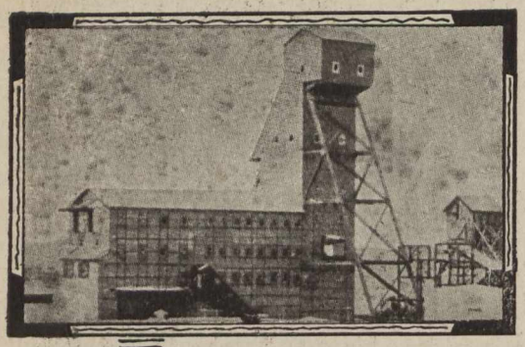
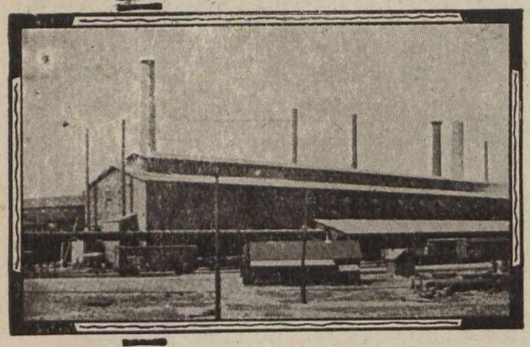
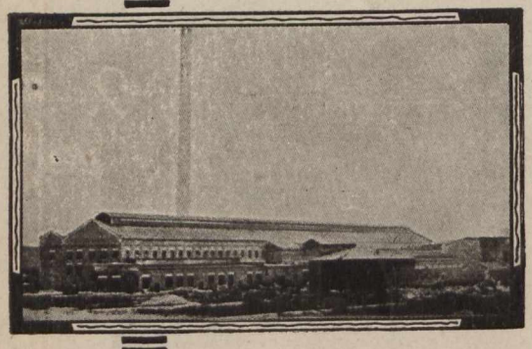
# CANADIAN MINING JOURNAL

Vol. XLI Gardenvale, P.Q., December 10, 1920. No. 49







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# DEPARTMENT OF MINES

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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:—

Fuel Testing Laboratory.—Testing value of Canadian fuels for steam raising and production of power gas; analyses, and other chemical and physical examinations of solid, liquid and gaseous fuels are also made.

Ore-Dressing Laboratory.—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.

Chemical Laboratory.—Analysing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.

Ceramic Laboratory.—Equipment is such that complete physical tests on clays and shale of the Dominion can be made, to determine their value from an economic standpoint.

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.

PROVINCE OF ONTARIO

DEPARTMENT OF MINES.

HON. H. MILLS, Minister of Mines.

# Ontario's Mining Lands

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favorable for the occurrence of minerals, 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver mines of Cobalt occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain Mines.

Practically all metals and economic minerals (with the exception of coal and tin) are found in Ontario:—actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, idon pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, meet every demand. Lime, Portland cement, brick and tile are largely manufactured.

Ontario in 1919 produced 38 per cent. of the total mineral output of Canada. Returns show the output of the mines and mineralogical works of the Province for the year 1919 to be worth $58,583,916, of which the metallic production was $41,590,759.

**Dividends and bonuses paid to the end of 1919 amounted to $15,545,238 for gold mining companies, and $78,335,943 for silver mining companies, or a total of $93,881,181.**

The prospector can go almost anywhere in the mineral regions in his canoe; the climate is invigorating and healthy, and there is plenty of wood and good water. Hydro-electric power is abundant, and many undevedoped water-powers remain to be harnessed. A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 240 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

For list of publications, illustrated reports, geological maps and mining laws, apply to

**Thos. W. Gibson,**
Deputy Minister of Mines,
**Toronto, Canada**

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# PROFESSIONAL DIRECTORY

# Canadian Mining Journal

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Devoted to the Science and Practice of Mining, Metallurgy and the Allied Industries; and more particularly to their progress in Canada.

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# EDITORIAL

## "The Extension of the Institute's Scope of Usefulness"

The Annual Meeting of the American Mining Congress at Denver has received much deserved publicity in the trade journals of the United States. This organization, which had its birth in Denver, had last year an income of $150,000, comparing with only $5,000 in 1910. It has become a political power of first rank, and a perusal of the text of the numerous resolutions adopted will sufficiently indicate how large a proportion of the deliberations of this Congress deal with applied politics, or what is usually termed legislation. No doubt this phase of the work of the Mining Congress is at this time brought into unusually sharp relief because of the manner in which the mining industry has been controlled by governments under war-measures enactments, and because of the unconscionable length of time occupied by bureaucratic control in accomplishing much-to-be desired death. Out of twenty-five resolutions adopted, there was only one, namely that relating to Minerals Separation Ltd., that it is possible to regard as non-political, and even this lone exception was a resolution asking for government action.

The American Mining Congress is, we gather, an organization of persons financially interested in mining, representing exclusively the corporate aspect of mining affairs, but numbering among its members men of wide technical experience. Such organization appears to fill a necessary part in the domestic economy of our neighbors, one that has a necessary corollary in Canada. The crowded programme of the Denver Meeting, and the multiplicity of political matters which were crystallized into formal resolutions, and others that presumably were not so crystallized, although discussed; is evidence of the absorption, exclusive of all other matters, that would result from frank adoption by the Canadian Institute of Mining and Metallurgy of such duties as come within the scope of the Mining Congress's charter.

The Ontario Mining Association was formed for much the same purpose as the American Mining Congress, and is functioning along much the same lines, but within smaller limits, and being frankly an operators' organization, it can with propriety advocate the interest of the operator and the purely commercial side of the mining industry, as is evident from the statement presented by the Association to the Tariff Committee.

The desirability of the Canadian Institute of Mining and Metallurgy adopting a more aggressive political stand, and the augmentation of its revenues to enable it to employ in its service men of high executive and technical standing, was freely urged at the last Annual Meeting in Toronto by gentlemen who were prominent in the counsels of the American Mining Congress at Denver. The need for an organization to represent the business interests of Canadian mining is great, and just how far Canadian mine operators can find it possible to work with the American Mining Congress it is difficult to state, as in some matters, such as those connected with tariffs on the so-called "war minerals", the interests of the Canadian and United States operator are opposed.

The endeavors of a technical society to advise the Government in connection with legislation is fraught with difficulty, but it is a service that up till now the Canadian Institute of Mining and Metallurgy has performed with commendable discretion, probably because it has been realised that its political advice was tempered by a realisation of its honorable traditions and professional ethics.

It is possible that at forthcoming meetings of the Institute there will be discussions that will reveal differing conceptions among the members of the Institute as to its functions. One section of thought will regard the traditional policy of the Institute as negative and timid, and will press for out and out political aggressiveness such as is being displayed by the American Mining Congress. Others will continue to regard a judicious admixture of technical wisdom and business acumen as a golden mean, not

to be departed from without injury to the future of the Institute; in which, of course, every member is genuinely interested, no matter what his views as to its functions.

The mining industry in the United States is large beyond all historical precedence. The value of the mineral products of the United States in 1918 totalled five and a half billion dollars. National records do not disclose any previous approach to such stupendous figures, and it is patent that the American Institution of Mining Engineers could not, without injury to either interest, any longer attempt to supervise the technique and also the business of mining in the United States. The load is too great and the divergence of interests is too great. In Canada, however, we have not yet attained to such eminence in production, nor to such divergence of interests, and in considering the work of the American Mining Congress some thought should be given to its juvenility.

This journal does not desire to express a decided opinion on what course the Canadian Institute of Mining and Metallurgy should pursue, except to voice the belief that the Institute should receive the fullest and the most unstinted support from its members. The sum of individual endeavor will be the measure of united achievement, and the far from satisfactory financial outlook for many branches of Canadian mining render it more than ever necessary that the Institute should be increasingly active.

We would, however, call the attention of the members of the Institute to the work of the American Mining Congress, to the wide extent and difficult character of the field it has undertaken to cultivate, and suggest that thought might be usefully devoted to the problems of the Canadian Institute in advance of the coming meetings of 1921, which it is understood will include a meeting of the British Columbia Division in February, the Annual Meeting of the Institute at Ottawa in March, and the Annual Meeting of the Mining Society of Nova Scotia (really the eastern meeting of the Institute) in May.

In this connection a careful perusal of the speech of the President, Mr. O. E. S. Whiteside, at the Winnipeg Meeting* is recommended. Mr. Whiteside's subject was "The Extension of the Institute's Scope of Usefulness" and there will be pretty general agreement with his concluding words, namely: "Inaction on our part, or an attitude of mere complacency with the position and reputation for good work we have won, with no desire to improve it, would be fatal and uncondonable. I need scarcely say that there is little likelihood of the Institute falling into that grave error."

Nevertheless it may.

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Note: See C. M. J. page 896, issue 5th Nov, 1920.

## *EFFICIENCY AN OFFENSE.*

The United States Government has won its suit against the Lehigh Valley Railroad, a so-called anthracite trust road, for violation of the anti-combine law, enacted in the days before the war, when the efficacy of unified control was not so recognised as it later became under the compulsion of national danger.

If there is one fact more patent than another in connection with the problem of coal supply in North America it is the deficiency of transportation and the notorious inefficiency and waste—not to mention profiteering—connected with the distribution of coal. The source of coal supply is more than adequate, except as regards anthracite, nor has the capacity of the coal mines of either the United States or Canada for output been at any time intensively tested. It is the complaint of the coal miner at the face that his coal is never taken away from the working place fast enough, a complaint that is not always justified. It is the just complaint of the coal operator that the railways have never been so equipped as to take away coal from the mines at all seasons as fast as it is consigned to them for delivery. Under these circumstances it has for a long time been evident that ownership by the coal operator of the means of coal distribution would lead to maximum efficiency. Efficiency in the production of coal is marked up to the yard limit of the colliery, but beyond that point the reserve is not infrequently true. No combination could logically obtain greater efficiency in coal production and coal distribution than one which places under centralised control both inter-related operations. Greater efficiency spells cheaper selling prices, and the classic exemplification of the benefits that follow centralised control of production and distribution together was the history of Standard Oil. The success and stability of United States steel rests on similar grounds. The operation of the anthracite mines have in recent years been marked by greater stability, more vision and truer conservation (using the term to imply maximum utilisation of resources) than has the operation of the bituminous colieries in the United States.

In Canada, in connection with the mooted British Empire Steel Corporation, much stress was laid upon a centralised control of production and transportation. This factor was not unduly emphasised, but it is singular that logical combinations which are welcomed in Canada should be regarded as inimical to the public weal in the United States. The term "restraint of trade" is used in the United States, and elsewhere, as though it were synonymous with "restriction of competition" the words "trade" and "competition" being assumed to have identical meanings. The assumption is not an accurate one. During the war period it was recognised by governments—if their actions are to be accounted an expression of their convictions—that the fullest amplification of trade could

be secured only by the extinction of competition, which was the effect sought to be achieved by control of key industries.

Is it not just possible that the elimination of competition—useless, wasteful competition—is required before efficiency, and consequent maximum cheapness, of production can be achieved, and that the principle expressed by the Sherman Law is untrue in fact and disastrous in operation?

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*IT PAYS CANADA TO PRODUCE NEW GOLD.*

A correspondent to the "Mining and Scientific Press" states rather epigrammatically that the price of gold today is $20.67, its value being $45 per ounce, "the price marked on gold coins being a mask to hide the value."

This is, of course, not precisely a correct statement. In those countries where the statement might be considered correctly made, the gold coin is not in circulation, for quite obvious reasons. The paper "equivalent" of the gold coin is a sham, partially or wholly corresponding with the extent to which it is backed by gold bullion, stamped as coinage or unstamped. The discount on the paper equivalent of any country expresses the view of financiers as to what are the chances of that country ever paying its debts in gold, and when. When the Hollinger Mine, for example, ships gold to New York, it receives, under present circumstances a substantial premium on the shipment, expressed in terms of the Canadian paper dollar, but that premium is only a gain, more or less apparent, if spent in Canada. The more gold our gold mines can export to the United States, the smaller will become the premium, but in such event no one in Canada would grumble, the gold miners least of all, because the purchasing value of our paper dollar in Canada would buy more labor and more material than it does today. Intensive production of gold, whatever may be its effect in the United States, is obviously one of the best directions in which Canadians can expend their national energies. It approaches the dignity of a national duty.

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*WHAT CONSTITUTES A NON-ESSENTIAL IMPORT.*

The annual addresses of the officers of the Bank of Montreal in presenting the Annual Statement of the institution review the industrial situation in the several Provinces tersely, with deletion of all non-essential statements, and supply an annual corrective of a less restrained literature with which newspaper readers are familiar. Sir Frederick Williams-Taylor cannot be accused of exaggeration in his references to mining in Quebec. "With the exception of asbestos, there is little mining done in the Province. Asbestos shipments show an increase, and prices have advanced." That is all. Similarly, throughout the whole of the references to mining in the Provinces, the relatively small attention attracted by mining is reflected by the extent of the bankers' mention.

There is no desire to criticise or be captious in this connection, but merely to take an opportunity to look at the mining industry through other eyes, a not unprofitable proceeding at times, particularly when the other man is in a position to view all Canada's economic features from the elevated and impartial stand of the banker, a pinnacle of judicial observation that but few can hope to attain.

Sir Frederick made one statement which it would be interesting, and no doubt profitable to have enlarged, namely; "What is wanted (to correct trade balances) "is rigid economies in the purchase of non-essentials, "with an increase in our own exports."

A definition of what constitutes a non-essential, from the mineral producers' point of view, is much to be desired.

Is a mineral product essential when it can be produced at home, in lieu of importation from outside, under circumstances where home production entails a higher apparent outlay in money to the individual? To the state, and to the general mass of people that compose the state, the individual saving may actually be a collective loss. A definition of "essential" from this point of view would be welcomed. It would throw needed light on the tariff debate. The poverty of our natural resources, opposed to the plenitude of the resources of our neighbors, is the condition that necessitates a protective import tariff in Canada. How far does cheapness constitute essentiality? Nothing, of course, is cheap that can be done without, but is anything really cheap that can be produced at home and is bought abroad, if purchasing abroad depopulates Canada, drains its finances, chokes its volume of production and depreciates its currency?

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*THE FLYING GEOLOGIST.*

A newspaper item intimates that airplanes may be used to take Dominion geologists from Peace River Landing to Fort Norman next Summer, thereby avoiding much arduous foot-travel. It was pointed out in an April issue by Mr. R. E. Hore that the presence of numerous lakes in Northern Canada might assist in providing alighting places if the seaplane type of machine were used. Canada has many aviators, with wide experience, who can give the best of advice as to the feasibility of the proposal, and, should the yield of oil in the Mackenzie Basin fulfill its present promise, much expenditure in mapping an air-route and providing intermediate stations will be fully justified. If the dirigible type of lighter-than-air machine were used, Canadium helium might be employed!

If the proposal is approved by the Air Board, its practical usefulness in many directions requires little emphasis.

## CORRESPONDENCE.

DEPARTMENT OF COLONIZATION, MINES AND FISHERIES.

Bureau of Mines.

Quebec, December 7th, 1920.

The Editor,

Canadian Mining Journal.

Dear Sir,—

The Canadian Mining Journal in its issue of December 3rd, reproduces an article of the "Labour Gazette" comparing legislation relating to the regulation of Mines in Canada.—As regards the Province of Quebec I find some inaccuracies, which probably have arisen from the fact that the "digester" may have consulted copies of the old Mining Laws of Quebec, instead of up to date copies with changes and amendments.—For instance I note that the writer says:—"The Yukon and all the provinces **except Quebec** have sections relating to the powers and duties of inspectors.—..... In the Yukon and all parts of the Dominion, **except in Quebec** and the coal mines of Nova Scotia, the inspector must give notice in writing to the owner or manager of the mine of anything which he finds to be dangerous or defective, and direct that it be remedied within a specified time".

The following quotations of articles of the Quebec Mining Law, refute the above statements and show that the phrase "except Quebec" is *de trop*.

**Article 2189.**—"Every inspector, constable or peace "officer in a mining division, may, at any time, enter "upon private or public lands that are being mined in "the said division, and examine the pits, shafts, "tunnels, subterranean passages or other mining works "or excavations constructed or commenced in any "manner whatsoever, and require from the proprietors "of such pits, shafts, tunnels, and other mining works, "and from their employees, all the facilities and assist-"ance necessary for that purpose.

**Article 2114.**—"Regulations may be made by the "Lieutenant Governor in Council, respecting the "sanitary condition and safety of the work in mines, "so as to protect the life and health of the workmen "therein employed.

"Such regulations, after their publication in the "Quebec Official Gazette, shall become law, and a copy "of the same shall be posted up in the most conspicuous "places of the mine, in conformity with the instruc-"tions of the mining inspector."

**Article 2214a.**—"It shall be the duty of the inspector "to make such inspections of mines, quarries, and ore-"mills for the reduction of minerals, as may be necess-"ary to ensure the observance of all regulations made "under article 2214.—The inspector shall have power, "further, to order in writing any owner of a mine or "his agents, to have remedied, within a certain lapse "of time, specified by the inspector, any state of "affairs, or any practices which he may consider bad or dangerous in the operation of any mine, quarry or "mill for reducing mineral.

"Any failure to obey such notice within the time "specified shall be an offence, punishable by the penal-"ties provided by article 2207".

Very truly yours,

THEO. DENIS,

Superintendent of Mines for the Province of Quebec.

## OBITUARY.

### Peter Christianson, Sydney Mines.

Mr. Peter Christianson died at his home at Sydney Mines on November 27th after a year's illness. Mr. Christianson was a sailor on a Norwegian sailing-vessel which touched at Sydney Mines when he was about eighteen years. This vessel was a "coffin-ship", which the young man thought it advisable to leave. When the ship sailed out of Sydney Harbor it did not have one particular member of its former crew aboard. Mr. Christianson who was ignorant of the English language, found work at the collieries at Sydney Mines, and by dint of perseverence learnt English and rose to be Assistant General Superintendent of the Dominion Coal Company. He was a student of the International Correspondence School of Scranton, and his rise from an unlettered sailor to a high official position was deservedly one of the favorite quotations in the I. C. S. advertisements. Mr. Christianson left the service of the Dominion Coal Company in 1910 and went with Mr. Charles Fergie to the Yellowhead Pass coal-fields, where he contracted from exposure the sickness which shortened his life. He returned to Cape Breton, and at the time when his failing health rendered it necessary for him to relinquish active work, he was Manager of the Jubilee Colliery of the Nova Scotia Steel Company.

Peter Christianson was a man of sterling character. Quiet and retiring, but very thorough and loyal, he had many friends. During his work as a colliery official he had to deal with many dangerous underground situations, and always proved himself to be a dependable man. Mr. Christianson at all times retained the confidence and respect of the workmen, a fact that was noticeable during the troubled times of the strikes in Cape Breton during 1909 and 1910.

Among those who regret Mr. Christianson's death, and who regarded his self-reliant and shortened life with admiration, the Editor desires to be numbered.

## OIL SHALES. USEFUL PUBLICATION BY COLORADO SCHOOL OF MINES.

The October issue of the Quarterly of the Colorado School of Mines contains a comprehensive article by Dr. Victor C. Alderson, the President of this Institution, upon the Oil Shale Industry in Scotland and England. The information in this article was obtained by Dr. Alderson during a visit in the Summer of this year.

Dr. Alderson notes in his introduction that recent literature on oil shales in Great Britain is exceedingly scarce. He states that the English oil-shales which exist in large quantities are commercially worthless until some method of desulphurizing the oil they yield is discovered.

A Supplement to Dr. Alderson's paper contains a directory of oil-shales retorts, the information being given by the makers. These retorting systems include the Anderson retort, Balcom process, Bishop continuous process, Chew process, Colorado continuous retort, Day, Erickson, and Galloupe processes, Jenson stage-eduction process, Johns retort, Porter process, Randall rotary-retort and process, Scott process, Seaman rotary-retort process, Louis Simpson retort and process (172 O'Connor St. Ottawa), Stallman-Wells process, Wallace process and Wingett process, together with other processes listed, but not described.

A Bibliography of publications on Oil Shales is also appended.

## STATEMENT OF THE ONTARIO MINING ASSOCIATION BEFORE THE COMMITTEE OF THE CABINET ENQUIRING INTO THE EFFECT OF THE CUSTOMS TARIFF IN CANADA.

The Ontario Mining Association, through its Secretary, Mr. B. Neilly, presented to the Cabinet Committee on Tariff Enquiry at its sitting in Toronto, on the 6th December, a statement of the views of the mining industry, the text of which is given below.

The only question put by the Committee was in regard to the Wedge furnace, the Chairman remarking that the action taken by the Customs Board was rather the fault of the Tariff than of its interpretation by the Board, and intimated that the section would be amended to avoid future ambiguity.

The Chairman stated that the mining industry need not expect representation on the Customs Board.

### The Statement.

This Association has within its membership, with some two or three exceptions, all the producing mines in Ontario, and can therefore speak with reasonable assurance on behalf of the Mining industry in this Province.

It is not our desire to enter into a discussion on the relative merits of protection, as against free trade, nor do we wish to make any general statement with reference to the present tariff. Unlike those engaged in Agriculture, who sell their products largely in the home markets, we sell ours almost exclusively in foreign markets, and absolutely at prices set by the law of supply and demand. In other words we cannot add the amount of customs duties to our selling prices, but on the other hand we must add the amounts so paid, to our cost of production.

The production from Canadian Mines in 1918 was valued at $211,301,897, and we presume it is hardly necessary to draw to your attention the fact that this amount is **new wealth in Canada.** The mining industry does not draw its raw material from another industry, and by a process of manufacture increase that value, but it takes raw material that without beneficiation is worthless, and turns that latent resource into something of value to mankind.

Measurable quantities of minerals can be found in nearly every substance that goes to form the earth's crust. But all such mineral is worthless unless the cost of mining, concentrating and refining that metal, is less than the selling price of the metal so recovered. **Cost of production must determine in every case whether or not an ore body is of economic importance,** and as we succeed in reducing costs of production, the volume of ore that can be treated at a profit, increases by leaps and bounds, and while the profit per ton to the operating company may be small the gross value of that production represents just that much new wealth to Canada.

To illustrate this point more specifically, let us assume that in a certain mine, the cost of production is $5.00 per ton. That means that all ore in this particular mine running **less** than $5.00 per ton, must be left in the ground, because it is for the time being without value. Next let us assume that for any reason, the cost of production in this mine is reduced to $4.50 per ton. Immediately the tonnage averaging between $4.50 and $5.00 per ton has economic value, and while the mining company then makes a maximum profit of 50c. per ton on this new available tonnage, Canada makes $4.50 per ton, or nine times as much, as the maximum profit that may be obtained by the Mine Operator.

**It is apparent then that anything the Government can do to decrease operating costs will vastly increase the value of Canada's mineral wealth..** We submit, having regard for the financial requirements of the Country, that it is the duty of the Government, in the interest of all Canadians, to use every facility at its disposal to reduce this operating cost, and, for example, to add, if possible, the above mentioned $4.50 ore to our immediately available wealth. One way that decrease might be brought about is by way of lowering the duties imposed on machinery and supplies imported, of necessity, from foreign countries.

Nevertheless we as an industry, do appreciate the heavy liabilities imposed upon Canada by reason of the part she played in the Great War. We know that your Government must obtain revenue, and mining operators as a class, are proud of the fact that we have never sought to dodge our fair and even generous portion of the common obligation.

**Under the circumstances as above outlined we are inclined to leave with you the problem, of finding the critical point of Canada's advantage, with respect to the duties to be imposed on the industry's foreign needs.**

### Interpretation of Tariff Schedules Criticised.

While then we have refrained from adversely criticising the Tariff proper, we would nevertheless voice our objections in the strongest possible language, to the way in which that Act has been interpreted, by your Customs Board. With no change in the Act, as it affected the Mining Industry, your Board have varied their rulings time after time, on the same class of article. Through lack of knowledge and experience, or because of absolute indifference to reason, time and again have they drawn an arbitrary line in interpreting some certain section of the Act, where no such decision could be supported by a fair interpretation of the Act itself.

Illustrating this charge of unfairness or incompetence, let us take the experience of one of our members. Before finally deciding on the adoption of a certain kind of roasting apparatus, they asked for a ruling of the Customs Board as to whether or not a certain kind of fire-brick liner not made in Canada, would be permitted to enter Canada duty free. They were advised in due course that they were included in the free list and the Company installed this particular equipment on the above understanding. Until 1915 they continued to import these liners free of duty, but suddenly they were advised, that under tariff item No. 282, they were dutiable at a rate of 22½ per cent. The Company naturally protested and referred the Board to their original ruling, which all things considered was not unlike an agreement, but without avail, and they perforce continue to pay duty. It is apparent, we submit, that injustice is being done.

As another illustration, of, shall we say lack of confidence on the part of the Board, one of our members imported a Wedge furnace. Under tariff item No. 462 it was admitted, quite properly, duty free. When they later were forced to renew certain parts of the furnace these parts were declared dutiable at 27½ per cent, and protests were unavailing. Surely

such action on the part of the Board is without justification.

In 1917 mining operators asked, that grinding machinery when used for fine grinding in cyanide solution, should be admitted free under Article 460. The Commissioner of Customs in his file No. 92065, November 16, 1917, advised, that stamp battery parts where used for fine grinding in cyanide solution, should be admitted free. Some time prior to this, tube mills when used for the same purpose, had been added to the free list. On July 9, 1918, the Customs Board issued, without warning and so far as we know, without reason, a ruling effective at once, that tube-mill parts and ball-mill parts whether used for fine grinding in cyanide solution or not, should be rated for duty under tariff item 453.

You will note that under the same Act they are first dutiable, next declared free, and later again made dutiable. The uncertainty that such action engenders tends to confusion and makes it almost impossible to estimate costs accurately, and we have already pointed out that the costs of production is the main factor in determining whether or not an ore body is of economic importance. Moreover it illustrates well our point that inexperience or lack of knowledge, pertaining to this Industry, has led the Board into error in imposing duty, later in relieving the Industry from that duty and latterly in again imposing it.

These unsatisfactory interpretations of the present Act, were discussed at a full meeting of the Association, in August of this year, and the following resolution was passed unanimously:

> "Resolved that the Dominion Government, should be asked to appoint to the Custom Board, at least one member thoroughly familiar with the requirements of the Mining Industry.".

We ask that this request be granted in the hope that friction may be eliminated, so far as the administration of this Act affects the mining industry, and so that costs of equipment may be estimated accurately, and the operators enabled more definitely, and prior to the making of heavy expenditures, to ascertain whether or not, the ore under consideration is worth developing.

We ask that the onus of proof of manufacture in Canada, be placed on the manufacturer, where under a system of protection it properly belongs.

### Mining the Pioneer Industry.

We further ask that when you undertake to review the present Act, that you will give careful consideration to the fact, that mining as a basic industry is doing more to open up the present unproductive areas in Canada than any other industry. It is risking capital and effort at all times, in the hope that the reward will be the great prize of the successful mining company, and merely suggesting that it, as an industry, is perhaps properly entitled to the same consideration as Agriculture, the Press Association and the Textile Industry, (see items 441, 442 and 468), we will close, by offering our whole hearted co-operation, in gathering and presenting any statistical details in connection with the mining industry, that in your estimation, might be useful in arriving at a scientific decision with respect to the points we have enumerated.

## COMPLETION OF A LARGE MINE-PUMPING INSTALLATION IN SOUTH AFRICA.

..The S. A. Mining & Engineering Journal for October 23rd contains an account of a new pumping layout of the Randfontein Central group of mines. Under the superseded arrangement from 3½ to 4 million gallons of water per day were required to be pumped, which necessitated the employment of over 100 units, mainly electrically-driven three-throw units with a capacity of 12,000 gallons per hour against 750 ft. head. Twenty-seven pumping stations and pumps were in use. The pumping cost in 1919 was equivalent to 2.15 shillings per ton crushed.

The new arrangement contains only four units, these being Sulzer pumps, designed to deliver from each pump 84,000 gallons per hour against a head of 2,500 ft. Each pumping set consists of one five-stage right-hand suction pump, and one eight-stage left-hand pressure pump. The pumps are coupled in series, and driven by an electric motor arranged between the pumps on a cast-iron baseplate common to pumps and motors. Motors are 1,750 h.p., 1,470 revs. per minute. Delivery is through three 10-inch rising mains taken from the pumping station to the shaft at an angle of 50 degrees, and thence to surface.

The weight of the metal in the discharge columns is 270 tons, and expansion joints are provided at two points, which permits of two permanent points of support unaffected by expansion and contraction. The water temperature is 72 degrees F. (the original article states this temperature as being 720 degrees, but presumably this is a typographical error) and the shaft temperature 52 degrees, so that when pumping ceases some contraction takes place.

The net result of the new installation has been to replace 80 pumps by four, and 22 pump stations by one. Reserve capacity of the pumping plant has been increased and one hundred percent, and all the old plant above the 2,500 ft. level has been cut out. Running staff consists of one foreman and three shiftmen per 24 hours. A saving of over four shillings per ton of rock to the mill collecting-bins is estimated by the new installation, which has been in successful operation for five months. No parts have been replaced up to the present, and the only noticeable wear and tear is on the end of the blades of the first-stage guide-wheel.

These particulars are contained in a paper read before the S. A. Institution of Engineers by Mr. G. H. Beatty, General Manager of the Randfontein Central.

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### New Westminster, B.C.

It has been announced that the Acetate Products, Ltd., a newly incorporated concern, will commence construction of plant immediately for the manufacture of wood alcohol, acetate of lime and charcoal. The raw material will be alder wood from the Fraser River Valley of which there is an abundance.

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### Edmonton, Alberta.

The existence of an extensive field of high-grade salt at Port McMurray has been definitely established by drillers operating under the direction of the Provincial Government of Alberta. The drill has been driven through thirty feet of pure salt at a depth of 650 feet.

# Detail Study of Forces in the Marcus Conveyor

JOHN S. WATTS, New Glasgow.

The writer came across a case where it was proposed to use a Marcus Conveyor, to deliver onto either one or both, of two picking belts, the general arrangement being as indicated in Figure 1. The gate shown on the delivery end of the conveyor, was supposed to be arranged to guide the coal to either side, while closing off the other side, or, if set in the central position, would allow a feed to both belts.

The arrangement was condemned by the writer, as being one that would cut down the delivery capacity of the conveyor, when the gate was set to close off one side, as shown in figure 1, if not stop it almost entirely. A study of the forces which act upon the material being carried, will show that an obstruction such as that of the gate, will retard the travel to a serious degree.

As the action of these forces seem to be generally only very superficially understood, a study of them at some length should be helpful to those who are or propose to be users of the Marcus conveyor.

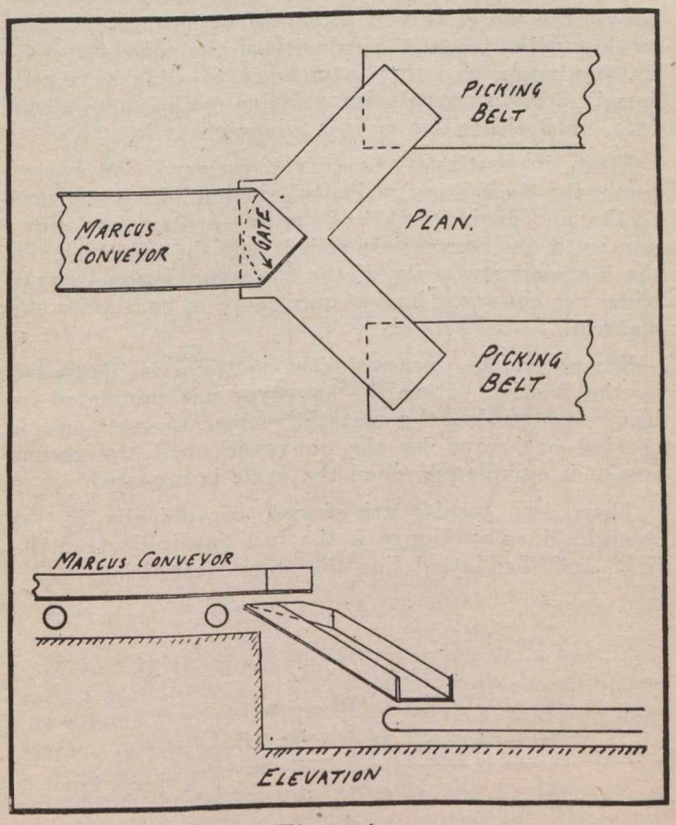


**Figure 1.**

The law upon which all shaking, knocking, or vibrating conveyors depend for their successful operation, is the law that the friction of a body at rest is greater than that of the same body in motion, all other conditions being the same. This law is well known, but it is not always appreciated that the difference is not great, and a very small obstacle will neutralise the small force available and prevent the forward motion of the material during the backward stroke of the conveyor.

To get a clear idea of the action, we will study in detail the forces acting during one cycle, starting with the conveyor at the commencement of its forward stroke. The material resting on the conveyor, will travel with the conveyor, providing that the frictional force, existing between the material and the conveyor, is sufficient to overcome the force of inertia in the material. Bear in mind that the friction during the forward movement is that of the material at rest, because the material travelling as it does, with the conveyor, is at rest, relatively to the conveyor.

Should the force of inertia, in the material, be greater than the effect of the friction, the material will slip relatively to the conveyor, or in other words will not gain the same velocity as the conveyor.

Whether this slipping will occur or not, depends upon the rate of acceleration given to the conveyor, as the inertia of the material varies with the rate of its acceleration, and with the mass of the material. The force of acceleration "R" required to give a velocity "V" is given by the formula

$$R = \frac{WV}{gT}$$

Where W is weight in pounds.
V is final velocity in feet per second.
g is acceleration due to gravity, 32.16.
T is time in seconds taken to acquire velocity V.

The force "R" is provided, or rather is transmitted by, the friction of the material, which will be 'W. x f.' where "f" is the co-efficient of friction at rest, from which it follows that "R" must be less than "W. x f."

To find the maximum velocity attainable, we combine the above formulae,

$$\frac{WV}{gT} = W. \text{ x } f.$$

$$V = g. \text{ x } T. \text{ x } f.$$

The maximum acceleration will be equal to the maximum velocity attained in one second as given by the above formula, which becomes,

$$V = g \text{ x } f$$

A theoretically perfect machine would have a uniform acceleration during the whole of the forward stroke, reaching its maximum speed at the end of the stroke. During the return stroke, the material gives out the energy acquired during the forward stroke, in over-coming the friction (of motion), and will slide forward relatively to the conveyor, until this energy is expended, which should not occur before the return stroke is completed.

As the friction is independent of the velocity, the rate of acceleration whether uniform or varying, would not, if the conveyor had a perfectly smooth surface, have any effect upon the sliding of the material on the conveyor. But in actual practice there are always slight inequalities such as joints in the plates, perforated screen plates, etc., which make it preferable to get the conveyor back quickly while the energy in the material is high enough to overcome any small obstruction. Therefore we have a quick acceleration at the beginning of the return stroke as the most desirable.

The most efficient motion, as described above may be shown graphically as in figure 2, the velocities being indicated by the heights of the vertical lines, and the divisions on the horizontal line representing equal periods of time. The vertical heights above the horizontal line are velocities in the forward direction and these below in the backward.

This theoretical motion is not practicable, as it involves a reversal at the end of the stroke, from a maximum velocity forward to a maximum velocity backward, instantly, which would throw too great a strain on the mechanism, even if otherwise possible of attainment.

The actual motion of a Marcus conveyor, can be laid out graphically on the same basis as in figure 2, and will serve as an indication of how close we are to the most efficient motion.

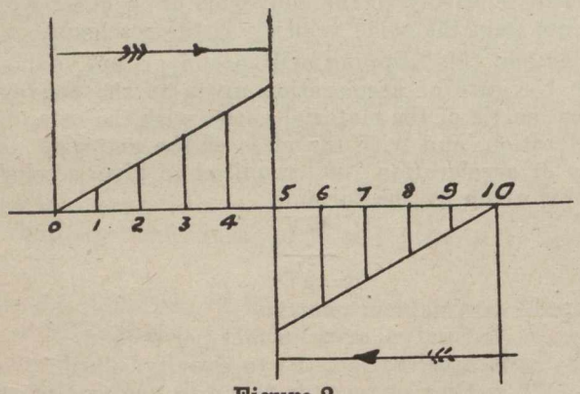


**Figure 2.**

First, we lay out a diagram of the propulsion mechanism, as in figure 3, to scale. Circle "A" represents the path of the crank pin on the pulley shaft, and is divided into ten equal parts, each of which parts will represent equal intervals of time, assuming that the pulley revolves at a uniform speed during a revolution. This assumption is not strictly correct, but is near enough to the truth for all practical purposes, as the pulley should be made heavy enough to hold the variation of speed during one revolution, to within two and one half per cent.

Circle "b" represents the path of the crank pin on the connecting rod crank shaft, and taking length ab, equal to the length of the drag-link, we lay off the points on circle "b", from those on circle "a", thus arriving at the position of crank pin "b" at equal intervals of time.

With the length of the connecting-rod as radius, from the points on circle "b", describe arcs, cutting the center line as shown in figure 3 the marks on the upper side of the line referring to the forward stroke and those on the lower side, the return stroke. The distance between each of these points will be, to scale, the travel of the conveyor, during one-tenth of a revolution of the pulley shaft.

We now proceed to lay out the curve of velocities, as shown in figure 4, the divisions on the horizontal line representing equal periods of time, those from 0 to 5, being on the forward stroke, and from 5 to 10, on the return stroke.

Raising verticals at each point, we mark on each the velocity at that point calculated as follows. Assuming that the pulley-shaft makes sixty revolutions per minute, each division will be one-tenth of a second, and the velocity at point I will be twice the distance from 0 to 1, in feet, multiplied by ten; this will also equal the acceleration during this period. From the length between points 1 and 2, deduct the travel due to the velocity at point I, and twice this amount multiplied by ten will be the acceleration during this period. This acceleration added to the velocity at point I, will give the velocity at point 2, and repeating this process we get the velocities at each point, in feet per second.

We can now find out what will be the theoretical movement of the material, and, referring to figure 4, so long as the acceleration is not more than V as shown above, the material will travel with the conveyor, up to that point where the velocity of the conveyor is at its maximum, and then commence to slide at a uniformly decreasing velocity, relative to the earth's surface, until either one of two things occur.

First, it continues to travel forward, at a continuously decreasing velocity, during the backward stroke, and during a part of the forward stroke following, until the decreasing velocity of the material and the increasing velocity of the conveyor, become equal, when the conveyor begins once more to accelerate the material.

Second, if the energy in the material is dissipated by the friction before the conveyor has completed its backward stroke, the material comes to rest, and is carried backward by the convevor until the return stroke is completed, when the cycle is repeated.

These two results are shown graphically in the straight lines on figure 4, the full line indicating the first, and the dotted line the second condition.

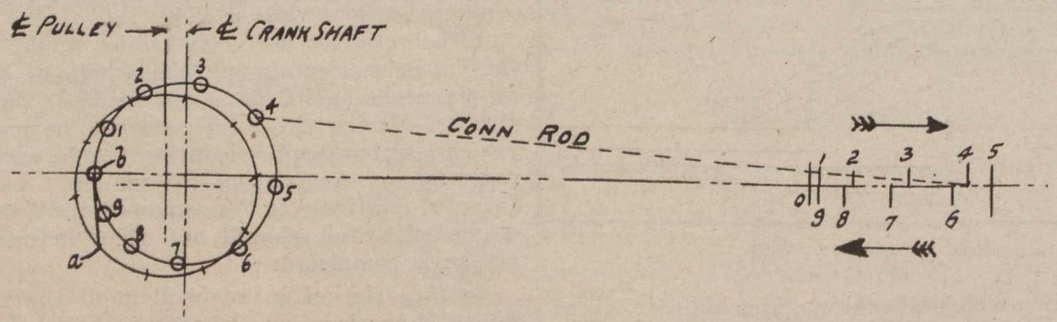


**Figure 3.**

The rate of de-celeration, or loss of velocity per second, is found by the same formula as we used to find the maximum acceleration during the forward stroke, namely,

$$R = \frac{WV}{gT}$$

"V" in this case being the actual maximum velocity, as found in figure 4, "R" being the available energy

in the material to overcome the force of de-celeration, which is the friction of the material in motion.

$$\frac{W\ V}{}$$

The formula becomes $W \times f' = g\ T$
where $f'$ = co-efficient of friction of motion
$T$ = time required to bring the material to rest
Cancelling and transposing, we get

$$T = \frac{V}{f'\ g}$$

Measuring off this time "T", from the point of maximum velocity in figure 4, and drawing the straight line as shown, where this line intersects the velocity curve of the conveyor, is the point at which the conveyor again begins to accelerate the material, under the conditions outlined in the first case above.

If, however, the second case applies, the result will be as shown by the dotted line.

We can now determine the mean velocity of the material, by taking the mean height to the velocity line during one cycle, for case one, where the motion is continuously forward.

For case two, the effective travel will be found by taking the mean velocity, during the time the material is travelling forward, that is from point 0 to 8, and multiplying this by the time 8 seconds, will give the forward movement. From this must be deducted the backward movement during the time 8 to 10, found in the same manner, and the difference will be the net forward movement.

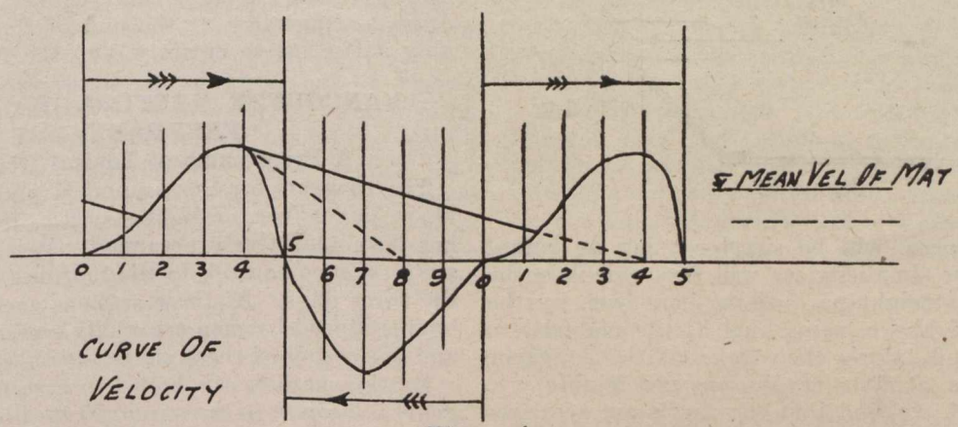


**Figure 4.**

Obviously the state of affairs outlined in case 2, is a very inefficient one, and is shown only to emphasise the effect of poor design. The mean velocity in both cases is shown in the figure by horizontal lines.

Knowing the mean velocity of the material, it is a simple matter to multiply this velocity by the area of the stream of material, and so calculate the theoretical delivery of the conveyor. For a plain conveyor with a smooth surface the actual delivery will closely approximate the theoretical, provided that the feed to the conveyor is uniform, and that the co-efficients of friction used in the calculations are correct.

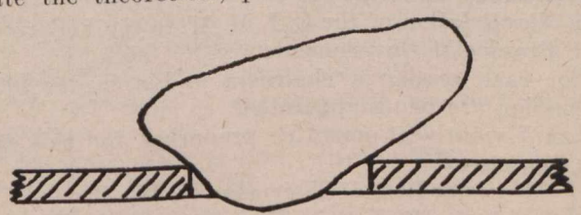

**Figure 5.**

Generally however, the question is complicated by reason of the conveyor being used as a screen, and fitted with perforated plates, the exact effect of which upon the travel of the material, is very difficult to determine, and must be always largely a matter of experience. There are nevertheless, certain calculations which can be made to ensure that the obstruction will not entirely kill the velocity, and this point will be taken up now.

Referring to figure 5, the material is shown fallen partly into a hole in the screen plate, and the problem is to determine whether the energy in the material is sufficient, at the maximum velocity, to raise the piece out of this hole, or over an obstruction of a given height.

The energy is found by the formula

$$E = \frac{W\ V^2}{2\ g}$$

where "V" is the maximum velocity of the material relative to the conveyor, that is the maximum total velocity shown in figure 4, taking both above and below the horizontal line.

The energy required to raise a body a height "h" in feet, is, neglecting friction, $E = W \times h$

The available energy is $\frac{W \times V^2}{2\ g}$

Therefore $W \times h = \frac{W \times V^2}{2\ g}$

$$h = \frac{V^2}{2\ g}$$

It should be remembered that if an obstruction is allowed, approaching this height, the piece meeting this obstruction will be in the worst position, when it stops just at this obstruction, and this is just where it will stop, unless it happens to meet it when its velocity is at about the maximum. A particle thus held at an obstruction will stay there until the conveyor completes a cycle, as it can pass only when the maximum velocity is reached. On the other hand if the material is coming in a continuous steady stream, and the obstructions are not frequent, the material which is behind the piece at the obstruction will exert some of its energy in assisting the obstructed piece

over, at the expense, of course, of the velocity of the whole stream.

Returning now to the type of obstruction, by deflecting-gates, as shown in figure 1. The forces acting in this case are, that while the acceleration force is in the direction 1, the travel of the material is compelled to be along the line "m", see figure 6.

The force due to the energy is therefore, divided into two resultant forces "m" and "n", of which "m" is the only one effective. Not only is the resultant "n" wasted, but it still further reduces the effective force "m" by reason of the additional friction which it induces. The actual delivery is cut down still more by reason of the travel of the piece being in a diagonal line, the effective longitudinal travel being less than the actual travel. There will also be a tendency to jam the pieces together sideways, still further increasing the friction to be overcome.

To show approximately what would happen under

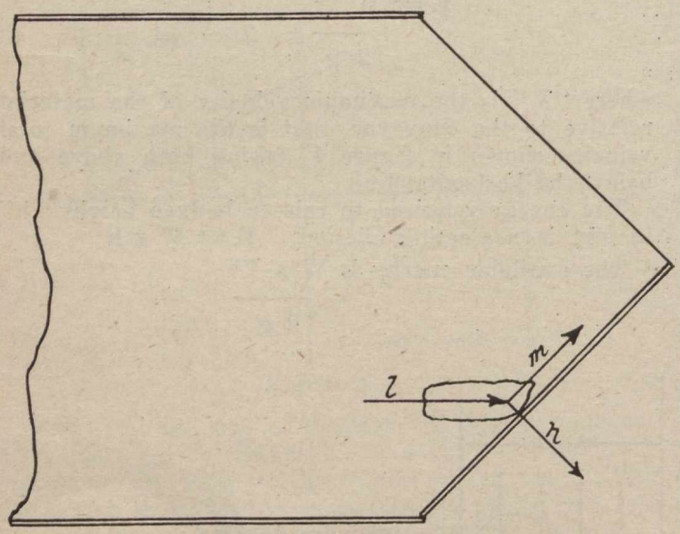


**Figure 6.**

these circumstances, will be simpler using an actual example, and for simplicity we will first calculate the results for the straight part of the conveyor, by the method outlined above, using coal as the material to be conveyed, and taking the stroke of the conveyor as twelve inches, at sixty revolutions per minute.

From figure 4, we find that the maximum acceleration is between points 1 and 2, and is at the rate of 1.7 feet per second. Taking .25 as the co-efficient of friction, and working out the formulae

$$V = f \times 32.16 = 8.04$$

we have a factor of safety of nearly 5. Probably the conveyor could be run faster, but would be likely to set up injurious vibrations in the structure of the building.

The material will begin to slide forward at a point between 3 and 4, figure 4, and will start with a maximum velocity of 3.3 feet per second, using the formula $T = V$ and assuming f' at .2, we get

$$T = \frac{f' g}{1.7}$$

$$.06 \times 32.16 = 1 \text{ second.}$$

As the divisions represent each one tenth of a second, we join the point of maximum velocity to a point ten divisions (one second) from it, and thus indicate the velocity of the material during the backward stroke. Taking out the average velocity as already explained, we get the answer as being 2.3 feet per second.

To determine the maximum height of any obstruction, such as dead plates over screens etc., we use the formula given above, namely

$$h = \frac{V^2}{2 \times g}$$

Taking the maximum velocity from figure 4, at 4¼ feet per second, we get

$$h = \frac{4\frac{1}{4} \times 4\frac{1}{4}}{2 \times 32.16} = .28 \text{ feet or say } 3'', \text{ neglecting friction.}$$

The friction will reduce this height by about 80 p.c. so that the maximum height will be about ¼", but as this would hold up every piece about half the time, such a height should be avoided if at all possible.

Coming now to the case shown in figure 6, and assuming an angle of the gate with the conveyor of 45 degrees, the force carrying the material along will be split into two resultants each equal to .7 of the total force.

The distance that the material would travel longitudinally, is therefore reduced to .7, and as the travel is to be at 45 degrees diagonally, the net longitudinal travel will be only .49 of that on the straight part. The re-action of the gate, is .7 of the total force and at a co-efficient of friction of .25, will account for .7 x .25 equals .175 of the total force, leaving only .525 of the orginal force as effective to produce movement, which multiplied by .7 results in an actual gain longitudinally of only .36 of the travel of the material on the rest of the conveyor. With a continuous stream, this would cause a congestion at the end of the conveyor, probably sufficient to entirely stop the flow.

## VANCOUVER MEETING OF C. I. M. & M. FEBRUARY, 1921.

### A Programme of Topical Discussions.

The program for the Annual Meeting of the C. I. M. M. in Vancouver, on February 9th, 10th and 11th next has been tentatively arranged. It is planned to have six sessions, one each in the morning and afternoon of the three days. At these sessions certain subjects will be introduced by men especially conversant with them, and discussion of these subjects is also being arranged.

By this method it is hoped to present matter of more general interest to the mining fraternity than if a series of specialized technical papers are read; to have a larger number take active part in the discussion, and to make the meeting correspondingly more profitable and interesting to all attending.

The six subjects decided upon, to each of which a session of about two hours will be devoted, are:

1. General Business and a Review of Mining in B. C. for the year 1920.
2. Fuel Supply.
3. Metallurgy—The Treatment of Complex Ores.
4. The Non-metallic minerals of British Columbia.
5. Geology and Mining.
6. The Relation of the C. I. M. M. to the Federal and Provincial Governments.

For each session a chairman and a leader of the discussion are being appointed.

The Executive Committee preparing for this meeting consists of:

H. Mortimer-Lamb, Chairman, R. W. Brock, E. A. Haggen, J. D. MacKenzie, F. E. Payson, P. W. Racey, S. J. Schofield and Nicol Thompson.

# Relation of Standardization to Mine Management

By CHAS. A. MITKE, Chairman, General Committee.

Standardization, Metal Mines Section, American Mining Congress. (Author of "Standardization of Mining Methods," Published by the Engineering & Mining Journal, 1919.)

It has been well said that "great economies in any business of production result from careful and thoughtful attention to details, and mining is no exception to this rule. On the contrary, successful mining is one of the greatest embodiments of the principle. Just as the difference between the careful manager and the careless one is apt to be the difference between profit and loss, so the difference between standardization and non-standardization is very frequently the difference between good and bad management."

Estimates show that in metal mining over 50 per cent of the total cost of production is chargeable to labor, therefore, the proper directing and systematizing of the activities of labor, to eliminate the waste of human efforts, is a very important factor in the standardization of mining operations.

In mines where only a few men are employed and a small tonnage produced, the entire supervision can be accurately directed by one general foreman, and the question of standardization does not enter largely into the daily work. However, where great tonnages must be produced at a low cost, and where the entire supervision of all details by one man is utterly out of the question, but of necessity rests in the hands of a large organization; then the standardization of all operations not only becomes very desirable but absolutely essential.

The need for a scientific investigation of mining practices or mining methods, with a view to alleviating present conditions, (as regards high production costs), which have been brought about largely through high cost of supplies, increased advances in wages, and loss of efficiency due to the unemployment of unskilled or raw labor, has made itself felt throughout the entire mining industry, not only in the United States but also in Europe.

In one large camp in this country, wages, which in 1914 ran from $3.75 to $4.25, now range from $5.65 to $6.40 per 8-hour shift. Taxes, supplies, freight rates, etc., are also considerably higher than they were several years ago, with no immediate prospect of reduction. Moreover, inevitably, the grade of the ore in many properties will decrease as the years go by. This necessitates the mining of much larger tonnages in order to maintain the ultimate output at the same level.

It would also appear, as one writer states, that "whatever may be our desires or regrets, the present high wage level will endure at least for a sufficiently long period to warrant formation of a constructive plan to meet it."

"Therefore, the only remaining alternative for the mine management is to make the workers so efficient that their daily performances will warrant the maintenance of the present wage scales."

This can only be accomplished in the following manner:—

First:—Americanization, which merely begins with the teaching of the English language.

Second:—Education of employees (from heads of department right through the entire organization down to the miners and muckers) in the most efficient method of performing the daily task.

Third:—By establishing a standard program for all operations, in order that human efforts may be utilized to the greatest advantage.

Fourth:—By furnishing the men with standard equipment, in order to facilitate routine work and make their efforts more productive.

Fifth:—In order to encourage the miner to put forth his best efforts in attaining maximum production, an incentive over and above day's pay, should be offered by the management.

Another most important factor in developing a scientific organization is the "setting of standards for work done." A very vital question is—what constitutes a day's work? What was assumed to be a day's work five years ago cannot be adopted as standard today. The wage system, whether contract or bonus, must be based on actual knowledge and justice. Nothing is more discouraging to a workman, or productive of more ill feeling and discontent, than to have the standard bonus or contract rate cut, because he has performed his work exceptionally well and made a greater footage than the rating engineer ever anticipated could be made under the schedule. Cutting the bonus after it is once established, is responsible for the great feeling of distrust which many men show towards working under any system other than day's pay.

In order to achieve a universal success, time and thought must be devoted to an intensive study of the details of mining. Each operation must be divided into its component parts, and standardization applied to each unit. Experimentation is also a very necessary part of the program and should be encouraged and fostered by the mine management. The workers must be trained to perform their tasks efficiently and intelligently and labor-saving devices and equipment substituted for hand labor wherever possible.

Unskilled labor should be supplanted as far as possible by mechanical means. This should not be interpreted as meaning a loss of employment to many who are now engaged in this class of work. There is plenty of work for all and the performance by machinery of work which requires little or no intelligence, will release thousands of men who can be trained for better paying jobs.

Until recently, the systematization of metal mining operations was considered impracticable, particularly those operations carried on underground, from which natural circumstances have, to a large extent, excluded the light of publicity. The reserves of many of the larger mines have also been so rich and extensive that economy has not played as important part, perhaps, as it should. The ever present possibility of "sweetening the ore," or, in other words, bringing the daily output up to expectations by the addition of higher grade (kept in reserve for such purpose), has often tided over situations which, otherwise, might possibly have disclosed unsystematized methods and careless supervision on the part of underground bosses, to whom quantity plus quality at the moment, meant everything.

regardless of the disastrous effect their methods might have upon the future life of the mine.

Moreover, underground operations are to a large extent shrouded in obscurity, and the intimate details are known only to a few, whose business it is to make daily visits to the working places. The larger number of the employees are frequently ignorant men, whose main interest in their work is to get out the number of cars required by the boss, and to whom ore and waste are of very little interest, except as they add to the required tonnage.

The needs of the manufacturing industry, and the keen competition encountered, have developed a host of experts, and production engineers, who have delved into the intricacies of the different branches and brought to light innumerable operations which lend themselves well to the adoption of standard methods.

Unfortunately, in the mining industry, no sweeping changes can be effected, which, in the course of a short period of time, might be expected to revolutionize the industry at large, and produce the same gratifying results as have been obtained in industrial plants. This fact, in itself, has acted as a deterrent in the standardization of mining operations, and while, in individual cases, alert, wide-awake operators have made considerable progress along these lines, the industry as a whole does not reflect the same systematization of operations that may be found in manufacturing plants.

It is generally conceded that mining is a profession which should require a highly specialized training, but as a rule sufficient emphasis is not placed upon the practical application of such technical knowledge. Too much dependency is placed upon practical experience alone, and too little on scientific principles. Far be it from the writer to discredit practical knowledge. The mining industry in the past owes much to its practical men, but what it now requires is practical knowledge superimposed on a scientific basis, or in other words, the attention of men who have added years of practical experience to their specialized or scientific training.

The metallurgical branch of the profession has been the subject of much thought and study, and considerable research is continually being carried on in this branch of the profession. Contributions have also been made to the mining branch, but in the main these have consisted rather of descriptions of practices already in use in certain localities, than in the nature of original research work.

An X-ray analyses of mining operations as a whole, frequently disclose out of date methods which would not for an instant be tolerated in surface plants. What large factory owner, for instance would permit one o fhis operators to spend two-thirds of his day away from his machine, hunting parts, supplies, lubricating oils, etc.? There, the output is based on machine production for each man, and the amount he can turn out is calculated to a nicety, and it is the imperative duty of the shop foreman to see that everything required is present and the machine in good order before the man starts to work. It is, however, a very common occurrence underground, for a first-class drill machine operator to spend a large portion of his time walking through drifts and tunnels in search of sharp steel, or the right kind of steel to fit his machine, repair parts, oil cans, or returning defective machines to the tool house and carrying new ones to take their place.

In the factory, fatigue studies have been made, covering every action from the steps taken in performing certain duties, to the movements made by each hand of the individual worker in handling manufactured parts. In mining, however, it has come to be an unwritten law that so long as the machine man drills a round of holes (special allowance being made for unusually hard ground), he has performed his daily task, regardless of the fact that (like Taylor's handler of pig iron), providing his operations are studied and systematized, he might be made to double his performance with comparatively little additional effort to himself. This has been demonstrated in a number of instances, yet, as a whole, it still continues to be the general practice to consider one round of holes a day's work. The responsibility for this lies largely with the mine management. Formerly, in a great many instances, atmospheric conditions of working places, were such that men could not work consistently during an eight hour shift, and in many cases it grew to be the practice for men to work a certain period and then seek a better atmosphere in the mine where they cooled off and rested for an equal period of time. Also, in years past, the ventilation of mines was so bad that no blasting could be allowed during the shift, and consequently, after the miner drilled his round of holes, he would merely while away the remainder of the shift until quitting time, and fire the shots when leaving the mine. With the improvement that has already been made in metal mine ventilation, it has been demonstrated in exceptionally well ventilated mines that shots can be fired at any time during the shift without inconveniencing the men, and as a matter of fact, in one large mine, which is exceptionally well ventilated, there is a shot fired every minute during the shift, with little or no resulting delay to the underground force. Now that every effort is being made to attain underground working atmospheres as nearly as possible approximating those on surface, this custom, of considering one round of holes a shift's work, (regardless of its depth), which is really nothing more than habit, must be overcome if mining operations are to be placed on an equal footing with those on surface.

This is but one example of the lack of systematization in mining operations. Much benefit could also be obtained by the devotion of careful thought and study to the question of explosives, their use and handling; the correct placing of machine drill holes; handling of timber, both underground and on surface, where much unnecessary labor is involved in handling and re-handling each piece as it comes from the cars, the writer having observed as many as twelve men employed at the same time in handling one stick of timber.

The distribution and care of underground supplies is another subject which would react most favorably to research.

The standardization of equipment and supplies is closely linked with the systematization of operations, and of necessity the one must be studied along with the other.

The industry at the present time is burdened with a multiplicity of machine drills, of varying types, sizes and weights, the difference in weight in some instances not being more than one to two pounds. The production of these machines follows each other with such rapidity that in an effort to stock up with the best equipment available on the market, many machines in good condition must be scrapped, and as parts are not interchangeable, a considerable investment in such supplies, must continually be charged off to profit and

loss. The development of these machines is, of course, carried on by the manufacturer to meet the needs of the industry, but unfortunately, these needs are often the individual ideas of various operators rather than the combined views of the majority. What may appeal to one does not appeal to the other, and consequently the necessity for purchasing and trying out this variety of types becomes an ever-increasing burden on the operator.

During the past seven years the necessity for drifting machine, permitting the use of water and air through machine and steel, became so evident to practically every purchaser of rock drills, that as a result, the manufacturers evolved the water Leyner. The self-rotating water stoper, which is now nearing perfection, is also the result of the combined needs of the mining industry, and many other improvements in drilling machines are possible, providing some research work is devoted to the subject of finding out just what specifications would meet the needs of the majority for the different types of machines, such as jackhammers, drifters, and stopers.

The chucks on all machines must become standard, so as to permit the interchange of different makes of steel. The lack in efficiency and the loss of time incurred at present through miners supplying themselves with steel which does not fit the machine they are using at the time, is such that this change has become an absolute necessity.

The sizes and types of steel should also receive attention. There are individual cases, where companies have standardized on the ¼ hollow octogon for all stoping and raising and find this type of steel satisfactory for all their needs. Other companies are achieving excellent results with the 1″ hollow round. Research would bring to light many facts which might tend to prove that one or the other of these two was the more satisfactory.

The same is true of hose fittings, and various parts and supplies for machines.

Underground power shovels to supplant manual labor in mucking and shovelling, should receive attention, in order to avoid the creation of the multiplicity of slightly varying types, similar to that which at present exists among rock drills. It is inevitable that mechanical equipment must supercede hand labor underground to a large extent, if we are to overcome the scarcity of labor—both skilled and unskilled—and increase the tonnage per man shift, (at the same time maintaining the normal grade of the ore), which is the principal means of combatting the present high cost of production. Shovelling or mucking is one of the most important items which comprise underground operations.

Care and attention might profitably be devoted to underground transportation, the grade of tracks, weight of rail, etc. Also the possibility of standardizing on a few sizes and types of mine cars, rather than on the unusually large number now on the market. and the various methods of haulage, compressed air, electric, and steam.

The ventilation of metal mines is a subject of the utmost importance. Without good air no man can live, much less work, and upon the condition of the working-place depends very largely the efficiency of the worker. Much of the trouble resulting from bad air in metal mines at the present day comes from the deficiency of ventilation in dead ends in drifts and stopes. The ventilation of such working places can greatly be improved by resorting to systematized methods in regard to the use of certain types of small blowers and ventilating pipe, care and attention being devoted to the manner in which these are located and operated. The prevention of dust in mines necessitating frequent blasting during the shift, is another means of raising the efficiency of the miners. In the past, bad air, rock dust, and heated atmospheres were looked on as necessary evils, which could not be overcome, and the man who could not put up with a certain amount of such discomfort was rather contemptuously referred to as one who "could not stand the gaff." Today, such conditions are unnecessary, and the adoption and use of standard equipment and standard methods will provide the men with a working atmosphere to themselves. The systematic testing of mine air and the adoption of a standard atmosphere is one of the pressing needs of the industry.

Fire fighting equipment and systematized rules for combatting outbreaks in the mine are also of the utmost importance, as the profit and loss accounts of many companies show large sums charged off to disasters of this kind, which might possibly have been averted through the keeping in stock of a standard line of fire fighting equipment.

There are many other subjects in the mining industry, to which standardization can be applied, such for instance as cost accounting. Frequent discrepancies in the manner of keeping costs are encountered, even in properties owned by the same company. For instance, one mine will charge off the work of preparing an orebody for stoping, to development work or to a separate fund which has been laid aside for such purpose. Their production costs may then appear quite low, for the reason that this large sum which should necessarily be added to the stoping cost, as it all goes against the ultimate profits, is omitted, while other companies include development costs, but exclude overhead and supervision, and so forth.

The estimation of ore reserves is another matter for research, equitable taxation, and many other items, all come under the head of subjects to which standardization might be applied.

An objection frequently raised against standardization is that it regards progress, and that having once decided on a standard, there is no possibility of change and old standards must be adhered to even though newer methods have been developed which have outclassed the old. In this connection it may be well to quote from an authority on this subject who well describes the functions of a standard, in the following words:—

"A standard is simply a carefully thought out method of performing a function, or carefully drawn specifications covering an implement, or some article of stores or of product. The idea of perfection is not involved in standardization. The standard method of doing anything is simply the best method that can be devised at the time the standard is drawn.... Improvements in standards are wanted and adopted whenever and wherever they are found. There is absolutely nothing in standardization to preclude innovation. But to protect standards from changes which are not in the direction of improvements, certain safeguards are erected. These safeguards protect standards from change for the sake of change. All that is demanded... is that a proposed change in a standard must be scrutinized as carefully as the standard was scrutinized prior to its adoption. Standards adopted and protected in this way produce the best that is known at any one

time. Standardization practiced in this way is a constant invitation to experimentation and improvement.'' *

The standardization of mine equipment and mine operations in the various branches, are of vital interest to the mine manager who is responsible for the ultimate cost of the product. In order to work out these problems, to accumulate the correct data upon which to base conclusions, and finally to introduce standard methods, it is absolutely necessary that the mine manager effect this change through the medium of his organization, composed of heads of departments, foremen, bosses and engineers. Their intelligent co-operation is therefore an essential part of the program. These are the men who represent the company, or mine management, and interpret the policies and desires of the company to the great mass of employees. They are also intimately acquainted and associated with the multiplicity of operations, which combined, form the activities of the mine. If their interest and enthusiasm is directed towards a study and systematization of the details which form the various groups of operations, then through the standardization of many small tasks, which by themselves may not appear important, under the careful supervision of the mine management, larger economies will result which, in turn, will ultimately have the desired effect of reducing the production costs.

* Morris L. Cooke, Bull. No. 5, Carnegie Foundation Series.

## A MONTREAL LETTER.

ALEXANDER GRAY

**The Opportunity of the Gold Mines.**

Evidence accumulates that gold-mining is about to have its turn, when multiple costs become less onerous.

Labor is more affirmative toward employment underground where ventilation is sanitary and housing accommodations at surface are what they should be.

It is not difficult to discern why this is so. The lower price of silver and temporary shortage of power have caused at least two Cobalt companies to suspend operations. No doubt others are not pressing production. This, and the number of men laid off elsewhere, has afforded a long-deferred measure of relief to operating gold mines, which are also assisted by reductions in provisions and supplies.

The resultant benefits to producing companies may not be manifest to a great extent in the yearly output —but crews are larger and the efficiencies are greater.

Such mines as the Hollinger, Dome, McIntyre and Lake Shore, therefore, are freer to proceed with development and increase the tonnage milled without unnecessarily encroaching upon their ore reserves.

Before properties removed from the milling stage—and ''prospects''—however inviting, pursue other than make-haste-slowly policies they must have reasonable assurance as to the quantity and grade of ore, co-operative labor, and working capital. Once the labor problem is solved, if capital is attracted upon equitable terms the proving of tonnage at a number of properties is foreseen. Not ''every prospect pleases'', consequently the first order of business is to avoid a recurrence of speculation in the cheaper class of shares. It is desirable to have crushing mines regenerate interest that waned, rather than to have a crush of shares of the 10-20-30 variety traded in. Of course the resumption of normal conditions will be taken by the more venturesome as a signal to start the printing presses; yet the integrity of the respective gold fields is at stake, and confidence ought to be maintained if the requisite capital is to be obtained. Competent Mining Engineers — not the catch-penny species—should have the say-so.

**Profits Tax to Go?**

Mines, as perishable assets, are particularly susceptible to Profits Taxation, so mining companies unanimously will welcome the seemingly semi-official announcement that the special War-time surtax will be discontinued.

Without questioning the necessity for extraordinary revenue when the Western World was crazy, it is equally admissable that precious metal mines were adversely affected by the superimposed levy. For that matter, metal mines already were heavily burdened with direct and indirect taxes and costs, and not all of them by any means were enabled to benefit by War prices for their products. Silver, copper and zinc mining companies—and certain non-metallic producers—had a period of exceptional prosperity. Gold and Nickel mines did not share in this to any great extent, in fact the former were harrassed in every direction and the latter refrained from profiteering. Operating costs and taxes throughout were so onerous as to be almost intolerable.

It has not been indicated whether or not there will be some other medium of raising revenue substituted for the irksome National Profits Tax. If such is to be enacted, the hope is that due consideration will be shown for Mineral Industries. Those industries are loath to seek or to expect exemption from equitable assessments. They are going to play a larger part in the impending struggle for trade, and they deserve more encouragement than they have received in official quarters.

Contrary to the impression prevailing in what should be well-informed circles, all mines are not ''holes in the ground with Liars on top.'' They are foundation stones in our economic structure, and without them parts of Canada might be pastorally beatific, but elsewhere there might be ''nobody home''.

Mining made the States from the Rockies to the Pacific, until it was discovered, there were soils and climate for semi-tropical and temperate zone fruits. The ''lumber-jack'' and prospector—not Mining Stock Exchanges—gave Northern Ontario its impetus. Is it possible to have highly-placed politicians in power who will recognize the true relationship of the pick to the plough? Before Comstock, Nevada had little excepting the cactus and the coyote. The Aztecs could have had Mexico to themselves were it not for its minerals. California placers and the Motherlode established the Golden State. Central City and Leadville preceded cattle-ranching in Colorado. The corollary need not be carried further.

Before the Mining & Metallurgical Club of the University of Toronto, Mr. James McEvoy said that in the event of serious labor trouble in the American coal fields, or of strained international relations between the United States and Canada, Canadian industry would inevitably suffer from an inadequate supply of coal unless some provision for such an emergency is started at the present time. Should such an emergency occur in Ontario, from an industrial standpoint the effects would be appalling, he said.

## NOTES FROM NOVA SCOTIA AND NEWFOUNDLAND COLLIERIES.

Progress is being made at the Hiawatha Coal Mining Company's mine near Morien, Cape Breton. Some 6,000 tons of coal has been raised and stocked. Deepening of the loading ground for vessels is being effected by dredging, and sufficient draft for schooners and small steamers will be available by the Spring. Some cargoes have already been shipped to Halifax by barges.

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The November production of the Dominion Coal Company in the Cape Breton district exceeded expectations, reaching 296,367 tons, the largest month's output since August 1917.

Individual colliery production was as follows:

| Mine. | Tons. |
|---|---|
| No. 1 | 31,383 |
| No. 2 | 47,440 |
| No. 4 | 26,996 |
| No. 5 | 9,665 |
| No. 6 | 25,413 |
| No. 9 | 24,193 |
| No. 10 | 11,707 |
| No. 11 | 14,778 |
| No. 12 | 13,902 |
| No. 14 | 21,881 |
| No. 15 | 9,863 |
| No. 16 | 12,905 |
| No. 17 | 3,539 |
| No. 21 | 17,323 |
| No. 22 | 18,544 |
| No. 24 | 6,835 |
| Total | 296,367 |

A slight underground blaze occurred near the electric-pumping station in the No. 9 Colliery of the Dominion Coal Company, but was fortunately discovered and extinguished before it had made headway. Overheating of the controller is stated to have caused the fire.

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Extensive additions are being made to the equipment of the Springhill Collieries, including a new bankhead recently completed. A new hoisting engine, and additions to the boiler equipment are also in progress. As was noted in last week's issue, production is being well maintained at these collieries.

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The coal production of the Nova Scotia Steel Company at Sydney Mines in November reached the high figure of 55,304 tons, the best month's output of coal since December 1916. Individual colliery production was as follows:

| | Tons. |
|---|---|
| Florence Mine | 18,892 |
| Princess Mine | 16,789 |
| Jubilee Mine | 14,402 |
| Scotia Mine | 5,221 |
| | 55,304 |

The development of a new colliery near Bonar Head is progressing satisfactorily.

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The Newfoundland Government is proceeding to develop the coal seams along the Codroy Valley, on the West Coast. A road is being opened up from the first mine opening to the nearest railway point, about three miles distant, and it is proposed to use five-ton motor trucks to take the coal from the mine to the railway, as a first means of transportation.

Systematic examination of the Carboniferous basin at St. Georges, situated further to the northward on the West Coast and not far east of Grand Lake, is being undertaken with a view to further mine openings.

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### Labor, Wages, Production and Disposals.

No new developments have taken place in the labor situation. Production is being increased, largely as a result of unemployment in other industries. The action of the miners union with regard to the so-called Montreal Agreement will be decided by a referendum on the 14th December. In the meantime the question is the subject of hot debate in the locals and in the newspapers of Nova Scotia. The ex-President of the United Mine Workers, Mr. John P. White has expressed unqualified approval of acceptance of the agreement, stating in a letter to the Nova Scotia District that "industrial conditions are becoming very serious in many sections of the United States, and the chances are that they may affect our wage standards before we anticipate." Mr. White presses for acceptance of the agreement "because, from what I know of the situation, everything was secured that could be under the circumstances."

The railwaymen employed in inter-departmental transportation at the Sydney steel plant and at the collieries and steel plant of the N. S. S. & C. Co. at Sydney Mines are still on strike, about 40 men at Sydney Mines and 120 at Sydney being on strike. Full operation of the collieries at Sydney Mines is being found possible, and at Sydney the plant is working in departments other than those occupied in steel production. The Dominion Steel Company takes the stand that no strike is in existence, and that the men in the railway department of the steel plant who have absented themselves from work are no longer employees.

The non-use of coal for the coke-ovens and other metallurgical requirements at the Sydney Plant releases between 3,000 and 4,000 tons of coal daily for shipment to outside points, and this, combined with the larger production of coal now found possible, leaves no further excuse for the embargo on coal exports, seeing that the St. Lawrence route is closed. Although no public announcement has been made by the Railway Commissioners it is understood the embargo has actually been lifted.

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It is likely that Nova Scotia coal will appear on the Montreal market in 1921. Enquiry among firms who formerly used Nova Scotia coal for steam-raising purposes discloses that there is a general tendency in the St. Lawrence market to welcome back the Canadian product, the temporary deprivation having shown up the relative quality of Nova Scotia coal to great advantage in comparison with imported coal. By next Summer, however, it may be taken for granted that the prices asked for imported coal in Quebec Province will be very much less than recently current prices and less than prices now ruling. Canadian coal should also be helped by the discount on Canadian funds, now almost as great as it ever was and seemingly little likely to materially decline, and by the increased railway rates. This presumes, of course, that freighting rates from Nova Scotia to Montreal will decline a little, and that marked reductions will be

possible in the pit-mouth costs of Nova Scotia coal. Nova Scotia coal operators are likely to hesitate to bank coal heavily during the present Winter, in view of the general uncertainty of the industrial outlook.

It was pointed out to the Railway Commission during the Summer, and previous to the imposition of the embargo on coal exports, that such a procedure could only be justified if the Government was in a position to guarantee full work for the collieries in supplying domestic needs during the coming Winter and the Summer of 1921. It was further emphasised that the amount of coal available for next Summer's domestic requirements could only be obtained by full work of the collieries during the Winter, and that the capital outlay and risk of banking out large tonnages of coal was only justified by contracts given at this time for next season's railway and other requirements controlled by the Railway Commission.

It is very doubtful if the additional quantity of coal made available for domestic requirements by the operation of the coal embargo has justified its imposition. The embargo has certainly entailed great monetary losses on the coal companies, and has acted as a deterrent to production, or perhaps it would be more correct to say, has acted as a deterrent to capital expenditures intended to enlarge future production.

## British Columbia Letter

The incorporation of a $15,000,000 company for the establishment, presumably near the City of Vancouver, B.C., of an Iron and Steel Industry; the announcement that British mining engineers have been quietly making a survey of the iron ore resources of the Province on behalf of British capital; and the further assertion that the Rothert Process Steel Company, of Seattle, Wn., proposes the construction at or near Seattle of an electric furnace and auxiliary plant at a cost of between $300,000 and $400,000 are the outstanding happenings of the past ten days in British Columbia.

For years the idea of actively developing the iron ores, Magnetite, Hematite, and Limonite, of the Pacific Northwest has been simmering in the minds of local promoters who at intervals have busied themselves in bringing the possibilities of such an industry to the attention of British and American financiers. Heretofore they have had no pronounced success but now, it would appear, there is a prospect that something will be done.

It is said authoritatively that the $15,000,000 Company is a British Company, that all the capital is being subscribed in England, and that, as a result of favorable reports from competent engineers, the work of launching the industry will go forward without delay, the $3 a ton bounty on pig iron produced in the Province from provincial ores having been guaranteed.

A similar project, it seems, is contemplated by another group of British capitalists. It was on the latter's behalf that Walter Dennis Rock, a steel expert of England and a mining engineer of prominence, was in this Province. He was quietly pursuing his researches, and it is said with satisfactory results, when stricken with an illness resulting in his almost instant death. Prior to his tragically sudden demise he had arranged for the shipment to England of a carload of Pacific Coast coal and the understanding is that, if this

upon test proved to be satisfactory coking coal. Mr. Rock's recommendation would have been that conditions in every respect were suitable. The British Government retained Mr. Rock during the war in connection with experiments then continuously carried on in conection with the by-products of coal.

The Rothert Company's enterprise cannot be said to have been definitely decided upon, if it is the intention to use the iron ores of British Columbia, because it is impossible to say what attitude a Provincial Government would take on the export of its mineral for refinement outside the Country. It is known that the Oliver Government, khich now is before the electors seeking further endorsation, discourages such a practice, but it is possible that another administration will be returned to power in which event the promoters of the Seattle plant might be able to come to an arrangement for the export of the material necessary to keep their plant in operation.

### Princess Royal Island.

Considerable excitement has been created by recent discoveries on Princess Royal Island. There has been quite a bit of staking and reports are to the effect that some of the claims have as good showings as those of the now well-known Surf Inlet Mine, one of the largest gold producers of the Province. Development on some of these new properties will go forward throughout the winter. Where this is impossible work will be started in the Spring so that it will be next Summer before it is known whether the sanguine expectations of the prospectors are to be realized.

### Alice Arm.

The Moose Group Mining Company Ltd., of Vancouver, B.C., has done much work in the opening up of its properties and in the construction of a permanent camp. During the summer a trail has been constructed, winter quarters built, and exploration and development pushed forward, the latter being by means of open cuts and the driving of tunnels. There are two veins so far proved, one intersecting the other. The main vein has a width of 20 feet. The upper tunnel is in 40 feet with the face in ore averaging about 25-oz. silver per ton. By extending the tunnel 80 feet further the two veins will be opened out at the point of intersection. On November 1, the lower tunnel was in 21 feet and the vein now is being cross-cut, with a showing of from 8 to 10 feet on ore on the downward extension of the ore-body. The main vein has a strike approximately east and west and the smaller vein strikes east and north. The dip is northerly. There is a difference of 310 feet in the elevation of the two tunnels. The main vein outcrops near the south end of the property. The veins occur in the so-called andesite braccia characteristic of the upper Kitsault section of Alice Arm. The mineralization shows grey copper with which the high silver values are associated; a little galena, and a considerable amount of manganese.

### Rossland, B.C.

There is little mining activity as yet in the Rossland Camp, once the leading metalliferous mining centre of the Province. Few men are employed on the properties of the Consolidated Mining & Smelting Co. and there are same leasers engaged at the Velvet Mine. While the plans of the Company's proposed large concentrating mill are complete and although the site for the plant is chosen, the work has not begun, doubtles owing to the decision of the Company to wait to see whether building costs will fall and perhaps also to permit the metal market to become more stable. Rossland's future depends on this Mill. When it is in operation the mines of the historic camp once more will become superlatively active and residents of the town are impatiently waiting for the Company to take definite action.

### Hazelton, B.C.

The Silver Standard Mine of the Omineca District has been closed down for an indefinite period, the reasons given being excessive freight costs, high cost of all material, and the steadily declining value of metals. There is no disguising the fact that this a blow to the Hazelton district of Northern British Columbia because this is one of its most promising mining properties, its development has been progressing with satisfactory indications, and there was reason for the hope that it soon would be placed on a permanent producing basis.

### Sandon, B.C.

At the Noble Five Mine, near Sandon, a new bunkhouse has been under construction for some months and now is complete. It cost $20,000, is electric lighted, steam heated, and fitted with shower baths provided with hot and cold water. There also are a reading room and a steam-heated drying room. The accommodation provided is for 55 men. Undoubtedly it is the most modern bunkhouse in the Interior, in fact it seems slander to refer to it as a "bunkhouse"; much more appropriate would be the "miners' residence".

### Moyie, B.C.

The Society Girl Mine again is among the shipping mines of the Interior. Leasers have uncovered some very rich ore and intend to continue work all winter. After working little over three months they have taken out $3,000 worth of ore. The news of this development has been received with enthusiasm by people of the district, who have of late been plunged more or less in gloom owing to the common report that the mine sof Moyie have played out never again to figure as producers of importance. Their confidence has been revived and predictions now are freely made that Moyie will come back.

### Golden, B.C.

Much is expected of the Bunyan silver-lead property situated on Bunyan Mountain, near Lake Windermere. A crew of from 100 to 150 men is to be employed as soon as weather conditions permit next spring in further development. For their accommodation bunkhouses, etc., are to be built with all possible dispatch, preparations already being underway. This property recently was taken over from the owners on lease and bond after having remained dormant for 19 years. The showings having satisfied the new operators, a 600 foot tram was installed, connecting the working tunnel and the new ore bunkers. Powerful motor trucks have been imported to transport the ore from the bunkers to the nearest rail point and an early shipment is to be made to the Trail Smelter.

Mining continues active in the Windermere District. Australian interests have opened the Isaac Mine at Birscoe and the same people have re-opened the Nip-

and-Tuck. From the latter a considerable tonnage of high grade ore has been packed down from the Mine for shipment. It is expected to return about $150 a ton.

The Paradise Mine still is producing. It is the most consistent producer of the District.

### Trail, B.C.

The Consolidated Mining & Smelting Co., of Trail, received shipments of ore during the week ending November 7th aggregating 11,149 tons. Ore came for the first time this year from the White Bear, Rossland; the Horn Silver, Similkameen; and the Knob Hill, of Republic Wn. This brings the shipments for the year up to the date indicated up to 307,771 tons, so that the $300,000 mark is well passed.

### Poplar Creek.

Ores of the Poplar Creek region are being tested by the Tacoma (Wn.) smelter. Returns have gone as high as 624 pounds of arsenic to the ton. Without considering the gold values this makes the material of commercial value.

### Squamash, B.C.

The districts traversed by the Pacific Great Eastern Railway are being subjected to intensive prospecting and reports are being to come to hand of results. For instance what is known as the Soda Mining and Products Co., of Vancouver, has been formed to develop and exploit the carbonate of sodium contained in many of the lakes found in the vicinity of this new railroad. One lake sixty miles in extent has been found to contain not less than 7 per cent pure carbonate of sodium. The necessary plant is being installed for its treatment. Every cubic foot of the lake contains over four pounds of carbonate of soda, and evaporation is a rapid and simple process.

## EATING WITH FOREIGN KNIVES

The editor of "The Canadian Mining Journal" complains that food eaten by Canadians "is cooked by Pennsylvania coal in a stove made from United States ore and served on a platter that came from Europe, or Japan, maybe. It is eaten with a Sheffield or Connecticut blade, and the platter is washed with soap from Chicago."

We do not think the situation is as black as painted. Would it not be better to say, for example, that the food is eaten with spoons and forks, rather than knives, plated with Ontario silver on base metal made up of Canadian copper, British Columbian zinc, and Ontario nickel? Furthermore, the food, even if partly foreign, is paid for with Ontario gold or with credit secured by the export of Quebec pulpwood or Saskatchewan wheat.

With the domestic population profitably employed, it is no disgrace to purchase what someone else can produce more cheaply, provided the supply is adequate. In the case of coal, we admit, it is not. "Engineering & Mining Journal."

NOTE:—Our comment has suffered in quotation. The "food" referred to was New Zealand butter and lamb, the consumption of which by the exclusive use of spoons and forks is not recommended.

If our contemporary considers that "it is no disgrace to purchase what someone else can produce more cheaply" why does the United States maintain a high protective tariff?—Ed.

## TORONTO MINING QUOTATIONS.

Following are the average quotations for active gold, silver, and oil stocks on the Standard Mining Exchange, for week ending 4th December, 1920.

| Silver. | High. | Low. | Last. |
|---|---|---|---|
| Adanac Silver Mines, Ltd. | 2 | 1¾ | 1⅞ |
| Bailey | 3½ | 3½ | 3½ |
| Beaver Consolidated | 34¾ | 30 | 30¾ |
| Chambers-Ferland | 5½ | 5½ | 5½ |
| Cobalt Provincial | 47 | 44 | 44 |
| Coniagas | 2.00 | 2.00 | 2.00 |
| Crown Reserve | 19 | 18 | 18 |
| Great Northern | 2 | 2 | 2 |
| Hargraves | 1½ | 1½ | 1½ |
| Kerr Lake | 3.35 | 3.35 | 3.35 |
| La Rose | 25 | 22 | 23 |
| McKin.-Dar.-Savage | 44 | 22 | 22 |
| Mining Corp. of Can. | 1.67 | 1.10 | 1.10 |
| Nipissing | 9.70 | 9.00 | 9.25 |
| Ophir | 1⅝ | 1⅝ | 1⅝ |
| Peoples Silver Mines | 10½ | 10 | 10 |
| Temiskaming | 26½ | 23 | 25 |
| Trethewey | 23 | 17 | 17¾ |
| **Gold.** | | | |
| Apex | 2 | 1½ | 1½ |
| Atlas | 22 | 15 | 16 |
| Boston Creek Mines | 15 | 15 | 15 |
| Dome Extension | 47 | 41½ | 42½ |
| Dome Lake | 2¾ | 2½ | 2½ |
| Dome Mines | 13.25 | 13.00 | 13.25 |
| Gold Reef | 3¼ | 3⅛ | 3⅛ |
| Hollinger Cons. | 5.70 | 5.55 | 5.55 |
| Inspiration | 3 | 3 | 3 |
| Keora | 15¼ | 14¾ | 14¾ |
| Kirkland Lake | 40 | 38 | 38 |
| Lake Shore M. Ltd. | 1.05 | 1.02 | 1.02 |
| McIntyre | 1.92 | 1.85 | 1.88 |
| Moneta | 10 | 9 | 9 |
| Newray Mines, Ltd | 4 | 3¾ | 3¾ |
| Porcupine Crown | 20 | 18 | 19 |
| Porcupine V.N.T. | 22 | 18½ | 18½ |
| Preston East Dome | 3 | 2½ | 2½ |
| Teck-Hughes | 7⅛ | 7 | 7 |
| Thomson Krist | 6 | 6 | 6 |
| West Dome | 6⅛ | 5¾ | 5¾ |
| West Tree Mines Ltd | 8 | 7¼ | 7¼ |
| **Oils.** | | | |
| Eureka | 30 | 30 | 30 |
| Petrol New | 40 | 37 | 37 |
| Rockwood Oil Gas | 3¾ | 3 | 3⅛ |
| Vacuum G. | 25½ | 22 | 22 |

## METAL QUOTATIONS.

Fair prices for Ingot Metals in Montreal, Dec. 8, 1920. (In less than carload lots).

| | Cents per lb. |
|---|---|
| Copper, electro | 18¾ |
| Copper casting | 18½ |
| Tin | 43 |
| Lead | 7 |
| Zinc | 8 |
| Aluminum | 34 |
| Antimony | 8 |

# Northern Ontario Letter

### THE SILVER MINES.
### The Cobalt Field.

In view of the weakness in quotations for silver, the operators in the Cobalt district are confronted with problems quite similar to those which in recent years beset the gold miners. There is no longer the feeling of security that, in spite of high costs, the margin of net profit is satisfactory. This does not apply seriously to the leading producers which are still able to produce at or under fifty cents an ounce, but it does fall with full force upon mines of second class rating.

Reflecting the changed condition, the Mining Corporation of Canada has announced that in view of the unfavorable hydro-electric power situation as well as the low price of silver it will not disburse the regular dividend for the current quarter. The indications are said to point toward net earnings being below dividend requirements. The announcement has caused more or less pessimism, entirely out of proportion to the seriousness of the situation. The fact is that economic conditions are improving rapidly and that in the future there are reasons to believe the cost of production will decline and the desired margin of profit again established.

The Northern Ontario correspondent of the Journal has made an effort to find an explanation for the slump in quotations for silver, which seems to be contrary to what the excess demand over present supply would indicate. What appears to be one logical cause is the defeat of the present United States government. Should this change in administration bring with it opposition to the continued operation of the Pittman Act, which authorizes the United States to buy its domestic output at one dollar an ounce, it is possible the leading metal authorities may even now be discounting such action. This would account to a large extent for the recession in quotations, and taken together with the exceedingly hard times in the Far East, especially in China, may constitute a full explanation of the unexpected downward turn in the price of silver. At any rate, this appears to be about the most logical explanation at this time.

President J. P. Bickel has made the following announcement relative to the decision of the directors of the Temiskaming Mining Company to suspend operations until next spring:—

"It has been decided by the directors to close the mine at the end of November, the contingent causes for this step being the shortage of power and present low price of silver.

"The scheme of development undertaken by the Company in the early part of this year included opening up for commercial working a considerable tonnage of low grade ore, the mining and milling of which would leave a good margin of profit at the higher price of silver then ruling. The reduction in market value to present low level has left no encouragement for continuing the development and breaking out of ore that, under existing conditions, would prove unprofitable. For the past two months the mill has been running on broken ore in stopes which it is necessary to select to obtain a payable grade thereby unduly depreciating the value of the remainder.

"To increase the recovery an oil flotation plant has

been added to the mill, one unit with a capacity of 125 tons per day being practically completed and a second unit for treating accumulated tailings being in course of erection.

"The shortage of power allows no possibility of working profitably on a reduced tonnage basis even with the additional revenue from oil flotation, and the Company are therefore compelled to stop operations until Spring. Owing to the difficulty of treating accumulations during the winter, the whole of the tailings plant cannot be operated. On the resumption of work in the mine, when sufficient power is available, both units will be ready, thereby ensuring greater profit than if the tailings treatment were carried on alone."

The date for the usual declaration of a regular dividend of 3 per cent on the McKinley-Darragh payable January 1st has passed, and it is believed this company may also have decided to fortify its financial position during the winter months, pending an adjustment of its operation to the changed economic conditions, and the lowered price of silver.

On the Chambers-Ferland a station has been opened up in the exploration cross-cut recently driven along the 385-ft. level and a winze is to be put down into the conglomerate formation. The cross-cut lies in a layer of slate, and the conglomerate is believed to lie not more than ten or fifteen feet below the cross-cut. The good milling values encountered in stringers extending up into the slate are taken to indicate the presence of high-grade ore in the underlying conglomerate. The next week or so will determine the accuracy of this belief.

Announcement is made that the Casey-Cobalt Company, holders of property in the township of Casey, some twelve miles north-east from New Liskeard will sell their assets. The property is equipped with considerable machinery, but has not been operated in recent years.

No further developments have been reported this week in relation to the manner in which the Ontario Department of Mines will deal with the recent Order-in-Council which certain portions of the press have criticised as being confiscatory as applied to patented mining claims. It has been officially stated that certain phases of the situation have been placed before the Government's legal adviser for consideration.

At the time of writing, mild weather continues in Northern Ontario, the settlers in some of the districts having been able to continue plowing their land during the first week of December. This mild weather is beneficial to the power situation in the mining districts, and if followed by a reasonable amount of rain would soon make it possible to increase general operations to full capacity, and would thereby provide employment for another 1,000 men at least.

### Ore and Bullion Shipments.

During the week ended Dec. 3rd, two Cobalt companies shipped ore, the following being a summary:—

| Shipper | Cars | Pds. |
|---|---|---|
| Temiskaming | 1 | 109,624 |
| O'Brien | 1 | 64,000 |
| Totals | 2 | 173,624 |

During the corresponding period, the Nipissing and the Mining Corporation were both heavy bullion shippers, the Nipissing alone sending out over a quarter of a million ounces and the Mining Corporation also sending out a large consignment as shown in the following summary:—

| Shipper | Bars | Ounces |
|---|---|---|
| Nipissing | 193 | 250,865 |
| Mining Corp. | 60 | 60,772 |
| Totals | 253 | 311,637 |

## THE GOLD MINES.

### The Porcupine Field.

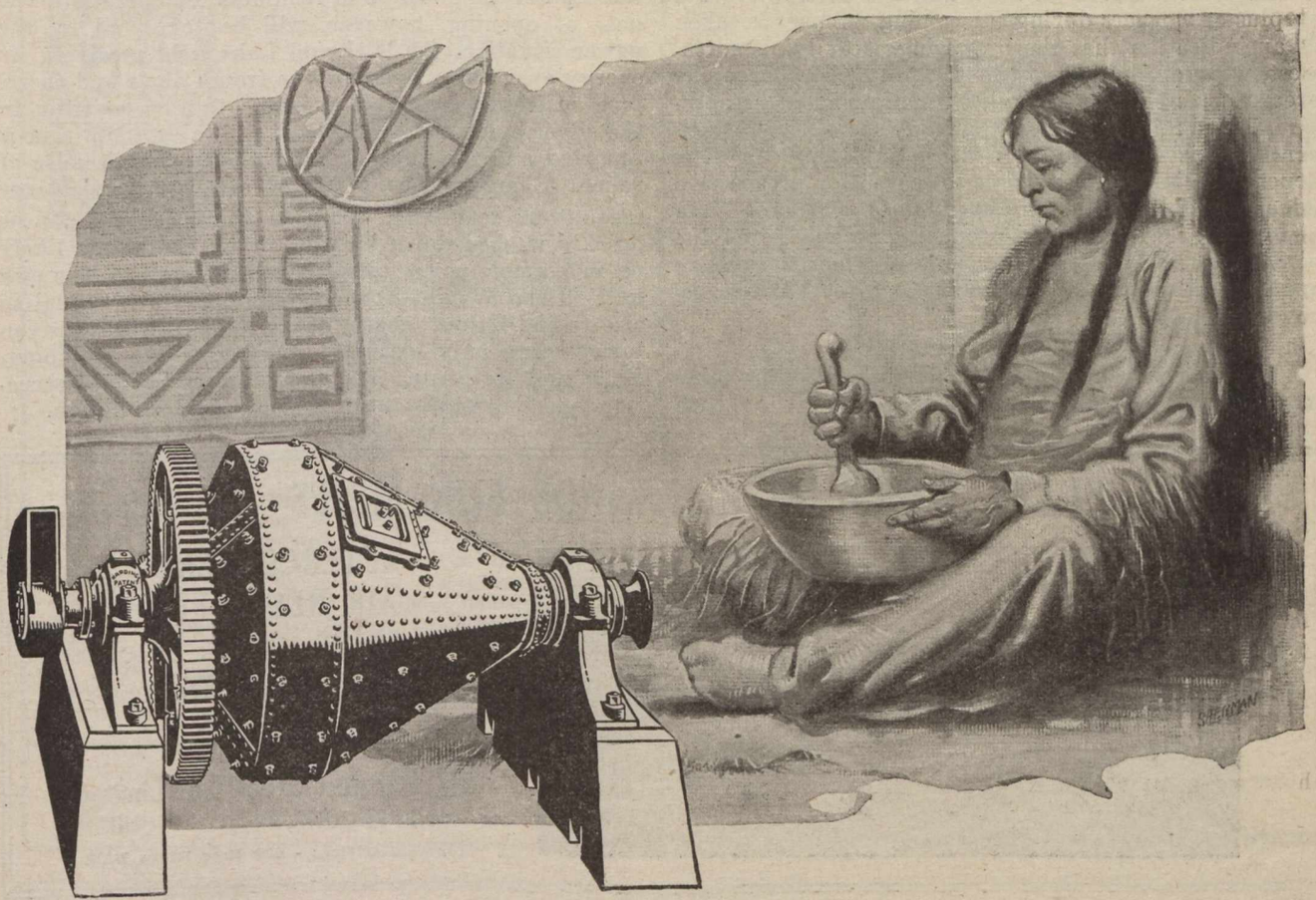
Conditions which are proving to be adverse to the base metal industry, and also unfavorable for silver mining, are having just the opposite effect on the mining of gold. The general depression in all parts of the world, which has set in on this continent, is operating in favor of gold mining. Given adequate hydro-electric power, there is nothing to prevent the mines from carrying on all branches of work at full blast.

Just what such an improvement signifies in connection with the gold mining industry is difficult to briefly summarize, and readers of the Journal will be presented with a more or less detailed statistical review a little later in the month. Figures will be presented showing the extent of the probable growth of the production and prosperity of the gold mines during the coming year or two.

It is intimated in usually well informed circles that the intention of the directorate of the Dome Mines is not to increase the present rate of dividend disbursement of 10 per cent annually, but, instead, to make a certain annual "capital return" to the shareholders. For instance, it is intimated the return of $2 a share may be possible before the end of the New Year, in addition to the dividends of 10 per cent. This would make $3 a share in all or equal to 30 per cent on the issued capital. The plan to make a capital return is said to be for the purpose of shielding the enterprise from too heavy taxation, such a return being exempt from taxes. The par value of the shares would thereby be reduced to $8 per share instead of $10 as at present. The company may pursue such a policy from year to year until the complete return of the par value.

A large amount of coal has been transported to the Porcupine district, and in the case of the Hollinger reserve of power will in this way be made available. Although no official statement has been made as to the extent of the auxiliary power which may be developed, it is understood the total will amount to close to ten per cent of full requirements at present capacity. This will greatly relieve the hydro-electric power shortage. As to the power shortage, there seems to be no doubt but that the situation has been exaggerated in certain quarters, and the depression caused has been far greater than may be warranted by the facts.

Plans to resume work at an early date on the North Davidson, and the prospects of similar action on the Davidson Consolidated about the middle of Winter, offers promise of the north-east part of Tisdale township becoming reasonably active again. These properties have usually been regarded as prospective. On the Davidson Consolidated a large amount of work has been done and a report recently issued would appear to give reason for a more or less optimistic view with regard to its future. Should success eventually be achieved, a comparatively large area would be given added prospective merit. The Davidson Consolidated lies some three or four miles north-east of the McIntyre mine.



# The Indian Crushes no more —

Like the horse-drawn vehicle, the Indian has been eclipsed by modern science. Though this historic American may entirely disappear, many of his creations will probably live for centuries. Take, for instance, his feather like canoe and his famous corn flour.

When grinding materials, the Indian used the same grinding principles as did the early Greeks and Romans; reducing a softer material by crushing it with one that was harder and heavier. This identical principle, marshalled into a commercial force by modern engineering science is the basis of the stage reducing action occurring in the Conical Mill.

One Hardinge Mill contains as many as 3600 steel balls of various sizes which strike the material being ground at an average of 90,000 times a minute exerting a reduction force of approximately 360,000 ft. lbs. of energy. Compare this mighty crushing force with the two lb. blows of the Indian and you can readily see what an appreciable part modern engineering has played in commercializing this gigantic power.

The reduction action of The Hardinge Mill is automatic. The feed and discharge is continuous. The scope of Hardinge grinding is wide including both wet and dry.

**Our engineering staff will be glad to have you submit your grinding problems to them for solution. Their many years of specialized experience is at your disposal without incurring any obligation.**

**HARDINGE COMPANY**
120 BROADWAY NEW YORK, N.Y.
WORKS YORK, PENNA. DENVER, COLO. ERITH, ENG.
BRANCH OFFICES
DENVER, COLO., FIRST NATIONAL BANK BUILDING
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SALT LAKE CITY, UTAH, NEWHOUSE BUILDING
LONDON, ENGLAND, SALISBURY HOUSE
CABLE ADDRESS "HARDINGHE, NEW YORK"

# Hardinge Conical Mills

SWEETLAND INC. ADV. MK.

The present influx of men, and the possibility of a surplus of workers during the coming Summer is taken as an indication that the promising areas lying north-west, west, and south-west of the producing Porcupine area may receive considerable attention from prospectors, beginning with next spring. The theory which carries most in connection with exploring for new deposits is that the best place to search for prospective mines is in the vicinity of proven mines. The area lying almost on every side of the producing area of Porcupine constitutes an ideal field, and one in which aggressive exploration work may reasonably lead to valuable discoveries.

**The Kirkland Lake Field.**

Construction work on the Wright-Hargreaves mine has been about completed and within a very short time the big new mill will be in readiness for operation. The date of opening, however, will be regulated by the power situation, the Kirkland Lake field receiving its energy over a transmission line from Cobalt and therefore suffering a similar shortage to that existing in the silver camp. At the time of writing a little rain is reported and the weather predictions offer promise of relief. Should a heavy fall of rain occur, the large amount of soft snow lying in the woods would be quickly washed down into the rivers and would likely provide ample power throughout the Winter. The new mill on the Wright-Hargreaves mine will be equal in size to the fourth largest of its kind in Northern Ontario, being only exceeded in size by the Hollinger, Dome and McIntyre. The plant is a model of construction, and the equipment of the most modern design.



**FOR SALE**—1—only C. G. E. 150 HP 720 RPM Form E. 550 Volt 1 phase 60 cycle INDUCTION MOTOR complete with paper pulley 21'' face x 24'' dia. and CR 1034 Form HI Starting Compensator.

1—Only, Canadian RAND Company, Class ''R.P. 2'' Cross Compound belt driven AIR COMPRESSOR including 55 feet of 18'' double leather pulley. Price for lot $5000.00. Apply Consumers Glass Company Limited Montreal, P. Que.

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**OPERATION & ADMINISTRATION** : Business Executive and Mine Accountant with many years technical and engineering experience. One year as Manager and two and a half as Assistant. Open for engagement. Apply Box 22, Canadian Mining Journal, Gardenvale, P. Que.

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**SILVER-GALENA MINE**—For sale limited number One Dollar shares in Yukon Silver-Lead Mining Company, incorporated under laws Yukon Territory, operating Lookout Mountain Claim in Mayo District of Yukon Territory, Canada, has option on five claims adjoining. Capitalised for $250,000. Bona fide opportunity. Geo. F. Johnson, 817 South El Molino Ave., Pasadena Calif.

# 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.
Peacock Brothers Limited.

**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 & Inspection 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.
Peacock Brothers Limited.
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 Red):**
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

**Bronze, 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.
Peacock Brothers Limited.

**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.

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# 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.
Peacock Brothers Limited.

**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.
Peacock Brothers Limited.
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.
Peacock Brothers 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:**
Dominion 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.
Peacock Brothers Limited.

**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, Q.

**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., Rockwa
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, L
Jones & Glassco (Regd.)
Mussens, Limited
The Wabi Iron Works

**Engineering Instruments:**
C. L. Berger & Sons

**Engines—Automatic:**
Canadian Fairbanks-Morse Co., Lt
Canadian Mead-Morrison Co., Limit
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., Mont
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, Q
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., Ltd.
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.
Peacock Brothers Limited.
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.)

**Silver:**
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 Electric:**
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.
Peacock Brothers 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.

**Sulphate 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.
Peacock Brothers Limited.

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

**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:**
Allan, Whyte & Co., Ltd.
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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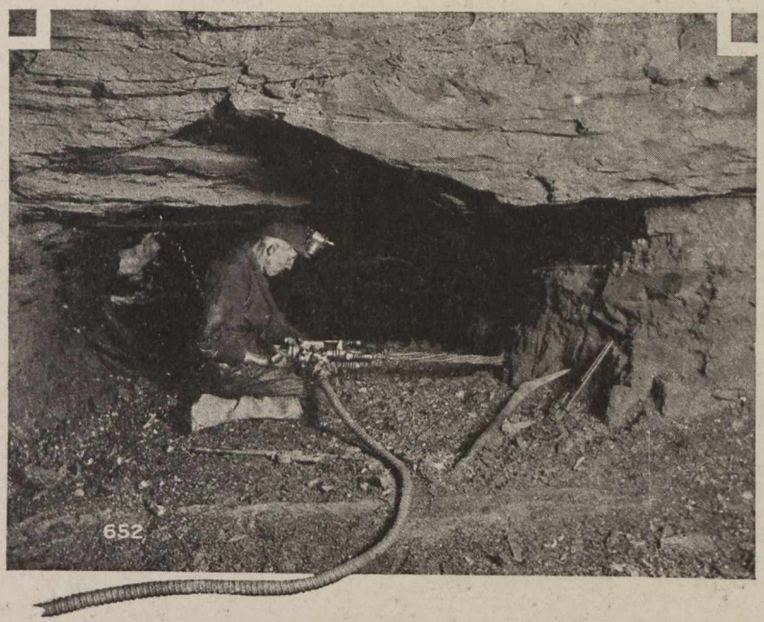
*"The Waugh Way Wins"*

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FOR years miners have dreamed of a small, light air drill that would go faster, hit harder, kick less, use less air, and last longer than the ones to which they have been accustomed.

AT last their dream has come true. The new Waugh "Nineties" will do everything in coal and metal mining that could possibly be required of small, light drills, and they will do it faster and better than it has ever been done before.

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***THE DENVER ROCK DRILL MANUFACTURING COMPANY***

*OF DENVER, COLORADO, U.S.A.*