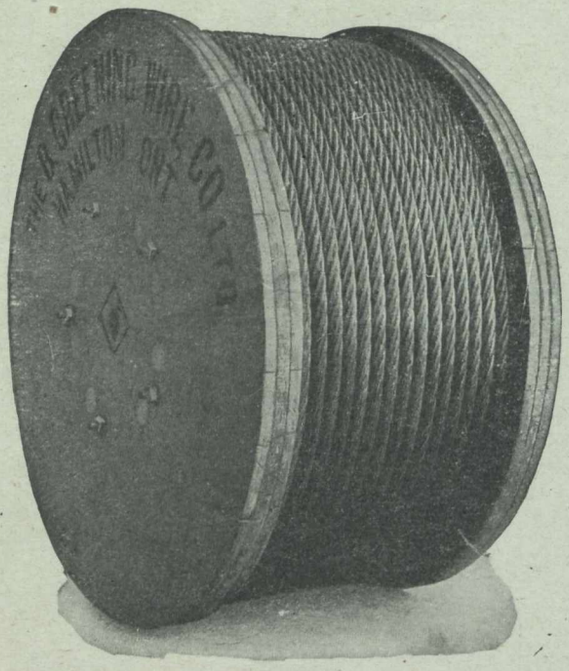
CANADIAN MINING JOURNAL

Vol. XLI. Gardenvale, P. Q., July 9, 1920. No. 27.

WIRE ROPES



HOISTING HAULAGE

CABLEWAYS
DREDGES
STEAM SHOVELS

THE B. GREENING WIRE CO., LIMITED

HAMILTON, ONT. MONTREAL, QUE.

CANADA
DEPARTMENT OF MINES

HON. ARTHUR MEIGHEN, *Minister* CHARLES CAMSELL, *Deputy Minister*

MINES BRANCH

Recent Publications

Iron Ore Occurrences in Canada, Vol. II. Compiled by E. Lindeman, M.E., and L. L. Bolton, M.A., B.Sc. Introductory by A. H. A. Robinson, B.A.Sc.

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.

Clay Resources of Southern Saskatchewan, by N. B. Davis, M.A., B.Sc.

Summary Report of the Mines Branch, 1918.

The Mineral Springs of Canada. Part II., by R. T. Elworthy, B.Sc.

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.

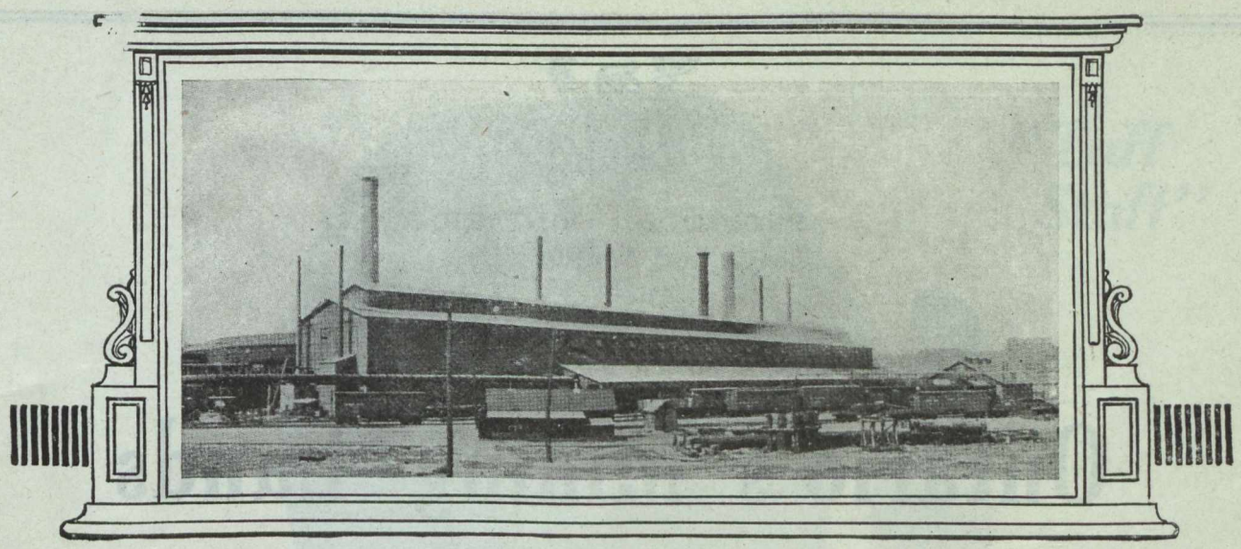
Map 1742. Ainsworth, Kootenay district, B.C. Geology.

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.**



The Largest Nickel Ore Smelter in the World

CONTINUALLY increasing demands for nickel have made successive additions to the Smelting Plant necessary until now it includes eight blast furnaces, one reverberatory furnace and six large basic converters, with a capacity of six thousand tons per month of Bessemer matte containing 80% of combined copper and nickel.

This equipment is of the latest type and the heavier manual operations are discarded.

These are two important factors in making "Nickel Service" famous the world over.

INCO NICKEL

INCO Nickel is sold as shot, high and low carbon; ingots, 25 and 50 lb. sizes; and electrolytic nickel, 99.80%.

Prime metals for the manufacture of Nickel steel, Nickel silver, Anodes, and all remelting purposes. It is also produced as rods, sheets, strip stock, wire and tubes.

INCO MONEL METAL

The name Monel is given to a line of metal products produced by The International Nickel Company from a natural nickel alloy—67% nickel, 28% copper, and 5% other metals. These products include Monel rods, Monel castings, Monel blocks, Monel wire, Monel strip stock, Monel sheets, etc.

Monel Metal withstands alkalies, high temperatures, most acids and erosive action of gases and superheated steam. Can be forged, cast, rolled, drawn, machined, brazed, soldered and welded. Takes and retains a perfect nickel finish.

Monel Metal may solve your difficulties—our Technical and Sales Departments will gladly cooperate with you.

The International Nickel Company of Canada, Limited

HARBOUR COMMISSION BUILDING

TORONTO, ONT.

INCO MONEL METAL TRADE MARK

INCO NICKEL TRADE MARK

PROFESSIONAL DIRECTORY

SUDBURY DIAMOND DRILLING COMPANY LIMITED

We contract for all classes of Diamond Drill work.

Saving a large percentage of Core is our specialty.

We solicit enquiries.

SUDBURY, ONT. - - Box 958

E. J. Longyear Company

EXPLORING ENGINEERS

DIAMOND DRILL CONTRACTORS AND MANUFACTURERS

Examination and Exploration of Mineral Lands

Shaft Sinking and Development

MINNEAPOLIS, - - MINNESOTA, U.S.A.

Canadian Laboratories, Limited

ASSAYERS AND CHEMISTS

410 Crown Office Building, TORONTO

"We Analyse Anything."

Special Rates ***Send for Prices*** ***Phone Main 5063***

JOHNSON, MATTHEY & CO. LTD.

Buyers, Smelters, Refiners & Assayers of Gold, Silver, Platinum, Ores, Sweeps, Concentrates, Bullion, &c.

Offices—Hatton Garden, London, E.C.
Works—Patricroft, Manchester, England

Cables: "REVORG," Toronto (Western Union and Bedford McNeil Codes) Telephone Main 6870

GROVER & GROVER

BARRISTERS, SOLICITORS, ETC.

George A. Grover
John I. Grover

157 Bay Street
TORONTO

Telephone Main 3813
E. M. Chadwick, K.C
David Fasken, K.C.
Alexander Fasken
R. S. Robertson
Geo. H Sedgewick.
James Aitchison
J. W. Pickup
Robt. E. Fennell

Cable Address: "Fasken," Toronto
Western Union Code

Fasken, Robertson, Chadwick Sedgewick & Aitchison

Barristers, Solicitors, Notaries, etc.

Offices: Excelsior Life Building, Adelaide & Toronto Sts., TORONTO

CAPPER PASS & SON, LTD.

Bedminster Smelting Works, BRISTOL ENGLAND

SELL

Antimonial Lead
Antimony Alloys
Tin Alloy

BUY

Ores, Mattes, Residues or Drosses, Containing Tin, Copper, Lead or Antimony

J. MACKINTOSH BELL

MINING ENGINEER & GEOLOGIST

Office with Messrs. BAIN, BICKNELL & CO., Lumsden Building, TORONTO.

London Address: c/o Bank of New Zealand, 1 Queen Victoria Street, E.C.

J. T. DONALD & CO.

ASSAYERS

Industrial and Analytical Chemists
Metallurgical Analyses, Microphotographs

318 Lagauchetiere St. W. MONTREAL

43 Scott Street TORONTO

Dwight & Lloyd Sintering Company, Inc.

SPECIAL PROBLEMS IN ORE TREATMENT

29 BROADWAY, NEW YORK CITY

Cable Address:—"SINTERER."

SMITH & TRAVERS COMPANY

LIMITED

CONTRACT DIAMOND DRILLING
FOUNDATIONAL WORK A SPECIALTY
DIRECTION OF EXPLORATORY WORK
DETAILED GEOLOGICAL MAPPING
SAMPLING AND VALUATION OF MINES
MINES EXPLORED FOR AN INTEREST

SUDBURY :: :: ONT.

LEDOUX & CO.

Assayers and Samplers

Office and Laboratory: 99 John St., NEW YORK

Weigh and Sample Shipments at Buyers' Works, representing the Interests of Sellers in all Transactions.

We are not Dealers or Refiners

PROFESSIONAL DIRECTORY

Canadian Mining Journal

PUBLISHED WEEKLY.

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

VOL. XLI. GARDENVALE, P.Q., July 9, 1920 No. 27

CONTENTS

Pages 557 to 573.

Published every Friday by The Industrial and Educational Publishing Co., Limited, at the Garden City Press, Gardenvale, Que. 'Phone, Ste. Anne de Bellevue, 165.

J. J. Harpell, Managing Director.

A. S. Christie, Eastern Manager,
Room 205 Drummond Building, Montreal.
'Phone Uptown 7773.

H. W. Thompson, Western Manager,
1402 C.P.R. Building, Toronto.
'Phone Adelaide 3310.

F. E. Payson, Pacific Coast Manager,
528 Winch Building, Vancouver, B.C.
'Phone Sey. 3920.

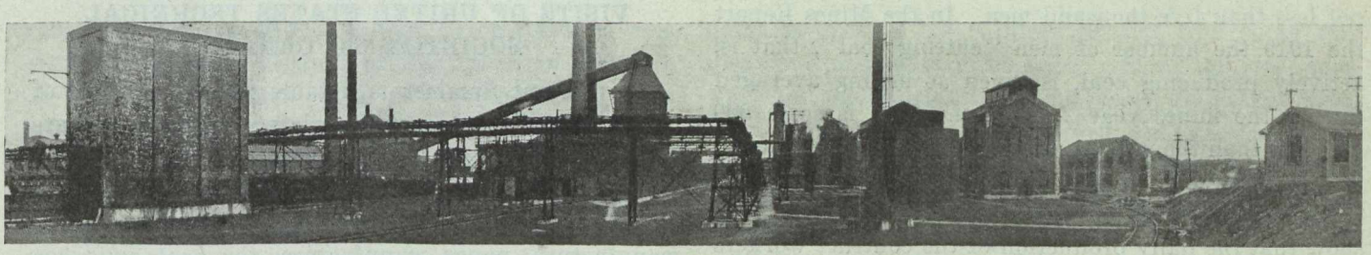
Changes in advertisements should be in the Publishers' hands ten days before the date of issue.

F. W. GRAY, M. I. Min. E., Editor,
Gardenvale, Quebec.

REGINALD E. HORE, Consulting Editor,
1403 C. P. R. Building, Toronto

The editor cordially invites readers to submit articles of practical interest which, on publication will be paid for.

Subscription to any address in Canada, United States and British Empire, $5.00 yearly. Other countries postage extra. Single copies 15 cents.



EDITORIAL

The Secretary-Emeritus of the Canadian Institute of Mining and Metallurgy

The June issue of the "Bulletin" announces the retirement of Mr. Lamb from the active secretarial duties of the Institute, and his appointment by the Council as Secretary Emeritus.

The title is one well earned, and there is no doubt that the necessity for Mr. Lamb's relinquishment of the secretaryship was occasioned by his long and difficult labors in that capacity. The members of technical society are usually vaguely informed in regard to the duties and importance of the work of the secretary, but it will be generally admitted that a society declines or increases in strength and public influence in proportion to the ability of its secretary to be all things to all men. The qualifications required of a secretary, should he attempt to fill all the requirements of the membership of a society, must indeed be as varied and as opposed as the individual characteristics of that membership. He is required to be a good executive, a person of tactful and polite personality, somewhat of a "literary gent," a good "mixer," an eloquent speaker, a financier, a possessor of varied technical qualifications, one who has had the leisure and desire to acquire the social graces and yet feels at home in a mining camp. We are strongly inclined to believe that there "ain't o sick person," but believe further that Mr. Lamb possesses as many of these essential qualifications as it is possible to combine in one who still functions on the terrestial plane, and is limited by mortal inability to be in two places at one time.

If the success of a technical society is to be taken as an indication of the ability of its secretarial direction, Mr. Lamb is entitled to credit for unusual ability. It is to be regretted that the ex-Secretary was unable to make a formal leave-taking at the Annual Meeting of the Institute in March. What was in effect Mr. Lamb's valedictory was given to the Annual Western Meeting in Vancouver last November, and naturally very few of the eastern members of the Institute heard Mr. Lamb record his modest and moving account of the evolution of the Institute from small and unimportant beginnings to its present eminence. The kindly thought which prompted the President of the Institute to suggest to the members assembled at the Annual Dinner in Toronto that a telegram of remembrance should be sent to Mr. Lamb in British Columbia was excellently conceived, but we doubt whether it is sufficient recognition of the ex-Secretary's services, or one that fully expresses the sense of the historical value of Mr. Lamb's incumbency that is felt by many of the members of the Institute.

We endeavored some months ago to express a feeling that the Institute had emerged from adolescence as the result of "many years of hard work, much ex-"perimentation, much vision and tactful organization, "some tribulation, but a far greater sum of good fel-"lowship and a desire to help the other fellow." No person in the Institute can lay just claim to a greater share in its upholding than Mr. Lamb, nor has contributed more of these components of its success.

The work of Mr. Lamb's successor will be lightened by the perfection to which the organization of the Institute and its branches have been brought, but Mr. Lamb has set a pace that will require hard work and unremitting labor to excel.

Labor Shortage at Canadian Mines

Reports from all centres of mining activity in Canada coincide in mention of a shortage of workman-Shortages are reported from the coal mines of British Columbia and Nova Scotia and from the mines of Northern Ontario, and in addition to the actual shortage of workmen statements have been appearing in the newspapers that the miners are not working efficiently. It is not fair to the miner that such statements should be allowed to go on without correction of some evident genuine misunderstanding of actual conditions on the part of the public, which leads to laying unmerited blame upon the miner. The shortage of production at Canadian mines, and at Canadian coal mines in particular, is due first of all to the actual numerical shortage of workmen. At the Nova Scotia collieries, to take a specific case, the shortage of workers is

not less than five thousand men. In the Mines Report the 1919 the number of men "cutting coal", that is, actively producing coal, is given as having averaged during the mines year 2,874 men. This is some 500 men less than the number of men of this class employed in the Cape Breton collieries of the Dominion Coal Company alone before the war. Examination will show that the daily production of the contract workers is equal to, and during the war period, was in excess of the daily production of the same class of workers before the war. It is the excess of non-producers, brought about by the unremedied shortage among the producers, that causes the apparent inefficiency in production when the total production in divided by the total force of workmen employed. This condition of affairs will be found generally true in every mining operation in Canada. The unbalanced and inefficient state of the working organizations at the mines is the cause of the reduction in "Tons per man employed per day,'. Were only one man employed in the actual production of mineral, it would still be necessary, if that lone producer's output is to be marketed, to maintain the whole auxiliary and non-productive organization of the mine. Such a supposition is palpably absurd, but the actual reduction of the productive workers, unaccompanied by the reduction of non- productive workers, has in many instances proceeded almost to the point of practical absurdity, and certainly it has proceeded to the point of financial impossibility.

The productive side of mining employment has always attracted the best class of men, and has paid the highest wages, and, generally, has included the largest proportion of native-born or British-born workers. The sons of these men are not staying at the mines, and it might perhaps be enlightening if employers of labor were seriously to ask why they are not. From observation of a good many mining towns we believe that wages are a secondary consideration, and that it is social and cultural considerations that keep the men at their original vocations. If superior living conditions are to be found elsewhere then men will move to those conditions. As was recently stated most industrial companies "have already passed from the "position of buying labor to selling employment", and it would appear that employment at mines is the most difficult kind to sell. The farmers are asking themselves why farm work does not attract men, and the improvement in farm housing shows that they have found a partial answer to a question that is not less imperatively obtruding itself upon mine executives.

Recently much was made of the abstention of coal miners from work to attend a circus. It was not stated, however, that no circus had visited that mining district for forty-two years previously, or that there is not a free library, workmen's club or public park in the whole radius of the mining community.

VISITS OF UNITED STATES TECHNICAL SOCIETIES TO CANADA.

The present Summer is notable for the number of technical and professional society meetings that are being held in Canada. The societies from the United States that have visited Canada recently include such varied industrial and professional activities as cotton manufacture, paper manufacture, the boot and shoe trade and editorial work, and from Great Britain there is coming to tour Canada probably the most influential group of newspaper men that have yet visited this country. No more important group of technical workers have, however, visited Canada recently than the American Institute of Chemical Engineers, now looking over the more important chemical industries in Ontario and Quebec. The reception given to the Chemical Engineers, so far as a representative of the "Journal" was able to observe it in Ottawa and in Belleville, was unusually cordial, and showed a discriminating sense of the value of the chemist in our day. In Ottawa, the local branch of the Canadian Institute of Chemistry were able to enlist the sympathetic assistance of the Government, and the attendance of Sir George E. Foster at the luncheon, and his speech there, undertaken under the pressure of business attending prorogation of the House, was appreciated as indicating the importance attached by the Canadian Government to the work of the industrial chemist.

In Belleville the visit of the Chemical Engineers coincided with Dominion Day, which was made the occasion for mutual international courtesies at the dinner given by the City of Belleville and the County of Hastings and their visitors. The thorough-going fashion in which the chemists were shown the chemical industries and mineral resources of this rich section of Ontario was we believe good business, both from the point of international amity and the future development of the mineral resources of Hastings County by chemical processes. As the Secretary of the Chemical Engineers well pointed out, the specialized work of this branch of chemistry is necessarily confined to a small number of men, because of the large capital investment necessitated to equip a chemical industry and to perfect its processes. The chemical engineer, therefore, is limited in his usefulness unless he is backed up by public opinion and large capital outlay. The members of the Canadian Institute of Chemistry, which body, together with the Engineering Institute of Canada, have joined to arrange and make pleasant and useful the itinerary of the Chemical Engineers in Canada, are well justified in the importance they have attached to this visit, and are to be congratulated on the manner in which they have succeeded in impressing the general public with this importance. That a good deal of quiet spade work was required to bring about so desirable a result is evident by the meagre

space devoted by the Canadian newspapers to this visit. Among the members of the American Institute of Chemical Engineers that have attended the Canadian visit were men who have contributed much to our civilization, whose names would be recognized in many and varied branches of scientific endeavor as being eminent in chemical work and literature. It is therefore well to know that—despite the small publicity given to the visit—this gathering of scientists was accorded such well-chosen and sincere hospitality in Canada by government and civic officials. Doubtless at Shawinigan the Institute would meet with similar courtesy, for of all places in Canada, Shawinigan understands the usefulness and the profitable uses of chemical engineering.

DIVERSIFIED INDUSTRIES ARE ESSENTIAL

The development of Northern Ontario depends largely on mining and lumbering operations. These are the pioneer industries that quickly and in a large way open up new areas for settlement. They help and are in turn greatly helped by the railroads. Following them comes agriculture, for the mining and lumbering communities afford a nearby market for farm products.

It is not sufficient however that the ore should be mined and milled and the lumber cut and shipped away. The continued growth of these new settlements depends upon the establishment of allied industries.

When silver was first mined at Cobalt the ore mined was all shipped away to southern smelters for treatment. As the industry developed a greater and greater amount of the treatment was done at Cobalt and for some years large quantities of silver bullion have been produced at the mines. This subsidiary industry, the treatment of the ores produced, is now perhaps the biggest industry at Cobalt.

At Iroquois Falls there is a splendid example of an industry subsidiary to lumbering. There is now a thriving community where ten years ago was an almost unbroken forest. If the trees had been cut and shipped away there would be no settlement of note at Iroquois Falls today. But a big pulp and paper mill was built here and a very large production of paper is being made and the plant is now being enlarged. A growing town with many of the attractions of southern towns, and some that many of these lack, has resulted from the establishment of the paper making industry at Iroquois Falls. The town in turn furnishes a market for the farmers who have taken up land in this vicinity.

The manager of one of the large copper mining companies in the United States, where mines have been in operation for scores of years, recently pointed out that mining companies would profit largely by the establishment of other industries in mining communities. Many a miner who likes his work leaves mining districts because his children do not find there employment satisfactory to them. Many miners' sons want to make automobiles and many daughters want to work in offices or manufacturing plants. The miner leaves the work for which he is best fitted in order to afford opportunities to his growing children to take up their chosen occupations.

Mining companies have done much to make mining districts attractive. They appreciate that men must have facilities for amusing themselves and educating their children. Good schools and playgrounds and the encouragement of all forms of healthy amusement are recognized as desirable. The desirability of encouraging other industries to locate in mining districts seems however not to have received the recognition that it should. For many industries the location is not attractive but there are favorable features for certain industries in most mining districts.

MINERAL STATISTICS.

It is understood there is a likelihood that the statistical work of the Mineral Resources Department of the Mines Branch at Ottawa may be transferred to another government department. The re-organization of the work of the Mines Branch that is likely—if for no other reason than the depletion of the staff by resignations—is a matter that is in competent hands, and comment is only proper from those in close touch with the work. We would venture, however, to endeavor to present the viewpoint of those persons outside of the government service who have occasion to study mineral statistics, and who appreciate the years of work, the endless correspondence and the desire to be of service to the mining community of Canada, that have combined to bring the statistics of the Mineral Resources Department to their existing admirable condition, under the direction of Mr. John Mc. Leish.

The object of all statistics is to afford a basis for comparison, and their adaptation to this end is in proportion to the length of time covered by the records and the unchanging nature of the forms of tabulation. Statistics are only useful as they enable comparisons to be made. A change of the form of tabulation destroys its value. It is therefore to be hoped that any transference of the statistical work of the Mineral Resources Division will not lead to radical alteration in the forms of tabulation, or in their scope.

What has given particular value to the Mines Branch's Statistics of mineral production is that the information tabulated year by year has not been confined to actual mineral output, but has followed the mineral product quarried or mined to its sale as a commercial article. It is not desirable, or usefully feasible, that any attempt should be made to separate the processes of mineral production from those of mineral utilization, otherwise incomplete and less useful statistics will result.

As an example, the Deloro Smelting Company purchase high-grade Cobalt ores and recover from them—at a plant quite distant from the mining point—arsenic, silver, cobalt, nickel and other products. Accurate mineral statistics require that in one report, or volume, there shall be recorded both the figures of ore production and the figures of ore recovery.

Compilation of mineral statistics is, we believe, a proper and very necessary part of the work of the Mines Branch. The work can be best accomplished, and will give most intelligible results, if done under the superintendence of persons trained in the technicalities of mining work. If, however, through a desire to centralize statistical work, or to effect economies, it should be decided to relieve the Mineral Resources Branch of statistical duties, we would enter an earnest plea for preservation of the continuity and the comparison value of the familiar tabulations of the Mines Branch, upon which the mining men of Canada have so long placed reliance.

THE EFFECT OF SHORTER WORKING HOURS ON PRODUCTION.

The effect of shorter working hours on production is the subject of a special study by the United States National Industrial Conference Board (Research Report No. 27: Hours of Work Problem in Five Major Industries.) The investigators reach the conclusion that allowing for variations in managerial efficiency a shorter working day increases the efficiency of workers who are called upon to use intelligence at their occupation; but, in factories where the product results automatically from mechanical processes production is reduced in the same ratio as the working day. From this point of view no uniform schedule of hours, equally adapted to all industries, is recommended; shorter hours are conceded to skilled workers to enable them to concentrate their minds with greater efficiency while at work, but efficiency requires no such consideration for "automatic" workers. For example, in the boot and shoe industry, which calls for the exercise of skill, it was found that maximum production could be obtained on a schedule substantially less than 54 hours per week. In the metal-working group it was found that a 50-hour week could be introduced in some trades with no loss to production, but that no such rule could be applied throughout the entire group. Similarly, output in the silk industry was maintained after a substantial reduction of hours. On the other hand, the cotton textile industry of the northern states showed that reductions of the working week to 56 hours involves a proportional reduction of output; while in the woollen manufacturing industry reduction to a 54-hour week resulted in a similar loss but less marked decline. No definite relation could be traced in any of the five industries under review between changes in wages and rate of production, but the investigators found some evidence of improved efficiency as the result of payment of a bonus, and in the piece-rate as compared with the day-rate system of wage payment. The information secured by the inquiry was not found sufficient to base upon it general conclusions as to the effect of shorter hours on the health of the workers. As to the frequency of accidents the reports state that only 13 per cent. of the employers questioned had observed any noticeable decline, while 85 per cent. had found none and the remainder had even reported a slight increase, which they attributed to the hiring of new men to make up for reduced production due to shorter hours. In fixing the hours of work, however, the investigators point out that there are many other factors besides output and health to take into account and that their present inquiry does not cover the wider social field.

An inquiry lately made by the United States Health Service resulted in the finding that the output of industry was more steadily maintained under the 8-hour than under the 10-hour shift, the pace of work tending in the latter to be set by the less efficient workers, while under the 8-hour day the output varies more nearly according to the industrial capacity of the worker. In regard to the frequency of accidents, a direct relation was traced between fatigue and risk, as a large number of the accidents occur in the last hours of the 10-hour or 12-hour day. If for any reason production was speeded up in the last hours, when the workers were fatigued, the rise in the number of accidents was so rapid as to leave no doubt that the increased rate could only be explained by the decline of working capacity in the employees.

BENTONITE.

One variety of clay which is common in Alberta is known as Bentonite or Soap-clay. It varies in color according to the impurities which it contains, from a dirty white to a creamy yellow. It is exceedingly smooth and fine textured, and when soaked in water forms a soft soapy jellylike mass. It the early days it was used by the employees of the Hudson's Bay Company and by the Indians as a substitute for soap. The main characteristic of the clay is that it absorbs an excessive amount of moisture; this clay will absorb about three times its weight in water.

Bentonite with varying degrees of purity is common in the Edmonton and Belly river formations. As some of the surface clays have resulted from the breaking down of these older rocks, it is not uncommon to find streaks of Bentonite in these clays. When such clays occur on the surface they are better known by the name of gumbo.

Bentonite was previously regarded as unfit for clay products, but experiments carried on by Keele on some of the Alberta bentonitic clays, show that most of them can be made workable by some process of pre-heating, if the commercial conditions in the locality in question allow the use of such a process.

A new use for bentonite has been recently found in the textile industry for the sizing of yarn. If a bed of bentonite of sufficient thickness and purity can be found, the same may be of commercial value if situated conveniently to transportation. Only pure material can be made use of. The quality of the clay can be tested by anyone dropping a lump in a cup of water, if the clay changes to a jellylike mass it is bentonite, and if there is no sediment or dirt in the bottom of the container, the quality is good. A workable bed of bentonite should be at least two feet in thickness.

The foreging account taken from the first Annual Report of Mineral Resources in Alberta is suggestive in view of the recently reported discovery in England of the adaptability of colloidal clay to soap manufacture

Centrifugal Pumps and their Use

Some Notes on Their Design, Application and Installation.

By F. A. McLean, Canadian Ingersoll-Rand Co., Ltd.

Many people erroneously regard the centrifugal pump as a very modern invention, while as a matter of fact it is considerably older than the steam engine. The history of its invention is rather obscure but the credit for it is usually given to Demesne Papin, who lived in Hesse, Germany about 200 years ago. Like many other inventions, little interest appears to have been taken in it and it was allowed to be more or less dormant until Andrews and Bessemer made some improvements on the original designs in the early part of the nineteenth century.

Its first appearance in America was about the year 1819 or 1820 and it was improved by Gwynne and J. P. Appold, in 1848-1851. Appold's improvements were so far reaching that the most modern form retains many of the features which distinguished his design. Appold's pump, which was not affected by solids in the water, was capable of pumping continuously a volume of water equal to more than 1400 times its own weight and was found to be fairly efficient.

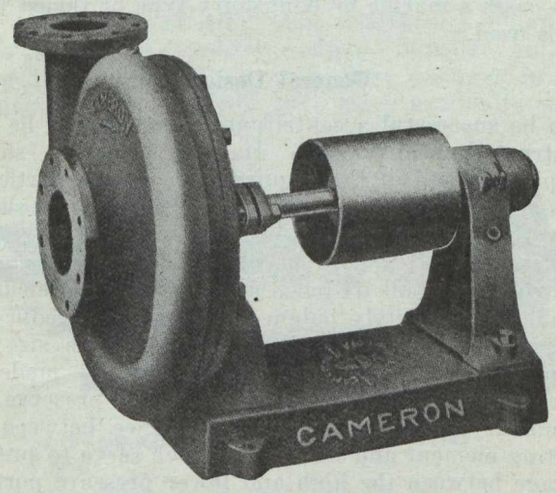


Fig. 1—Single-Suction, Belt-Driven, Open-Impeller Type Pump

Centrifugal pumps were for many years considered only suitable for handling water in comparatively large quantities at very low heads and due to poor design and consequent low efficiency, were considered too wasteful to allow their wide adoption. The development of the direct acting steam pump to a higher state of perfection put the centrifugal pump in the background where it remained for a number of years. The ability of the centrifugal pump to operate at high speeds brought it into the lime-light again, due to the rapid advance which had been made in the development of the steam turbine and the electric motor, and the consequent need for a pump which could be directly connected to these types of prime mover, thereby gaining full advantage of the reliability, low maintenance cost and compactness of this method of drive.

It is now possible to secure centrifugal pumps which will give most satisfactory and economical service on nearly all classes of low and high-head installations for which a few years ago only reciprocating pumps would have been regarded as suitable The simple rugged construction of the modern centrifugal pump, its long life and entire absence of trouble from water hammer and shock, naturally appeal to users of pumping machinery. In their simple construction and lack of valves, pistons, rods and other reciprocating parts, they present a radical contrast to the ordinary steam or power-driven reciprocating pump. Due to the fewer wearing parts, they usually last longer, are not so much affected by semi-solids or solids in the liquid pumped, require far less attendance and generally operate with considerably less power.

Types of Centrifugal Pumps.

Present day centrifugal pumps are made in two general classes, known according to the type of impeller used as either open or enclosed impeller machines. The open impeller has a number of spokes or arms which radiate from a central hub like the rotor in an ordinary rotary blower. The sides of the vanes or arms are usually machined to enable them to be run close to the sidewalls of the casing. The closer the blades run to the casing the less is the loss from slippage of the water or otherliquid being pumped.

When well designed and properly built, open impeller pumps will give quite satisfactory results in delivering a large quantity of water at a small head but the large amount of slippage, skin friction and surging or internal disturbance which become worse as the head is increased limit the efficiency of this type of pump. As inherent losses in these pumps are variable quantities, it is impossible for the designer to accurately predetermine the ultimate performance of the pump. Open impeller pumps are particularly adapted to handling gritty or dirty water and semi-solids, and for this reason have been widely adopted in pulp and paper mills and for pumping tailings, slimes, etc. in concentrating plants. The open impeller pump illustrated is made in sizes to handle from 200 to 8000 gallons per minute at heads up to 70 feet.

The enclosed type of impeller consists of a number of vanes or arms radiating from a central hub and enclosed by discs on each side to form walls. In operation, the liquid which is being pumped is admitted at the centre or eye of the impeller and passes around the shaft and through the impeller in channels formed by the walls and vanes. In single-suction pumps the water enters on one side of the impeller only, while

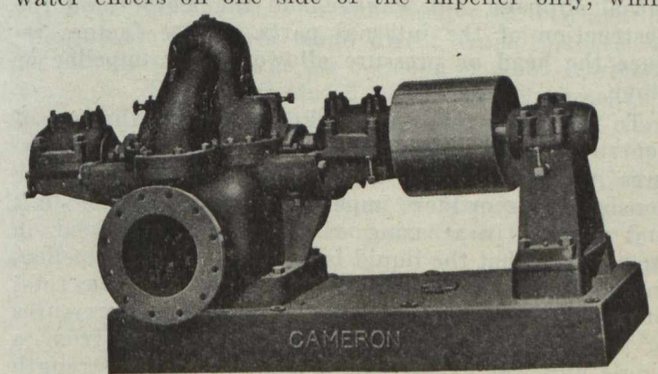


Fig. 2—Belt-Driven, Double-Suction Volute Pump

in the double-suction type it enters on both sides. Double-suction impellers, which are subject to an equal pressure on both sides are therefore self balancing against thrust along the centre line of the shaft when operating at ordinary heads. Single-suction pumps do not have this self-balancing feature and consequently require thrust bearings.

With the enclosed-impeller type of pump the liquid being raised passes through passages, or channels of fixed form with a limited amount of leakage and considerably less disturbance than is the case with open impellers. The designer can thus quite accurately determine and control the perfomance of the pump over a broad range of requirements such as are met with in different classes of service. For this reason the enclosed-impeller pump will suitably meet all medium and high-head pumping requirements where efficiency is essential.

Single and Multi-Stage Centrifugal Pumps.

Single-stage pumps contain usually one impeller and are built for almost any capacity and will operate efficiently on moderately high heads, the larger sizes naturally being more efficient that the smaller. Single-stage pumps are somewhat limited by the pressure existing between the suction and discharge chambers of the pump; the higher the head the greater the difference in pressure and the larger the loss from internal slippage and leakage and the more rapid the destruction of the internal parts. These factors reduce the head or pressure allowable per impeller or stage.

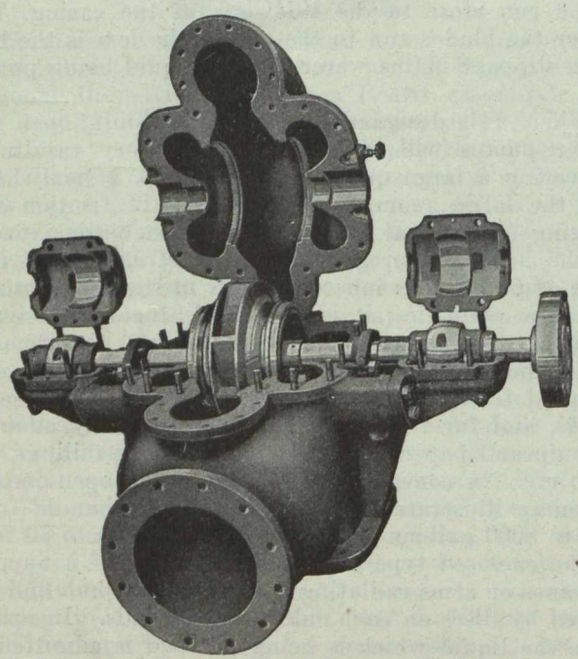


Fig. 3—Double-Suction Volute Pump, with Casing Open Ready for Inspection

To overcome this drawback and permit the use of centrifugal pumps on higher heads and higher pressures the multi-stage types were produced. These consist of two or more impellers mounted on one shaft and running in a casing with passages arranged in such a way that the liquid is led through the impellers in succession, each one adding its share to the total pressure required. By this arrangement pressures of several hundred pounds may be obtained from a single unit, the exact limit depending on the strength of the materials from which the pump is constructed and their resistance to the wearing or abrasive action of the liquid at high velocity. In pumps of the multi-stage type the liquid is discharged from all but the last impeller at a very high velocity and must be turned through a half circle or 180 degrees in order to enter the succeeding one, and this necessitates the use of baffle plates or vanes to reduce the speed of the liquid and convert it into pressure as soon as it leaves the impeller, so that it will pass to its successor with a minimum amount of disturbance and shock on the walls of the casing. These vanes or baffles are called diffusers.

In all multi-stage pumps some means of maintaining the correct alignment of the passages of the rotating impellers with those in the casing, and equalizing any end thrust that may take place is necessary. This is often accomplished by means of a hydraulic device in which the end thrust is absorbed by a body of water acting against a diaphragm or piston on the pump shaft.. This device is only applicable when the pump is used with clean water and is very simple in construction, automatically and quickly adjusting itself to the variations in the load with practically no friction or loss of power. Sometimes it is necessary to pump liquids which contain grit or solids which would wear out the hydraulic balancer very quickly and in such cases a marine or Kingsbury type of thrust bearing is used.

General Design.

To be successful a centrifugal pump should be well constructed mechanically. Its performance should comply with all of the requirements of the particular class of service under which it is to be used, and should show the highest possible efficiency when in use on that service. It should be of simple and substantial construction in all its parts and the rotating elements should be accurately balanced in order to reduce vibration. The bearings should be of ample size and accurately fitted, and provision should be made for their proper lubrication, in order to preserve the alignment and small running clearance between the rotating element and its casing which serve to prevent leakage between the high and lower pressure portions of the pump. As with other classes of machinery, centrifugal pumps are no better than their bearings, from the standpoint of continuous operation, and the better proportioned these parts are the longer the life and the lower the maintenance cost.

All materials entering into the construction of the pump should be carefully selected in view of the duty to be performed, and care should be use in the various manufacturing and machining processes. The general design of the machine should be such as to allow ready accessibility to all parts without difficulty.

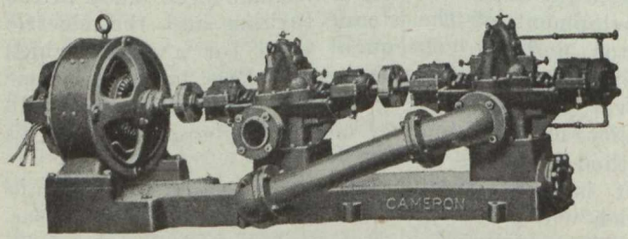
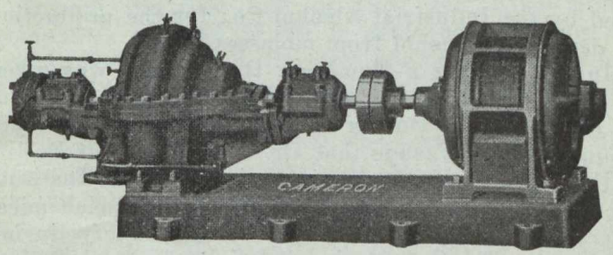


Fig. 4—Motor-Driven Double-Suction Volute Pumps in Series

Principle of Operation.

The principle on which the operation of the centrifugal pump is based is quite simple and easily understood. The liquid to be pumped is speeded up or accelerated by passing it through the revolving impeller; energy received from the vanes resulting in an increase both in pressure and velocity, the velocity being subsequently converted into pressure in the stationary discharge passages. It is however, a very complicated problem to design and construct pump to deliver a definite quantity of water against a given head at a certain fixed speed, with the highest efficiency. An experienced designer can, however, predict within a very small percentage of error on either side, both the capacity and brake horse-power required at the normal operating point as well as over a wide range of variation from such conditions as free discharge against little or no head to a closed discharge with no liquid flowing. The solution of problems of this nature, of course, requires a thorough theoretical knowledge of centrifugal pump design and the examination of a vast amount of data obtained experimentally from pumps intended for similar service conditions. For this reason, the volume of output and reliability of the pump manufacturer, other things being considered, may be regarded as pretty good indications as to whether the pump will fulfil the requirements to the degree claimed by its maker or not.

To produce an efficient and satisfactory pump requires not only a correctly designed impeller, but the casing itself must be so made that changes in the velocity of the liquid will take place gradually with-



Two-Stage Motor-Driven Turbine Pump

out undue shock and disturbance. To put into practice all of the little details which are carefully worked out by the designer requires careful and accurate shop work of a high order, with rigid supervision and inspection throughout the various steps of manufacture. As an assurance against defects in material and workmanship, it is also essential that finished machines should be subjected to a thorough test under conditions like those which will be met in the field, or even more stringent if possible. When this method is thoroughly carried out any mistakes or discrepancies are detected and properly corrected before the pump leaves the shop, and where this testing is not properly carried out, it is impossible for the manufacturer honestly to guarantee the performance of the pump when it is finally put in service. To get the very best results each installation should be treated as a problem by itself as in this way it is possible to obtain far higher efficiencies than if the equipment is chosen haphazardly on a shelf hardware basis, on the recommendation of a small dealer or jobber.

(To be concluded in next issue.)

THE "SINGING FLAME" LAMP FOR DETECTION OF METHANE.

Discussing the Fleissner Singing-flame Lamp at the June meeting of the Institute of Mining Engineers, Mr. William Maurice observed that it is known that the detection of very small quantities of methane by means of the safety-lamp requires the greatest attention, and a certain degree of practice, and that errors of observation are easily possible. In the lamp under consideration advantage is taken first of the means of methane detection by the phenomenon of the **explosive limit**—that is to say, by observation of the "cap" or "halo," and, secondly, by sound. It is to be noted that the observations are by no means final, and that only the first rough models of testing-apparatus are yet available. The experiments already carried out have, nevertheless, sufficed to establish the usefulness of the principle. The device has its origin in the phenomenon of the "chemical harmonica" or the "singing flame." The "chemical harmonica" effect, otherwise known as the "gas harmonica," results when a vertical tube, open at both ends, within which a flame is burning, produces a powerful resonance of the tube. The phenomenon was noticed as early as 1777 by B. Higgins, who, however, only published his observations in 1797, so that others (Deluc, 1787; Hermbstaedt, 1793; Tromdorf, 1794) preceded him in publication. At first the experiment was always made with hydrogen, which was allowed to escape through a tube with a narrow jet. The gas was lighted and another glass tube placed over it in such a manner that the flame was in the lower third of its length. Later, it was discovered that any other combustible gas could be used, and with acetylene-gas especially Dr. Fleissner had been able to produce exceptionally powerful tones.

MINERALS OF HASTINGS COUNTY, ONTARIO.

On the occasion of the visit of the American Institute of Chemical Engineers to Belleville, Mr. J. W. Evans, who is the Vice-Chairman of the Hastings Branch of the Canadian Institute of Mining and Metallurgy, and who it will be remembered gave a paper at the last annual meeting of the Institute descriptive of the mineral occurrences of Hastings Co., had on view a number of mineral specimens. The most striking was a large piece of iron pyrite from Queensboro, said to be representative of a vein running five feet wide. A specimen of green fluorspar from the Bailey Mine, and a smaler piece of transparent white spar were shown. Samples of the talc from the Henderson Mine at Madoc were exhibited showing the material in various stages of density. Gold ore from the Belmont Mine, and specimens of molybdenum and galena were also shown. A fine sample of iron ore together with tool-steel made direct from this ore in the electric furnace was the occasion of much interestd comment. This ore is stated to contain 53 percent of iron, 7.5 percent of titanium and .41 percent of vanadium.

Mr. Evans is an enthusiastic believer in the mining and metallurgical possibilities of Hastings Co., and is doing good work in bringing them to public attention.

Gold-bearing quartz is reported to have been found on the Boisdale Hills near Sydney, Nova Scotia.

The Canadian Visit of the American Institute of Chemical Engineers

By the courtesy of the Secretary of the Institute a representative of the "Canadian Mining Journal" was enabled to accompany the visit of the Chemical Engineers to Ottawa and Belleville, and the following notes upon this portion of a notable gathering are necessarily confined to the events of two days and do not deal with the itinerary of the Institute, which covers a fortnight's travel in Eastern Canada. After spending two days in Montreal, where papers were read during a two days meeting and courtesies were extended by the Montreal branches of the Canadian Institute of Chemistry and the Engineering Institute of Canada, the visitors arrived in Ottawa at noon on June 30th, and were entertained at luncheon in the Chateau Laurier by the Ottawa members of the C. I. C. The Chairman of the local branch, Mr. Edgar Stansfield presided over the luncheon, and, in addition to the visitors there were present representing the Canadian Government and the City of Ottawa, Sir George Foster and the Mayor and President of the Board of Trade. Among those at the speakers's table were noted the Chairman of the Hon. Advisory Council and the Deputy Minister of Mines.

Carbonized Lignite Briquettes.

The speeches turned largely on the contents of a small cardboard box placed by the plate of each visitor, which on examination proved to be a small briquette of carbonized lignite presentd with the compliments of the Lignite Utilization Board. The President of the Chemical Society remarked that the researches of the L. U. B. in Canada were being watched with much interest by the neighboring states of the Union, such as Dakota, where there existed the extension of the same lignites that Canada is seeking to utilize in Saskatchewan and Alberta. The speeches made in regard to the lignite briquette by Sir George Foster and the Chairman were in jocular vein, but underlying was serious purpose, and the exhibition of a briquette—which presumably the Lignite Utilization Board is satisfied with—to the visitors, was understood to signalize substantial progress to meet the most pressing material need of Canada, that of internal fuel supply.

After the luncheon, the visitors were shown over the plants of the E. B. Eddy Co. at Hull, and witnessed what to a miner is always a sight for lugubrious reflection, namely the conversion of good mine timber into newspaper print.

Leaving Ottawa at six in the evening the Chemical Engineers arrived at Belleville shortly before midnight, and were greeted at the station by a brass band, much to tehir pleasurable astonishment, and under the guidance of the local member of the A.I.C.E., Capt. Lucius Allen, paraded to the Hotel Quinte.

Visit to Deloro Smelter.

On Thursday morning, Dominion Day, automobiles took the visitors 40 miles by road through a picturesque and opulent countryside to the works of the Deloro Smelting and Refining Company, being greeted en route at Marmora by the local band. At Deloro, the manager, Mr. S. W. Wright, presided at a luncheon provided by the Deloro Company, served in the local church hall with the assistance of the ladies of Deloro, after which the engineers were shown over the plant, the technical operation of which was explained at the luncheon by Mr. Wright, who said that his directors desired to withhold nothing from the visitors.

At the Deloro Plant high-grade silver-cobalt-nickel arsenides from Cobalt are treated, recovering silver, cobalt—as oxides and in metallic form—arsenic and nickel. Paris green is also made in a neighboring plant. The making of the alloy "Stellite" was seen in process, and particular interest was taken in Mr. Wright's announcement that machinery was approaching completion for the manufacture of table-knives in "stellite". The equipment for making blades was shown, and it was intimated that later the manufacture of forks was to be undertaken. "Stellite" does not lend itself to forging, and, after being cast, the blades are ground to shape, sharpened and polished. As the alloy is much harder than anything it is likely to come into contact with in domestic use, and quite stainless, there is no necessity for sharpening of the blade or the polishing that is required to keep ordinary steel knives in good order.

The Talc Mine, Madoo

From Deloro the party went to Madoo and looked over the Henderson talc mine and the grinding plant of the G. S. Gillespie Co. Practically all the talc produced in Canada comes from the Madoc mines, the production in 1919 amounting to over 18,000 tons.

From Madoc the visitors returned to Belleville, calling on the way at the Corbieville distillery, now operated by the Industrial Alcohol Co., for the production of denatured alcohol from molasses.

In the evening a Dominion Day Dinner was given to the guests by the City of Belleville and the County of Hastings. During the course of the dinner announcement was made that Dr. C. K. Moore of Berlin, N.H., had been chosen as the recipient of the Institute medal for the most valuable contribution to chemical literature among the members of the Society during the year. The international felicitations which are usual upon an occasion such as this dinner were given unusual interst by its occurrence upon Dominion Day, and the fact that it was the first time that many of the visitors had been in Canada.

After the dinner the Institute resumed its itinerary and left for Shawinigan Falls, the most important centre of the activities of the chemical engineer in Eastern Canada.

METAL QUOTATIONS.

Fair prices for ingot metals at Montreal, 8th July 1920:—

	Per lb.
Electro copper	24c
Castings copper	23½c
Lead	10c
Zinc	10¾c
Tin	57c
Antimony	10c
Aluminium	37c

Dr. Michael Clarke says that war in the immediate future is an economic impossibility. So they said in June 1914. And can anyone say how many wars were going on in July 1920?

A Review of the Gold and Silver Production of Northern Ontario During the First Half of 1920

(By J. A. McRAE, Cobalt).

A mid-year summary, based upon preliminary estimates from the mines, for the first half of 1920, would indicate a total production of silver and sold from Northern Ontario of approximately $12,500,000, made up of a little over $6,000,000 from the gold mines and approximately the the same amount from the silver mines. The production of gold appears to be likely soon to definitely assume the lead, the only visible likelihood of the situation being reversed hinging upon the possibility of a big rise in quotations for silver.

The fixed price of gold, however, has prevented the gold from yielding profits equal to the silver mines. Verification of this may be gathered by turning to the annual statements for 1919 in which it is shown that the leading silver producer, the Nipissing, produced $3,752,083 during the period and made $2,717,311 net profit, while on an output of $6,722,266 the leading gold producer, the Hollinger, realized only $2,321,290 net profit. A re-adjustment of economic conditions appears to promise equal relief to both the silver and the gold mines in so far as material and supplies are concerned, while it promises greater relief to the mines in regard to labor supply in that during the past three years the silver mines have been fully manned, while the gold mines have only been able to procure a little under two-thirds of full requirements.

Paying Big Dividends.

During the first half of 1920, the silver-mining companies paid $2,237,905 in dividends. During the corresponding period, the gold-mining companies paid $1,442,048, making an aggregate of $3,679,953 for the half year.

For the last half of 1920, the present rate of dividends will probably continue at all the dividend-paying mines, disbursements for the year amounting to close to seven and a half million dollars. With dividends paid to the middle of 1920 having reached a total of $99,437,321, the grand total up to the end of the year promises to amount to approximately $103,-117,274.

Over Quarter Billion Produced.

The silver mine up to the end of July, 1920, have produced approximately 309,010,836 ounces valued at $188,411,972. The gold mines of this part of Northern Ontario have produced approximately $65,591,614. The aggregate output of silver and gold, since the discovery of silver in Cobalt in 1903 and the discovery of gold in Porcupine and Kirkland Lake in 1909, amounts to $254,001,586.

Nor does the peak appear to have been reached in the production of precious metal from this field. The total ore reserves of the present actually exceed the total in sight at any previous time in connection with the industry in this country. This state of affairs offers at least the suggestion that production will increase to a corresponding degree.

Figures which show the total output of silver since the first discoveries in Cobalt is somewhat remarkable that from 1904 to 1911, both years inclusive, there was an increase each year in the number of ounces produced, while from 1911 up to the present there has been a decrease each year. Not in a single case was this rule broken, showing the uniform manner in which the silver deposits have been mined. The value of the output, however, fluctuated. This was due to the rise and fall of quotations for commercial bar silver.

In reviewing the figures presented below, as representing the silver production, it is necessary to keep in mind the fact that cobalt metallics and cobalt oxide now play quite an important part in the output of the silver mines and the returns for this mineral are not included in the figures given. With cobalt valued at from $2.00 to $2.25 a pound at present as compared with very little value in the early years of the camp, the income is enhanced considerably.

New Mines Developing.

While the Gowganda field appears to offer possibilities of stemming the tide of declining silver production from this province, yet in Cobalt, too, there are possibilities of new developments altering the situation for a time. During the last half of 1920 the Bailey Silver Mines and the Colonial Mine both of which have been idle for years promise to be added to the producing list. In addition to these are new properties opening up on which are encouraging possibilities, such as the Victory Silver Mines and the Oxford-Cobalt.

The Nipissing Mining Company continues to produce silver at a rate between $4,000,000 and $4,500,000 annually and is easily the leading silver producer in Canada.

Following is a table showing the silver output from the mines of Northern Ontario:—

Silver Production.

Year	Average Price cents Per ounce	Ozs. Produced	Value
1904	57.02	206,875	$ 111,887
1905	60.4	2,451,356	1,360,503
1906	66.8	5,401,766	3,667,551
1907	67.5	10,023,311	6,155,391
1908	52.09	19,437,875	9,133,378
1909	51.5	25,897,825	12,461,576
1910	53.5	30,645,181	15,478,047
1911	53.3	31,507,791	15,953,847
1912	60.8	30,243,859	17,408,935
1913	57.8	29,681,975	16,553,981
1914	54.6	25,162,841	12,765,461
1915	49.69	24,746,534	12,135,816
1916	65.66	19,915,090	12,643,175
1917	81.41	19,401,893	16,121,013
1918	96.77	17,661,694	17,341,790
1919	111.12	11,224,970	12,747,621
1920 (first half)	118.03	5,400,000	6,372,000
Totals		309,010,836	$188,411,972

The Gold Mining Industry.

Figures were presented in the "Journal" two weeks ago, showing the gold production from this district from the time gold was first discovered in Porcupine in 1909 up to the end of 1919. They may be brought up to date as of June 30th, 1919, by the addition of a little over $6,000,000 for the first half of this year.

The mining situation in all its phases is sound. It finds no artificial support; but, instead, is standing on its merit alone. Over-enthusiasm is playing little or no part, even among the smaller and new enterprises, and the foundation of the industry is such as to assure longevity.

Our Northern Ontario Letter

THE SILVER MINES.

With the world output of silver estimated at about 180 million ounces annually, and the United States Government prepared to purchase at $1 an ounce all the current output of that country, which amounts to 60 million ounces a year, it is obvious that only 120 million ounces are left to meet the demands of all the other nations of the world. Not only that, but the consumption of silver in the arts in the United States must be cared for out of foreign silver as it is only natural that silversmiths will turn to the foreign market for the metal just as long as it remains below the fixed price of $1 as provided in the Pittman Act.

It is for these reasons, among others, that silver producers are resting easy in the belief that prices will again rise.

A notable instance of confidence in higher prices is the fact that the Nipissing Mining Company as of June 22, had $1,685,406 in silver on hand or in transit. More than a million of this, in fact close to one and a half million is understood to actually consist of silver bars stored in the local vaults of the mine. In addition to this large liquid asset are $3,376,497 in cash and war bonds, making a total net quick asset of $5,061,903.

Another rich shoot of ore has been encountered on the Beaver Consolidated mine, making a total of six more or less important finds on this property since last Autumn. Current production is said to be running comparatively high, and the physical condition of the mine has been materially strengthened. This condition lends weight to current reports that dividend disbursements may be made at regular intervals of every three months from this date forward.

Output from the Kerr Lake mine is gradually declining, the May report showing a production of 48,834 ounces as compared with 61,512 ounces in April and 99,398 ounces in March. This falling off was expected, as intimated in recent weeks in the "Journal." It is due to the exhaustion of the high-grade ore, and signalizes a turn to lower-grade ore and consequent lower production. While a still further decline is expected, yet a uniform rate may soon be established, and it should perhaps be kept in mind that in low-grade are resources, inclusive of the large dumps which may be worked over, the Kerr Lake has an asset of big proportions. Also, the extent of the company's holdings in other countries lends added stability to the Kerr Lake.

In the boundary dispute between the O'Brien and the La Rose, the former company is favored in a decision just handed down. The judgment specifies that the O'Brien is entitled to possession of all that territory lying east of a straight line between the No. 4 post of the Colonial mine to the "Shaw" post, and is granted an injunction against the La Rose for trespass beyond that point with damages, if any. The text of the decision leaves cause for believing that O'Brien may enter some specified claim for damages, in which case in the event of the contestants failing to agree upon the amount the point would have to be determined by the Master at Haileybury.

Arrangements are being made to explore the Mohawk-Cobalt property, situated near Mud Lake a few miles from the producing Cobalt area. In 1907 a shaft was driven to a depth of 200 feet at which point developments were suspended without doing any lateral work. In 1919 about 103 feet of cross-cutting was done, during the course of which three fairly wide veins were opened up in each of which heavy cobalt mineralization is said to occur.

Rich samples of silver have just been brought out from the Thompson claims, situated in the township of Van Hise in the Gowganda silver district. The deposit is said to be exceedingly rich and is attracting attention of the leading mining companies in other fields. It is intimated that the proposition has been placed before the McKinley-Darragh Company of Cobalt, and that the Temiskaming Mining Company is also desirous of making an examination of the property.

A deal is pending on the Cane Silver Mines, a property situated in the township of Cane in the Montreal River district. The object in view is to enlist the finances necessary to carry out a comprehensive exploration and development program. A number of veins on the property contain short but quite rich shoots of ore at surface.

During the past few days, prospectors in Haileybury have become more or less excited about a newly discovered silver deposit the location of which is as yet kept secret. Quite a number of prominent prospectors have disappeared as though by magic, leaving behind them among their intimate friends the mere suggestion that they are on the track of something new. The element of mystery surrounding the matter has created an atmosphere very similar to the early days when rushes of the kind were quite frequent occurrences. Whether or not anything of value will merge from the present mystery cannot be predicted at this time, but that it will become public information within a short time seems certain as recording will be necessary and will offer a "tip" to those now on the outside but with "their ears to the ground," so to speak*.

---

*A newspaper dispatch from Haileybury under date of 4th July states that bismuth, not silver, has been found in the town ship of Rattray by the rush of prospectors to the supposed new silver fields, and as bismuth is regarded as of no commercial value, the rush of prospectors has suddenly ceased. Men working on a lumber camp were supposed to have discovered a vein of almost solid silver.

Bismuth is quoted at from $2.70 to $3.00 per pound in New York but the dispatch does not state the extent or nature of the occurrence. The commercial production of bismuth has not yet been recorded in Canada. During the war the price of bismuth was increased owing to the shutting off of customary European sources of supply.

Important bismuth ores occur in Bolivia and Peru (where the San Gregorio Mine, east of Hauraucaca is stated to have sufficient ore in sight to supply the world's demand for many years (see Miller and Singewall "Mineral Deposits of South America")., In several instances in South America the bismuth ore occurs in association with tin ores.—Ed.

In view of the Nipissing not having included a bonus with its July 20th dividend disbursement, and in view of the current quick assets being now over five million dollars, the highest in the company's history, it is believed that it is not the company's intention to yield to the request of shareholders to increase the rate of dividend payments, but, instead, to make a substantial capital reduction by perhaps paying the shareholders $1,200,000, an amount equal to $1 per share, thus reducing the par value from $5 to $4 per share. This would appear to be a popular move for the company at this time.

Ore and Bullion Report.

During the week ended July 2nd, three Cobalt companies shipped an aggregate of four cars containing approximately 281,012 pounds of ore. The Mining Corporation with two cars was the heaviest shipper, as shown in the following summary:—

Shipper	Cars	Pounds
Mining Corporation	2	129,370
Temiskaming	1	65,584
Nipissing	1	86,058
Totals	4	281,012

During the corresponding period, no bullion shipments were made, the tendency still being to await higher prices for the metal.

THE GOLD MINES.

The greatest confidence is expressed by careful observers that the supply of labor for the gold mines will become adequate in a reasonably short time, on account of the great tide of men moving to this continent from the nations of Europe. This would eliminate the chief obstacle to maximum production and would probably result in all the leading mines increasing their net earnings.

In regard to the Porcupine V.N.T., concerning which there is a proposal to borrow $50,000 with which to start work, and to grant a first mortgage against the mine, strenuous opposition is developing. It is pointed out by shareholders that the Porcupine V.N.T. has 750,000 shares still in its treasury, that the mine is well thought of and that with a small advertising compaign the money could be raised by selling only a small block of shares. General resentment is made manifest in connection with the mortgage proposal which is contended to be entirely uncalled for.

The head office of the Hollinger Consolidated has been changed from Toronto to Timmins, as provided for in a by-law passed at a meeting held in Toronto on June 29th. A number of other companies are reported to be preparing to take similar action.

At depth on the McIntyre-Porcupine, the result of operations continue extremely favorable, according to latest advice, and the year just closed on June 30th is understood to have been the most favorable so far in the company's history. It is intimated that total income exceeded $2,000,000 and that net earnings amounted to well over $1,000,000. This earning power is large as compared with the issued capital of $3,600,000 made up of 3,600,000 shares.

In regard to the Lake Shore Mine at Kirkland Lake, it is officially announced to the "Journal" that the main shaft is to be continued from the present depth of 400 feet to a depth of 800 feet. In view of nearly a million dollars having already been produced by using the small mill of 60 ton daily capacity on ore between the 400 ft. level and surface, chiefly from between the 400 and 200-ft. level, and with several years' ore still in sight at this horizon, it is quite evident that very considerable importance attaches to the announcement of the intention to get another 400 feet deeper. Success at the 800-ft. level would tend to the present mill being enlarged to double or perhaps treble its present size, according to official advice.

Owing to further delays in connection with the consolidation of the Tough-Oakes Gold Mines with the Aladdin-Cobalt and the Burnside, the belief has taken form that a situation has developed which is more serious than was at first supposed. It is believed the difficulty is in part at least due to a satisfactory arrangement in regard to the disposal of the treasury of one of the participating companies.

It is learned that a plan is being arranged with the object in view of working the Orr Gold Mines. The Wettlaufer interests of Buffalo and Hamilton B. Wills of Toronto, are said to be negotiating along lines mutually satisfactory. The plan includes arrangements to construct a mill so as to place the mine on a self-supporting basis as quickly as possible.

The main shaft on the Bidgood property at Mud Lake in the township of Lebel has reached a depth of 200 feet, and a cross-cut is being driven to the downward continuation of the vein. This was expected to be cut today, July 5th. At the first or 100-ft. level, the Bidgood vein had a width of about 12 feet, about eight feet of which was medium grade ore. After intersecting the body it is planned to continue the shaft to the 300-ft. level at which point extensive lateral operations will be carried out.

Good progress continues to be made at the Argonaut Gold Mines in Gauthier township, lying East from Lebel, and the belief has taken from that this is the eastward continuation of the auriferous zone along which the mines of the Kirkland Lake field are located.

During the course of performing assessment work on the claims owned by the Kirkland-Porphey company (now in voluntary liquidation), a wide vein had been opened up. The claims are situated in Teck township, south from the producing area. Whether or not the gold content of the vein is such as to offer more than ordinary encouragement is not yet announced.

A vein about ten feet in width has been opened up on surface on the Wood-Kirkland property in Lebel township. Gold tellurides are said to occur in the newly discovered vein.

A contract has been let to diamond drill the Porcupine-Miracle property in the Night Hawk Lake section of the Porcupine district. It is planned to cut the main vein at a depth of 300 as well as 500 feet. Former underground work was carried to a depth of 86 feet at which point some shoots of high grade ore are reported to have been found. The property is equipped with a mining plant as well as a small mill.

A good deal of interest appears to be developing in connection with the occurrence of oil shales in the vicinity of Long Rapids on the Abitibi River, and considerable local support may be given to enterprising individuals who propose to investigate the possibilities of the deposits.

In connection with the lack of a highway between this part of Northern Ontario and the older parts of the province, a proposal has been made by the Associated Board of Trade of Temiskaming suggesting that the government set aside ten townships, each six

miles square, the timber to be sold by tender and the proceeds to go towards paying for the construction of a macadam road from North Bay to Cochrane with branches to Porcupine and to Iroquois Falls. The road would be about 300 miles long and would cost at least $3,000,000. It would link up the entire district of Temiskaming as so far developed, with the roads connecting with old Ontario.

Manitoba Letter

C. S. MILLICAN.

Pas Mineral Belt.

At the Flin Flon Property work is going on rapidly and the shafts have reached a depth of 100-ft. and 70-ft. respectively. Some trouble was encountered with water in one shaft, but that has now been overcome. In the more northerly shaft where the ore-body was struck native copper was found at the contact between the ore body and the country rock—apparently a concentration product. Drifting and cross-cutting will take place either at the 200′ or 400′ level in order that the whole ore-body may be fully prospected at one definite horizon during the summer. The total number of men in camp is approximately one hundred. Investigations are being carried on in the field with reference to fluxes and the development of the water power necessary for the operation of the property.

Big Island Lake District.

Considerable interest has been aroused in this district which lies directly east of the Mandy Property owing to the occurrence of cobalt bloom over what is apparently a fairly wide zone of country rock. It would seem that the country rock at this point is mineralized with fine-grained smaltite in a zone closely connected with copper-sulphide mineralization. Not much work has yet been done to determine whether there is a possibility of silver mineralization connected with the cobalt but the ground is looked on as one of the best areas for prospecting in the territory.

Copper Lake District.

Diamond drilling is proceeding on Gordon's Big Lode. The results of the assaying of the cores are not yet to hand. It is understood the mineralization at depth is heavier than on the surface. The total width of the lode as ascertained by diamond drilling is approximately forty-five feet. If the values are found to continue at depth this property will hold out great promise.

Elbow Lake District.

In the district there has been considerable interest taken this Spring. A discovery made by T. Webb (an old-time prospector in the field) of very spectacular gold in quartz near the mouth of Webb Creek was followed by other discoveries by Forrest and others of fairly extensive lodes carrying apparently good values. These discoveries have caused an influx of prospectors into the territory north of Elbow Lake where there is likelihood of other discoveries of value yet being made.

Second Cranberry Lake.

North-east of the Lake, work has ben done by Rosen who is responsible for the discovery of cobalt bloom on Big Island Lake) in chalcopyrite bands which show promise of giving workable values. This ties on the same belt of mineralization as the Copper and Brunre Lake territory. The whole field between Elbow Lake. the Cranberries and the east side of Athapuskow Lake is still open for prospecting and forms one of the most attractive areas in the whole belt.

Herb Lake.

The Rex Mine is again in operation with some 20 miners under J. R. Campbell. Additional capital has been obtained to place the property on a working basis and careful management is assured. On the Bingo property there are some 12 miners. On the Northern Manitoba, work is being done preparatory to opening up the property again. Before the end of the Summer it is expected that there will be much further development in this area. The wagon roads from Sturgeon Landing to Lake Athapapuskow, leading into the copper belt, and from Mile 82 to the south end of Herb Lake, leading into the eastern part of the gold territory, are being kept in repair by the Provincial Government.

The following names of mining companies having headquarters at Winnipeg, were omitted from the list that were given in this letter in the issue of the "Journal" of June 11th, (see page 486.)

Bingo Mines, Ltd., 315 Paris Bldg., Winnipeg.

The Pas Consolidated Mines, Ltd., 315 Paris Bldg., Winipeg.

Northern Manitoba Mining and Development Co., Ltd,, 711 Paris Bldg., Winnipeg.

SILVER ISLET MINE.

Geological Survey of Vicinity Required.

By J. J. O'Connor.

The Silver Islet Syndicate are meeting with most satisfactory results in their investigation of the roof of the Silver Islet Mine. All reports indicated large bodies in the roof, and so far as the operations have proceeded, everything has been found as indicated. Another body of high grade ore has been uncovered in the east stope, above the first level. A few shots put in show it to be very rich, and of considerable extent, as yet not fully determined, but such as to be very gratifying to the operators.

Dr. T. L. Tanton, of the Geological Survey, Ottawa, has strongly recommended that a complete geological survey be made of the "Wood Location" (Silver Islet) together with the adjoining territory north and west. to Sawyer's Bay, including Thunder Cape.

The "Wood Location" comprises ten square miles. The adjoining territory recommended for survey, embraces and are of fifteen square miles, making twenty five square miles in all. If this survey be carried out, it will enable systematic prospecting of the area to be done in an intelligent and effective manner. This bit of ground has been too long neglected by the Survey, considering the large amount of silver it has produced in the past from one small speck of rock in Lake Superior on the "Wood Location". The whole area is cut by a series of dykes, and it does not seem reasonable that the only place silver will be found, is at the point where one of these dykes cut the Silver Islet vein. There are many such intersections known, and a survey would doubtless throw light on others, and place in the hands of prospectors the necessary information for opening up a prosperous silver-mining field. In any case, the dyke zone should have a thorough geological survey made of it. The necessary capital is at hand, on the ground, and immediate advantage could be made of any discovery resulting therefrom. It is hoped that the Geological Survey will accede to the recommendation.

Nova Scotia Notes

The Minister of Labor announces that a Royal Commission will be appointed to enquire into and if possible adjust the questions connected with the demand of the United Mine Workers in Nova Scotia for an increase in wages effective May 1st. The Commission will presumably hold separate sittings to consider the wage question as it affects the several companies.

The Dominion Coal Company is making preliminary inspection of several mooted sites for new collieries to win the lowest seams in the Glace Bay district, but no definite announcement of the chosen locations has yet been made. Work is rapidly proceeding on the re-opening of the Morien seams.

The production of the Glace Bay collieries during June totalled 281,000 tons, which compares with 256,874 tons in May, and is 57,000 tons larger than the output of June 1919. The production for the first six months period of the past two years compares with 1920 as follows:

	Tons
1918	1,685,432
1919	1,539,328
1920	1,615,713

The production from the Glace Bay collieries in the first six months of 1914 was 2,254,043 tons, and in June 1914 was 452,279 tons, so that present production is approximately thirty percent below the pre-war rate.

The output of the Springhill Mines during June was 35,743 tons. The production rate at these collieries has changed very little from pre-war figures, the output for the first six months of the years noted below being as follows:

	Tons
1914	199,961
1918	201,852
1919	187,690
1920	220,000

An output at the tonnage rate exceeding that of 1914 is unique among the operating collieries in Nova Scotia—except for some recently commenced small collieries.

The production of the Acadia Coal Company for the first six months of 1920 was approximately 250,000 tons, comparing with 190,000 tons in the first half of 1919. An output increase of 25 per cent is notable.

The Intercolonial Coal Mining Company at Westville had a production during the first six months of the year of about 81,000 tons, comparing with 89,000 tons in the corresponding period of 1919. Production has been hindered by fire in a portion of the underground workings, necessitating temporary walling-off of the affected area.

Greenwood Coal Co. produced some 28,000 tons in the first half of the year, comparing with 17,770 tons in corresponding period of last year.

The Nova Scotia Steel and Coal Co. report output during June of 56,307 tons, about one thousand tons in excess of May production.

A well-known financial bulletin contains an article headed: "The Hope for Price Maintenance." This betrays one point of view, but it is not a general one. Hope in this instance is commingled with fears that prices may not come down yet awhile.

British Columbia Letter

THE METAL MINES.

Stewart, B. C.

The mining communities of Stewart and Hyder, as well as the scattered mining population of northern British Columbia and Alaska, were alarmed by a hurricane which swept up the Portland Canal about two weeks ago. Trees were torn up, houses were shaken, and small craft along the water front were swamped. There were no fatalities and not a great deal of material damage on which residents of the town are congratulating themselves.

Diamond drilling has been commenced on the Province Claim of the "Big Missouri" Group. Boyle Bros. have the contract. Last year the same form of development took place on the E. Pluribus Claim of the same Group. This property is one of the most extensive of the low grade prospects of the Salmon River Section, Portland Canal District.

Col. T. A. Hiam, the representative at Stewart of Sir Donald Mann, expects the Northeastern Railway up the Bear River, to be in operation this season. The bridges and right-of-way are being repaired and the gasoline locomotive to be used has arrived. As there are a number of properties up the valley to be developed Col. Hiam is confident that the road will be kept very busy.

Alice Arm, B. C.

The Taylor Engineering Co. is reported to have awarded a contract for the installation at the Dolly Varden Mine of a hydro-electric power plant. The cost is put at $65,000.

Hazelton, B. C.

The Kitselas Mountain Copper Co.'s concentrator at Usk B. C. has been in operation for about a week, having started early in the month of June. It is giving satisfactory results. A considerable quantity of ore is being treated and development is in progress at the mine. The ore carries values in gold, silver and copper.

The Silver Standard Mine, New Hazelton, B. C., has been shipping steadily this year and important development is also in progress on the property. A new tunnel is being driven which has reached two veins and will continue until it crosscuts the main lead. Transportation to the concentrator is furnished by a large motor truck. It is used both summer and winter. Travelling in the winter is good after the snow becomes hardened, wires being wound about the truck wheels to ensure traction. Considerable high grade ore is being shipped direct to the Trail Smelter. Although the property is very promising it admittedly is yet in the development stage. The utilization of some of the water-power possibilities of the district is planned and with such a facility to hand the management look forward to placing the mine on a more productive basis.

Barkerville, B. C.

Placer miners are preparing for the season's work in the Cariboo District. John D. Galloway, government mining engineer, recently made a trip through a part of the section and, while it is impossible as yet to estimate the extent of the hydraulic mining to be

undertaken this year, the prospect generally is good. Owing to the unusualy late spring and the heavy fall of snow there should be a plentiful supply of water and fall operations appear assured. The old channel on Grouse Creek, where the values are reported to be good, will be piped by the Waverly and there will be operations at Lowhee and Stout's Gulch. Generally it is expected that most of the old companies will be on their ground again and that some new leases will be worked. Notwithstanding lack of labor and high costs it looks as though the old Cariboo would seem more placer mining, both hydraulic and individual, than it has for some years and that the gold output will show an increase as a result.

Nelson, B. C.

Preparations are in full swing for the International Mining Convention to be held at Nelson from July 20 to 24th inclusive. Fred S. Starkey, Commissioner of the Associated Board of Trade of Eastern B. C., again is in charge of the arrangements. He proposes placing on display a representative exhibit of the ores of the Kootenays as well as outlining a programme that will furnish visitors both mental stimulation and diversion. One of the special features, it is understood, will be a trip through the mining sections of the eastern part of the Province for those of the delegates who care to make it.

The Mandy Mine, of Le Pas, Manitoba, is resuming shipments to the Trail Smelter according to authentic word received at Nelson. The first consignment for the year consists of 30 cars. Ten cars are to be shipped every two days throughout the season. It will be transported by water to Le Pas, by the Canadian National Railway to Calgary, and thence by C. P. R. to Trail. The Mandy last year shipped 8401 tons of ore to the British Columbia Smelter.

Rossland, B. C.

The faith of the old-time residents of Rossland, B.C., one of the oldest camps of the Province, that prosperity, which momentarily passed away when the mines of the Consolidated Mining & Smelting Co. were practically closed down, would return is about to be justified. At least such are the indications. The company's mines, it is stated, are to be put on a producing basis very soon, it being expected that shipments will be resumed early in July. The ore bunkers have been repaired, ore from the Mandy Mine, Manitoba, which the smelter management like to handle with the Rossland mineral, is coming, and all other conditions are satisfactory. The only element of doubt lies in the labor shortage. If the men are available there is no doubt that the mines will be made to yield without delay and that Rossland once more will take her accustomed leading place among British Columbia mining centres. That this will come about eventually is certain because the improvement of metallurgical methods of treatment of Rossland Ores and the construction of a concentrator for the application of these improved methods assures it. The Consolidated Mining and Smelting Co. will start work on this Mill shortly.

Trail, B. C.

Ore receipts in gross tons at the Trail Smelter of the Consolidated Mining & Smelting Co. for the week ending June 14, totalled 6,913. For the week ending June 21 there were received 6742 tons. Two new shippers appeared in the latter list, namely, the old Whitewater Mine, of the Slocan, and the Sunnyside, Rock Creek. The total ore receipts at Trail Smelter for the year up to date are 135,068 tons.

Princeton, B. C.

W. P. Tierney, the contractor in charge of the construction of a railroad to connect the Copper Mountain Mine of the Canada Copper Co. and the Kettle Valley Railway, has stated that rails will be laid within 30 days. This 15-mile stretch of steel probably represents the hardest and roughest piece of construction undertaken in western Canada in recent years. The only work comparable to it is the road to the Dolly Varden Mine. The contractor states that the cost totals $1,500,000. It describes it as having been heavy rockwork, bridges and trestles all the way.

Invermere, B. C.

Interest is keen in the work of the Toby Creek Mining Co., of Vancouver, B. C., in the opening up of their property, the Maple Leaf and Silver King Groups, situated on the Jumbo Fork of Toby Creek. On these claims is a large ledge of silver lead ore upon which there is active development. A 121 foot tunnel has been driven and it is to be extended. There is a quantity of concentrating ore already on the dump awaiting shipment. The government is constructing a road and with the completion of this work it will be possible to reach the properties by automobile.

Cranbrook, B. C.

With reference to the revival of placer mining activity on Wild Horse Creek, to which reference already has been made, it is interesting to note that the annual meeting of the Wild Horse Creek Gold Mining Co. was held recently at which the manager reported that the pipe line had been completed and that water would be turned on immediately. Officers were elected as follows: President, Lester Clapp; vice-president, A. Raworth, Secretary-Treasurer, W. D. Gilroy; Directors, C. R. Ward, Gustave Nelson, F. M. McPherson, F. A. Russell, and L. P. Sullivan; auditor, F. W. Burgess; Manager, A. J. Pamquist.

Victoria, B. C.

W. E. Ditchburn, Chief Inspector of Indian Agencies for British Columbia, reports that there have been a number of applications for permits to prospect on Indian reservations in this Province for the precious metals. This is allowed under an Order-in-Council passed by the Dominion Government giving effect to certain amendments passed by the Provincial Government to both the Mineral and the placer Mining Acts. While mining men consider the action of the authorities in throwing open the reserves for this form of mining a step in the right direction they do not consider that it goes far enough to do much good. A prospector may get a permit and may locate a claim on an Indian reserve but he cannot remove more than the gold and silver. These two minerals in British Columbia are usually found with other minerals so that the problem that the Dominion and Provincial Governments have left the miner to solve is easily appreciated.

Vancouver, B. C.

Dr. Edwin T. Hodge, formerly of the mining branch of the British Columbia University and who has accepted a lectureship on the faculty of the Oregon University, has bonded the Emancipation Group of Mineral Claims, situated on the Coquahalla river, near Dewdney Creek, about fifteen miles from the town of Hope. Some development has taken place on this property and ore has been shipped containing gold and silver values. Dr. Hodge is impressed with the possibilities of this property and, it is said, proposes giving his personal attention to its development.

That the sourdoughs of Dawson, Yukon Territory, scorn to permit, as far as it is in their power to prevent, the circulation in that part of Canada of dimes, nickles, and pennies is the purport of an interesting newspaper dispatch from the north. These old-timers, as well as those who date the commencement of their residence in those parts to more recent times, held fast to the principles laid down in the rush of 1898. The least that will be accepted in Dawson is a twenty-five cent piece and one grizzled old prospector thought the limit should bet set at a dollar "as the dollar buys no more now than a nickel did a few years ago."

The Coal Mines.

In view of the alarming reports in circulation as to the increasing shortage of fuel oil, and the possibility of important industries being forced to close down, at least until coal-burning appliances can be installed, anything bearing on coal production is of interest in the Canadian West. As it has just been stated that there is a likelihood of the several pulp manufacturing plants of this province being compelled to cease operations for a considerable period because of lack of oil, a contingency that will have to be met by substituting coal as a fuel, it is especially noteworthy that the collieries of British Columbia are at present handicapped in their operations through difficulty in obtaining an adequate supply of labour. If the threatened added demand develops, while there is no doubt that there is plenty of coal to be got in this Province for all requirements, the problem of securing miners would assume a more serious aspect. As it is it is serious enough. Neither the Canadian Collieries (D), Ltd., nor the Canadian Western Fuel Co., the two large operators of Vancouver Island, have as many men as could be taken care of and the Pacific Coast Coal Company, which is under the new management of George Wilkinson, formerly Chief Inspector of Mines, is commencing extensive development both of its fields at Extension and at Suquash is advertising for men in Victoria and Vancouver. The idea of inviting applications for employment from coal miners in the cities is sufficiently novel to furnish a striking indication of the conditions. The explanation is hard to find as the miners are highly paid unless it be that they no longer have the advantage of workmen of other crafts as to hours of labour, the eight hour day now being general. The suggestion has been made that coal miners who went overseas have not returned to their work underground. In the majority of cases, it is said, they have sought employment elsewhere. Whatever the cause there is no doubt that qualified coal miners are hard to find in such numbers as is necessary to place all the mines of the Coast and of the Interior on a basis of maximum production.

PEAT AS A FUEL.. A BRITISH INVESTIGATION

The Department of Scientific and Industrial Research has published the lecture delivered before the Royal Dublin Society by Prof. Pierce F. Purcell on the Peat Resources of Ireland, as the second of the Special Report Series of the Fuel Research Board, the first being Mr. Leonard C. Harvey's report on Pulverized Coal Systems in America. The peat problem, although of venerable antiquity, becomes periodically rejuvenated in times of fuel scarcity. But the present virile phase of this much-debated question seems to present some points of difference, as compared with former waves of public interest in the subject—partly because the advance of knowledge has opened up new channels for its prospective utilization, but mainly because the pressing needs of land reclamation for agricultural purposes in certain countries has made it inevitable that many peat-covered areas should be stripped and made available for cultivation. From this standpoint peat has in some cases become a by-product of agricultural development, and its utilization for some purposes or other has therefore become an essential factor in the economy of these schemes. To cut peat for its own sake and to find a use for a secondary product are totally different questions; and it is necessary to bear this fact in mind when estimating the commercial value of some modern methods of utilization.

The Fuel Research Board have therefore been well advised to consider the peat problem in its present-day aspect, and no better exponent than Prof. Purcell, could have been found to expound it. At the same time, the old economic difficulty still remains that, compared with coal mining the working of a bed of peat 20 ft. thick, as Sir George Beilby reminds us in a prefatory note to this report, is somewhat like developing a 15 in. seam of coal. The labor involved in procuring one ton of dry peat involves handling once or oftener, at least ten tons of raw material, and this fact alone would seem to militate against any prospect of success in working peat deposits on a large scale.

The question arises, therefore, whether it is possible to overcome the labor difficulty in peat production to any extent, and this is answered by Prof. Purcell somewhat hopefully in the light of experience gained in Canada and in Germany of the application of mechanical methods of extraction of this extremely low grade fuel. The nature of the problem is aptly illustrated by the fact, pointed out by Prof. Hugh Ryan of Dublin, that there is a greater percentage of solids in milk than than of peat in a drained bog. Air-drying can never by itself be an entirely satisfactory solution of the difficulty because of the hygrometric property of peat, which limits the final water content to about 16 per cent in theory, but to a much larger figure in practice, and so far no really economic process of artificially dehydrating it has been proved to be entirely successfully, although the Ekenberk system, still in an experimental stage, is claimed to have given promising results.

It is not necessary to follow Prof. Purcell in his admirable survey of the area and fuel content of the countries. Neither do we need to dwell upon the many uses to which peat has been put apart from its value as fuel. It will be more to our purpose to follow Prof. Purcell in his remarks upon the utilization of this substance for power purposes. To this end, the gas producer certainly promises the best results, because the presence of 60 to 70 per cent of moisture may not in this case prove to be prohibitive, since some manufacturers of gas producer plants already claim that this can be achieved. With regard to this point, however, Prof. Purcell is of opinion that the Italian practice, whereby the peat is first dried by exhaust gases to a moisture content of 33 per cent, is probably more economical, and in this view he is supported by Haanel, of the Canadian Departments of Mines, who maintains that with a moisture content of 60 per cent the quantity of heat generated is not enough to enable the producer gas reactions to take effect so as to enable power gas of the necessary heating value to be formed. But even when these criticisms are admitted it still remains true that peat with a moisture content of about 40 per cent can be effectively used in a specially constructed gas producer—a result which could scarcely be expected by direct combustion under a boiler.

Prof. Purcell examines in some detail the various ways in which the power gas from a producer could be used. It can be used in a gas-fired boiler or used in a gas-engine. Of these the latter is shown to be the more efficient in theory, but it is doubtful whether it can be employed on a large scale. As a matter of fact the best way of utilizing energy from peat remains still an unsolved problem, and it is hoped that the elaborate series of experiments about to be undertaken by the Fuel Research Board at the new research station in East Greenwich will definitely settle the question. There are many factors to be considered besides the over-all efficiency of any particular process. Questions of labor, depreciation, maintenance, capital charges and profits from by-products should also be taken into account, and in this connection it is a somewhat debatable point whether the end in view should be the maximum production of by-products or the greatest development of power gas, both of which cannot be achieved at the same time. It must also be remembered that the yield of sulphate of ammonia depends upon the percentage of nitrogen in the peat, which is by no means a constant quantity; so that while by-product recovery on one peat bog might be a payable proposition, on another it might prove a failure. Thus, as Prof. Purcell truly remarks, the problem is very complex. Hitherto, attempts to run peat power in Ireland have been limited to two only, one being in use at Clifden in Galway by the Marconi Company, and another, a producer plant, at Portadown, Co. Armagh, but these are on too small a scale to enable any general conclusions to be drawn from them. The wet-carbonising plant at Dumfries, run by the War Department for the production of briquettes during the war, furnishes another object lesson in the possibilities of peat utilization; and other projects have been under contemplation, nothing so far has been attempt in this country at all comparable with the work done in this direction in Canada, Sweden, Germany and Russia, where large scale plants, both experimental and commercial, have been installed, but for various reasons it is necessary to suspend judgment as to the results achieved. The largest peat power plant in the world, that of Bogerodozk, near Moscow, only began work in 1914, and its subsequent history is naturally obscure; and the great Fidesland project has been too intermingled with political considerations to be a trustworthy example of economical working. Moreover, in both these cases the peat is burnt direct under water-tube boilers.

PAPER AND COAL

A Curious Parallel to Our Newsprint Situation

(From the "Colliery Guardian")

Most of our readers have had so many worries of their own during the past few months that we have foregone the temptation to ventilate a trouble that has afflicted ourselves in common with all other periodicals. We refer to the shortage and high cost of paper. Modern industrialism, however, is so compacted that no trade can remain indifferent to the woes of its neighbors. Thus, when we called for an increased output of coal we were not entirely disinterested, for paper mills have been stopped for lack of fuel, and pulp boats from Norway have been detained for similar reasons. The prospect of a reduction in exports we view with the same mixed feelings. It shipments of coal are to be limited to 20 million tons, and 65 per cent of these are embarked from France and Italy, it will be possible to spare very little for our Norwegian friends, in return for their iron ore, timber and pulp, and the pits and the papers are, to that extent, in the same boat.

A short time ago one of the news agencies told us that the Norwegian Government were requiring makers of newsprint to supply Norwegian newspapers with their full needs of paper at a price below cost, otherwise they would not be permitted to continue their export business.

The Anglo-Norwegian Trade Journal characterises the whole story as a warped representation of the facts. The official organ of the Norwegian Chamber of Commerce in London says:—

By an Order in Council, in November 1919, the Government fixed the price of paper for home consumers at 55 ore per kilogramme. The price is due for a period running till the end of this year. At the time of the Order the price was quite sufficient to cover the cost. Since then the cost has increased, owing, particularly to dearer coal, and the mills, of course, have had to make good the loss by increasing the prices for later sales abroad. If paper contracts cannot be carried out at the originally agreed prices, the real cause is the increased coal prices. About the same time as the Norwegian Government, in November, fixed the price of paper for Norwegian consumers, the British Government in December, took off 10s. per ton of coal for British consumers. The loss was made good by enhanced coal prices for foreign consumers. The coal prices up till recently paid by British consumers are very much below cost price, so much below that if only 10s. had now been put on again the British consumers would still have had their coal below cost. Norway is one of the foreign consumers who have to pay the enhanced coal prices and the British Press is one of the home consumers who benefit thereby. No Norwegian news agency was stigmatised the British Press as being for this a "subsidised" Press. What moral difference is there between Norwegian paper and British coal? . . . . . One can understand the feelings of British consumers paying the high paper prices, but what about the unhappy paper mills and other consumers in Norway paying the prices of British coal? In addition to the soaring prices there is the expensive delay of coal ships and the deficient delivery. As a typical instance can be mentioned that a Norwegian steamer, 3,000 tons arrived in the Tyne on January 31, and only on April 24 could she sail with a cargoe of coal for one of the principal paper mills in Norway, and what stuff, at crying prices, can they get, these three months delayed steamers? They take small coal and duff and such inferior coal as the Coal Controller has no use for How can anybody under such circumstances expect cheap paper from Norway?.... It is just coal that can speed up production in Norway, but as a matter of fact, she gets even less coal from Britain this year than last year.

The argument is unanswerable. It little becomes us to sneer at a friendly nation, which has grave troubles of its own, for doing things which we have done much more extensively and masterfully ourselves. Moreover, from the economic standpoint, these fiscal reprisals are deadly—to those who set them in train!

TIME APPROACHING WHEN OIL-SHALE DEVELOPMENT WILL BE REQUIRED.

Pres. Alderson, of Colorado School of Mines, says the time has come when production of crude oil wells must be supplemented by production from oil shale. Position of the shale industry has been essentially changed in the last few years because of pronounced advance in crude oil. At present prices of crude oil, it is possible for oil from shale to compete profitably with oil from wells. This was not the case a few years ago, when oil in Mid-continent sold for as low as 40 cents a barrel, against present price of $3.50. He says:

"Crude oil can be produced from shale under present costs at $1.85 a barrel in Colorado and Utah. Crude oil in Wyoming, the nearest big field to Colorado and Utah shale supplies, is selling at $2.75 a barrel. Pennsylvania grade oil is quoted at $6.10.

"The oil shale industry in relation to the oil business is similar to position of the porphyry companies to the copper industry. In Colorado and Utah there are 5,500 square miles of oil shale, which, with a yield of one barrel of oil to one ton of shale, will produce a practically unlimited supply of oil.

"Production of petroleum from wells in this country to date has been obtained from 4,109 square miles with estimated yield of 2,280,000 barrels to the square mile. One ten-foot seam of shale, yielding one barrel to the ton, will give 15,488,000 barrels of oil, or seven times the square mile output from wells. The 5,500 square miles of oil shale in Colorado and Utah will produce 255,000,000,000 barrels."

In his opinion the desirable minimum investment for the best operation of oil shale retorting plants is $500,000. Under more favorable conditions in Colorado and Utah fields, as compared with Scottish fields, return on capital investment will be substantial.

Dr. Alderson points out that several oil fields in this country have passed their peak and are steadily declining in output. Fields in Wyoming, however, are still capable of greatly increased production, and the same is true of fields in Kansas and Oklahoma.

Scottish shale oil industry has been profitable over a long period and its record should be improved by the shale industry in this country, especially in Colorado and Utah, because of greater richness of shale strata and their more easily workable surface location.

Dr. Alderson will sail for England shortly, where he will investigate oil shale conditions—"Boston News Bureau."

Labor politics in Australia seem to be accompanied by much bitterness. The "Industrial Australian and Mining Standard" last to hand contains a sardonic cartoon, in which a gentleman of the traditional "capitalist" type as portrayed in American lampoons, is shown addressing an audience of apparent jailbirds as follows:—"Now boys, I will put the motion, Hands "up the b..... scabs and traitors who want to con-"tinue doing a fair day's work for a fair day's pay. "Thank you, boys, not a single hand raised: I declare "the resolution to strike carried unanimously."

STRUCTURAL GEOLOGICAL FEATURE OR MORPHOLOGIC AGENCIES?

There are two reverse faults and three erosion fault-scarps underground at the mine that are of great interest geologically and of much value minerallogically to the proposition. Two of the fault-scarps are normal and exhibit great importance to age disturbances or (dynamic) crustal movement and ore-deposit.

"After very technical investigations it is observed that these faults at the mine were developed from very early morphologic agencies; therefore will offer no serious obstacles to mining on the property, for the fault were long in progress and evidently complete according to the dynamic aspect before the formation of the vein; but have rather aided secondary enrichment."—Extract from a report on a property.

C.M.I. "Bulletin."

The Canadian Miners' Buying Directory.

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

A.C. Units:
MacGovern & Co.

Agitators:
The Dorr Co.

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

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

Alternators:
MacGovern & Co.

Spielman Agencies, Regd.
Aluminium:

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

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

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

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

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

Balances—Heusser:
Canadian Fairbanks-Morse Co., Ltd.
Mine and Smelter Supply Co.

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

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

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

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

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

Belting (Transmission):
Goodyear Tire & Rubber Co.

Belting (Elevator):
Goodyear Tire & Rubber Co.

Belting (Conveyor):

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

Blasting Batteries and Supplies:

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

Bluestone:

The Consolidated Mining & Smelting Co

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

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

Blue Vitriol (Coniagas 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.

Cable—Aerial and Underground:
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 undounted integrity and reliability.

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

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

BRITISH COLUMBIA

The Mineral Province of Western Canada

Has produced Minerals valued as follows: Placer Gold, $75,436,103; Lode Gold, $97,121,786; Silver, $46,839,631; Lead, $42,294,251; Copper, $145,741,069; Other Metals (Zinc, Iron, etc.), $13,278,058; Coal and Coke, $187,147,652; Building Stone, Brick, Cement, etc., $28,843,272; Miscellaneous Minerals, $651,759; making its mineral production to the end of 1918 show an

Aggregate Value of $637,353,581

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.

Production During last ten years, $313,976,022

Lode-mining has only been in progress for about twenty 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:
Canadian Mead-Morrison Co., Limited.

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

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

Carbide of Calcium:
Canada Carbide Company, Ltd.

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

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

Carriers (Gravity):
Jones & Glassco

Castings—Brass
The Canada Metal Co., Ltd.

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

Cement and Concrete Waterproofing:
Spielman Agencies, Regd.

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

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

Chain Drives:
Jones & Glassco (Regd.)

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

Chemical Apparatus:
Mine and Smelter Supply Co.

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

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

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

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

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

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

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

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

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

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

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

Coal Pick Machines:
Sullivan Machinery Co.

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

Cobalt Oxide:
Coniagas Reduction Co.
Everitt & Co.

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

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

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

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

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

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

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

Consulters and Engineers:
Hersey Milton Co., Ltd

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

Conveyor Belts:
Gutta Percha & Rubber, Ltd.

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

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

Conical Mills:
Hardinge Conical Mill Co.

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

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

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

Crane Ropes:
Allan Whyte & Co.
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.

Crude Oil Engines:
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., Rochester
Osborn, Sam'l (Canada) Limited.
Mussens, Limited
Swedish Steel & Importing Co., Ltd

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

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

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

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

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

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

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

Engineering Instruments:
C. L. Berger & Sons

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

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

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

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

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

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

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

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

Feed Water Heaters:
MacGovern & Co.

Fire Fighting Supplies:
Gutta Percha & Rubber, Ltd.

Flashlights—Electric:
Spielman Agencies, Regd.

Flood Lamps:
Northern Electric Co., Ltd.

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

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

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

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

Frequency Changers:
MacGovern & Co., Inc.

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

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

Gaskets:
Gutta Percha & Rubber, Ltd.

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

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

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

Granulators:
Hardinge Conical Mill Co.

Grinding Wheels:
Canadian Fairbanks-Morse Co., Ltd

Gold Refiners
Goldsmith Bros

Canadian Miners' Buying Directory.—(Continued)

Gold Trays:
Canada Chicago Bridge & Iron Works
Hose (Air Drill):
Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.
Hose (Fire):
Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.
Hose (Packings)
Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.
Hose (Suction):
Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.
Hose (Steam):
Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.
Hose (Water):
Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.
Hammer Rock Drills:
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Osborn, Sam'l (Canada) Limited.
Mussens, Limited
The Mine & Smelter Supply Co.
Hangers and Cable:
Standard Underground Cable Co. of Canada, Ltd.
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.
Levels:
C. L. Berger & Sons
Locomotives (Steam, Compressed Air and Storage Steam:
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.
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 Canada
Canada Metal Co.
C. L. Constant Co.
Everitt & Co
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.
Dominion Wire Rope Co., Ltd.
Greening, B. Wire Co.
Northern Canada Supply Co.
Mussens, Limited

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

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

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

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

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

Screens—Perforated Metal:
Hendrick Mfg. Co.

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

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

Scheelite:
Everitt & Co.

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

Shaft Contractors:
Hendrick Mfg. Co.

Sheet Metal Work:
Hendrick Mfg. Co.

Sheets—Genuine Manganese Bronze:
Hendrick Mfg. Co.

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

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

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

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

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

Siline:
Coniagas Reduction Co

Saline Refiners:
Goldsmith Bros.

Smelters:
Goldsmith Bros.

Sledges:
Canada Foundries & Forgings, Ltd.

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

Special Machinery:
John Inglis Co., Ltd.

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

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

Spring Coil and Clips Electrico:
Canadian Steel Foundries, Ltd.

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

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

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

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

Steel Drums:
Smart-Turner Machine Co.

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

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

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

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

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

Surveying Instruments:
C. L. Berger

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

Switches and Turntables:
John J. Gartshore

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

Tanks:
R. T. Gilman & Co.

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

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

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

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

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

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

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

Canadian Miners' Buying Directory.—(Continued)

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

Transits:
C. L. Berger & Sons

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

Transmission Appuiances:
Jones & Glassco (Regd.)

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

Troughs (Conveyor):
Hendrick Manufacturing Co.

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

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

Trucks:
Canadian Fairbanks-Morse Co., Ltd.

Tubs:
Hadfields, Limited

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

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

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

Turbines—Water Wheel:
MacGovern & Co.

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

Twincones:
Canada Foundries & Forgings, Ltd.

Uranium:
Everitt & Co.

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

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

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

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

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

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

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

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

Wire Rope Fittings:
Canada Wire and Iron Goods Company.

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.

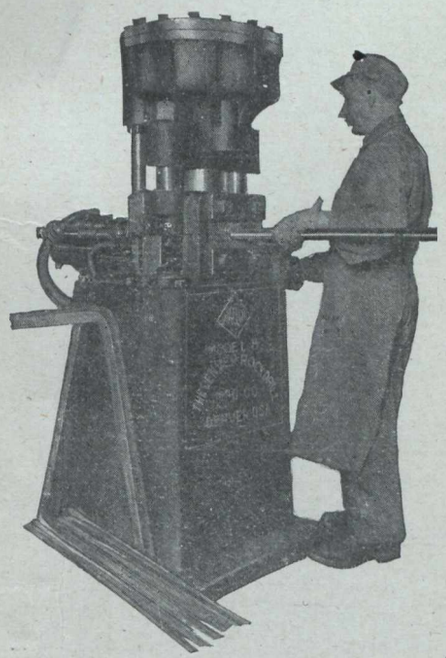
Woodworking Machinery:
Canadian Fairbanks-Morse Co., Ltd

Zirconium:
Everitt & Co.

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

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

ALPHABETICAL INDEX TO ADVERTISERS



"The Waugh Way Wins"

A Perfect Tribute

THE Tonopah Extension Mining Company, speaking through its Master Mechanic, Mr. H. A. Reid, says of the Waugh Model 8 Drill Sharpener:

"As we have been using one of your Waugh D. S. 8 drill sharpeners at the Tonopah Extension in Tonopah, and one at the White Caps mine in Manhattan, for a period of over three years with most gratifying results, I wish to state that we consider it the best sharpener on the market today.

"We have used several different types of machines, changing makes to keep abreast of improvements as they came up. * * * * * * * * * *

"To date we have purchased no repairs for any of the equipment, and we consider the Waugh D. S. 8 to be the best machine we have ever used from every standpoint, as to low upkeep, durability, low air-consumption, and efficiency."

Tributes of this sort not only point the way to contentment and efficiency in the mine blacksmith shop but afford further proof of the well-known fact that

"The Waugh Way Wins."

Canadian Rock Drill Company, Limited

TORONTO, ONT.
COBALT, ONT.

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

Sole Agents in Canada for

THE DENVER ROCK DRILL MANUFACTURING COMPANY

OF DENVER, COLORADO, U.S.A.