limited.
Mussens, Limited
R. T. Gilman & Co.
The Wabi Iron Works

Sulphate of Copper:
The Mond Nickel Co., Ltd
Coniagas Reduction Co.

ulphate of Nickel:
The Mond Nickel Co., Ltd.

Surveying Instruments:
C. L. Berger

Switches and Switch Stand:
Canadian Steel Foundries, Ltd.
Mussens, Limited.

Switches and Turntables:
John J. Gartshore

Tables—Concentrating:
Mine & Smelter Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.

Tanks:
R. T. Gilman & Co.

Tanks—Acid:
Canadian Chicago Bridge & Iron Works
The Mine & Smelter Supply Co.

Tanks (Wooden):
Canadian Fairbanks-Morse Co., Ltd.
Gould, Shapley & Muir Co., Ltd.
Pacific Coast Pipe Co., Ltd.
Mine & Smelter Supply Co.
The Wabi Iron Works

Tanks—Cyanide, Etc.:
Hendrick Mfg. Co.
Pacific Coast Pipe Co.
MacKinnon Steel Co.
Fraser & Chalmers of Canada, Ltd.
Mine & Smelter Supply Co.
The Wabi Iron Works

Tanks—Steel:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Canadian Chicago Bridge & Iron Works
Marsh Engineering Works
Osborn, Sam'l (Canada) Limited.
MacKinnon Steel Co.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
Hendrick Mfg. Co.
The Wabi Iron Works

Tanks—Oil Storage:
Canadian Chicago Bridge & Iron Works
The Mine & Smelter Supply Co.

Tanks (water) and Steel Towers:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Chicago Bdidge & Iron Works
Gould, Shapley & Muir Co., Ltd.
MacKinnon Steel Co.
Mine & Smelter Supply Co
The Wabi Iron Works

Tires—Auto, Truck and Bicycle:
Gutta Percha & Rubber, Ltd.

Canadian Miners' Buying Directory.—(Continued)

Tramway Points and Crossings:
Canadian Steel Foundries, Ltd
Hadfields, Limited

Transits:
C. L. Berger & Sons

Transformers:
Canadian Fairbanks-Morse Co., Ltd
R. T. Gilman & Co.
Northern Electric Co., Ltd.

Transmission Appuiances:
Jones & Glassco (Regd.)

Transmission Machinery:
Canadian Link-Belt Co., Ltd.
Hans Renold of Canada, Limited, Montreal, Que
Jones & Glassco (Regd.)

Troughs (Conveyor):
Hendrick Manufacturing Co.

Trucks—Electric:
Canadian Fairbanks-Morse Co., Ltd.

Trucks—Hand:
Canadian Fairbanks-Morse Co., Ltd.

TTrucks:
Canadian Fairbanks-Morse Co., Ltd.

Tubs:
Hadfields, Limited

Tube Mills:
The Electric Steel & Metals Co.
Fraser & Chalmers of Canada, Ltd.
Hardinge Conical Mill Co.

Tube Mill Balls:
Canada Foundries & Forgings, Ltd.
Fraser & Chalmers of Canada, Ltd.
Hull Iron & Steel Foundries, Ltd.

Tube Mill Liners:
Burnett & Crampton
Fraser & Chalmers of Canada, Ltd.
Hull Iron & Steel Foundries, Ltd.

Turbines—Water Wheel:
MacGovern & Co.

Turbines—Steam:
Fraser & Chalmers of Canada, Ltd.
MacGovern & Co.

Twincones:
Canada Foundries & Forgings, Ltd.

Uranium:
Everitt & Co.

Weighing Larries:
Canadian Mead-Morrison Co., Limited.

Welding—Rod and Flux:
Prest-O-Lite Co. of Canada, Ltd.
Imperial Brass Mfg. Co.

Welding and Cutting—Oxy-Acetylene:
Prest-O-Lite Co. of Canada, Ltd.
Canadian Fairbanks-Morse Co., Ltd
Imperial Brass Mfg. Co.

Wheels and Axles:
Canadian Steel Foundries, Ltd.
Hadfields, Limited
The Electric Steel & Metals Co.
The Wabi Iron Works

Winches—Power Driven:
Canadian Mead-Morrison Co., Limited.

Winding Engines—Steam and Electric:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd.
Marsh Engineering Works
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
Mussens, Limited
R. T. Gilman & Co.
The Wabi Iron Works

Wire:
Canada Wire & Cable Co., Ltd.
Greening, B. Wire Co.

Wire—Bare and Insulated:
Canada Wire & Cable Co.

Wire Rope:
R. T. Gilman & Co.
Canada Wire and Iron Goods Company.
Canada Wire & Cable Co.
Dominion Wire Rope Co., Ltd.

Wire Rope Fittings:
Canada Wire and Iron Goods Company.
Canada Wire & Cable Co.

Wire Cloth:
Northern Canada Supply Co.
Greening, B. Wire Co.
Canada Wire & Iron Goods Company

Wire (Bars and Insulated):
Standard Underground Cable Co. of Canada, Ltd
Northern Electric Co., Ltd.

Wolfram Ore:
Everitt & Co.

Woodworking Machinery:
Canadian Fairbanks-Morse Co., Ltd

Zirconium:
Everitt & Co.

Zinc:
The Canada Metal Co., Ltd.
Consolidated Mining & Smelting Co

Zinc Spelter:
Canada Metal Co., Ltd.
Hoyt Metal Co., Ltd.

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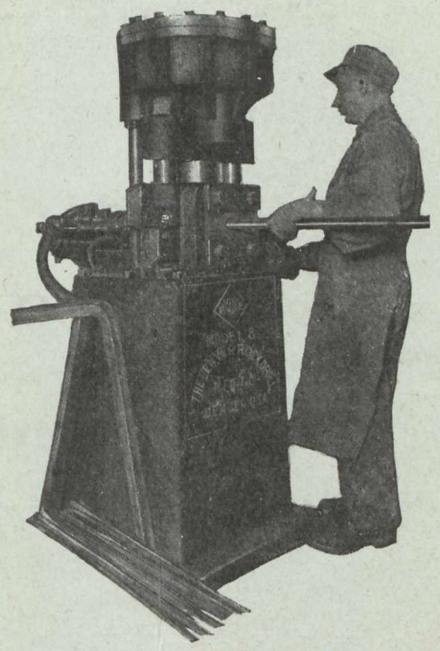

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The Touch System in Drill Steel Sharpening

THE SUCCESSFUL mine blacksmith who sharpens his steel the Waugh way uses the "Touch System."

THE FEEL of the control handle tells him just what sort of blow he is going to deliver, and without the slightest effort he can, according to his desire, crash down on the steel with a blow of nine tons or caress it gently with a quarter-pound blow.

SOON you, too, will sharpen your steel with the Waugh Model 8 Drill Sharpener.

IS YOUR blacksmith shop equipped with it yet?

Canadian Rock Drill Company, Limited

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COBALT, ONT.

NELSON, B.C.
VANCOUVER, B.C.

Sole Agents in Canada for

THE DENVER ROCK DRILL MANUFACTURING COMPANY

OF DENVER, COLORADO, U.S.A.

APPROXIMATELY 65% of the White Metals used in Canada last year were made in our plants

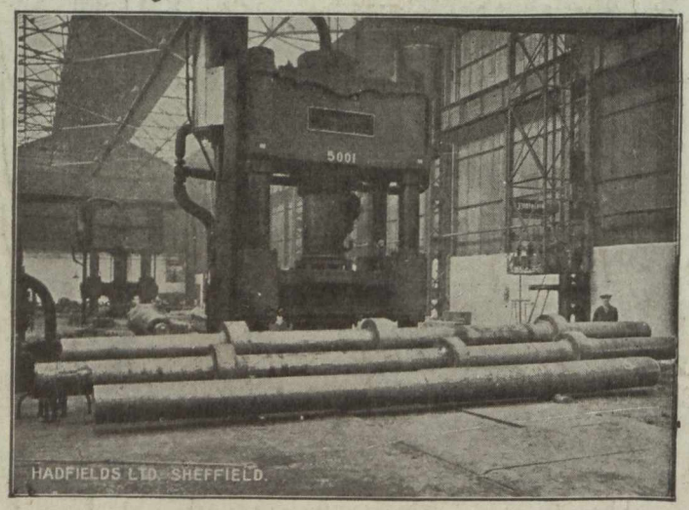
HOYT METAL COMPANY

MONTREAL TORONTO WINNIPEG

HADFIELDS Ltd.

Workmen employed 15,000 — East Hecla and Hecla Works, SHEFFIELD, England — *Works area over 200 acres*

Sole Agents: PEACOCK BROTHERS, Limited, 179 Delorimier Avenue, MONTREAL



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STEEL FORGINGS

in the rough, rough machined, or finished,
FOR MARINE AND OTHER ENGINEERING PURPOSES
of any analysis and to pass any required test.

INGOTS, BLOOMS, SLABS

made by the
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Sole Makers of Hadfield's Patent
MANGANESE STEEL
THE SUPREME MATERIAL
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Hadfield's "Heclon Superior" High-Speed Tool Steel

The finest air hardening steel for machining the hardest and toughest material

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Makers of the best kinds of
STONE BREAKING & ORE CRUSHING MACHINERY

MINING REQUISITES
of every description