

C-190-2 \*  
C-192-4  
C-2

DECEMBER 1, 1916

Single Copies 15 Cents

# CANADIAN MINING JOURNAL

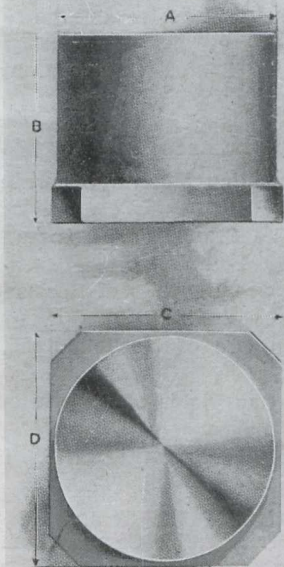
VOL. XXXVII

TORONTO

No. 23

## No More Trouble with Your Repair Parts

*We specialize in the manufacture of pieces called upon to withstand hard wear. A few of our lines are :*



**Kominuter Grinding Plates  
Krupp Mill Grinding Plates  
Linings for Hardinge Mills  
Crusher Heads, Concaves  
and Jaw Plates, Cams,  
Tappets, Stamp Heads,  
Shoes and Dies** made  
from Manganese or our  
**HISCO Chrome Nickel  
Steel.**

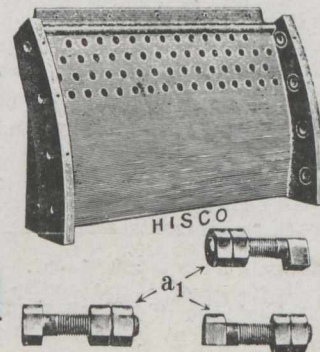
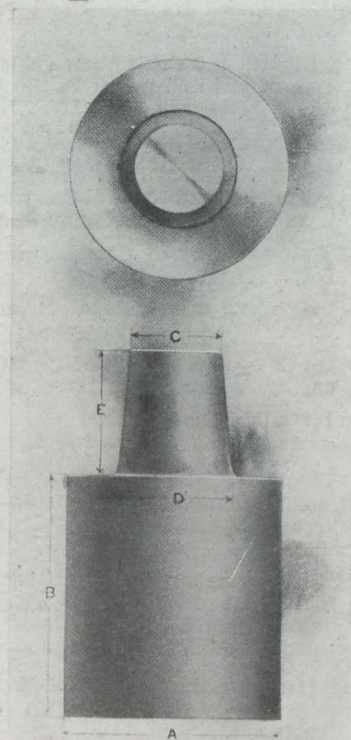
**We hold written testimony that our material has outlasted other makes by 25%, and we will have the same from you if given a trial.**

**Machine Moulded Gears, any size up to 18 feet in diameter. No pattern required.**

*Send us your specifications and leave the composition of the material to us.*

**WRITE**

**Hull Iron and Steel Foundries, Limited  
HULL, P.Q., CANADA**



Krupp Mill Grinding Plate



# CANADA

## DEPARTMENT OF MINES

HON. P. E. BLONDIN, Minister.

R. G. McCONNELL, Deputy Minister.

### MINES BRANCH

#### Recent Publications

- The Nickel Industry: with special reference to the Sudbury region, Ont. Report on, by Professor A. P. Coleman, Ph.D.
- The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.
- Building and Ornamental Stones of Canada (Quebec). Vol. III. Report on, by W. A. Parks, Ph.D.
- The Bituminous Sands of Northern Alberta. Report on, by S. C. Ellis, M.E.
- 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 Report of the Mineral Production of Canada During the Calendar Year 1914 by John McLeish, B.A.
- The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.
- The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.
- Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.
- Electro-thermic Smelting of Iron Ores in Sweden. Report on, by A. Stansfield, D.Sc.
- Non-metallic Minerals Used in Canadian Manufacturing Industries. Report on, by H. Frechette, M.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 of the Geological Survey for the Calendar Year 1915.
- Memoir 34. The Devonian of Southwestern Ontario, by Clinton R. Stauffer.
- Memoir 57. Corundum, its Occurrence, Distribution, Exploitation and Uses, by A. E. Barlow.
- Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.
- Memoir 65. Clay and Shale Deposits of the Western Provinces (Part 4), by H. Ries.
- Memoir 66. Clay and Shale Deposits of the Western Provinces (Part 5), by J. Keele.
- Memoir 69. Coal Fields of British Columbia, by D. B. Dowling.
- Memoir 73. The Pleistocene and Recent Deposits of the Island of Montreal, by J. Stansfield.
- Memoir 74. A List of Canadian Mineral Occurrences, by Robert A. A. Johnston.
- Memoir 76. Geology of the Cranbrook Map-area, British Columbia, by S. J. Schofield.
- Memoir 77. Geology and Ore Deposits of Rossland, British Columbia, by C. W. Drysdale.
- Memoir 78. Wabana Iron Ore of Newfoundland, by A. O. Hayes.
- Memoir 81. The Oil and Gas Fields of Ontario and Quebec, by W. Malcolm.
- Memoir 82. Rainy River District of Ontario. Surficial Geology and Soils, by W. A. Johnston.
- Memoir 84. An Exploration of the Tazin and Taltson Rivers, Northwest Territory, by Charles Camsell.
- Map 59A. Wheaton, Yukon Territory.
- Map 150A. Ponhook Lake Sheet, Nova Scotia.
- Map 160A. Manaimo Sheet, Vancouver Island.

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

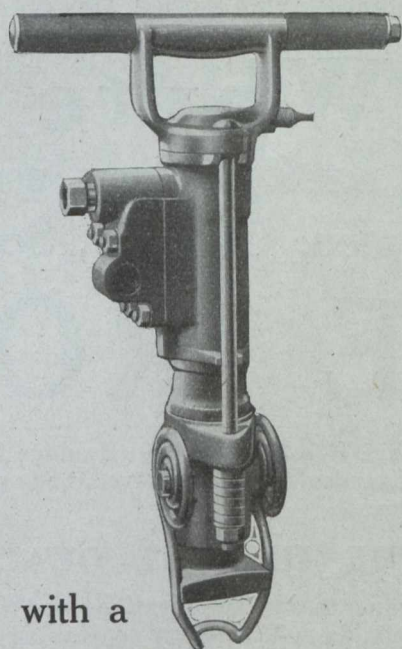
Maps published within recent years may be had, printed on linen, at the nominal cost of ten cents each.

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. Letters and samples that are of a Departmental nature, addressed to the Director, may be Mailed O.H.M.S. free of postage.

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



Sinking  
Raising



Drifting  
Stoping

with a

# “Jackhammer”

## *The One-Man Rock Drill*

Here is what one user says :  
Canadian Ingersoll-Rand Co., Limited,  
Timmins, Ont.  
Dear Sirs :—

Alexo Mine,  
Porquois Junction, Ont.,  
Oct. 19, 1916.

Re performance of the “JACKHAMER” at the Alexo Nickel Mine, I might say that they are very satisfactory.

We have been and are using them mounted on a single jack column for drifting and raising, and without the mounting for underhand stoping and sinking, so that they have been given a thorough test.

They use very little air in proportion to the work done. I have also noticed a considerable saving in powder as compared to the big machines which we formerly used.

I might add that the repair and upkeep cost is very low, one machine in fourteen months only requiring one fronthead spring.

Yours very truly,  
(Signed) Wm. Dermead,  
Mine Supt.

The reference to “saving in powder” is due to the fact that the drill holes can be placed to best advantage.

*Ask for Bulletin.*

**CANADIAN INGERSOLL-RAND COMPANY, LIMITED**

**Commercial Union Building, MONTREAL, CAN.**

Works : Sherbrooke, Que.

Sydney, Toronto, Cobalt, Timmins, Winnipeg, Nelson, Vancouver.



CONTRACTORS TO ADMIRALTY WAR OFFICE AND COLONIAL GOVERNMENTS

# Allan, Whyte & Co.

CLYDE PATENT WIRE ROPE WORKS,  
Rutherglen, Glasgow, Scotland

## WIRE ROPES

For Mining, Engineering and Shipping: For Hoisting and Haulage in Collieries and Mines: For Cableways and Aerial Ropeways: For Dredgers and Steam Shovels: Specially Flexible Ropes for Winches and Fast Hoists, Coal Towers and Cranes.

### OF THE HIGHEST QUALITY

made from special grades of Wire drawn to our specifications and carefully tested before being used. They are at work in all parts of Canada from Vancouver to Halifax and are everywhere recognized as the best on the market. Complete stocks held in all parts. Orders executed and quotations furnished by:

Nova Scotia: Wm. Stairs, Son & Morrow, Ltd., Halifax. New Brunswick: W. H. Thorne & Co., Ltd., St. John.  
Quebec, Ontario, Manitoba and Saskatchewan: Drummond McCall & Co., Montreal, Toronto and Winnipeg.  
Alberta and British Columbia: McLennan, McFeely & Co., Ltd., Vancouver.

Highest Quality. Satisfaction in Use. Prompt Delivery. Keen Prices.

CABLES: "Ropery, Rutherglen." CODES: Western Union, A. B. C. (4th and 5th Editions), A. 1., Liebers and Private.

## SULLIVAN "DR6" WATER HAMMER DRILLS ARE RAPID DRILLERS



"DR-6" Water Hammer Drills have established a reputation for drilling speed under numerous conditions of work.

Here are some sample reports:

Wilson Ave. Water Tunnel, Chicago: Bedded Joliet Limestone—

4 "DR-6" Drills on bar advanced 15 ft. diam., complete tunnel (Mayfair heading), 4,900 ft. at rate of 22.5 ft. per 24 hr. (3 shifts).

Arizona: Drifting hard sulphide ore—average drilling speed 6.2 in. per min. actual drilling time.

British Columbia: 7x9 drifts in quartz, chert and sulphide, 111 ft. drilled 218 min., or 6.11 in. per min. Increase in speed over nearest competitor, 26.2 per cent.

These notes should be suggestive of the performance that you may expect of Sullivan "DR-6" Drills under your conditions.

Ask for Bulletin 670-C.

SULLIVAN MACHINERY COMPANY, 122 So. Michigan Ave., Chicago, Ill.

Montreal

Cobalt

Nelson

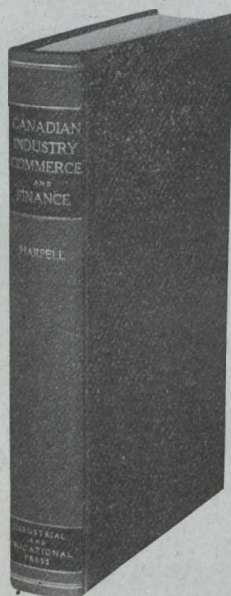
Vancouver

Juneau

Spokane



# CANADIAN INDUSTRY, COMMERCE AND FINANCE



By

J. J. HARPELL

It is essential that every business man in Canada, or elsewhere, who is interested in the Industrial, Commercial and Financial Development of the Dominion should know Canada thoroughly.

## READ THESE CONTENTS:

### INTRODUCTION.

#### Industry:—

Production and Consumption—Fur Hunting and Trapping—Mining—Fisheries—Lumbering—Agriculture—Orchards and Gardens, Field Crops, Animal Products—Manufacturing.

#### II. Commerce:—

Development—Foreign Commerce—Domestic Trade—Ocean Transportation—Ocean Ports—Inland Water Transportation—Railroads—The Common Road or Highway—Methods of Despatch—Markets—Weights and Measures.

#### III. Finance.

Development—Banking—Coinage—Credit—Instruments of Credit—Government Notes—Bank Notes—Cheques—Money Orders, Postal Notes, and Telegraph Transfers—Drafts—Letters of Credit—Documentary Bills of Exchange—Foreign Exchange—Quotations in the London Market—Bills of Lading—Warehouse Receipts and Dock Warr-

ants—Promisory Notes—Mortgages and Liens—Deeds—Stocks—Bonds and Debentures—Stock Exchanges—Insurance—Marine Insurance—Fire Insurance—Life Insurance—Annuities—Accident and Sickness Insurance—Employers Liability and Workmen's Compensation—Fidelity Guarantee Insurance—Boiler, Burglary, Plate Glass, Live Stock, Hail, Weather and Tornado, and Title Insurance.

#### IV. Marketable Commodities and Canadian Producers.

#### V. Foreign Manufacturers of Special Machinery and Supplies Necessary to Canadian Industry, Importers, Manufacturers' Agents, and Wholesale Houses, Wholesale Dealers and Exporters.

Foreign Manufacturers of Special Machinery and Supplies Necessary to Canadian Industry, Textile Machinery and Supplies, Pulp and Paper Makers Machinery and Supplies, Mining Machinery and Supplies, Printers

Machinery and Supplies, Fishermen's Supplies—Importers and Manufacturers' Agents—Wholesale Houses: Dry Goods, Men's Wear, Woolens, Linings and Trimmings, Hats and Caps, Millinery, Boots and Shoes, Leather, Groceries, Glass and China, Sporting Goods, Hardware, Flour and Feed—Wholesale Dealers and Exporters: Apples, Bacon and Hams, Bran and Shorts, Butter, Cattle, Cheese, Eggs, Fish, Fruit, Furs (raw), Hay, Hides, Hogs, Honey, Horses, Lard, Maple Syrup and Sugar, Milk (Condensed, Evaporated, and Powdered), Oils (Fish), Pork, Potatoes, Poultry, Produce (General), Pulpwood, Seeds, Wool.

#### VI. Institutions Necessary to the Business Interests of the Country—Banks—Trust Companies—Stock and Bond Brokers—Life Insurance Companies—Fire Insurance Companies—Accident and Casualty Insurance Companies—Consulting Engineers—Consulting Chemists and Analysts—Leading Canadian Technical and Specialized Periodicals.

This Book has been compiled and published as a companion volume to the Journal of Commerce, and is included with each subscription to the JOURNAL OF COMMERCE at : : the regular price of Three Dollars per Year. : :

*The Book is published and distributed by*

**The Industrial & Educational Press, Ltd.**  
35-45 ST. ALEXANDER ST. MONTREAL, Que.



# ESCHER WYSS & CO.

CENTRIFUGAL PUMPS  
WATER WHEELS  
AIR COMPRESSORS  
STEAM TURBINES

## MOST RELIABLE MACHINERY FOR MINES

WRITE FOR INFORMATION  
AND PRICES

ESCHER WYSS & CO.  
12 Coristine Building - Montreal

## Nova Scotia Steel and Coal Co., Limited

Proprietors, Miners and Shippers of SYDNEY MINES BITUMINOUS COAL. Unexcelled Fuel for Steamships and Locomotives, Manufactories, Rolling Mills, Forges, Glass Works, Brick and Lime Burning, Coke, Gas Works, and for the Manufacture of Steel, Iron, Etc. COLLIERIES AT SYDNEY MINES, CAPE BRETON.

Manufacturers of Hammered and Rolled Steel for Mining Purposes

Pit Rails, T Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel 3-8" to 1-4" Diameter, Steel Tub. Axles Cut to Length, Crow Bar Steel, Wedge Steel, Hammer Steel, Pick Steel, Draw Bar Steel, Forging of all kinds, Bright Compressed Shafting 5-8" to 5" true to 2/1000 part of an inch. A full stock of Mild Flat, Rivet Round and Angle Steels always on hand.

SPECIAL ATTENTION PAID TO MINERS' REQUIREMENTS. CORRESPONDENCE SOLICITED.

Steel Works and Head Office: **NEW GLASGOW, NOVA SCOTIA**

A Book Every Prospector Should Have

### MINERALS and How They Occur

By Dr. Willet G. Miller

Cloth Bound Price \$1.00

For Sale by Book Department

CANADIAN MINING JOURNAL  
263-265 Adelaide St. W. TORONTO



**SOS FURS**

**Safety First**

Nothing is more important to the Fur Shipper than doing business with an Honest—Reliable—Responsible—Safe Fur House.

**"Ship to Shubert"**

the largest house in the World dealing exclusively in American Raw Furs, where you will always receive an Accurate and Liberal Assortment, the Highest Market Prices and the usual "Shubert" Efficient, Speedy, Courteous service.

Write for the latest edition of "The Shubert Shipper" containing valuable Market information you must have.

**A. B. SHUBERT, Inc.** 25-27 WEST AUSTIN AVE.  
Dept. C17, CHICAGO, U.S.A.



## Queen's University

Faculty of Science  
School of Mining

KINGSTON - - ONTARIO

1. Four Year's Course for a Degree (B.Sc.) in
  - (a) Mining Engineering.
  - (b) Analytical and Applied Chemistry.
  - (c) Mineralogy and Geology.
  - (d) Chemical and Metallurgical Engineering.
  - (e) Civil Engineering.
  - (f) Mechanical Engineering.
  - (g) Electrical Engineering.

For Calendar and further information apply  
to Registrar, Queen's University,  
Kingston, Ont.

## International Molybdenum Company, Limited

Molybdenite Ores Purchased.  
Mfrs. Ferro Molybdenum, Molybdic Acid,  
Ammonia Molybdate.

HEAD OFFICE : RENFREW, ONT.  
CONCENTRATOR, Renfrew, Ont.      REFINERY,  
Orillia, Ont.

UNIVERSITY OF TORONTO

## Faculty of Applied Science and Engineering

Courses in--  
1--Civil Engineering      5--Analytical and Applied  
2--Mining Engineering      Chemistry  
3--Mechanical Engineering      6--Chemical Engineering  
4--Architecture      7--Electrical Engineering  
8--Metallurgical Engineering

Leading to ACADEMIC and PROFESSIONAL Degrees.

For Calendar and other information apply to the Secretary--  
A. T. LAING.

## AMERICAN ZINC LEAD & SMELTING CO.

PURCHASERS OF

## ZINC ORE

PRODUCERS OF

## HIGH GRADE SPELTER

Including "MASCOT" and "CANEY" Brands

## SULPHURIC ACID

Send Ore Inquiries to  
1012 PIERCE BUILDING  
ST. LOUIS, MO.

Send Spelter and Acid Inquiries to  
120 BROADWAY  
NEW YORK, N.Y.

## DIAMOND DRILL CONTRACTING CO. SPOKANE, - WASHINGTON.

Contractors for all kinds of Diamond Drill Work.  
Complete Outfits in Alberta and British Columbia.  
Write for Prices.

AGENCY :--  
ROSSLAND, B. C.

## The Buffalo Mines, Limited

COBALT :: ONTARIO

Producers of Refined Silver  
Cobalt Residues

Mercury for Mining Purposes

HEAD OFFICE :: 14 WALL ST., NEW YORK





# NICKEL

Shot—High and Low carbon.

Ingots—Two sizes, 25 lbs., 50 lbs.

**ELECTROLYTIC NICKEL—99.80%**

Prime Metals for the Manufacture of Nickel Steel, German Silver, Anodes and all remelting purposes. Our Nickel is produced as Rods, Sheets, Strip Stock, Wire and Tubes.

**MONEL  
METAL**

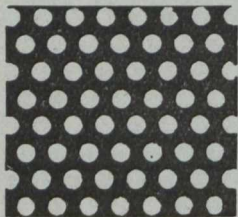
We are **SOLE PRODUCERS** of this natural, stronger-than-steel, non-corrodible alloy.

Manufactured forms are Rods, Flats, Castings, Tubes, Sheets, Strip Stock and Wire.

*Send Enquiries Direct to Us*

(Reg. U.S. Pat. Off.)

**THE INTERNATIONAL NICKEL COMPANY**  
43 Exchange Place, NEW YORK



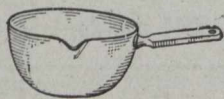
## PERFORATED METALS *For Every and All Purposes in all Metals*

Elevator Buckets (plain and perforated).  
Conveyor Flights and Trough, also  
General Sheet Iron Work.

**HENDRICK MANUFACTURING CO.,** Carbondale, Penna., U.S.A.  
New York Office: 30 Church St.

# LUCKY STRIKE!

**COORS** U.S.A.  
*Chemical and Laboratory*  
**PORCELAIN**



*A Comparative Test:*

No. 3 Casserole Acid Treatment,  
15 hours at 180° C.—

|                        | Loss Grams |
|------------------------|------------|
| Coors . . . . .        | .0000      |
| Royal Berlin . . . . . | .0004      |

**Crucibles, Dishes, Etc.**

Order now and avoid *Porcelain Troubles*; we know you've had them.

**LYMANS, Limited**  
MONTREAL

ESTABLISHED 1875

## IMPERIAL BANK OF CANADA

HEAD OFFICE: TORONTO

|                 |             |
|-----------------|-------------|
| Capital Paid Up | \$7,000,000 |
| Reserve Fund    | 7,000,000   |

Branches in Northern Ontario at

**Cobalt, South Porcupine, Elk Lake,  
Cochrane, New Liskeard, North Bay  
and Timmins.**

Branches in Provinces of  
**Ontario, Quebec, Manitoba, Saskatch-  
ewan, Alberta and British Columbia.**

Money Transfers made in all parts of the World. Travellers' Letters of Credit, Drafts cheques, etc. negotiated.



# BRITISH COLUMBIA

## The Mineral Province of Western Canada

Has produced Minerals valued as follows: Placer Gold, \$74,039,603; Lode Gold, \$86,763,450; Silver \$39,298,273; Lead, \$33,407,662; Copper, \$96,774,870; Other Metals (Zinc, Iron, etc.), \$3,659,473; Coal and Coke, \$156,928,640; Building Stone, Brick, Cement, etc., \$25,398,282; making its Mineral Production to the end of 1915 show an

### Aggregate Value of \$516,270,253

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 1894, inclusive, \$88,904,199; for five years, 1894-1899, \$46,906,258; for five years, 1899-1904, \$90,391,394; for five years 1904-1909, \$121,618,733; for five years, 1909-1914, \$139,002,161, for the year 1915, \$29,447,508.

### Production During last ten years, \$267,607,077

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

## YOUR Fine Ores, Concentrates and Fluedust

Can be Cheaply and Successfully  
Sintered by the

### DWIGHT & LLOYD SYSTEM

(Fully Protected by Patents.)

SIMPLE, EFFICIENT, CONTINUOUS  
LOW COST OF INSTALLATION

Many plants now in daily operation in U.S., Dominion of Canada, Republic of Mexico, Australia and European Countries. For particulars as to Licenses in Canada, Estimates, etc., address

### Dwight & Lloyd Sintering Co., Inc.

(Successor to Dwight & Lloyd Metallurgical Co.)

29 Broadway, New York.

Cable Address: SINTERER, NEW YORK

"For information regarding sintering of iron ores and iron flue dust, consult special licensee."

American Ore Reclamation Co.

71 BROADWAY, N.Y.

## Northern Canada Supply Co.

LIMITED

Head Office: HAILEYBURY

Branches at Cobalt, Timmins, South Porcupine

Headquarters for

General Hardware,  
Mining Machinery and Supplies,  
Mill Supplies, Hoisting,  
Conveying and Transmission Material,  
Screens of All Kinds

Complete Line of Camp and Kitchen Equipment

Complete Stocks Carried at all Branches

Prompt Attention Given to all Orders



# The Minerals of Nova Scotia

The extensive area of mineral lands in Nova Scotia offers strong inducement for investment.

The principal minerals are:—Coal, iron, copper, gold, lead, silver, manganese, gypsum, barytes, tungsten, antimony, graphite, arsenic, mineral pigments, diatomaceous earth.

Enormous beds of gypsum of a very pure quality and frequently 100 feet in thickness are situated at the water's edge.

The province contains numerous districts in which occur various varieties of iron re practically at tide water and in touch with vast bodies of fluxes.

The Gold Fields of the Province cover an area of approximately 3,500 square miles. The gold is free milling and is from 870 to 970 fine.

Deposits of particularly high grade manganese ore occur at a number of different localities.

Tungsten-bearing ores of good quality have lately been discovered at several places and one mine has recently been opened up.

High-grade cement-making materials have been discovered in favorable situations for shipping.

Fuel is abundant, owing to the presence of 960 square miles of bituminous coal and 7,000,000 acres of woodland..

The available streams of Nova Scotia can supply at least 500,000 H.P., for industrial purposes.

Prospecting and Mining Rights are granted direct from the Crown on very favorable terms.

**Copies of the Mining Law, Mines Reports, Maps and Other Literature may be had free upon application to**

**HON. E. H. ARMSTRONG,  
Commissioner of Public Works and Mines,  
HALIFAX, N. S.**



## 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 date of the staking, the prospector, to retain his rights, must take out a mining license.

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

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

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

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

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

**HONOURABLE HONORÉ MERCIER,  
MINISTER OF COLONIZATION, MINES AND FISHERIES, QUEBEC.**

*When Answering Advertisements please mention THE CANADIAN MINING JOURNAL.*



## Dominion Coal Company

Limited

Glace Bay

Nova Scotia

19 Collieries

Output—5,000,000 tons annually

“Dominion” Coal

Screened, run of mine and slack

“Springhill” Coal

Screened, run of mine and slack

Collieries at Glace Bay, C.B., and Springhill, N.S.

Shipping Ports—Sydney and Louisburg, C.B., and Parrsboro, N.S.

For Prices and Terms Apply to:

**Alexander Dick, General Sales Agent,**

112 St. James Street, Montreal

or at the offices of the Company at  
171 Lower Water Street, Halifax, N.S.

and to the following Agents

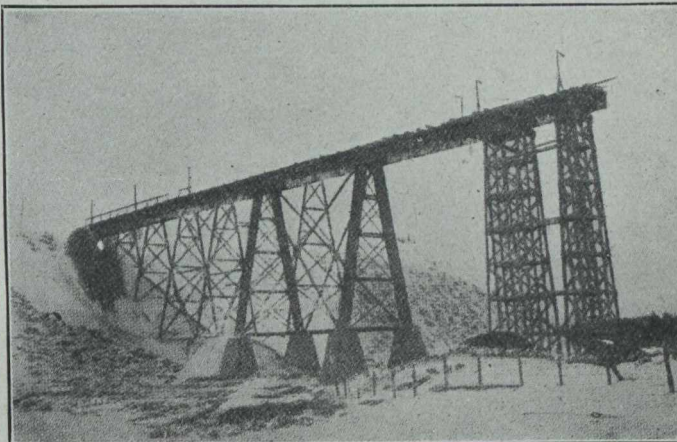
R. P. & W. F. Starr, St. John, N.B.  
Buntain, Bell & Co., Charlottetown, P.E.I.  
Hull, Blyth & Co., 1 Lloyds Ave., London, E.C.  
Harvey & Co., St. John's, Nfld.

MANUFACTURERS AND ERECTORS OF

## STEEL STRUCTURES

OF EVERY DESCRIPTION

MINING WORK A SPECIALTY



DESIGNS AND ESTIMATES FURNISHED

*We are equipped to guarantee quick delivery.*

### MacKinnon, Holmes & Co.

Limited  
SHERBROOKE, QUE.

## Milling and Mining Machinery

Shafting, Pulleys, Gearing, Hangers, Boilers, Engines, and Steam Pumps, Chilled Car Wheels and Car Castings, Brass and Iron Castings of every description, Light and Heavy Forgings.

**Alex. Fleck, Ltd. - Ottawa**



WEARPROOF Concentric Duplex Mining Machine Cable.

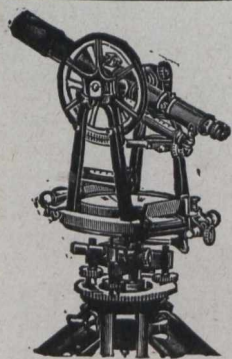
**Quality is Economy**

when buying wires and cables for mining service. We can supply mining machine cables, gathering locomotive cables, bore hole cables, etc., at economical prices.

*Write our nearest office.*

**Standard Underground Cable Co. of Canada, Limited**

Hamilton - - - Ont.  
Montreal, Que. - - - Winnipeg, Man. - - - Seattle, Wash.



## Berger

TRANSITS AND LEVELS

Tell us the kind of Engineering Work you are to be engaged on, and Berger can surely ship to you promptly from stock, any size or style of transit or level suitable to be used on your contemplated project. Own a BERGER, and have No Regrets, though they cost more at first.

**C. L. Berger & Sons**

BOSTON, MASS., U.S.A.

## DARLINGS STEAM APPLIANCES

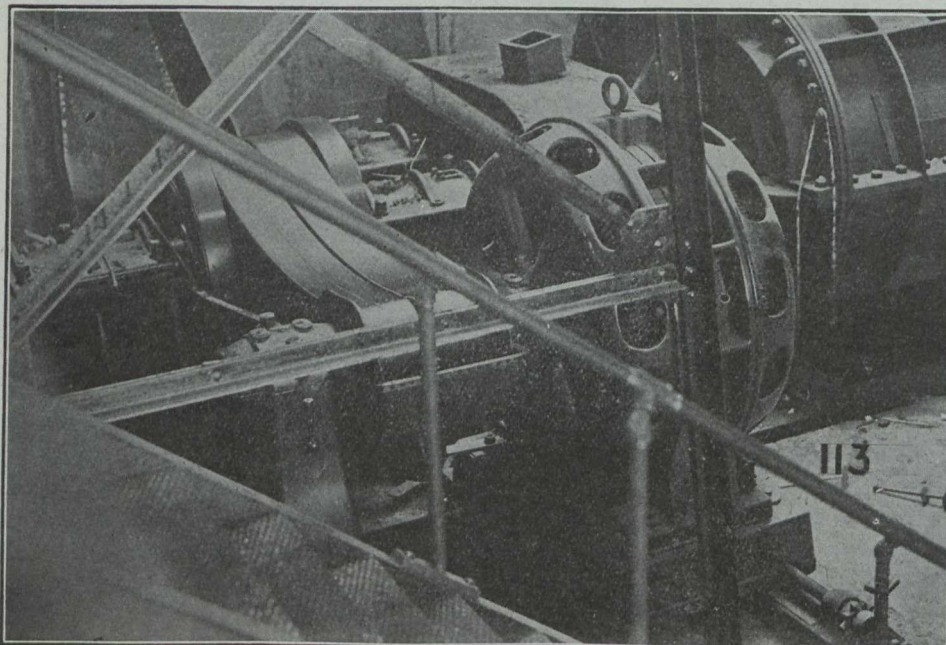


DARLING BROTHERS LIMITED  
Engineers and Manufacturers  
MONTREAL, CANADA

Branches: Toronto and Winnipeg Agents: Halifax, St. John, Calgary, Vancouver



# STUDY THIS PHOTOGRAPH



It represents a No. 9 Roots Blower in a Canadian Plant driven from a 200 H.P. Motor by means of the Renold Patent Silent Chain.

The plate was exposed fifty seconds while the

## Renold Patent Silent Chain

was transmitting 200 H.P. at 1320 feet per minute.

Note the **STEADY, SMOOTH**, running which means **HIGH EFFICIENCY (98.2%)** and uniform turning which means when applied to Individual Machines or Line Shafts Maximum Output and highest quality of work.

Note also the compactness (centres 6'); also note chain is quite slack, no initial tension is required and therefore no excessive journal friction.

Branch Office  
TORONTO

SOLE CANADIAN AGENTS  
**JONES & GLASSCO (Reg'd.)**  
Engineers

49 Place D'Youville  
MONTREAL

WE STOCK CHAIN AND REPAIRS

## Armstrong, Whitworth of Canada - - Limited

MANUFACTURERS OF

High Speed and Carbon Tool Steel

Special Alloy Steels

Miscellaneous Shop Tools, etc.

"AWCO" MINING DRILL STEEL

(MADE IN CANADA)

HEAD OFFICE  
22 VICTORIA SQUARE  
MONTREAL

WORKS  
LONGUEUIL  
QUE.

DOMINION BANK BUILDING - - - TORONTO

## FOR SALE

Two New Gasoline  
Hoists--10 H.P. "Novo"  
Engines, single drum,  
reversible, capacity  
3000 lbs.

—Also—

One New Horse-  
Power Hoist, double  
Clutch-Drum.

F.O.B. Montreal

**MUSSENS LIMITED**  
MONTREAL WINNIPEG VANCOUVER

H. L. Osborne  
COBALT

H. Turnbull & Co.  
TORONTO



# THE CANADIAN MINING JOURNAL

VOL. XXXVII.

TORONTO, December 1, 1916.

No. 23

## The Canadian Mining Journal

With which is incorporated the  
"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

Published fortnightly by the

**MINES PUBLISHING CO., LIMITED**

Head Office . . . . . 263-5 Adelaide Street, West, Toronto  
Branch Office . . . . . 600 Read Bldg., Montreal

Editor

REGINALD E. HORE

**SUBSCRIPTIONS**— Payable in advance, \$2.00 a year of 24 numbers, including postage in Canada. In all other countries, including postage, \$3.00 a year.

Advertising copy should reach the Toronto Office by the 8th, for issues of the 15th of each month, and by the 23rd for the issues of the first of the following month. If proof is required, the copy should be sent so that the accepted proof will reach the Toronto Office by the above dates.

### CIRCULATION

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd 1879."

### CONTENTS

| Editorials—   | Page |
|---|------|
| The International Nickel Company.....                   | 551  |
| German Control of Metals.....                           | 552  |
| Our Exports.....  | 552  |
| American Sources of Nickel.....                         | 553  |
| Is Canadian Nickel Being Shipped to Germany? ....       | 553  |
| Chromium.....   | 553  |
| Mining and Industrial Research. By T. L. Walker.....    | 556  |
| Large Increase in Ontario's Metal Production.....       | 555  |
| The Cost of Coal. By G. O. Smith and C. E. Leshner..... | 557  |
| The Weathering of Coal. By J. B. Porter.....            | 560  |
| Mine Earnings.....                                      | 564  |
| English and Engineering.....                            | 566  |
| Cost of Dredging in Yukon.....                          | 568  |
| Personal and General.....                               | 570  |
| Special Correspondence.....                             | 571  |
| Markets.....  | 574  |

## THE INTERNATIONAL NICKEL COMPANY

During the past two years the International Nickel Company has been repeatedly unjustly attacked by certain persons in Canada. It is refreshing therefore to read such statements as that of Solicitor-General Meighen who said, in Toronto, on Thursday, November 24th, that in connection with the checking of the destination of nickel exported from Canada, that our Government had from the beginning of the war met with friendly co-operation from the officials of the company. "It has been said, although I have never heard anything in support of the allegation," said Mr. Meighen, "that this is a German company with an American or English veneer. If it were a German company, then Germany and its friends had enough money to stop production at that refinery. I think a little common sense will teach any reasonable man that, whatever else is said, it cannot be said that German influence has had any effect."

Mr. Meighen has said some foolish things about nickel during the past year, but we believe that his statements concerning the International Nickel Company are correct.

The Canadian Mining Journal has repeatedly stated that no sufficient reason has been given for the charges made against the International Nickel Company. We are pleased to see that the Solicitor-General has in fairness to the company given out a statement of the facts. It is all very well to avoid giving out information that would be useful to the enemy, but if unscrupulous politicians in Canada were allowed to go on unchecked more harm would be done than by imparting some information to the people.

The International Nickel Company is controlled by Americans who have no desire to be classed with the Huns. The company is doing very useful work at a critical time. The directors of the company know, as our readers know, that many of the nasty statements about nickel export, made by some of our Toronto politicians and newspapers are false. Some of these statements we have undertaken to dispute in these columns. The continued activity of the politicians and the widespread publicity given to their false statements has doubtless led the Government to state some of the facts. We believe that when all is told it will be found that the International Nickel Company has been very unfairly criticized. In the meantime the company will have to be satisfied with its handsome profits and the knowledge that those in Canada best acquainted with the facts know that the criticism is unjust.

We are in favor of having all our nickel refined in Canada, and we will be pleased if arrangements can be



made so that the International Nickel Company will decide to do all its refining here. The company's record is a clean one and the only fault we find with it is that its operations are not all carried on in Canada. We look with favor on the agitation for home refineries but we object to the publicity given to false charges against the company.

### GERMAN CONTROL OF METALS

For some years Germany has to a considerable extent controlled the world's trade in metals. By various means enterprising Germans, assisted and encouraged by the German government, had obtained a hold on the industry that placed them in a dominating position. Germany imported mine products far in excess of her own needs and established plants for refining metals and manufacturing products which should have been refined and manufactured in other countries.

Perhaps the most notable example was that of Australia zinc ore, the producers of which shipped their concentrated product to German smelting plants for treatment, under contracts which gave the Germans large profits and at the same time prevented the establishment of rival smelting plants in the British Empire. Writing of this a few years ago, Mr. T. J. Hoover said:

"The present selling contracts to the German zinc smelters represent a handsome profit to the latter. It seems certain that every ton of concentrate, which mostly goes to Germany, represents a clear profit to the Germans of at least 40s per ton of concentrate or 11s per ton of the original material. From the standpoint of the treatment company this seems a rather liberal share of profit to the zinc smelter, and it speaks well for the acumen of the Germans that they tied up this large production under long contracts."

What the Germans have accomplished in the zinc industry they have duplicated in several other branches of the metal industry. It has been notorious that buyers of metals in many countries depended for their supply on Germans who obtained the metals in various parts of the world.

In some cases the metals passed through German hands without ever reaching Germany. Germany, however, made a business of importing a larger supply of metals than she needed and passing on the excess after exacting toll. A considerable part of the Canadian nickel used in Europe passed through Germany in this way, and thus her neighbors had to arrange for new sources of supply as soon as Germany decided to wage war.

As has been recently pointed out by Mr. H. H. Dewart, of Toronto, the largest metal importing firm in England, Henry R. Merton & Co., Ltd., of London, is or was believed to be controlled by the German Metal Trust. The firm was under suspicion and has been doubtless long ago forced to rid itself of its German affiliations.

In commenting on the fact that Henry R. Merton & Co., Ltd., continue to act as London agents for the International Nickel Company, a company which deals almost exclusively in the products of Canadian mines, Mr. Dewart said at a political meeting in Toronto, that the International Nickel Company was employing as its agents men who were hostile to the interests of the Allies and who had been proved to have knowingly traded with the enemy during the progress of the war.

If it were true that the British Government had failed to take precautions to prevent enemy firms from operating in London we would claim with Mr. Dewart that no Canadian nickel should be permitted to pass through the hands of such firms. In view of the fact that Britain has blacklisted enemy firms trading in other countries, it is scarcely conceivable that an enemy firm is being allowed to handle in London such an important article as nickel. Our conclusion from the fact that the Merton company is handling the business is therefore that the control of that company is now completely in British hands. We have some confidence in the common sense of British officials and cannot therefore agree with Mr. Dewart that in dealing with Merton & Co. the International Nickel Company is aiding the enemy. We incline rather to the belief that the company is endeavoring to meet the wishes of the British Admiralty.

### OUR EXPORTS

The war has brought prominently to the attention of the people of the British Empire the importance of guarding our basic industries. It has shown the desirability of utilizing our resources as far as possible within the Empire. It is to be hoped that Canadians will do their part towards developing industries which are necessary to keep in British hands the control of our products. Canada has wonderful mineral resources and is rapidly assuming greater importance as a source of the world's metals. Every encouragement should be given to those who endeavor to utilize Canadian ores in Canada. We should be in a position to ship refined metals instead of ores and matte and we should, whenever possible, ship manufactured products instead of the unworked metal. If European countries want our products they should be encouraged to get them direct from Canada and not through other countries. To make it to their advantage to do so is a problem worthy of the attention of our Department of Trade and Commerce.

We must first, however, have the necessary industries established in Canada. We do not even refine all the metals we need in Canada, nor do we manufacture as large a proportion as we might of the metal goods used here.

In discussing the subject of refining, it is too commonly argued that the amount of a certain metal used in Canada is not large and that we must look to other countries for our market. This is of course true, but



it does not follow that we should not refine every pound of our metal here. If we must look to other countries for our market, why not look for the market for refined instead of that for the raw product?

Suppose that a Russian manufacturer wanted a supply of one of the metals Canada produces. Did any Canadian hear of it? Not likely. And yet the Russian often received metals derived from Canadian ores. He paid far more for it than we received. Refiners, manufacturers and merchants in other countries received the difference.

#### AMERICAN SOURCES OF NICKEL.

Recent articles on the question of our nickel exports, published in the daily press contain strange statements concerning the sources of nickel in the United States. Many of these statements are incorrect and it is surprising that so little effort is made to tell the public the truth about nickel. Some of the articles appear rather to be published for the purpose of misleading the people.

A favorite yarn with some of our newspapers is that all the nickel imported or exported by the United States is Canadian nickel. It is of course true that most of the nickel is of Canadian origin, but it is foolish to say that it all is. In the year ending June 30th, 1916, the United States imported from countries other than Canada ore and matte containing about 2,000 tons nickel. This is a small amount compared with that imported from Canada, but at the rate the "Deutschland" is carrying nickel to Germany it would keep that adventurer busy for some time.

It does not follow, of course, that this nickel is available for shipment to Germany. If we have been correctly informed, most of it goes to Russia and Italy. Why some of our newspaper editors continue to deny its existence is, however, a problem.

Some nickel is recovered in United States refineries treating copper containing very small quantities of nickel. The total recovery of nickel from the treatment of foreign and domestic copper in 1914 was 423 tons. Some of this might be obtained by German agents; but it is just as likely that most of it passed into other hands.

#### CHROMIUM.

According to reports the "Deutschland" on its second return trip carried a cargo of nickel, chromium, vanadium, rubber and silver. Canada produces large quantities of nickel and silver and a considerable amount of chromite, the chief ore of chromium. It has been stated by our officials that the nickel is not of Canadian origin. No statement has been made concerning the chromium and silver.

Chromium is quite as essential as nickel in the manufacture of most of the steels used for armor plate and armor-piercing projectiles. Chromium is less costly than nickel and nickel-chromium steels can be made somewhat more cheaply than simple nickel steel of the same strength and ductility.

In 1915 Canada exported to the United States 10,087 tons of chromic iron ore. The other chief sources of the chromium used in the United States are New Caledonia, British South Africa and Portuguese Africa. Canada's chief producing deposits are in Quebec in the vicinity of Black Lake.

The United States manufacturers are dependent almost entirely on British and allied countries for their chromium. Greece is the only other country now contributing. Turkey in Asia was formerly an important source.

If the United States is exporting chromium to Germany it is because Britain is allowing more than the United States needs to enter that country. Ships are scarce and could be more advantageously used than in carrying from Africa and New Caledonia to the United States chromium ore which is not needed there.

#### IS CANADIAN NICKEL BEING SHIPPED TO GERMANY?

On November 10th, the "Providence Journal," a newspaper which has during the past year proven to be exceptionally well informed concerning the activities of German agents in the United States, publishes the following:

"The German submarine 'Deutschland' is now ready for sea or can be made ready at an hour's notice. Every possible precaution has been taken to prevent the knowledge of contents of her cargo from becoming public property. The Journal, however, has secured all the details concerning this cargo. It consists of nine carloads of nickel, averaging forty tons to a car, and ten carloads of crude rubber, averaging eighteen tons to a car, making a total shipment of five hundred and forty tons. In addition to this material, the 'Deutschland' now has in her hold three carloads of a chemical known as chromium, and one carload of vanadium, both used in the process of hardening steel.

"There still remains in the warehouses of Eastern Forwarding Co., of New London, a consignment of over four hundred tons of crude rubber and two hundred tons of refined nickel, which is apparently stored for export by another submarine.

"All the nickel aboard the Deutschland is part of a large consignment which was purchased in November, 1914, from the International Nickel Co., at Communipaw, N.J. The Journal discovers that this consignment was taken by the purchasers, ostensibly German-Americans, but really men acting for Dr. Heinrich Albert, fiscal agent for the German Government in this country, and transported to the storehouses of the Nassau Smelting and Refining Co., at the foot of West 29th Street, North River, N.Y.

"The nickel was then transferred at various times to the New York Dock Co., in Brooklyn, where it was stored in warehouse No. 104 and placed in casks weighing from nine hundred to fourteen hundred pounds.

"The metal was partially in ingots and largely in a form about the size of buckshot. Just before the ar-



rival of the 'Deutschland' last July, the parties supposed to be controlling this nickel became active and every effort was made to cover up the source of supply by a series of rapid shipments to various points. The last of the shipments took the consignment intended for the 'Deutschland' at Baltimore, to Pittsburg, over the Baltimore & Ohio Railway. The cars containing this nickel remained in the yards at Pittsburg for four days and were then reshipped to Baltimore, being ultimately shipped to the docks of the Eastern Forwarding Co. in that city.

"The next movement of nickel, which remained after the first departure of the 'Deutschland,' came in the beginning of last September, and soon afterwards a number of carload lots were received by the Eastern Forwarding Co., in New London. Two of these cars arrived in New London on September 14th, one on the 15th and four on the 18th. On September 25th, two cars, containing both nickel and rubber, reached New London, and these were followed on September 29th by another car, containing both nickel and rubber. On October 11th another car of nickel was received, and during the next eight days twenty-nine cars of rubber, three cars of chromium and one car of vanadium.

"All this freight was transferred immediately on arrival over a spur track to the warehouses of the Eastern Forwarding Co., on the state pier at New London. It was unloaded by employees of the company and immediately after being placed in its warehouses the nickel was taken from casks to shot bags, in which form it has been placed aboard the 'Deutschland' for its approaching voyage. A large quantity of nickel which reached the New London docks in ingots is still stored in the warehouses there. The metal which was purchased from the International Nickel Co. reached that corporation from Sudbury, Canada, through the Canadian Copper Co."

In view of the repeated assurances by Government officials that our nickel was not getting into enemy hands, we cannot easily accept the statement made by the "Providence Journal." There is, however, cause for uneasiness. Frequently during the past two years it has been claimed that the arrangements made by our officials were not satisfactory; but none of these claims are backed by strong evidence. Those who make such statements fail to disclose the facts, if there are such, which would justify them. It has remained for the "Providence Journal" to offer some real evidence that the safeguards placed around the sale of nickel are not sufficient.

In view of the many false charges which have been made against the nickel producers and Government officials it would be inadvisable to conclude that the statements made by the "Providence Journal" are all correct. The story seems plausible enough, however, and it would be the height of folly to treat it as many

of the absurd stories have been treated. Mere denial will not suffice.

If a "large consignment" of Canadian nickel had been purchased from the International Nickel Co. in November, 1914, by German agents, it is scarcely credible that our secret service would not have learned of it in two years. Our officials would know of it and would not be willing to repeat their assurance and thus mislead the public. In spite of the "Providence Journal's" good reputation, we therefore incline to the belief that the nickel shipped on the 'Deutschland' was not Canadian nickel purchased from the International Nickel Company since the war began.

The United States is importing from Canada nickel-copper matte at the rate of over 1,000 tons per week. This amount of matte contains about 600 tons of nickel. In four days there is imported from Canada more than enough matte to furnish the 360 tons of nickel said to have been shipped on the 'Deutschland.' It is natural, therefore, for us to suspect that in spite of the arrangements made this comparatively small amount might have passed into German hands. It is a striking tribute to the perfection of the safeguards that our officials are able to say that such is not the case. We would not have been greatly surprised if they had been forced to admit that a small leak had been found, for the task of preventing such is a great one. When we consider that millions of pounds of Canadian nickel are being used by American manufacturers it is easier to believe that there are leaks than that there are not. If there were leaks our officials would surely not mislead us by saying that there are not.

#### CANADIAN MINING INSTITUTE.

A luncheon meeting of the Toronto Branch of the Canadian Mining Institute was held at the Engineer's Club on Saturday, No. 18. Twenty-five members were present.

Dr. W. G. Miller, who is a member of the Ontario Nickel Commission, gave an account of his recent trip to New Caledonia. He related many interesting experiences. In company with Mr. T. F. Sutherland, Dr. Miller visited nickel mines in Tasmania and New Caledonia. At the meeting he described the deposits and presented some idea of the conditions under which the properties are operated. In a later issue of the Journal we will publish some account of the trip.

The talk was illustrated by wall maps and samples of the ore being mined were shown. It was incidentally remarked that New Caledonia has some good chromite mines, one recently developed being exceptionally good.

New Caledonia has been producing nickel ore since 1875. Several of the richest deposits near the sea have been worked out and the operators are now going further inland.

The deposits are much more irregular than those of Ontario and not so large. One mine produced about 600,000 tons of ore, but is now worked out. The industry is well established, has good financial backing and is being profitably carried on.

Following Dr. Miller, Dr. A. P. Coleman and Mr. Geo. T. Holloway spoke briefly on nickel.



## LARGE INCREASE IN ONTARIO'S METAL PRODUCTION

The Bureau of Mines has collected returns from the metalliferous mines and works of Ontario showing the production for the nine months ending 30th September, 1916. Following are the figures for the period, and for purposes of comparison, figures for the corresponding period of last year. It will be noted that there has been a large increase in the aggregate value, and also in the value of nearly all the individual products, due to causes mentioned in the notes appended.

### Summary of Mineral Production First Nine Months of 1916.

| Product.  | Quantity.  |            | Value.    |            |
|---|------------|------------|-----------|------------|
|   | 1915       | 1916       | 1915      | 1916       |
| Cobalt ore, tons....                              | 92         | 98         | \$ 12,472 | \$ 10,591  |
| Cobalt oxide, lbs....                             | 135,337    | 378,732    | 107,363   | 231,947    |
| Cobalt metallic, lbs..                            | 76,979     | 172,055    | 66,552    | 146,467    |
| Cobalt and nickel oxides (unseparated), lbs. .... | 2,501      | 57,026     | 500       | 22,890     |
| Copper ore, tons....                              | .....      | 1,715      | .....     | 21,685     |
| Copper in matte, tons                             | 14,057     | 16,989     | 2,024,658 | 6,285,930  |
| Gold, oz. ....                                    | 281,712    | 363,955    | 5,826,941 | 7,513,734  |
| Iron ore, tons.....                               | 302,586    | 271,034    | 601,044   | 673,170    |
| Molybdenite (concentrates), lbs....               | .....      | 15,845     | .....     | 15,845     |
| Nickel, oxide, lbs....                            | 142,483    | 54,152     | 16,085    | 6,381      |
| Nickel, metallic, lbs.                            | 11,905     | 17,435     | 4,762     | 7,618      |
| Nickel in matte, tons                             | 24,054     | 31,046     | 5,369,536 | 15,523,000 |
| Pig iron, tons.....                               | 354,153    | 501,410    | 4,510,906 | 6,686,965  |
| Silver, oz. ....                                  | 17,178,629 | 16,203,091 | 8,030,469 | 9,750,040  |

#### Gold.

The output from the mines of northern Ontario is steadily increasing, being 28 per cent. in excess of that for the nine months of 1915. Hollinger Consolidated continues to be the chief producer, accounting for 47 per cent. of the total. Dome followed with 21 per cent., and McIntyre-Porcupine with 10 per cent. The other considerable contributors in this camp are Porcupine Crown, Schumacher, Vipond and Jupiter, which together furnished 5.5 per cent. Outside of Porcupine proper, Tough-Oakes yielded \$519,149; Canadian Exploration, Croesus and a small output from Dome Lake amounted to over one-quarter of a million dollars. At Teck-Hughes (Kirkland Lake), the mine has been developed, and a mill built which will be put in operation as soon as the power transmission line now being erected from Cobalt has been completed. Other prospects here, the Lake Shore, Wright-Hargrave, Kirkland Lake Gold Mines, La Belle-Kirkland and Sylvanite are also being developed. This is a promising camp. In Gauthier township the Huronian mine is being worked under a lease. Several discoveries of gold were made during the summer in Benoit township, but there has not been time to prove their value. At Tashota, the Tash-Orn company has bought the Wells' claim and has put in machinery to give it a thorough test. This company is also working the King-Dodds claims. A diamond drill has been operated on the Devanney, Reamsbottom and Clive claims.

#### Cobalt.

The silver mines of the Cobalt district have definitely established their supremacy of the sources of the world's supply of this mineral. Notwithstanding the war, which has closed the European markets, the shipments of cobalt oxides were much greater, both in quantity and value than in the first nine months of 1915. It will be observed that metallic cobalt is assuming an important place in the list. This is mainly due to its use in the manufacture of special alloys,

principally stellite, for high speed tools. Stellite is made of cobalt, chromium and tungsten, and is finding a good demand from munition makers and other workers of modern hard steels.

#### Copper.

The extraordinary rise in the price of copper, which averaged 27 cents per pound in New York during the nine months, has brought about the opening of several deposits of copper ore chiefly west of Lake Superior, from which shipments have been made to British Columbia smelters. The principal of these mines is the Tip Top; another at Mine Centre has lately been sending forward to B. C. a carload or ore daily. The price received by the shippers has averaged 18.5 cents per pound for the copper contents. This figure has also been applied to the copper contained in the heavy shipments of matte from the Sudbury nickel-copper mines, and a considerable part of the increase in value of the copper reported is due to the higher valuation, although the quantity shipped was also greater by 20 per cent.

#### Molybdenite.

There is a demand in Britain for making tool steel, and several deposits of the ore in eastern Ontario have been opened and are being worked. There are dressing plants at Renfrew and Ottawa, the latter operated by the Dominion Mines Department. Ferro molybdenum is also being made at Orillia and Belleville. The supply of molybdenite throughout the British Empire has been reserved as a war measure, and a price of 105 shillings per unit fixed for concentrates delivered at Liverpool. This approximates \$1.00 per pound here.

#### Nickel.

The Canadian Copper Company and the Mond Nickel Company have been working their mines and smelters at maximum capacity, and the output of nickel, contained in the matte product of the furnaces for the nine months falls little short of that for the full year 1915. The production for 1916 will probably exceed the production of 1915 by 20 per cent. The valuation of the nickel in the matte has been increased from about 11 cents per pound (the figure adopted by the mining companies) in 1915 to 25 cents per pound in 1916. Nickel refineries are to be erected in Ontario by the International Nickel Company and the British American Nickel Corporation, the latter of which is developing the Murray mine. Small quantities of metallic nickel are being produced from Cobalt ores by the Deloro Smelting and Refining Company.

#### Iron.

The whole production of iron ore was from the Helen and Maggie mines of the Algoma Steel Corporation. At the latter the ore (siderite) is roasted previous to shipment. Four blast furnace companies at Port Colborne, Sault Ste. Marie, Deseronto and Hamilton respectively, produced pig iron in quantity 41 per cent., and in value 48 per cent. greater than in the corresponding period of 1915.

#### Silver.

The mines at Cobalt continue to produce, though on a slowly diminishing scale. The number of fine ounces contained in the shipments of the nine months was 975,538 below the record for the same period of last year, but owing to the much higher prices that



have prevailed for silver the return to the mining companies was \$1,719,571 greater. Silver started the year at 56.76 cents per ounce and rose to a maximum in May of 74.27 cents, when it receded to 63.06 in July, reaching 68.51 cents again in September. In 1915 the monthly average was 49.75 cents per ounce. Nipissing still leads in production; Mining Corporation coming next, followed by Kerr Lake, Coniagas, McKinley-Darragh-Savage, Seneca-Superior, Temiskaming, etc., The flotation process is likely to assist materially in increasing the production of silver at Cobalt. It has been introduced at the Buffalo mine, where it is treating successfully low-grade rock containing 5 or 6 ounces per ton. From the gold ores treated during the period 66,347 ounces of silver were obtained, and from the copper ores 607 ounces.

### THE LUCKY JIM MINE.

**Slocan.**—Concentrate from Lucky Jim zinc ore is now being shipped regularly to the Consolidated Co.'s zinc reduction works at Trail. While several small shipments of zinc ore from other mines in West Kootenay have been sent to Trail for test purposes, this is understood to be the first instance of custom zinc ore being contracted for to be delivered in stipulated quantity. It has been announced that the arrangement made provides for the delivery of 600 tons of Lucky Jim concentrate monthly for a year. Heretofore, since the destruction by fire in the summer of 1915 of the Ivanhoe concentrator at Sandon, all Lucky Jim ore has been concentrated at the Rosebery concentrator, but there has always been a middling product that has not been marketable. Since the resumption of operations at the plant at Kaslo, on Kootenay lake, this middling product has been sent to Kaslo for magnetic separation and the excess iron is now got rid of. It is stated that the basis of settlement is rather more advantageous to the Lucky Jim management under the terms arranged with Trail than if the concentrate were shipped to the United States smelting works.

The Lucky Jim was visited a short time ago by Mr. Sidney Norman, of Spokane, editor of "Northwest Mining Truth," who wrote: "While we have no official figures as yet, we believe we are safe in saying that the net value of 45 per cent zinc ore from the Lucky Jim will be around \$17 a ton after allowing for mining, milling, treatment, and overhead charges. This would indicate that the Lucky Jim will henceforth be able to earn approximately \$10,000 a month net, upon a production of 1800 tons of mine-run ore. Concentrating ratio is calculated at three into one, but we believe it will probably prove to be nearer two into one in actuality. It is understood that local interests are in a fair way to compose their differences and that tentative arrangements to that end have been entered into. If the present plan be adopted, bonds will be issued for the second mortgage and all other indebtedness on a five or ten-year plan. This will permit of full operation of the property, with overhead charges for interest and sinking fund to retire the bonds at maturity. It is probable that the delayed meeting of stockholders will be held very shortly and a new directorate of heavy local (Spokane) stockholders be elected."

It is said that 70 per cent. of the labor used in connection with the production of nickel is Canadian. Why not the other 30 per cent.?

## MINING AND INDUSTRIAL RESEARCH

By T. L. Walker, Ph.D.

During the past few months much has appeared in the press regarding the urgent need of industrial research. In many instances scientific investigations may lead to the improvement of industrial processes or to the utilization of products which at present are thrown away. Much of the success of German industry was due to the general application of Science to their industrial problems. All will agree that our industries must keep in touch with the scientific progress.

My object in writing at this time is to call attention to the fact that in the mining industry we already occupy a very enviable position in this regard. In Canada most of the mining is conducted by men who are technically trained for their work and who are able to direct scientific investigations or call in the assistance of specialists on concentration, metallurgy, geology, mineralogy and chemistry when special problems arise.

In the sciences closely related to mining and metallurgy, the members of the college teaching staff are usually men who are in touch with the mining industry—as a rule men who have at some time or other been employed in technical work. Contrary to the impression of some advocates of industrial research, these men are working in close co-operation with mining men. While they are frequently called on to assist in the solution of problems, their findings are not available for publication. This fact may account for some of the lack of appreciation as to what they are doing.

The work of the government technical staffs as maintained by the Geological Survey, Mines Branch and the Bureaus of the separate provinces is on the whole satisfactory. The men in these branches are employed in taking stock of the mineral resources of the country and in the solution of special problems as they arise. This satisfactory condition is due to the fact that the mining men—largely technically trained—have been able to direct the work of the governments along the lines most useful.

It is proposed by some that a large central research bureau should be established by the government in order to drive into useful lines the college men who are now supposed to be doing little of practical value to the industries. I would suggest that the relationship occupied by the government towards mining might very well be taken as the type of development of research for other industries. If, for example, the tanning, brewing or dyeing industries are to be assisted by the applications of Science, it might be well for the government to employ graduates of special schools in tanning, brewing or dyeing, and to supply each of these specialists with the necessary staff to study the problems of his particular branch with a view to advising operators and solving problems connected with the industry.

The mining industry in Canada is not suffering because of lack of co-operation between the men who are operating mines and smelters and the college and government specialists. I am not aware that mining men feel that there is need of any radical departure. To be sure there is much to be accomplished but the method of procedure has already been settled.



### THE "TANK."

St. George to-day his dragon tames  
And sends to do his will;  
From mouth, tail, sides, its hot breath flames  
In jets that sear and kill.

Across the weird, misshapen lands,  
Through misty dawn it crawls;  
No clump or pit or cleft withstands,  
No bog or mesh now stalls.

Loose-jointed and ungainly reels  
Its bulk o'er crater, stump,—  
All's smooth for caterpillar wheels  
And alligator hump.

Like prehistoric monster dread  
It undulates and grunts;  
Shall it be comic, tragic, said?—  
Depends on how it fronts!

With clownish grin the Tommies trail  
The lurking path it's made,  
And cheer to watch it squat and flail  
Each trench in enflade.

But Teuton caveman views with pain  
O'erhead, at front, on flank,  
The pterodactyl aeroplane,  
This ichthyosaurian tank!

Like dragon-scales its armor plate,  
Of prehistoric view;  
And yet, it's doubly up-to-date,  
And most symbolie, too,—

The farm-tool, that a pervert soil  
Of stone and stump makes yield,  
Adapted still to clearing toil,  
Grubs now in war's red field!

### HOLLINGER COSTS.

In his report for 1915 Mr. N. A. Timmins, president of the Hollinger, says:

"The principal work of the year consisted in mining and milling 334,750 tons of ore having a gross value of \$3,384,666.84, and an average value of \$10.11 per ton. Exclusive of taxes and depreciation, an actual working profit of \$6.16 per ton was made. We believe that this record will compare favorably with work of a similar nature being done in any other mining camp. Development work has not been neglected, as is evinced by the fact that two miles was added to our already extensive underground workings, and an addition of 35,000 tons was made to our reserve of broken ore. A gratifying reduction has been achieved in the costs of operations. In last year's report the hope was expressed that a cost of \$4.00 per ton could be reached before the end of the year. Results for the year show that in spite of material advances in the costs of supplies, a total working cost (exclusive of depreciation) of \$3.54 per ton was attained. We confidently expect to effect still further reductions during the present year."

### THE COST OF COAL\*

By Geo. Otis Smith and C. E. Leshner.

The price of coal is a matter of vital concern to the average citizen. No less important, however, is the question what our coal actually costs to produce and the interest in this subject is typical of the popular interest in the large productive enterprises of the country. As citizens we recognize the consumer's dependence upon the producer and are taking advanced ground as to their relative rights. In few industries does this dependence seem more vital or the consumer's equity appear larger than in that of producing and selling coal. The per capita annual expenditure for the useful metals is roughly equivalent to that for coal, but few citizens purchase pig iron or bar copper, whereas of the urban population only the dwellers in apartments, boarding houses, and hotels are spared the necessity of buying coal. The consumption of coal in the United States for heating and cooking is between 1 and 1½ tons per capita. A careful estimate for 1915 is 1.1 tons, which happens to be identical with the figure determined for similar consumption in Great Britain in 1898. This nonindustrial consumption is greatest in cities, and in Chicago in 1912 it was nearly 2 tons. Of course every citizen indirectly pays for his share of the total consumption which last year amounted to 4.6 tons per capita.

Again it may be that because to a larger degree the cost of metals is charged to capital outlay rather than to the operating expense of life, we appreciate less keenly the unit price of these materials that are not immediately consumed with the using. At any rate, public opinion is more easily brought to a high temperature by considering the price of coal than by considering the price of any other product unless we except gasoline, recent discussion of which has been almost explosive.

Looking backward as well as forward, one need not be an alarmist to suggest that in the whole field of productive business the coal industry seems the one most likely to be threatened with Government operation. The foodstuffs are produced on land owned and operated by the millions, and so far as the production of the raw material for them is concerned, "monopoly" is an unknown word, but when we think of coal, terms like "barons" and "trusts" instinctively come to mind. For these reasons the determination of certain facts connected with coal production and the analysis of the cost elements that enter into the price of coal constitute a timely subject for discussion.

In discussing costs, however, we do not overlook the too evident fact that at times price may far outstrip cost. The price of coal depends upon the balance between necessity for fuel on the one hand and ability to produce and to deliver on the other; the ability to produce is in turn controlled by the labor available and the ability to deliver is dependent upon car supply. Increased foreign demand for American coal, large industrial consumption, unusual weather—all may have great influence on the current price of coal, but none of these is to be considered a factor in the actual cost of production except so far as it causes irregularity in operating expenses and promotes a decrease in efficiency of mine labor. To-day high prices are being received for coal by those who are able to produce and deliver more than their outstanding contracts require. In other words, a few traders may be able and willing to capitalize the urgent necessity of the consumer and

\* Extracts from a paper read at the American Mining Congress, Chicago, Tuesday, November 14th, 1916.



their own ability to deliver. The premium for fuel now being paid generally by the consumers, and by such traders as have been caught short in their contracts is in reality not properly chargeable to cost of coal, but to cost of car and labor shortage, just as in the times of stress accompanying labor troubles the premium paid by their consumers is a part of the price the country pays for strikes.

Four general items of cost must be considered as normally controlling the price of coal to the consumer—resource cost, mining cost, transportation cost, and marketing cost. Under usual conditions each of these items includes a margin of profit which may seem either excessive or inadequate, according to your point of view. Yet an unbiased consideration of these cost items is absolutely essential as a preliminary to the decision by the public whether we are buying coal at a fair price, and if not why not. As long as it is the popular view that the price of coal is made up of one part each of mining costs and freight costs to two parts each of operator's profits and railroad dividends, with the cost of a certain amount of needless waste on the side, the demand for investigation will continue, and in so far as there is any element of truth in this view, legislative action is justified, even though the prescribed reform may approach the extreme of public ownership and operation of mines and railroads.

As the initial item of cost, the amount charged against the marketed product as the value of the coal in the ground, which for brevity may be termed the resource cost, is perhaps the item most often overlooked by the coal consumer. The item of marketing cost is one that can be brought directly under observation by the consumer if he will but study the matter intelligently; the transportation cost can be learned by simple inquiry; and the details of mining cost can best be set forth by the mine operators themselves, for they have now adopted the policy of free discussion of these matters, which they once regarded as sacred from public view.

The item of cost first to be considered represents that part of the value given to the ton of coal by the mine operator and the mine worker. This may be termed mining cost, but it must include the operator's selling costs and other overhead expenses as well as the mining costs proper which include the larger expenditures for wages, supplies, and power. This cost plus the resource cost—the royalty or depletion charge—and the profit or loss on the sale make up the value at the mine mouth. The mining cost varies not only between mines of different companies in separated fields but even between adjacent mines of the same company in the same field. Both nature and man contribute to such variation.

It is not practicable to assign a very exact figure to the mining cost—the census of 1909 indicated an average of \$1 a ton for bituminous coal and \$1.86 for anthracite, but these figures are believed by some operators to be too low. It is possible, however, to show in a general way the distribution of this item; the cost of mining is divided between labor, 70 to 75 per cent.; materials, 16 to 20 per cent.; general expense at mine and office and insurance, 2 to 4 per cent.; taxes, less than 1 per cent. to 3 per cent. for bituminous coal, and 3 to 7 per cent. for anthracite; selling expenses, nothing to 5 per cent., and recently to these items has been added the direct and indirect cost of workman's compensation, which may reach 5 per cent. for bitu-

minous coal. The charges for labor, material, and general office expenses are easily understood, as is also a charge for depreciation of plant and machinery; but taxes and selling expenses are important items that may be overlooked by the casual observer. Some figures recently published show that the taxes levied in West Virginia last year on coal lands and coal-mine improvements—that is, on the industry as a whole—were equivalent to nearly 3 cents per net ton of coal produced, which is doubtless fully as much as the profit made by many of the operators in that State.

The cost of selling coal is nothing for the companies that use their own product, including the Steel Corporation and a large number of others, and is little or nothing for the producers who sell nearly all their coal to such large consumers as the railroads. Companies that produce coal for domestic use and the general run of steam trade, must figure on a selling cost as high as 10 cents or more per ton, the cost depending on the extent of their business. The average selling cost for bituminous coal is probably 5 to 10 cents a ton, and for anthracite the usual charge of sales agencies is reported as 10 cents a ton for steam sizes and 15 cents for the prepared sizes.

The producers of coal and the transportation companies are concerned not so much with the actual rates charged for carrying coal as with the adjustment of rates between different coal fields and between different markets. The consumer of coal, however, is interested in the actual rather than the relative freight rate.

The transportation rate in force from any coal field to any market can readily be learned by the consumer who wishes to figure this item in the cost of the coal he buys. Therefore in the present general consideration of the subject it is sufficient to state the average value of this item. In the interstate traffic, both rail and water, bituminous coal probably pays an average freight of nearly \$2 per ton. In other words, the transportation costs more than the product and, as some parts of the country are just now learning, is sometimes more difficult to obtain. The value of coal like the value of so many other commodities, is a place value.

The average freight charge on anthracite is higher than that on bituminous coal, first because the rates are higher and second because, all movement considered, the coal is carried a greater distance.

The cost of handling the coal, exclusive of freight, from the time it leaves the producer until it is in the consumer's fuel bin, may be termed the marketing cost. It can readily be seen that a large part of the coal produced is not subject to this cost for most large users of steam coal, such as the railroads and the coke manufacturers, place contracts directly with the producing companies or their selling agencies, and buy in the open market only when their needs exceed the deliveries under their contracts. Much of the coal, however, both anthracite and bituminous, passes through the hands of a wholesale dealer or jobber before it is received by the retail dealer who puts it in our cellars, or in the bins of a power plant. Coal that gets a long way from the mine may pass through many hands before it reaches the consumer, and it not only pays commissions all along the line, but is subject to shrinkage and deterioration, both of which enter into the final selling price to the consumer. Brokers are usually satisfied to make a gross profit of perhaps 10 cents a ton, but as several brokers may



make a "turn over" on the same car before it is unloaded, this element of cost may be several times that amount.

About half of the anthracite and around 15 per cent. of the bituminous coal is retailed in less than carload lots, and the greatest number of individuals are directly concerned in the marketing of this portion, regarding the profits on which there is the widest divergence of opinion. The margin in the retail business between cost on cars and price delivered is between \$1.25 and \$2 a ton, and is not more than enough to give on the average a fair profit. The shrinkage and, in part, the deterioration are together seldom less than 1 per cent. of the weight and may exceed 4 per cent., and the retail dealer also must provide in his selling price for uncollectable accounts.

The largest single item in the cost of retailing is of course that representing the labor of handling and the local cartage, which together make up about half the marketing cost.

There now remains to be considered the first major item, or the resource cost, which is what the operator has to pay for the coal in the ground—the idle resource, which he starts on its career of usefulness. This cost is expressed as a royalty or a depletion charge.

One of the latest leases by a large coal-land owner provides for the payment of 27 per cent. of the selling price of the coal at the breaker. This percentage is therefore not only a royalty figured on the mineral resource but also a commission based on the miner's wage. To bring this right home to you and to me, it may be said that the practical result is that if the anthracite we burn in our range this winter happens to come from that particular property, we will pay fully \$1 a ton into the treasury of the city trust that owes its existence to the far-seeing business sense of a hard-headed citizen of Philadelphia. Whether such a royalty is excessive or not, the fact remains that this is the tribute paid to private ownership.

The present average rate of royalty on anthracite is probably between 32 and 35 cents a ton on all sizes, which is from 12 to 14 per cent. of the selling value at the mine

The bituminous coal industry is a modern institution compared with the mining of anthracite, and much of the bituminous coal land was acquired by the operating companies during the last 20 years for little if anything more than its surface value. To-day there are large areas of bituminous coal-bearing lands that, because they are undeveloped and without railroads, can be purchased at a low price, but little or no anthracite land is on the market, and little has changed hands for years. The present average resource cost of bituminous coal is not much over 5 cents a ton, or about 4 per cent. of the average selling value at the mine. In the Pocahontas region and the Pittsburgh district the royalties are much higher, but these like others that might be cited, are exceptions—one due to coal of special quality, and the other to location—factors which, incidentally, are exactly those that have assisted in making the resource cost of anthracite what it is.

Should you be interested in summing up all these various costs and striking a balance between labor's share and capital's return, you would find that the mine worker, the trainman, and the wagon driver together receive fully half of the price of the anthracite delivered at your house, and the same three classes of

labor receive not less than half the price paid by the average consumer for the cheaper soft coal. In a similar manner the average return on the capital invested in land, mining plant, railroads, and coal yard may be roughly calculated, with the result that landlord, bondholder and stockholder of coal company and railroad together receive about \$1.15 from the ton of anthracite, and only 50 to 75 cents from the ton of bituminous coal, and of either of these amounts the mine operator's share is only a small fraction.

#### STANDARD SILVER-LEAD MINING CO.

The following information concerning the Standard Silver-Lead Mining Co., which is operating silver-lead-zinc mines and a concentrating mill near Silverton, Slocan Lake, British Columbia, was published recently in Spokane, Washington, in which city the company has its head office:

The relative operating profit of the Standard Silver-Lead Mining Company for September was \$38,287, according to a report that accompanied checks for the monthly dividend of \$50,000 issued yesterday. The profit for July was \$56,608, June \$30,398, and March \$136,943.

In addition to the receipts the company has 600 tons of zinc concentrates made during September, the value of which does not enter into the figures representative of profits. These concentrates have been netting the company \$30 a ton. The shipment of all zinc accumulations is expected during this month, it is stated by Charles Hussey, the secretary.

The financial statement of the Standard for September is summarized as follows:

| <b>Receipts.</b>                          |             |
|---|-------------|
| Preliminary settlements for 275 tons..... | \$33,056 63 |
| Zinc sales .....                          | 17,137 08   |
| Financial settlements for July .....      | 4,073 17    |
| Boarding house .....                      | 4,781 55    |
| Store supplies .....                      | 2,101 19    |
| Total.....                                | \$61,149 62 |
| Less zinc penalty for May .....           | 673 42      |
| Balance .....                             | \$60,476 20 |

| <b>Disbursements.</b>  |               |
|--|---------------|
| Ore production, including mining, shipping, marketing, power, salaries, expenses and taxes ..... | \$36,287 98   |
| Relative operating profit .....  | 24,188 22     |
| Development .....  | 4,709 85      |
| Construction .....   | 19 00         |
| Aylard tunnel .....  | 1,683 30      |
| The balance on hand September 30 was   | \$254,319.01. |

#### GOLDENVILLE MINING CO.

The Goldenville Mining Company property at Goldenville, Nova Scotia, and the J. B. Niely property at the same place have recently been consolidated under the name of the Goldenville Consolidated Mining Company. No operations have been carried on underground since early in August.

#### LOON BROOK MINING CO.

The Loon Brook Mining Company at Montague have recently run into bonanza ore on east drift of 180 foot level. Gold to the value of between \$25,000 and \$30,000 in specimens was taken out in two days. This is the richest of several strikes that have been made at this mine within the past two years, and is the richest find made in the province in recent years.



## THE WEATHERING OF COAL\*

By J. B. Porter.

Weathering in nature takes place at and near the outcrop of coal seams, and in some cases this action has even resulted in spontaneous combustion and considerable quantities of coal have been completely or partially destroyed in place in the beds. Ordinarily, however, the natural weathering of seams is too slow to cause fire, and all that happens is the disintegration of the coal, accompanied by the loss of part of its combustible matter, and a more than equivalent increase in ash. Outcrop coals are thus almost always of poor quality, but fortunately the damage rarely penetrates far into the seam, and coal as ordinarily mined shows little or no sign of oxidation in the destructive sense in which the term is used in this discussion.

The artificial or commercial weathering of coal begins the moment the miner's pick exposes its surface to the air of the mine, and this weathering continues with increasing, or decreasing intensity, depending on circumstances as long as the coal is exposed to the air. Weathering may thus be considered as taking place (a) in or near outcrops or fissures in nature; (b) in the coal mines; (c) on the surface during preparation and in transit; (d) in storage while awaiting use.

The first case is of little interest or importance except to the geologist and will not be discussed in this report, but the other cases are all deserving of separate consideration, although the general phenomena of weathering are alike in all.

### Weathering Action Taking Place in the Mine.

Changes undoubtedly commence to take place in coal immediately upon mining, owing to the alteration of conditions. Coal *in situ* is under pressure due to the superincumbent strata, and it is also absolutely removed from contact with the atmosphere, but as the mining operations approach the coal gases, which it ordinarily contains under pressure, begin to escape. This evolution of gas becomes more rapid when the coal is actually broken down, and for a time probably almost protects it from oxidation, but both oxidation and desiccation no doubt commence almost immediately and increase as the escaping gases decrease, and cease to protect the coal from the action of the air.

Evolution of Gas.—Par and Wheeler have shown that a combustible gas is given off by coal immediately upon mining; they sealed coal up in air-tight jars, and found that after ten months the vessels were filled with a combustible gas under pressure.\*

Taffanel states that it is during the first ten days after mining that the greater part of the available methane is set free; he obtained a liberation of 14–22 c.c. per grm. of coal. These figures do not include the methane evolved during the period elapsing immediately after breakage at the face.

Porter and Ovitz believe that methane is formed by slow decomposition of the coal, and they quote the work of Chamberlin, in which he crushed coal under a high vacuum, obtaining only a quantity of gas equal to one fourth the volume obtained by bottling for six months. During two weeks after mining they found that a certain coal lost three-fourths of its own volume of gas, and after five months it has lost an amount equal to one and three-fourth times its own volume. They seem to think that this is a great deal, and in a chemical sense it may be, but from the practical standpoint it is of little importance except in the case of coal carriage in ships. If we consider the huge

volume of air which sweeps constantly through a mine and the amount of gas given off by the coal during development work and before it is mined, this gas from the mined coal is unimportant: although, of course, immediately bad ventilation comes in, we have an entirely different situation. The loss in calorific value due to the escape of this  $1\frac{3}{4}$  volumes of methane if calculated out, is seen to be negligible as compared with other weathering losses.

Taffanel draws attention in his paper to the evolution of methane from coal in the mine, he, however, attacks the subject chiefly from the point of dust explosions; he gives figures for the quantities of gas given off by the samples upon which he experimented.

In this, as in every other action which we are to study in connection with this subject, every coal has its own individuality, due in part to the particular condition of pressure, water, associated strata, etc., in the mine; and in part to the exceedingly complicated organic compounds, resins, albuminoids, etc., of which it is composed.

Absorption of Oxygen and Oxidation.—This subject will be taken up at length in subsequent pages, but we may perhaps here quote certain observers who have particularly studied underground conditions. Porter and Ovitz following various earlier writers, state that "the air in a poorly ventilated section or closed portion of a mine is deficient in oxygen, and contains much less carbon dioxide than it would if all the oxygen that must have been removed from the air by the coal were immediately split off in combination with carbon." This absorption of oxygen is due in part to the coal left in the walls and pillars, but in most cases the chief absorption is by the broken coal and carbonaceous shale, and particularly by the coal and shale dust which is always produced in mining.

Parr and Wheeler state that pillar coal in a particular district after 25 years loses only 2.5 per cent. of its calorific value; this illustrates the imperviousness of unbroken coal to the air. The main deterioration in pillar coal is found, however, to be due to its increased friability resulting chiefly from the heavy pressure to which it has been subjected.

Interesting figures are given by Haldane and Meachen, to show that 80 per cent. of the heating which air undergoes while passing through a mine, can be accounted for only by the weathering of the pyrite and the coal itself. Their experiments which are described below were carried out at the Hamstead colliery, South Staffordshire, where the "Thick Seam" is worked at a depth of about 2,000 feet below the surface, and their observations and conclusions are so interesting that no apology need be offered for summarizing them at some length.

They noticed that the general effect of opening up the mine was to warm both the coal and the strata adjacent to the workings. The average temperature on the surface at Hamstead is 49 degrees F. At the bottom of the intake shaft the temperature is much more constant than at the surface and averages 60 degrees F. The air is compressed as it descends the shaft and this compression would account for a gain in temperature of 10 degrees. A little moisture is taken up by the air in the shaft, and this must tend to cool the walls so that some heat is transmitted to the air from the strata.

From the pit bottoms the air steadily increases in temperature at the rate of about 6 degrees for every



3,000 feet. In the workings the temperature is generally about 80 degrees to 85 degrees. In the return airway there is a relatively slow though steady fall of temperature from the face to the upcast shaft. The average temperature in the main north return airway is 77 degrees. Analysis of the air shows that this fall in temperature is probably due to the leakage of air from the intake to the return airway.

To determine the temperature of the undisturbed coal a maximum and minimum thermometer was inserted into the end of a 10-foot borehole in freshly cut coal. The hole was then closed with clay and left undisturbed for at least several days. Several such experiments showed the temperature of the coal to be 66 degrees. Similar experiments were made in coal which had been long exposed. They showed that coal behind such an exposed surface gradually rises in temperature. Thus at two places in the side of a main road the temperatures at the ends of 10-foot boreholes were taken in 1894 and 1898. In 1894 the temperatures were 66 degrees and in 1898 they were 93 degrees and 90 degrees.

It was impossible to correctly calculate the total heat generated in the mine since there must have been large radiation losses through the walls, roof and floor. The amount of heat, which escaped by the return airway could, however, be calculated. Such a calculation shows that the total heat carried away per minute by the air-current was 48,000 B. Th. U., each cubic foot of air passed through the mine, therefore, carried off with it approximately one B. Th. U. of heat.

Summarizing Haldane and Meachem's paper further there are several possible sources of heat in a mine. Of these the most obvious are the presence of men and horses and lights. The heat from these sources is, however, approximately determinable and in the case of the particular mine under very careful calculations showed that it could not have exceeded 7 per cent. of the heat leaving the mine. Another possible source of heat is the friction due to the settling down of the roof and consequent grinding of the coal and other material by the pressure of the superincumbent strata. The depth of the Hamstead workings is 2,000 feet. Assuming the specific gravity of the strata to be 2, the authors arrived at a pressure of 250,000 lbs. per square foot or about 0.8 tons per square inch. The average output of coal from the north side of the pit was about 15 cubic feet per minute and the average rate of settling down of the strata could not exceed this. The heat liberated could therefore not exceed the heat equivalent of 15 x 250,000 ft. lbs. of work, i.e., 4,850 B. Th. U. Even if this were all given up to the mine air it would only be about 10 per cent. of the total heat leaving the mine. The friction of the air current passing through the mine also produces heat,—the amount which could have thus been generated could, however, never exceed 1.7 per cent. of the total heat withdrawn from the mine.

It is clear then, that the main portion of the heat generated in the mine was due to some cause other than any of those mentioned, and the obvious conclusion is that it is due to the chemical action of the air on the coal. Haldane and Meachem made a large number of experiments on the subject and compiled analyses of samples of air taken in the mine.

These analyses show that as the air passes through the mine it steadily loses oxygen and gains carbon dioxide. On the average, however, the oxygen loss is 3.13 times the gain in carbon dioxide. It is very noticeable that the temperature increases with the diminution

of oxygen from the air, and Haldane and Meachem's calculations show this increase to be greater than could be accounted for by friction.

Two more series of tests similar to the above were made at different times. The results checked those of the first test very closely except that the percentage of carbon dioxide in the samples taken on January 5 showed a marked increase over that found in previous samples. Haldane and Meachem attribute this to the fact that the barometer was falling on that day, and that this fall caused a flow of gas from old workings.

The absorption of oxygen by anthracite and by bituminous coals in the mine, is clearly demonstrated in a paper by G. N. Burrell, for the gases in an enclosed portion of an anthracite mine. This section of the mine was sealed off because of a fire which existed in an adjoining section. The fire did not, in his opinion, affect the particular area from which the samples were obtained, because of a heavy intervening roof fall, consequently the gases represent those trapped and given off normally in a stagnant section, except that one stopping was leaking and some air was entering from the ventilating current. The stopping was tightened and rapid absorption of the available oxygen by the coal ensued. Four days later the oxygen had dropped to 3 per cent., even though some air was still finding access to the enclosed area.

This matter of underground weathering is ordinarily of but little importance, so far as the commercial value of the coal is concerned. It is however of immense importance in mining, as a certain amount of broken coal and coal dust is unavoidably left in the workings and abandoned there, and this material and the carbonaceous and pyritic shales often found just over the coal frequently give great trouble by heating and starting underground fires. In some seams spontaneous gob fires are of so common occurrence that special methods of mining have to be employed, and in still other cases the only safe way of operating is to laboriously remove all fine coal and all fallen shale.

#### Weathering Losses in Transit.

Parr and Wheeler sampled some coal at the mine and again a week or so later after transit in cars, and they found deterioration in the order of 100 B. Th. U. for the coals taken, whose value when mined was about 14,600 B. Th. U. It is probable that part of the above loss of calorific power was due to the escape of hydro-carbon gases, but the observers are no doubt right in ignoring this as a factor of importance.

The chief loss, in transit, however, must be due to breakage caused by handling, and, although with the modern equipment now in use by large companies, breakage is greatly reduced, these breakage losses are quite considerable.

In the majority of cases of shipment by rail, the coal does not remain long enough in the cars to suffer any great change, except that of breakage just referred to, but when shipment is made by vessel, and the distances are great, the case is different. As has already been stated in the introduction, the subject of weathering was first brought before the public in connection with the all too numerous cases of fires in sailing ships carrying cargoes of coal from England to distant ports. Such ships frequently spend months on a single voyage and much of that time is often in the tropics, and unless the coal is an anthracite, or very exceptional precautions are taken, spontaneous fires are almost certain to occur. It is not necessary, however, to deal at length in the present work with this very special subject of coal cargoes, as the causes of heating will be sufficiently considered in the general



discussion of weathering, oxidation and storage, while the technical problems of loading and discharging colliers, and of preventing and fighting fires on ship-board, have already been reported on at length by the several Royal Commissions appointed for the purpose.

#### Weathering Losses in Storage.

From the work of many experimenters we know that if fresh coal of almost any character be stored in a pile, the temperature of the mass will at first rise. Many kinds of coal never go further than this, in ordinary storage, but gradually cool off again and remain without further marked change for any length of time.

A great variety of coals on the other hand continue to heat, and if nothing be done to ventilate them or otherwise artificially cool them, they ultimately catch fire, and the main purpose of the report prepared for the Mines Branch is to discuss the causes of this destructive action and the various methods which have been proposed for its prevention or cure.

In our study of the subject of weathering it was unnecessary to attempt to distinguish any further between action taking place in the mine, in transit, or in storage. In fact it would be impossible to do so satisfactorily as in some cases the character of the coal seam and the method of mining make it possible to get out the coal very promptly, and to place it in the consumers' storage pile while it is still giving off hydro-carbon gases, and has scarcely had time to begin to oxidize. In other cases much of the coal remains in underground pillars for a very long time and even the mined coal is handled slowly and suffers considerable change before it reaches the consumer. It is, therefore, best from the practical point of view to consider the question of weathering as a whole.

#### Causes.

It is generally believed that anthracite is not liable to spontaneous combustion and this belief is correct in that anthracite will not ignite spontaneously under ordinary conditions. Fayol's experiment, which has been fully confirmed in a general way by numerous observers, proves conclusively that liability to weathering is least in anthracites and greatest in lignites with bituminous coals in an intermediate position, and in a practical sense we may take it that hard anthracite is not appreciably affected by exposure. On the other hand the true lignites suffer so greatly not merely by spontaneous heating, but by dehydration and disintegration, that their storage on a large scale is unlikely to become an important problem for some time in Canada at least. The real practical problem is, therefore, to be found in a study of bituminous and semi-bituminous coals, and the remainder of this paper will deal almost exclusively with coals of this character.

#### The Effect of Moisture.

In all probability the temperatures of ordinary coals under ordinary conditions of storage are not raised to any appreciable extent by moisture. The question naturally arises, what was the basis of the once prevalent belief that moisture was an important factor in spontaneous heating?

This belief is, no doubt, chiefly due to the confusion of cause and effect on the part of persons who have discovered fires in coal storage. It is commonly observed that fires or hot spots in the pile are discovered shortly after rain storms, and that nearly always a hot spot is surrounded by damp or wet coal even if the main part of the pile is dry. The first case is easily explained by the fact that dry coal is so poor a con-

ductor that the surface of a pile may show no indication of a hot spot or even an incipient fire in the interior. A rain storm would however provide moisture enough to soak into the pile, and this moisture on approaching the hot spot would be turned into steam which would work its way back to the surface and be observed, thus attracting attention to the hitherto unsuspected heating. The second explanation is equally simple. Air dry coal always contains some moisture, and in lignitic coal there is also a very considerable amount of combined water. In the case of a hot spot in the interior of a pile this moisture is driven off, either by escaping at the surface as steam, or condensing on the cooler coal in the neighbourhood. Added to this there is of course an actual formation of water when the hydrogen constituents of coal are oxidized.

#### Disintegration Due to Weathering of Pyrite.

That pyrite causes disintegration of coal on weathering is well known, and the fine coal thus produced, undoubtedly increases the tendency of the mass to heat, but it is difficult to get any very definite measure of the effect, as other causes also result in disintegration. The action in brief is that pyrite in the presence of moisture and oxygen is more or less completely converted into oxide and sulphate of iron with the simultaneous production of appreciable quantities of sulphuric acid. This acid in time attacks the carbonates of lime and magnesia which are usually present in the cleavage and joint planes of the coal, converting them into sulphates. These chemical reactions all involve increase in bulk followed often by shrinkage due to the solution of the soluble sulphates produced. Thus the coal on the whole suffers a much greater degree of disintegration than might at first be expected from the small amount of pyrite oxidized, which in ordinary cases does not exceed from 10 to 25 per cent. of the total pyritic matter in the coal, i.e., a small fraction of 1 per cent. of the total.

From a review of the various and apparently contrary opinions held by the numerous experimenters who have studied the oxidation of pyrite in coal, it seems reasonable to conclude that the divergence of opinion is very largely due to differences in the coals studied, and that in an average bituminous coal the actual heat generated by oxidation of the pyrite is, in itself, not usually very important. Taken, however, in connection with the fact that any small increase in temperature of the coal will greatly increase the rate of absorption of oxygen and consequent heat production, the heat produced by the weathering of pyrite may become a very important factor. Whether it will do so or not will depend on whether the coal under consideration can generate heat sufficiently fast by its absorption of, or chemical combination with oxygen, to raise its temperature to the danger point without assistance from the heat due to the oxidation of the pyrite. The effect of pyrite in liberating free sulphur and thus lowering the ignition point is unimportant since the point at which autogenous oxidation begins will have been passed before the ignition point of sulphur is reached.

The calorific value of a carbon hydrogen compound is so much greater than that of pyrites that a much smaller quantity of the former would yield any given amount of heat, and this fact taken in conjunction with the relative simplicity and accuracy of the chemical determination of sulphur makes it probable that heating has in many cases been ascribed to the alteration of the pyrite, when in reality it has been due to an oxidation of organic matter that has not been detected by the chemist.



There are, however, some coals in which the pyrite or marcasite is excessive in quantity or, like the "Barnsley softs" or the Williamson county, Illinois, "New Ohio," in which it is peculiarly susceptible to oxidation, and in such coals, it is probable that pyrite oxidation is an important, and perhaps the primary cause of heating. Such coals are, however, comparatively rare and, owing to their softness and excessive sulphur they are of lower commercial value than normal coals.

#### Size of Coal.

Whether it be the pyrites in the coal which first oxidizes or the coaly matter itself, it is clear that the action is largely superficial, or in other words, the rate of weathering in any coal is approximately proportional to the surface exposed to oxidation. This surface is of course inversely proportional to the diameter of the particles, or in other words a ton of coal in one-inch lumps has only half the surface of a ton of half-inch lump, or one one-hundredth the surface of 1-100-inch lump, which may be taken roughly as the average size of coal dust, although really fine dust is of course much finer than this, and therefore has very much more surface.

Other things being equal, therefore, we may say that the rate of weathering increases directly with the reduction in size and is immensely more rapid with fine coal than coarse, but this is only true within limits, for in order that weathering may take place it is of course necessary for air to come into contact with the surface, and excessively finely divided coal packs so close that it is virtually impermeable to air and thus after the included air gives up its oxygen no more can gain access.

The aim of every colliery is always to produce as large a proportion of lump coal as possible, not primarily because of anticipated difficulties due to weathering, but because lump coal burns better in ordinary use and, therefore, commands a better price; but the operations of mining unavoidably produce a considerable percentage of fines even from the hardest coals, and many otherwise very good coals are so friable that "slack" constitutes the chief product of the colliery.

The experience of the Calumet and Hecla Mining Company may well be quoted here; they at one time stored all their coal in the form of "run-of-mine," and experienced much trouble from heating; upon changing their methods so that only oversize from a bar-screen was stored, and the undersize used as soon as possible, all trouble with heating of piles ceased.

#### The Size, Shape, Etc., of the Storage Pile.

When coal is kept in a storage pile for a considerable length of time it is a comparatively simple matter to study its condition by keeping a record of temperatures in a sufficient number of places in the pile. We can thus readily follow the variation in temperature of the mass, as all the reactions are exothermic.

Any heating of the interior of the pile, whether it be small or great, must be primarily due to oxidation, and the source of oxygen is the air which filled the voids in the broken coal during the piling, and other air which thereafter works its way into and through the interstices during the whole existence of the pile. Some of the heat evolved is lost by radiation and convection, but a considerable part of the loss is due to the cooling effect of the interstitial circulation above referred to. It is thus clear that the physical condition of a storage pile, that is to say its bulk, porosity, etc., has a very important influence on its rate of heat-

ing. A thin or porous pile may oxidize rapidly, but it will be kept cool by radiation and excessive ventilation. A very high and compact pile will get too little air to support any serious oxidation in the interior and its deeper parts will, therefore, heat very little. A pile of intermediate porosity or a particular zone in a large pile will get enough air to cause heating and not enough to carry the heat away and will thus give a maximum of trouble.

This matter of porosity is of greater importance than might at first be imagined as the interstitial spaces in a pile of broken mineral range from 15 per cent. to nearly 50 per cent. of the total bulk, but in addition to this the initial temperature of piling also has a considerable effect. Oxidation proceeds, other things being equal, more rapidly as the temperature rises, and the rate of ventilation also increases both for evil and good as the coal gets hotter and the difference between the internal and the atmospheric temperature rises.

#### Initial Temperature of Storage.

The term "autogenous oxidation" has been so widely used that it is retained in the present volume, but the word autogenous is not always correctly employed, and here as elsewhere it is liable to give rise to misapprehension. There is undoubtedly for each particular case some particular temperature below which oxidation will generate heat no more rapidly than radiation and convection can dissipate it; and coal stored below this temperature will not rise above this critical point, and will, therefore, be safe; whereas the same coal stored at a higher temperature, or heated by any means to such temperature, will have its rate of oxidation accelerated, and will thus generate heat more rapidly than it dissipates it, and, therefore, grow hotter and hotter until it ignites. This critical temperature is, however, dependent not merely on the particular coal used, but on the size and shape of the pile, the size of the fragments of coal itself, the degree of moisture, and to a certain extent on the external temperature, the character of ground under the coal pile, etc., etc. The changes in the critical temperature due to variations in these numerous factors are so great that any statement of the temperature of autogenous oxidation of a coal is useless and often mischievous unless accompanied by a statement of the determining conditions. It is, however, quite possible for persons experienced in the storage of particular coals to arrive experimentally at the approximate critical temperature below which their coal in their standard storage pile may be permitted to heat without anxiety to those in charge; while if the heat in any spot rises above this temperature the coal requires prompt ventilation, careful watching, and possibly digging out.

From what has been said above it is obvious that the initial temperature of storage is of very great practical importance. Attention was directed to the matter in 1898 by the New South Wales Commission which recommended strongly that when coal was put into storage in any shape or form, the handling should be carried out as much as possible during the coolest part of the day. The commission was considering the case of loading ships in a subtropical climate, and its advice appears very necessary in that if the coal is being loaded while the sun is shining it becomes greatly heated and these hot layers get covered over and so retain their heat as the superincumbent coal is a poor conductor. As a matter of fact the Commission's advice is good even for temperate climates, and piles made in summer are often quite hot to start with and liable to give trouble. Of course the converse is also true and piles



made in winter rarely give trouble; in fact it is said that ice and snow are sometimes found as late as midsummer in coal piles made at Glace Bay in midwinter.

Every precaution should also be taken to ensure that coal after being stored is not heated even locally from some external source. Coal piled near boilers, and particularly over or around hot pipes or flues is quite liable to develop violent spontaneous combustion. The action of the sun on a finished pile is on the other hand not likely to do harm as it is superficial and the heat gained in the day is usually lost in the night.

Porter and Ovitz cite a case in which a pile of cinders was observed to take fire due to the influence of heat radiated to them from a furnace. The cinders contained in one case 33 per cent., and in another 40 per cent. of carbon.

## MINE EARNINGS

The wonderful earning powers of American mines and works can best be illustrated by referring to the disbursements made by 167 companies during the 10 months of 1916. These companies, between Jan. 1, 1916, and Oct. 31, 1916, divided among shareholders the princely sum of \$184,830,127. If the dividend payments of the securities-holding corporations were to be included (and a large proportion could be rightfully included), the year's total would reach \$223,433,208, a wonderful and convincing argument that mining, as now carried on, is one of the principal reasons for America's present standing at the head of the world's great industrial centres.

That these companies not only enjoyed a remarkable prosperity during the past 10 months, but in previous years we are able to show by reports made to "Mining and Engineering World," that these companies paid dividends amounting to \$1,067,277,064, which, with the dividends paid in 1916 makes a total of \$1,252,107,191. This is a return of better than 133 per cent. on the combined issued capital of the companies. When it is considered that a large number of these companies did not pay a dividend previous to 1915 or 1916, this is a remarkable record and one, we believe, not duplicated by any other industry.

While October disbursements were not as large as during the previous month they were considerably larger than in any other October in the history of American mining industry. With 60 companies participating, dividends were paid to shareholders during the month totaling \$16,663,385. This does not include the \$630,000 disbursed by the holding companies. The copper companies distributed \$7,517,580 of this, the gold-silver-lead-zinc companies \$8,154,447 and the metallurgical companies \$991,358.

Of the 167 companies participating in the 1916 disbursements 42 operate copper properties, all but two in the United States, and these divided among shareholders \$88,280,814. In previous years these companies paid dividends amounting to \$571,530,726, making their total to date \$659,811,540. This is a return on the combined issued capital of 186 per cent.

One hundred nineteen properties, classified as gold-silver-lead-zinc producers, paid dividends during the 10 months of 1916 amounting to \$77,149,398. Added to dividends paid in previous years brings their total to \$380,088,724, on the combined issued capital of \$309,979,039, a return of practically 124 per cent.

Of the 119 companies mentioned above 91 are operated in the United States and they have to their credit

in 1916 dividend payments of \$64,530,768. Added to the dividends paid previously brings their total to \$294,657,558, a return of approximately 150 per cent. on the \$197,644,778 outstanding.

Twenty-three of the above 167 companies operate properties in Canada and they contributed to the 1916, \$9,210,621, making their total to date \$69,522,318. This is a return of nearly 75 per cent. on the outstanding share capital and is a splendid record considering the comparatively few years of operation.

But three Mexican companies report as having paid dividends in 1916, these paying \$1,108,009. To date these companies have disbursed \$8,858,848.

Six metallurgical companies, looking to their profits largely from the treatment of ores for other companies had a very prosperous 10-months' period, for they disbursed among shareholders \$19,399,915. Added to previous disbursements these companies have paid dividends totalling \$212,206,927. This is a return of approximately 80 per cent. on the \$273,003,040 outstanding share capital.

Eight securities-holding corporations, mentioned above, divided among shareholders during the 10 months of 1916, no less than \$19,399,915. Since incorporation disbursements total \$156,054,205.—Mining and Engineering World.

## CONSOLIDATED CO. ON VANCOUVER ISLAND.

The Consolidated Mining and Smelting Co. of Canada, Limited, owning the LeRoi and Centre Star-War Eagle group of gold-copper mines in Rossland camp, the Sullivan lead-zinc mine in East Kootenay, the big smelting and refining works at Trail, West Kootenay, and a number of other but less important properties in British Columbia, is reported to be extending its mining activities to the Coast district of that Province. Recently the company issued new stock, to provide for its expanding needs.

Although the Coast Copper Co., which has options on a large copper property in the Quatsino district, Vancouver Island, is not mentioned in the company's circulars, it is believed in some quarters that this is the company that has been taken over. The Quatsino properties at one time were under option to the Stewart Mining Co., operating in the Coeur d'Alene district of Idaho, but, following an adverse report from an engineer, the option was allowed to lapse. During the life of the option considerable development work was done, and it is said that the occurrence on the property of immense bodies of low-grade ore was proved. No deep development was done, however, and the belief prevails that only work at depth will reveal ore bodies of sufficient size and value to warrant operations on an extensive scale. It is said that in recent months engineers representing the Consolidated Co. have made exhaustive examinations and that their reports are satisfactory.

The Quatsino holdings are several miles from June Landing on Quatsino Sound, but a railway line has been surveyed from tidewater to the mine workings, and there is no doubt but that this line will be constructed if the Consolidated Co. makes the purchase. Nearly the entire distance will be heavy construction, owing to the mountainous nature of the region, but there are not any particularly difficult engineering problems to solve. June Bay is an excellent harbor and deep-sea vessels can easily berth at the landing, a condition that ensures cheap transportation to the smelting works.



### MINERAL RESOURCES OF GRAHAM ISLAND, B.C.

The Geological Survey, Ottawa, has issued a report, memoir 88, on the geology of Graham Island, B.C., written by Mr. J. D. MacKenzie. The southern islands of the Queen Charlotte group are known to contain several deposits of metallic minerals, the value of which has not yet been ascertained except in a preliminary way, and Graham island, the subject of this report, has long been considered to have deposits of coal, lignite, and petroleum. The search for workable bodies of these substances has been carried on at irregular intervals since 1859, and has lately been vigorously renewed.

The deposits of economic value found on Graham island comprise coal, lignite, clay, building stone and limestone and gold. Deposits of black tar also are found, but are not considered to indicate the presence of petroleum.

Coal is found in the Haida formation of the Queen Charlotte series, of Upper Cretaceous age. The coal has been exposed at several localities, and the seams show considerable variation, caused by original differences in deposition as well as by later changes. Coal seams have been prospected at Cowgitz and in the Slatechuck valley on Skidegate inlet; at Camp Robertson, Anthracite, Trilby, and Wilson, and near Yakoun lake, all in the interior.

On Skidegate inlet the seams dip at high angles and are much disturbed and the measures are intruded by volcanic rocks, which have changed the coal, which is ordinarily bituminous, to an anthracite variety. Somewhat similar relations are found near Yaoun lake, where the coal is also altered. At Camp Robertson the coal is well exposed in several prospect openings. One seam is found, which is folded and faulted in such a way that previous investigators have supposed that two or three seams existed. The maximum thickness of this seam is nearly 9 feet, and the maximum thickness of coal it contains is 3 feet 10½ inches, in several bands. The coal is hard and black, and is a low grade bituminous variety, high in ash. The horizon of the seam extends over a considerable area south and west of Camp Robertson, but some parts of this area may not contain coal. At Camp Anthracite south of Camp Robertson, the same seam is also exposed. At Camp Wilson the best seam of the district is exposed in several openings. It is from 4 to 18 feet thick, and in places contains 16 feet of coal. The seam is of much better appearance than the one at Camp Robertson, and the quality of the coal is also superior to the other, although it is rather high in ash.

Lignite occurs in numerous seams at Skonun point, and at other places on the north and east coasts. It is very tough and woody, and its value at present is very low; but it may prove to be a useful fuel in the future.

The clay deposits of Graham island are extensive, particularly in the northeastern part; but, so far as they have been examined, they are of low grade and suitable only for common brick and the cheaper varieties of plastic ware.

Stone suitable for building, should a demand for it arise, could probably be found in some of the more massive bands of the Haida formation on Maude island. Good limestone is found in abundance at the southeast end of South island.

The bituminous rocks of Graham island have attracted considerable attention of late years, and hopes have been entertained that extensive petroleum deposits would be eventually discovered. These hopes are not justified by the nature of the occurrences found and Graham island can scarcely be looked to as a future petroleum producer.

Gold is found on the Southeaster and Beaconsfield claims near Skidegate Indian village, associated with sulphides, in a quartz gangue. It is also found on the east coast of the island in beach placers.

### ANTIMONY ORE IN THE YUKON.

Newspapers published in Dawson City, Yukon Territory, and others in British Columbia, last month printed the following news concerning a reported strike of antimony ore up the Fortymile river:

A promising strike of antimony and silver has been made on the headwaters of the Fortymile. Ben Norvall is the discoverer. John Colver, who is in Dawson City from the head of the Fortymile, where he is mining on Chicken Creek, tells of the strike.

"Norvall made the strike," he says, "and several of us have staked claims, and are well pleased with them and intend to hold them. Assays made of the samples, which we sent to Colorado, show \$125 a ton in antimony and also a heavy percentage of silver.

"The lead is 18 ft. wide on the outcrop, and well defined. Owing to the remote location the property cannot be opened now. What we need is a railway running near there.

"The property is 140 miles up the Fortymile river from Fortymile post, on the bank of the Yukon. That is too long a haul by sleigh to ever pay for handling the material. Since Uncle Sam is building railways in Alaska, he may start one in our direction some day, in which event we would have a chance to market the product of the new strike and other materials of the upper Fortymile. As it is to-day we confine our operations to producing gold, which can be taken out of the country at a profit.

"Quite a number of men are remaining in the Chicken creek and other localities of the upper Fortymile this winter. In coming to Dawson I had to cross country 200 miles, and walked all the way with the exception of the 60 miles from Glacier creek, which I covered by riding in with the mail carrier.

"Snow covers the trail all the way to within two miles of Dawson. From Ten-mile roadhouse out to Glacier the snow is plentiful and the sleighing good. I saw no caribou on the way in. In the Chicken creek district caribou, moose and other game are plentiful, so the miners will not want for fresh meat this winter.

### MOLYBDENITE MINING IN QUEBEC.

Within thirty-five miles from Ottawa, at a distance of two miles from the railway station of Quyon, a remarkable deposit of molybdenite has been developed by Canadian-Wood Molybdenite Co. The first shipment of ore was made in April, and since July 1 the shipments have averaged 250 tons a week of ore containing about 2½ per cent. molybdenite, which, for the three months ending September 30, will total approximately 75 tons of molybdenite. The ore is now being concentrated partly in Ottawa and partly in Denver, Colorado. The product is being shipped to London and to France. A concentrating mill is being put up as fast as possible near the mine.



### ENGLISH AND ENGINEERING.

Many engineers have expressed regret that in their undergraduate days they did not devote more attention to the study of English. The average engineering student is content to get along with as few courses in English as he can and not until too late does he realize that he has neglected to take advantage of a great opportunity.

It seems that the desirability of a good grounding in English is not sufficiently impressed on the student, and that the teachers of English are not overly anxious to have engineers in their classes. In a recent article in "Engineering Education," Mr. H. A. Watt in commenting on this attitude says:

"The English department has never relished the accusation of supereiliousness which some of its friends of the professional schools have implicitly brought against it. And yet in our attitude toward the engineering and agricultural colleges can we be entirely absolved of the charge? Haven't we after all just a trace of academic Pharisaism, a feeling down in our hearts that we cultured ones are a little better than these hewers of wood and drawers of water, who must needs exist, but with whom the less we have to do the better? Aren't we tolerably certain that Keats and cows and Carlyle and carburetors can not by any possibility have a common denominator, and that the 'engineer' who desires a course in Shakspeare or the 'agric' who has the temerity to tackle Browning are to be welcomed, perhaps, but regarded either as possible proselytes to our faith or as students not worthy of serious attention? The demand for the engineering and agricultural sections in freshman English at Wisconsin has never been a very insistent one. On the contrary, there is in the freshman English filing case a request from one of the older instructors in the department for 'all morning sections and no engineers or agrics, please, and this request is, I think, an expression of desire only slightly franker than most English instructors would be willing to make."

Commenting on the period in his college course when an engineering student is likely to reap the best results from a study of English, Mr. Watt says:

"Freshmen in professional courses are not as receptive to liberalizing study as are the seniors. They are narrow in point of view and regard with suspicious jealousy any encroachments upon their 'practical' studies. They fear the Greeks who bear gifts. It would be a difficult task for any English instructor to beat in the Philistinism of a commerce freshman of mine who wrote 'I am taking the commerce course so that when I get out, I can look the other fellow straight in the eye and do him on a strictly legitimate business proposition.' Three years of college might make such a student receptive to higher views; for this particular student the executive committee decided that one year of college life was enough.

"Another handicap is that the freshman's horizon is bounded by the June of his graduation, and his interests have not yet extended to the point at which he comes to have a vital interest in things bigger than his college affairs. The senior, however, realizes that the time of his departure into the great world beyond his graduation is painfully close, and he is beginning already to see the limitations of his college course as a genuine preparation for life. It is the senior in the professional schools, then, who will reap the greatest good from a contact with English as a liberal study.

"To substitute a required senior course for professional students for the freshman English course would

not, however, be wise. No liberal English course for seniors such as I have in mind could be given excepting to students who had received the corrective drill which it is the aim of freshman English to provide."

Mr. Watt says of an advanced course for engineers:

"The course which I have in mind would aim specifically to teach students to think straight rather than to write correctly. Mere correctness of expression is the primary aim of the first semester's drill in freshman English; it would, therefore, be incidental in an advanced course. A liberal course in English composition for seniors in the professional schools should aim to stimulate rather than to impart bare facts. The professional school senior has been pumped full of facts. What he has not received in any definite measure is the ability in connection with abstract ideas to separate fact from theory, to weigh evidence, to recognize authority, to co-ordinate diverse elements, and to generalize safely, to grip, in other words, with any real mental vigor, once outside his world of facts, great questions of human interest. And yet this demand upon his intellect is absolutely certain to be made as soon as he leaves college."

Mr. Watt, who is an instructor in English at the University of Wisconsin, has in mind the engineering schools of the United States. Many of his remarks are, however, applicable to our Canadian institutions, though the tendency to narrowness is perhaps not so strong here as in some American colleges.

### PROFESSORS LECTURE AT THE PAS.

The Pas, Man., Nov. 17.—Mr. J. A. Campbell, Commissioner of Northern Manitoba, returned from Winnipeg on Tuesday. While in the city arrangements were made for a series of lectures on mining and mineralogy, prospecting and kindred subjects, to be delivered in this town, covering a period of about a week, from December 9th to 14th, inclusive. The lectures will be delivered by Professors Wallace and DeLury, of the University of Manitoba. These gentlemen are eminently qualified for the work in question, not only having the technical knowledge but they have a practical knowledge of this northern district, having spent some considerable time examining the mining regions to the north of here, during last summer. They have shown themselves alive to the situation, and have been conducting similar courses of lectures in Winnipeg, which have been largely attended. Owing to the distance from here, it has been impossible for those interested in this district to attend the Winnipeg lectures, and it is for this reason that the above mentioned arrangements have been made. This course will be a great boon to all the people of this northern territory, and especially those who have or expect to have anything directly to do with prospecting and mining developments.

The series will open with a general lecture of a somewhat popular nature, to be held on Saturday evening, the 9th prox., and there will probably be three sessions each day, commencing with the Monday following. The opening lecture, and probably the succeeding evening lectures, will be illustrated with lantern slides.

The gold receipts at the Dominion of Canada Assay Office, Vancouver, B.C., in the month of October totalled 369 deposits, the value of the gold being \$460,685.29, as compared with 238 deposits and a value of \$457,973.58 for the corresponding month of 1915. The increase this year over last was 31 deposits and \$2,711.71 in value.



### SHORTAGE OF MEN IN KOOTENAY, B.C.

A press despatch from Nelson, British Columbia, gives some information relative to the effect of the shortage of working men in East and West Kootenay and Boundary districts of that Province, as follows: Conferences held by Mr. R. F. Green, M.P., National Service Director for British Columbia, with mining men, lumbermen and other large employers of labor in this district have brought out the fact that southern British Columbia is suffering from a shortage of men, which has already reduced the output of raw materials used in war munitions.

On November 15, Mr. Green was in the Crow's Nest district, where he learned that the collieries there need fully 500 more men. The labor shortage has caused an insufficient supply of coke, which has had the effect of closing two copper furnaces at the Trail smelter and one at Grand Forks, while the British Columbia Copper Company at Greenwood would treat more ore and turn out more copper if it could get the coke to run another furnace.

Lumbermen tell a similar story of labor shortage. J. S. Deschamps, of whose production of lumber 80 per cent. is used in mining, told Mr. Green that he needed 100 men, but could get only 15.

Employers of labor without exception have urged that the ban on the admission of workers from the United States be lifted. They say there is no longer any reason for the embargo, which was imposed when hard times produced a flooded labor market.

Every man present at an open conference with Mr. Green expressed his desire to assist the National Board in its work of taking a census of Canada's manpower. Recruiting in Kootenay and Boundary was stopped by the Militia Department several weeks ago because the district had been so drained of men that a serious decrease in the metal output was feared. The district produces zinc, lead and copper, all used in munitions, in addition to gold and silver.

Mr. James J. Warren, managing director of the Consolidated Mining and Smelting Company, told Mr. Green that Canada was saving money through buying metals in the Kootenays. The home production, in addition to permitting the Munitions Commission to make term contracts at favorable prices, prevented Canada being held up by foreign producers.

The British Columbia correspondent of the Canadian Mining Journal writes: "Concerning a reported 'Big Gold Strike Made Near Rossland,' relative to which a press despatch seems to have been given wide publicity, while I have no information, neither in confirmation nor contradiction of the published report, I desire to make known that I was at Rossland and Trail from Tuesday afternoon, October 24, to Saturday evening, October 28, during which time I did not notice any sign of excitement, which if it was general in Rossland on October 18, must have died down quickly, for not any one of the numbers I met in those towns in connection with a meeting of the Western Branch of The Canadian Mining Institute, to attend which I was in that neighborhood, even mentioned the matter to me. While I am not warranted in questioning the truth of the statement that a little high-grade gold ore was found on Murphy creek, as alleged, I think it well to suggest that judgment as to the importance or otherwise of the reported discovery be suspended until such time as its value from an ore-production point of view shall have been vouched for by some responsible official or other person."

### RAMBLER-CARIBOO MINES, LIMITED.

The following information concerning the affairs of the Rambler-Cariboo Mines, Limited, which company has for many years been operating a silver-lead-zinc mine, situated in McGuigan basin, Slocan district of British Columbia, was published on November 1, in Spokane, Washington, in which city is established the head office of the company. The president of the company is Mr. A. F. McClaine, and the statements are reported to have been made by Mr. A. F. McClaine, Jr.

"An addition of approximately \$23,000 will be made to the resources of the Rambler-Cariboo Company in the sale of its zinc concentrates, just made through officers of the company upon which a telegram in confirmation has been received. Also, the company has preliminary notices from the smelting works reporting the treatment of silver-lead ore having a value in excess of \$13,000. Other lots of silver-lead ore have been received at the smeltery or are in transit.

"The sale of the zinc ore was made to the United States Zinc Co., at Denver, Colorado. The lot is of 1,000 tons and it is on a dump at the company's concentrating mill alongside the Kaslo & Slocan railway. The rate of payment will be approximately \$23 a ton, the average content being 34 per cent. zinc and 28 ozs. silver to the ton. Shipments on the 1,000-ton contract will be made to the plant at Blende, Colorado, as soon as railway cars can be obtained for its transportation, the buyer being desirous of early delivery.

"The value of four carloads of silver-lead ore treated in October at Trail, B.C., was, respectively, \$4,200, \$3,600, \$1,100, and \$4,500, a total of \$13,400."

### OBITUARY.

The death occurred at Nanaimo, Vancouver Island, British Columbia, on November 3, of Mr. John Kirkup, Provincial Government Agent and Gold Commissioner for Nanaimo and district, as a result of blood poisoning and diabetes.

The late Mr. Kirkup was born at Kemptville, Ontario, in 1855, his parents being James and Hannah Kirkup, natives of Northumberland, England. He was educated in his native town, removed to Winnipeg, Manitoba, in 1876, and to Victoria, B.C., in 1877. In 1881 he entered the Provincial service at Yale, on the Fraser river. From that time until his death, he filled numerous Government offices at various towns in the Province. After a wide official experience he was appointed, in 1898, Government Agent and Gold Commissioner at Rossland, in which important and flourishing mining camp he had already been stationed three years. His annual reports, as Gold Commissioner, were always carefully prepared, and gave the chief features of the year's progress and results at Rossland mines. Several years ago he was transferred to Alberni, on Vancouver Island, and this year to Nanaimo. In 1891 he married Miss Kerr, daughter of Mr. Robert Kerr, of Kemptville, who with their two sons, survive him.

The Idaho-Alamo groups of mineral claims, on Howson creek, Slocan district of British Columbia, have been bonded by Mr. Clarence Cunningham of Spokane, who was already developing the Wonderful, the Queen Bess, and the Slocan Sovereign mines, all in the same district. The Idaho and Alamo were important producing mines in the nineties; a concentrating mill was put in alongside the railway about a mile below Three Forks, and an aerial tramway was constructed between mines and mill in those early days.



**GOVERNMENT OF THE YUKON.**

Placer claims in the Yukon are held under the provisions of the Yukon Placer Mining Act, a statute of the Dominion House of Commons, while all other classes of mineral rights are administered under the provisions of Orders-in-Council passed by the Government of Canada.

The Yukon Territory Act provides for the appointment of a chief executive officer to be styled and known as the Commissioner of the Yukon Territory. An administrator may also be appointed to execute the office and functions of the Commissioner during his absence or illness or other inability. The Commissioner shall administer the government under instructions from time to time given him by the Governor in Council or the Minister of the Interior. By an order in Council of the 7th July, 1898, the Commissioner has power to suspend any official temporarily pending a decision by the minister of the department to which the suspended officer is attached.

The Yukon Council is composed of ten members elected to represent the electoral districts in the Territory. There are five electoral districts and two members are elected for each district. Any person who is qualified to vote is eligible for election as a member of the Council. All natural born or naturalized British subjects of the full age of 21 years and who have resided in the Territory for a period of twelve months prior to the date of election, shall be entitled to vote.

Every Council shall continue for three years from the date of the return of the writs for the general election, but the Commissioner may dissolve the Council and cause a new one to be elected. The Council shall be convened at least once in every year after the first session thereof.

**COST OF DREDGING IN YUKON.****Working Costs.**

Dredges are operating in the Yukon river in the beds and on the bars of the Klondike river, and also on the placer claims on Bonanza, Eldorado and Hunker creeks. Owing to the difference in the character of the ground, even in the same locality, dredges of the same make and bucket capacity may show entirely different working costs even under the same management.

Having determined the values which the property contains, the prime factor in dredging is to handle a maximum quantity of material in a given time. To accomplish this necessitates the highest percentage in working time.

**Dredging Cost Per Cubic Yard.**

The following figures represent the operating cost of the Yukon Gold Co.'s eight dredges operating on Bonanza, Eldorado and Hunker creeks for one season. The yardage totalled 5,133,575 cubic yards, which produced \$3,343,667, or an average of 65.3c per cubic yard. The average cost, including depreciation, was 29.53c per cubic yard made up as follows. Of the area dredged 68.4 per cent was frozen and had to be thawed by steam.

|                                  |                  |
|----------------------------------|------------------|
| Fixed salaries . . . . .         | \$0.0008         |
| Labor . . . . .                  | .0238            |
| Fuel . . . . .                   | .0009            |
| Shop expense (repairs) . . . . . | .0174            |
| Material and supplies . . . . .  | .0246            |
| Power . . . . .                  | .0021            |
| <b>Total direct . . . . .</b>    | <b>\$ 0.0696</b> |

|   |                 |
|---|-----------------|
| Preliminary (accumulated during closed season) . . . . .            | \$0.0228        |
| Taxes (renewal of grants) . . . . .                                 | .0005           |
| Bullion charges (mint refinery and government gold tax) . . . . .   | .0198           |
| General charges . . . . .   | .0185           |
| Depreciation . . . . .  | .0183           |
| Insurance . . . . .   | .0012           |
| Assay office . . . . .  | .0013           |
| Stables (hauling) . . . . .   | .0021           |
| Maintenance and depreciation of company's telephone lines . . . . . | .0003           |
| Transportation . . . . .  | .0001           |
| Miscellaneous . . . . .   | .0051           |
| <b>Total indirect . . . . .</b>                                     | <b>\$0.0900</b> |

|   |              |
|---|--------------|
| Thawing . . . . .   | \$0.1357     |
| <b>Total operating cost . . . . .</b>                                   | <b>.2953</b> |
| Detail cost per cubic yard for all dredges of the Yukon Gold Co., 1914: |              |

|                                  | Cents per yd. |
|----------------------------------|---------------|
| Fixed salaries . . . . .         | .07           |
| Labor . . . . .                  | 2.51          |
| Fuel . . . . .                   | .05           |
| Shop expense (repairs) . . . . . | .43           |
| Material and supplies . . . . .  | 1.86          |
| Power . . . . .                  | 1.28          |

**Total indirect . . . . . 6.20**

|                                   |      |
|-----------------------------------|------|
| Preliminary . . . . .             | 1.66 |
| Bullion charges . . . . .         | 1.67 |
| General charges . . . . .         | 2.44 |
| Depreciation . . . . .            | 1.67 |
| Insurance . . . . .               | .13  |
| Assay office . . . . .            | .15  |
| Stables . . . . .                 | .23  |
| Company telephone lines . . . . . | .03  |
| Miscellaneous . . . . .           | .05  |
| Development . . . . .             | .50  |
| Dredge construction . . . . .     | .71  |

**Total direct . . . . . 9.24**

Thawing . . . . . 12.18

**Total operating costs . . . . . 27.62**

**BRITISH AMERICA NICKEL.**

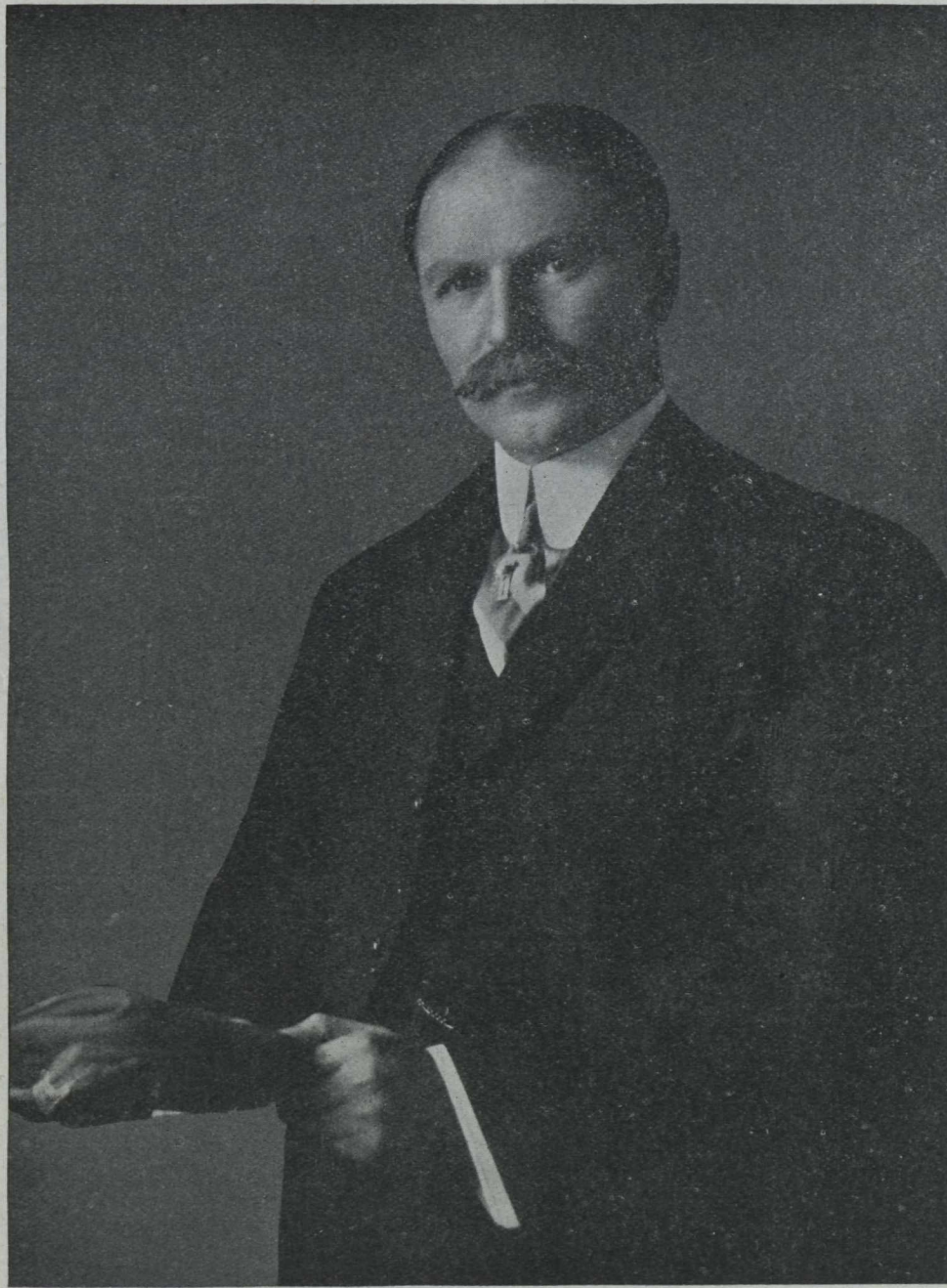
Mr. E. P. Mathewson, recently appointed general manager of the British America Nickel Corporation, is rapidly getting his staff organized, and it is evident that the company intends to go ahead in earnest. It is expected that the site for the company's nickel refinery will soon be selected. Development work is in progress at the Murray Mine, and arrangements are being made for the supply of power. Mr. E. Hibbert is in charge at the mine and has been appointed superintendent of mines. Mr. J. S. H. Wurtele is superintendent of power. Mr. Fred. J. Brule, who was with Mr. Mathewson at Anaconda, has been appointed chief engineer, and has started on his new work. Mr. J. E. McAllister will be consulting engineer.

The new offices of the company will be in the Royal Bank Building, Toronto.





The Honourable W. J. Roche, Minister of the Interior.



George Black, Commissioner of the Yukon Territory.



## PERSONAL AND GENERAL

Mr. Frederick J. Brule has resigned from the staff of the Anaconda Copper Company, to accept the position of chief engineer of the British America Nickel Corporation. He will reside in Toronto. Mr. Brule has been for some years in charge of important work for the Anaconda company.

Mr. J. S. H. Wurtele is superintendent of power for the British America Nickel Corporation.

Mr. E. Hibbert who has returned to Murray Mine after being seriously wounded in France, is now superintendent of mines for the British America Nickel Corporation.

Mr. C. E. Smith was in Toronto last week and is now in New York.

Mr. G. C. Bateman was in Toronto last week.

Mr. Robt. Bryce is in Toronto.

Mr. G. R. Baneroff, stated to represent the Tonopah-Belmont company, has taken a bond on a mining property on the north fork of the Telkwa, in Omineca mining division of British Columbia, owned by Messrs. J. L. Hatch and P. J. Powers.

Mr. W. H. Batty has been superintending work at the Tribune silver-lead mine, a few miles from Ferguson, Lardeau, B.C., for its owners, a Minneapolis company.

Mr. G. O. Buchanan, formerly of Kaslo, B.C., Supervisor of Lead Bounties for the Dominion Government, recently expressed the opinion that the silver-lead-zinc belt in Ainsworth and Slocan mining divisions of British Columbia, which he says offers a splendid field for investment, is now coming into its own with fresh capital available for development and a gradual increase in the amount of "imported money" being expended in it.

Mr. P. W. Clark, of Silverton, Slocan lake, B.C., general manager of the Galena Farm mine and concentrating plant, has returned to the mine from a visit to Spokane, Washington.

Mr. A. D. Cummings, of Duluth, has been investigating mining properties at the head of McGillivray creek, Lillooet mining division of British Columbia.

Mr. O. Drange, of Seattle, Washington, has been looking over a number of mineral claims in the Bella Coola division, British Columbia.

Mr. E. E. Emmons and associates have recently again been giving attention to their placer leases near the junction of Bear creek with Tulameen river, British Columbia.

Mr. W. Gardner, of London, England, secretary of the Tyee Copper Co., is still in Victoria, B.C. He has lately been negotiating with United States men for the sale to them of his company's smelting works at Ladysmith, Vancouver island, B.C.

Mr. W. J. Gifford is in charge of preliminary work being done on the Park group of mineral claims, near Kimberley, East Kootenay, B.C.

Mr. E. Hinman, Jun., stated to be acting for the Lewisohn interests, New York, has bonded a group of mineral claims situated on the Ecstall river, in Skeena mining division, British Columbia, owned chiefly by the estate of the late John Bryden, who was associated with the Dunsmuir coal mining companies on Vancouver island for a number of years.

Mr. J. F. Menzies, one of the best-known coal mine managers in the State of Washington, lately made an

automobile tour through the coal mining regions of Vancouver island, B.C.

Mr. I. L. Merrill, of Los Angeles, California, president of the Hedley Gold Mining Co., early in November paid one of his periodical visits to the company's gold mine and 40-stamp mill in Camp Hedley, Similkameen district of British Columbia.

Major E. C. Musgrave, D.S.O., has been given the rank of Lieutenant-Colonel. He was formerly superintendent of the Tyee Copper Co.'s mine, on Mt. Sicker, Vancouver island, B.C., during its dividend-earning days. Afterward he was mining in Mexico. He was in England when the European war broke out and, having previously had four years' training at the Royal Military College, Kingston, Ontario, he soon obtained a captaincy in the King's Royal Rifles. He has been at the Front for about eighteen months, and during that period has been through some severe fighting, principally in the Ypres salient. He received his majority early last summer and was awarded the Distinguished Service Order.

Mr. W. G. Norrie, who last Autumn went from the staff of the Consolidated Mining and Smelting Co. at Trail, B.C., to superintend mining operations at the Silver Standard mine, near Hazelton, Skeena district, B.C., a short time ago found in that mine a new vein stated to contain 12 inches of solid ore—grey copper and zinc.

Mr. W. H. North, Silverton, B.C., local manager for the Standard Silver-Lead Mining Co., has been on a business visit to Spokane, Washington, and the Coeur d'Alene district of Idaho.

Mr. F. S. Peters, superintendent of the Le Roi mine, has returned to Rossland, B.C., from a visit to Nova Scotia.

Mr. M. E. Purcell, of Rossland, B.C., superintendent of the Consolidated Mining and Smelting Co.'s Centre Star-War Eagle group of mines, was in Spokane, Washington, last month.

Mr. J. C. Ryan, who controls the Soho mine, in Slocan district, British Columbia, has returned to Spokane, from the mine, on which development is being done.

Mr. Frank C. Stockdale is supervising development work on the Sitting Bull claim, in the Windermere mining division, East Kootenay, B.C. This property was recently bonded by Seattle men, who have organized the Sitting Bull Mining Co.

Mr. M. H. Sullivan (B.Sc. McGill, 1904), for several years assistant superintendent of the Consolidated Mining and Smelting Co.'s smelting works at Trail, B.C., has been appointed superintendent of the new smeltery the Bunker Hill and Sullivan Mining Co. is erecting at Kellogg, Idaho. He is expected to assume his new duties about the end of November.

Mr. Raleigh P. Trimble, manager for the Cassiar Crown Copper Co., developing a mining property situated near Telkwa, Omineca mining division of British Columbia, at the beginning of November went to Portland, Oregon, on a visit to his old home there.

Mr. Frederick Bradshaw, of Tonopah, Nevada, general superintendent for the Tonopah Belmont Co., is reported to have stated, after having visited the Surf Inlet gold mine, Princess Royal island, B.C., which his company purchased at the end of 1915, that the property is a valuable one and that he expected it will, when further developed, prove quite up to the expectations of the company.



## SPECIAL CORRESPONDENCE

### BRITISH COLUMBIA.

Dividend payments in the current year by metaliferous mining companies operating in British Columbia totalled \$2,636,100 by the middle of November, and by a coal mining company \$279,567; together \$2,915,667. This total compares with \$1,586,820 for the whole of 1915, and with \$1,689,331 for 1914. Other dividends will be declared before the end of the year, so that a total for 1916 of at least \$3,300,000 is confidently expected.

Cold weather having set in, the year's placer-gold mining season is practically at an end. Newspaper reports from the Atlin field, in the northern part of the Province, make it appear that about \$400,000 is the total value of the season's yield from Atlin creeks. It is likely, though, that the official estimate will be lower than that sum, for it has been stated from time to time that the water supply for hydraulicking was not as plentiful throughout the season as in some other years, the gold recovery in which did not reach so high a total as that above mentioned. Cariboo and Quesnel divisions of the Cariboo district together gave a total value of \$300,000 in 1915; it is not thought probable this year's yield will be higher, but advices as to the result of operations in 1916 have not yet been received.

### East Kootenay.

During the ten expired months of the current year, the total quantity of ore received at the Consolidated Mining and Smelting Co.'s smelting works at Trail from East Kootenay mines was 78,288 tons, which was more than twice as much as during the corresponding period of 1915. This considerable increase, however, was chiefly the result of much enlarged production from the Consolidated Co.'s Sullivan lead-zinc mine, the proportion of which was 76,846 tons. It is pleasing to find, though, that, with the exception of 766 tons from the same company's St. Eugene mine, nearly all the remainder was from mines that were not on the list of producers in 1915. Besides the two mines mentioned, ten properties made shipments to Trail, and since the end of October still another small shipper, from the northern part of the district, has been added to the list. It is evident, therefore, that mining is receiving more attention, and this, too, in parts of the district in which there had not been much, if any, production for a comparatively long while.

Several "bumps" in one of the mines of the Crow's Nest Pass Coal Co.'s Coal Creek colliery, which occurred on November 7, and several later days, have interrupted coal production there. First reports stated that ten men had been caught in the mine, but nine of them made their way out, leaving only one not accounted for, and it is feared that one has lost his life, rock-falls and caves of ground having prevented those who have been trying to find him from getting far into the mine. A press despatch from Fernie on November 14, stated that "this calamity has had the effect of minimizing operations in all mines here and is causing serious interruption in the coal mining industry. There is also a report of another demand from the miners of the district for increased pay, so that the present outlook for that part of the Province is not favorable. To what extent the supply of coke to the smelting works of West Kootenay and Boundary districts will be affected, can not yet be ascertained, but since all the operating smelting works of those districts are already hampered by a

shortage of coke, the probabilities do not seem to be promising for an early improvement in conditions.

### West Kootenay.

**Ainsworth**—Seventeen ore-shippers from this division are on the Trail list as at the end of October, when the year's total of ore received from Ainsworth mines stood at 11,480 tons, as compared with less than 8,000 tons for the corresponding period of 1915. The larger shippers this year have been the Bluebell 4069 tons, Highland 2,645 tons, and No. 1, 2,381 tons. The No. 1 has been inoperative since the end of March, but the Highland, also owned by the Consolidated Company, has been a regular producer for the last six months. The Utica, in the western part of the division, with an output of 839 tons; the Florence, a mile or so north of the town of Ainsworth, with 834 tons; and the Comfort, across Kootenay lake, near the Bluebell, with 435 tons, are the only other shippers worthy of mention, the remaining eleven having all shipped less than 50 tons each. Good progress has been made in driving a long crosscut adit on the Crow Fledgling, this having cut the vein on which drifting is now being done. It has been announced that similar development work will now be undertaken on the Skyline, which is another property owned by Mr. A. W. McCune, of Salt Lake City, Utah, and situated near his Crow Fledgling and Krao mines.

**Slocan**—The ten months' shipments from Slocan mines to the Trail smeltery have totalled 13,300 tons, against less than 11,000 tons in 1915 to the end of October of that year. In addition, much zinc ore and concentrate has been shipped to United States reduction works. Twenty-two mines in Slocan division and four in Slocan City division are on the Trail list of shippers. The standard has made the largest production for the year, with 5,682 tons; the Rambler-Cariboo came next, with 1,598 tons, and then the Galena Farm, with 1,367 tons. Only three others made an output of silver-lead ore above 500 tons, namely the Slocan Star 924 tons, the Ruth 685 tons, and the Lucky Thought 572 tons. The Lucky Jim shipped 607 tons to Trail, chiefly of zinc ore. The Idaho-Alamo group, at the head of Howson creek, has been bonded by Mr. Clarence Cunningham, who is also operating the Queen Bess, Slocan Sovereign, and Wonderful mines. The Chambers group, near Cody, has been bonded, and it is reported the old Washington mine, situated across the gulch from the Rambler-Cariboo group, is to again be worked. Early completion of the new Hydro-electric installation for the Slocan Star is looked for. Shipment of 1,000 tons of zinc concentrate by the Rambler-Cariboo has been arranged for. The opening of a good shoot of galena on the Echo is announced.

**Nelson**—Efforts are being made to obtain the establishment of a custom stamp mill near Nelson. The Athabasca gold mine is to be again worked after having been idle for years. A neighbouring property, the California, is to be supplied with compressed air, for power uses, from the Athabasca mill. The development of the Granite-Poorman mines is being continued. The Eureka Co. is now operating the copper mine of that name, those who had been working it under option of purchase having relinquished their bond; shipment of ore to trail is to be resumed. The Silver King, on Toad Mountain, a few miles from Nelson, which has lain unworked for more than two years, is



to be further developed; during eight months of 1914, until shortly after the outbreak of the European war, 13,457 tons of silver-copper ore from this mine was shipped to Trail, but none since then. On the Fog Horn, in Ymir Camp, diamond-drilling is being done. The Relief, in Erie camp, is now operating a tube-mill at its stamp mill, also a cyanide plant. Molybdenite ore is being shipped from the Molly, situated in the southern part of Nelson mining division, to the works of the International Molybdenum Co., at Renfrew, Ontario; a published report states that three cars of ore have been shipped in the first half of November.

**Rossland**—The total quantity of ore shipped to Trail from Rossland mines in 1916 to the end of October was 269,287 tons; the proportions were: Centre Star-War Eagle group 150,935 tons, Le Roi 104,271 tons, Le Roi No. 2 (Josie) 13,957 tons, and Velvet 124 tons. Now that the coke supply is insufficient to allow of all the copper blast furnaces to be operated at the Trail smelting works, the Consolidated Co. has reduced the number of miners employed in its Rossland mines, and some of those not required there have gone to the company's Sullivan mine in East Kootenay.

**Trail**—The total quantity of ore received at the Trail smelting works during ten months of 1916, ended October 31, was 416,554 tons. The following summary shows the districts and mining divisions from which the ore was shipped to Trail: East Kootenay, 78,288 tons. West Kootenay: Ainsworth division, 11,480 tons; Slocan and Slocan City divisions 13,300 tons; Nelson division, 3,472 tons; Arrow Lake division, 8 tons; Trail Creek division (Rossland mines), 269,287 tons; Trout Lake division, 101 tons; Revelstoke division, 415 tons. Boundary: Grand Forks division, 7,010 tons. Yale: Nicola division, 298 tons; Ashcroft division, 41 tons; Kamloops division, 2,779 tons. Omineca division (Skeena), 603 tons. Alberta, 52 tons. Ontario, 268 tons. United States, 29,132 tons. Of the total, mines operated by the company sent 345,722 tons, and the remaining 70,832 tons was of custom ores.

#### **Alice Arm, Skeena Division.**

The Esperanza group, also known as the Spanish group, has been bonded by a syndicate stated to be of men identified with the Granby Consolidated Co. Buildings and tramway are being put in order, preliminary to doing more development work. The chief value in the ore is reported to be in silver.

A compressor has been taken in for use on the Dolly Varden group of six claims, under bond to Mr. R. B. McGinnis, of San Francisco. A sawmill has also been put in. Work done in 1915 opened much fine silver ore on this property. This year's developments are reported to be satisfactory.

Work has been suspended by Messrs. Stilwell Brothers, of Seattle, Washington, on their molybdenum property, pending necessary changes and additions to the plant already installed.

#### **Atlin.**

The agent at Atlin for the White Pass & Yukon route said recently that while many of the younger men of Yukon Territory and Northern British Columbia had volunteered for service in the European war, and were either at the front or in training preparatory to going there, the mining industry continues to be in a flourishing condition in Atlin camp. Most of the larger mining companies have been working to capacity during the 1916 season, and considerable attention has been

given to the placer claims on Spruce creek and other gold-bearing streams in Atlin district. Lately, however, the customary Fall exodus had been taking place, and the last two steamers out had taken about 100 people, most of whom were men who had spent the summer and early autumn at mining work and were now going to various Coast places for the winter.

Occasional carload shipments of hydromagnesite are being made from Atlin, near which town there is a deposit owned by Messrs. Armstrong & Morrison, of Vancouver. Another Atlin product that has lately been attracting attention is lode gold from the Engineer mine, rich specimens of which have lately been exhibited in the Hotel Vancouver, Vancouver City, by Capt. J. Alexander, who is reported in newspapers to have stated that "not so long ago he refused \$2,500,000 for the property which he expects will, in the course of a few years, yield him something like \$1,000,000 per annum." That kind of talk seems to make acceptable "copy" for some of the newspapers.

#### **General Notes.**

The Kitchener and North Star mineral claims, on Kuskanook mountain, three miles from Sirdar, which is near the western terminus of the Crowsnest railway, have been bonded by Calgary men, who are erecting buildings for the accommodation of miners they will keep employed on development work throughout the winter. Silver-lead ore occurs on these claims.

Mr. J. A. Schubert, of Tulameen City, who during last season did some placer-mining on Tulameen river, above Otter flat, has sent out 15 oz. of gold and 20 oz. of platinum. For one-half of the platinum, last sent out, he received at the rate of \$62.50 per ounce.

The West Kootenay Power and Light Co. has completed and put in operation at one of its Bonnington Falls hydro-electric power-generating stations another 10,000-h.p. unit; this addition brings the available power up to 40,000 horse-power; the increase has been made to provide for the enlarged demands from the Consolidated Mining and Smelting Co.'s reduction and refining works at Trail, and for district mining and smelting industries generally.

In several of the older mining districts of the Province attention is being given to the development of properties on which little or no work had been done for years. This applies to East Kootenay, in both Fort Steele and Windermere mining divisions; to some parts of West Kootenay; to Yale district, in Nicola valley, Kamloops division, and in the mountains about Hope; and in some measure to the Coast district, which is showing progress in a similar direction.

#### **East Kootenay.**

The Sullivan mine is the chief ore producer in this district, its output far exceeding that of the combined production of all other metalliferous mines in the district. For thirteen weeks ended October 21, the total quantity of ore received at Trail from all mines in East Kootenay was 37,823 tons, of which quantity 37,114 tons was from the Sullivan, leaving only 709 tons from all other mines. This large disparity may be expected to be continued for some years, since there is not at the present time any large body of ore opened elsewhere in East Kootenay.

A find of copper ore is reported to have been made on a claim on the middle fork of Spillimacheen river, in Northeast Kootenay. The locality is stated to be 22 miles west of Carbonate, and it is reached by pack trail.



**West Kootenay.**

**Ainsworth.**—The output of ore is not now large, but a number of mines are being developed. Progress is being made with the construction and equipment of the concentrating mill for the Florence Mining Co. The Bluebell and Comfort, on the east side of Kootenay lake, continue to ship lead ore to Trail. In the western part of the Ainsworth division, the Utica is now doing well, and the development of the property at greater depth is shortly to be undertaken, the driving of an adit at a lower level having been resolved on.

Mr. W. J. McMillan, of Vancouver, is continuing his efforts to make arrangements that will render it practicable for him to ship antimony ore from the Alps-Alturas property, situated in the mountains above Three Forks and distant about ten miles from that place. The Kaslo "Kootenaiian" recently published the following information: "Mr. McMillan is still endeavoring to arrange for a market for his product, but is handicapped by reason of the fact that there are no smelting facilities in Canada for treating this class of ore. The Alps-Alturas property was examined recently by Dr. W. F. Ferrier, on behalf of the Dominion Government.

**Lardeau.**—Dr. W. H. Willson, who in partnership with Mr. H. Y. Anderson, is operating the Beatrice mine, near Camborne, in the Fish river region of the Lardeau division, has given the Nelson "Daily News" the following particulars: "Remodelling of the tramway for shipment of ore from the Beatrice mine has been completed, and about two carloads of ore have already been taken out. The ore is being mined from a 4 ft. 6 in. shoot of rich gray copper ore on No. 1 level, and from 2 ft. 6 in. of steel galena on the intermediate level between Nos. 1 and 2. The gray copper assays about 100 oz. of silver to the ton and the steel galena 90 oz. silver, 25 per cent lead, and 28 per cent zinc. It is intended to ship the galena to Mr. M. S. Davys' magnetic separator, concentrator, and flotation plant at Kaslo, where a lead-silver and a zinc-silver concentrate will be produced. Twelve men are employed at the Beatrice; the number will be increased to 25 when rawhiding down the mountain shall be undertaken. Andy Daney, of Trout lake, has the contract for rawhiding, which is expected to be commenced about November 15.

**Coast District.**

Much activity continues to be manifested in connection with the further extensive development of the Britannia Mining and Smelting Co.'s mining and milling properties in Vancouver mining division. Considerable quantities of mine and mill supplies are being received, as for several years past, and the number of men employed by the company is still large.

A most unlikely story relative to the value of copper ore reported to have been discovered recently near Cowichan lake, Vancouver Island, has been published in Provincial newspapers lately. The following excerpt is from the Vancouver "Sun": The most conservative reports of the property tend to show that there are three veins running throughout the length of seven claims registered. One of these is computed to be 60 ft. in width, another 40 ft., and a third 30 ft. Even the outcropping, taking the average of the three veins, has assayed 8 per cent pure copper, and Mr. C. H. Dickie, possibly the most expert man who has ever handled copper properties in Canada, declares that this property will prove to be fully the equal of

the Granby mines, and infinitely superior to either the Flora or Tyee properties." While there is no reason to suppose that picked specimens of ore from this or any other deposit of copper ore will not give an assay return of 8 per cent copper, the statement that the average of the "outcropping" of three veins totalling 130 feet in width is as high as that, if supposed to be made by a dependable assayer, may be taken to be a simple fabrication. Further, the opinion may be given with confidence that Mr. C. H. Dickie, who has long been known as a very careful and conservative man in his statements for publication, and who certainly is likely to resent being styled "the most expert man who has ever handled a copper property in Canada" since he makes no such claims to such a distinction, and such a designation can only bring ridicule upon him, made no such statement as that attributed to him, for he knows far better than to compare an undeveloped prospect with such a property as that of the Granby Co. with its estimated reserves of nearly 20,000,000 tons of ore. It is a great pity city dailies publish such fiction as mining news.

**TORONTO MARKETS.**

Cobalt oxide, black, \$1.05 per lb.  
 Cobalt oxide, grey, \$1.15 per lb.  
 Cobalt metal, \$1.25 to \$1.50 per lb.  
 Cobalt anodes, \$1.50 to \$1.75 per lb.  
 Nickel metal, 45 to 50 cents per lb.  
 White arsenic, 5½ to 6 cents per lb.  
 Nov. 24.—(Quotations from Canada Metal Co., Toronto)—  
 Spelter, 16½ cents per lb.  
 Lead, 9 cents per lb.  
 Tin, 49 cents per lb.  
 Antimony, 18 cents per lb.  
 Copper, casting, 34 cents per lb.  
 Electrolytic, 38 cents per lb.  
 Ingot brass, yellow, 19 cents; red, 24 cents per lb.  
 Nov. 24.—(Quotations from Elias Rogers Co., Toronto)—  
 Coal, anthracite, \$9.00 per ton.  
 Coal, bituminous, \$10.00 per ton.

**SILVER PRICES.**

|                   | New York,<br>cents. | London,<br>pence. |
|-------------------|---------------------|-------------------|
| November 9th..... | 71¾                 | 34¼               |
| " 10th.....       | 71¾                 | 34¼               |
| " 11th.....       | 71½                 | 34⅞               |
| " 13th.....       | 71¾                 | 34⅞               |
| " 14th.....       | 71¾                 | 34⅞               |
| " 15th.....       | 71¾                 | 34⅞               |
| " 16th.....       | 71¾                 | 34                |
| " 17th.....       | 71¾                 | 34                |
| " 18th.....       | 71¾                 | 34⅞               |
| " 20th.....       | 72¼                 | 34¾               |
| " 21st.....       | 72½                 | 34⅞               |
| " 22nd.....       | 72¾                 | 34⅞               |

**MOLYBDENITE PRICES.**

Schedule of prices per unit (20 lbs.) of Molybdenite in ore delivered at concentrator, Renfrew.  
 Ores carrying between 2% and 3% MoS<sub>2</sub>, \$13.00 per unit.  
 Ores carrying between 3% and 5% MoS<sub>2</sub>, \$14.50 per unit.  
 Ores carrying between 5% and 10% MoS<sub>2</sub>, \$16.00 per unit.  
 Ores carrying between 10% and 15% MoS<sub>2</sub>, \$17.00 per unit.  
 Ores carrying between 15% and 20% MoS<sub>2</sub>, \$18.00 per unit.  
 80% concentrates \$1.00 lb. of MoS<sub>2</sub>.  
 Penalties imposed for copper and bismuth.



## MARKETS

## NEW YORK MARKETS.

Nov. 23—Connellsville Coke—

Furnace, spot, \$6.50 to \$7.00.

Furnace, contract, nominal, \$4.00.

Foundry, prompt, \$9.50 to \$10.00.

Foundry, contract, \$5.50 to \$6.50.

Straits tin, f.o.b., 45.62½ cents.

Copper—

Prime Lake, nominal, 33.50 to 34.00 cents.

Electrolytic, nominal, 33.50 to 34.00 cents.

Casting, nominal, 32.50 to 32.75 cents.

Lead, Trust price, 7.00 cents.

Lead, outside, 7.20 to 7.25 cents.

Spelter, prompt western shipment, 12.67½ to 12.92½ cents.

Antimony—

Chinese and Japanese, nominal, 14.50 cents.

Aluminum—nominal—

No. 1 Virgin, 98-99 per cent., 64 to 66 cents.

Pure, 98-99 per cent. remelt, 58 to 60 cents.

No. 12 alloy remelt, 45 to 47 cents.

Powdered aluminum, \$1.00 to \$1.15.

Metallic magnesium, 99 per cent. plus, \$3.50.

Nickel—

Shot and ingot, 45 cents.

Electrolytic, 50 cents.

Cadmium, nominal, \$1.45 to \$1.50.

Quicksilver, \$80.

Platinum, \$105.

Cobalt (metallic), \$1.50.

Tungsten ore, per unit, 16 to 17 cents.

Silver (official), 72¾ cents.

Metal Products.—Following base prices represent mill quotations:—

Sheet copper—

Hot rolled, 41 cents.

Cold rolled, 42.00 cents.

Copper wire, 40 cents.

Copper wire, January, 38.75 cents.

Full lead sheets (f.o.b. mill), 8.50 cents.

Cut lead sheets (f.o.b. mill), 8.75 cents.

Sheet zinc (f.o.b. smelter), 19 cents.

London—by cable—

Standard tin, spot, £191.

Standard tin, futures, £193.

Straits tin, spot, £191.

Easter price c.i.f. London—delayed.

Standard copper, spot, £144.

Standard copper, futures, £139 10s.

Electro copper, spot, £164.

Spelter, spot, £57.

Spelter, futures, £55.

Lead, spot, £30 10s.

Lead, futures, £29 10s.

Silver (official), 34¾d.

Ferromanganese—

Prompt (f.o.b. seaboard), \$162 to \$165.

Imported on contract, \$164.

Domestic on contract, \$162 to \$165.

Ferrosilicon, 50 per cent.—

Eastern freight allowed. Prices nominal.

600 ton lots, \$90.

100 ton lots, \$91.

Carload lots, \$92.

For 1917 contracts 50 per cent., carload lots, \$100.

## STOCK QUOTATIONS.

(By courtesy of J. P. Bickell &amp; Co., Toronto.)

As of close November 23rd, 1916.

## New York Stocks.

|                             | Bid.  | Asked. |
|-----------------------------|-------|--------|
| Can. Car. . . . .           | 40.00 | 50.00  |
| Curtiss Aeroplane . . . . . | 25.00 | 30.00  |

|                                      |       |       |
|--------------------------------------|-------|-------|
| Can. Copper . . . . .                | 2.06  | 2.18  |
| Canada Cement . . . . .              | 68.00 | 72.00 |
| Howe Sound . . . . .                 | 7.50  | 8.00  |
| International Nickel (new) . . . . . | 46.50 | 46.75 |
| Kennecott Copper . . . . .           | 57.75 | 59.00 |
| Midvale Steel . . . . .              | 69.25 | 69.50 |
| Marconi. . . . .                     | 3.12  | 3.37  |
| Steel of Canada . . . . .            | 75.00 | 80.00 |
| Steel and Radiation . . . . .        | 35.00 | 45.00 |
| Submarine Boat . . . . .             | 41.00 | 42.00 |
| Tonopah Extension . . . . .          | 5.25  | 5.50  |

## Porcupine Stocks.

|                              | Bid.  | Asked. |
|------------------------------|-------|--------|
| Apex . . . . .               | .087½ | .09    |
| Dome Extension . . . . .     | .28½  | .29½   |
| Dome Lake . . . . .          | .60½  | .61    |
| Dome Mines . . . . .         | ...   | 23.50  |
| Eldorado. . . . .            | ...   | .00½   |
| Foley O'Brien . . . . .      | .70   | ...    |
| Gold Reef . . . . .          | .04½  | .05    |
| Hollinger. . . . .           | 6.95  | 7.00   |
| Jupiter. . . . .             | .27½  | .28    |
| McIntyre. . . . .            | 1.77  | 1.78   |
| McIntyre Extension . . . . . | .51   | .53    |
| Moneta. . . . .              | .15½  | .17    |
| Davidson. . . . .            | .63½  | .64    |
| Porcupine Crown . . . . .    | .69½  | .70    |
| Porcupine Imperial . . . . . | .03   | .03½   |
| Porcupine Tisdale . . . . .  | .00¾  | .01½   |
| Porcupine Vipond . . . . .   | .37½  | .39    |
| Preston East Dome . . . . .  | .03¾  | .04    |
| Lally Gold Mines . . . . .   | .15   | .15½   |
| New Ray . . . . .            | ...   | 1.15   |
| Bonanza. . . . .             | ...   | .12½   |
| Kenabeek. . . . .            | .24½  | .25    |
| Teck Hughes . . . . .        | .55   | .57    |
| Schumacher. . . . .          | .70   | .71½   |
| West Dome . . . . .          | .34   | .34½   |
| Inspiration. . . . .         | .20   | .30    |

## Cobalt Stocks.

|                                 | Bid.  | Asked. |
|---------------------------------|-------|--------|
| Adanac. . . . .                 | .25   | .30    |
| Bailey . . . . .                | .07½  | .08    |
| Beaver . . . . .                | .45½  | ...    |
| Buffalo. . . . .                | 1.05  | 1.25   |
| Chambers Ferland . . . . .      | .17½  | .18    |
| Coniagas. . . . .               | 4.85  | 4.90   |
| Crown Reserve . . . . .         | ...   | .45    |
| Foster. . . . .                 | .03   | .06    |
| Gifford. . . . .                | .04   | .05½   |
| Gould . . . . .                 | .00¼  | .00¾   |
| Great Northern . . . . .        | .09½  | .09¾   |
| Hargreaves . . . . .            | .04¾  | .05½   |
| Hudson Bay . . . . .            | 61.00 | 75.00  |
| Kerr Lake . . . . .             | 4.95  | 5.00   |
| La Rose . . . . .               | .52   | .60    |
| McKinley. . . . .               | .60   | .62    |
| Nipissing . . . . .             | 8.90  | 9.12½  |
| Ophir. . . . .                  | .11   | .11¼   |
| Peterson Lake . . . . .         | .18   | .18½   |
| Right of Way . . . . .          | .05¼  | .05½   |
| Rochester. . . . .              | .03½  | ...    |
| Seneca Superior . . . . .       | ...   | .07    |
| Shamrock Consolidated . . . . . | .17   | .17½   |
| Silver Leaf . . . . .           | .01½  | .01¾   |
| Temiskaming. . . . .            | .65½  | .66    |
| Trethewey. . . . .              | .17   | .17½   |
| York Ontario . . . . .          | .01¼  | ...    |
| Wettlaufer. . . . .             | .08½  | .09    |
| Lorrain. . . . .                | .50   | ...    |
| White Reserve . . . . .         | .35   | .35½   |



# PROFESSIONAL DIRECTORY.

## ENGINEERS, METALLURGISTS AND GEOLOGISTS

### Canadian Inspection and Testing Laboratories, LIMITED

Canadian Express Bldg., Montreal, Que.

Inspecting and Metallurgical Engineers.  
Consulting and Analytical Chemists.

Assays of Ores.

Tests of Materials.

Inspection of Mining Equipment.

BRANCH OFFICES :

Toronto, Winnipeg, Edmonton, Vancouver, New Glasgow

### COHEN, SAMUEL W., E. M.

Consulting Engineer,  
Room 601, Dom. Express Bldg. Montreal

General Manager,  
Crown Reserve Mining Co. Ltd.  
Cobalt, Can.

H. J. Griswold,  
Montreal.

B. W. Seton,  
Toronto.

### Dominion Engineering & Inspection Co.

INSPECTING and TESTING ENGINEERS

Inspection and Tests of Materials  
Supervision of Manufacture

MONTREAL

320 Lagauchetiere St. West.

Toronto

24 Adelaide St. East.

Winnipeg

707 Union Trust Bldg.

### THE DORR COMPANY

John V. N. Dorr, President

Hydrometallurgical and wet Chemical Engineers.

DENVER NEW YORK LONDON E.C.  
Cooper Bldg. 17 Battery Place 16 South St.

### FERRIER, W. F.

Consulting Mining Engineer  
and Geologist

204 LUMSDEN BLDG., TORONTO, ONT.

### FORBES, D. L. H.

Mining & Metallurgical Engineer  
Chuquicamata, Chile

Chief Construction Engineer for  
Chile Copper Co.

Cable Address : Codes : Broomhalls  
"Lindsey" Western Union

G. G. S. Lindsey, K.C.  
BARRISTER, SOLICITOR, Etc.

Bank of Toronto Building - TORONTO  
Special attention given to  
Mining Law.

Phone Adelaide 1032.

### HITCHCOCK C. H.

Mining Engineer

Mines examined with a view to purchase

COPPER CLIFF, ONT.

A. M. Can. Soc. C. E.

M. Am. I. M. E.

### CHAS. J. MURPHY

Mining Engineer

Reports, Surveys, Plans, Estimates, Specifications,  
Design and Supervision

Formerly Chief Engr. 1911-16 The Crow's Nest Pass  
Coal Co., C.N.P. El. Light and Power Co., The  
Morri sey, Fernie and Michel Railway.

22 NOVA SCOTIA BANK BLDG. ST. CATHARINES, ONT., CAN.

### SPEARMAN CHAS., B.Sc., M.A.

Mining Geologist and Engineer

Structural geology problems relating to  
ore deposits, examinations, reports,  
petrographical examinations, radio-ac  
tive tests, etc. Box 413, Haileybury, Ont.

### SMITH, SYDNEY.

Mining Engineer,

HAILEYBURY, ONT.

### TYRRELL, J. B.

Mining Engineer,

534 Confederation Life Building,

TORONTO, - - CANADA.

### SMITH & DURKEE Diamond Drilling Co. LIMITED

Contractors for all classes of dia  
mond drill work.

We make a specialty of saving a  
large percentage of core in soft  
ground.

Plans showing location of holes  
and surveys of holes can be  
supplied.

SUDBURY - ONT.

### HASSAN, A. A.,

Mining Geologist and Consulting  
Engineer.

SUITE 203-204 RIGGS BLDG.,  
WASHINGTON, D.C.

## LAWYERS

Telephone Main 3813 Cable Address: "Chadwick" Toronto  
Western Union Code

E. M. Chadwick, K.C. Beatty, Blackstock, Fasken  
David Fasken, K.C. Cowan & Chadwick  
M. K. Cowan, K.C. Barristers, Solicitors, Notaries  
Harper Armstrong Offices: Bank of Toronto,  
Alexander Fasken Cor. Wellington & Church Sts.  
Hugh E. Rose, K.C. 58 Wellington St. East  
Geo. H. Sedgewick Toronto  
James Aitchison

## ASSAYERS, CHEMISTS AND ORE TESTERS.

### MILTON HERSEY CO., LTD.

Chemists and Mining Engineers

Assays of Ores Tests of all Materials

DR. MILTON L. HERSEY, President

(Consulting Chemist to Quebec Government)

JAMES G. ROSS

Consulting Mining Engineer

HEAD OFFICE: 84 St. Antoine St., MONTREAL

Phone M. 1889 Cable address "Heys"  
Established 1873.

### HEYS, THOS. & SON,

Technical Chemists and Assayers,

Rooms M and N, Toronto Arcade  
Yonge Street, Toronto, Ont.  
Sampling Ore Deposits a Specialty.

### 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

### Canadian Laboratories, Ltd.

ASSAYERS AND CHEMISTS

24 Adelaide St. West

"WE ANALYSE ANYTHING" TORONTO

SPECIAL RATES SEND FOR PRICES PHONE MAIN 5063

### 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.

### CAMPBELL & DEYELL, Limited

Ore Samplers, Assayers

Head Office & Works  
Cobalt, Ontario

L. M. CAMPBELL,  
General Manager.

Mechanical selection of samples from  
shipments of any size and quality

Phone Main 2311 Cable Address  
"Segsworth" Toronto

### R. F. SEGSWORTH

Barrister, Solicitor, Notary, Etc.

JARVIS BUILDING

103 Bay Street - TORONTO



### 3 Mining Claims

120 Acres Patented  
Will Sell or give Working Option

These claims are located in the Township of Auld, Lot 1, Concession 1 and are approximately 16 miles from Latchford, on the Montreal River Claims numbers 7111, 1866½, 1867½. One Claim corners on Montreal River.

These properties can also be reached by wagon road from Haileybury. Assays show Silver Cobalt and Arsenic. Free silver has been found on properties in the immediate vicinity. Maps and other information as to work already done on the property can be obtained applying to

**John Bourke**

Secy. Auld Silver Mines Limited  
P. O. Box 6 North Bay, Ont.

### MINING CLAIMS

We have for sale Gold, Silver, Copper, Lead and Molybdenite properties. Further particulars upon request.

**A. S. FULLER & CO.**

STOCK AND MINING BROKERS  
South Porcupine and Timmins, Ont.

### WIRE ROPE

FOR SALE.—6000 feet  
1-inch Improved Plow  
Steel Allan Whyte rope.

**EUSTIS MINING CO.**  
EUSTIS, QUE.

### FOR SALE

13.67 Tons of 20 lbs Steel Rails, 200  
Fish plates for same. For particulars  
apply:—

**H. A. Steven, 230 Stuart Street**  
Kingston, Ont.

### Keep Posted on Porcupine

By subscribing to

### The Porcupine Advance

The only full sized newspaper printed on the ground  
SUBSCRIPTION RATES  
Canada, \$2.00. United States \$3.00.  
Sample copy on request

### MACHINERY FOR SALE

1-30 H.P. 750 r.p.m. 220 volts, A.C.  
B. squirrel cage motor with base,  
pulley and starter.

Price.....\$321.20

1-20 H.P. 750 r.p.m. C.G.E. squirrel  
cage motor, 220 volts, with  
base and pulley. Price, \$247.50

1-15 H.P. 1500 r.p.m. 220 volts,  
Westinghouse type "C" motor.  
No base, pulley or starter.

Price.....\$231.00

1-3 H.P. 750 r.p.m. Westinghouse  
"CCL" with pulley and base.

Price.....\$80.85

THE EUSTIS MINING CO. - EUSTIS, QUE.

### Reliable News

If you want all the  
news of the gold and  
silver camps of  
Northern Ontario,  
subscribe to

### The Northern Miner

**RICHARD PEARCE, Editor.**  
Head Office :  
Cobalt

### Smith & Travers Diamond Drill

Company, Limited

Box 169, SUDBURY, ONT.

All classes of Diamond Drilling done.

Engineer's Reports on All Work, Furnished.

**TO LEASE.**—Large Hematite property, also a trap rock property, a pyrite property and two properties containing gold, silver and copper. The properties are located about 104 miles from Toronto. Apply to **JOHN SEABROOK, Preneveau, Ontario, Can.**



The Babbitt Metal that's at the  
Front in Efficiency and Economy

## HARRIS HEAVY PRESSURE

"The Babbitt Metal Without a Fault" is guaranteed to give EXCELLENT SERVICE. It will not crack or squeeze out. It will run cool at any speed. It is copper coated and copper hardened. It is best for all general machinery bearings. Order a box from your dealer or from our nearest factory.

It is Made in Canada. What We Make We Guarantee.  
We Manufacture All Grades of Babbitt Metals.

WRITE FOR COMPLETE LIST

## THE CANADA METAL COMPANY, Limited

Head Office and Factory TORONTO

Branch Factories: HAMILTON, MONTREAL, WINNIPEG, VANCOUVER.



**BUYERS AND SELLERS OF METALS**

**The Consolidated Mining and Smelting Company of Canada, Limited**

Offices, Smelting and Refining Department  
**TRAIL, BRITISH COLUMBIA**

**SMELTERS AND REFINERS**

Purchasers of all classes of Ores.  
Producers of Fine Gold and Silver, Base Bullion, Copper Matte, Pig Lead, Lead Pipe, Bluestone and Electrolytic Bearing Metal.

**Oldest Experts in**

Molybdenite  
Scheelite  
Wolframite  
Chrome Ore  
Nickel Ore  
Cobalt Ore  
Cerium, and  
all Ores  
and  
Minerals

**GEO. G. BLACKWELL, SONS & CO., Limited**  
*Metallurgists, Mine Owners, Merchants, Manufacturers*  
**THE ALBANY, LIVERPOOL, ENGLAND**

Talc  
Mica  
Barytes  
Graphite  
Blende  
Corundum  
Fluorspar  
Feldspar

Largest Buyers, Best Figures, Advances on Shipments, Correspondence Solicited  
Cables—Blackwell, Liverpool, ABC Code, Moreing & Neal Mining and General Code, Lieber's Code, and Muller's Code.  
ESTABLISHED By GEO. C. BLACKWELL, 1869

**HENRY BATH & SON, Brokers**  
London, Liverpool and Swansea

ALL DESCRIPTION OF **METALS, MATTES, Etc.**

Warehouses, LIVERPOOL and SWANSEA.  
Warrants issued under their Special Act of Parliament.

**NITRATE OF SODA.** Cable Address, BATHOTA, London

**Deloro Mining and Reduction Co., Ltd.**

Smelters and Producers of

**Cobalt Oxide and Metal  
Nickel Oxide and Metal  
Refined White Arsenic  
"STELLITE"  
High Speed Tool Metal**

Head Office and Works : DELORO, Ont.  
Branch Office : Room 1111 C.P.R. Bldg., Toronto

**C. L. CONSTANT CO.,**

42 New Street - New York

**SHIPPERS' AGENTS**

FOR

**Selling, Sampling and Assaying Ores,  
Metals and Furnace Products**

Entire charge taken of shipments from the receipt of bill of lading to the collection of smelter's return

NOT CONNECTED WITH ANY SMELTER

Canadian Representative :  
G. C. BATEMAN - Traders Bank Building, Toronto

**Balbach Smelting and Refining Co.  
Newark, N. J.**

Buyers of

Gold, Silver, Lead and Copper Ores.  
Lead Residues and Copper Residues.

**Electrolytic Copper Refinery**

INQUIRIES SOLICITED

**The Coniagas Reduction  
Company, Limited.**

St. Catharines - Ontario

**Smelters and Refiners of Cobalt Ores**

Manufacturers of

**Bar Silver, White Arsenic, Cobalt Oxide and  
Nickel Oxide**

Telegraphic Address : Codes : Bedford McNeill  
"Coniagas" A.B.C. 5th Edition  
Bell Telephone 603, St. Catharines





# Blasting      Accessories

**E. B. Caps**      Made in No. 6, No. 7 and No. 8 strengths. No. 8 being twice as strong as No. 6. We strongly recommend our strong blasting caps. They more than pay for themselves in decreasing fume and getting increased work from the explosive.

**Blasting Machines**      Made to explode from 10 to 150 E.B. Caps. These batteries are made with particular care and can be absolutely depended upon to do the work.

**Connecting Wire**      Our Connecting Wire is especially adapted for our E. B. Caps. Experience has proved that its capacity to carry ample current for a large number of caps makes large blasts successful.

**Leading Wire**      Made single and double strand. Our single strand leading wire is made of copper wire, is well insulated and adapted for use in larger blasts. Double strand insulating wire is found convenient for use in mines or other places where wires have to be moved frequently.

WE SUPPLY ALL OTHER ACCESSORIES  
NECESSARY FOR BLASTING

## Canadian Explosives Limited

Head Office      -      -      -      MONTREAL, P.Q.  
Main Western Office      -      VICTORIA, B.C.

### DISTRICT OFFICES:

|                   |            |           |                  |              |   |               |
|-------------------|------------|-----------|------------------|--------------|---|---------------|
| NOVA SCOTIA:      | -          | -         | -                | -            | - | Halifax       |
| QUEBEC:           | -          | -         | -                | -            | - | Montreal      |
| ONTARIO:          | Toronto,   | Cobalt,   | South Porcupine, | Port Arthur, | - | Ottawa        |
| MANITOBA:         | -          | -         | -                | -            | - | Winnipeg      |
| ALBERTA:          | -          | -         | -                | -            | - | Edmonton      |
| BRITISH COLUMBIA: | Vancouver, | Victoria, | Nelson,          | -            | - | Prince Rupert |

### Factories at

|                  |                    |                     |
|------------------|--------------------|---------------------|
| Beloil, P.Q.     | Vaudreuil, P.Q.    | Windsor Mills, P.Q. |
| Waverley, N.S.   | James Island, B.C. | Nanaimo, B.C.       |
| Northfield, B.C. | Bowen Island, B.C. | Parry Sound, Ont.   |



# The Canadian Miners' Buying Directory.

- Air Hoists—**  
Canadian Ingersoll-Rand Co., Ltd.
- Amalgamators—**  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.
- Antimony**  
Canada Metal Co., Ltd.
- Assayers and Chemists—**  
Milton L. Hersey Co., Ltd.  
Campbell & Deyell, Cobalt  
Ledoux & Co., 99 John St., New York  
Thos. Heys & Son.  
C. L. Constant Co.
- Assayers' and Chemists Supplies—**  
C. L. Berger & Sons, 37 William St., Boston, Mass.  
Lymans, Ltd., Montreal, Que.  
Stanley, W. F. & Co., Ltd.
- Babbitt Metals**  
Canada Metal Co., Ltd.
- Ball Mills—**  
Fraser & Chalmers of Canada, Limited.
- Belting—Leather, Rubber and Cotton—**  
Northern Canada Supply Co.  
Jones & Glassco
- Blasting Batteries and Supplies—**  
Can. Ingersoll-Rand Co., Ltd.  
Curtis & Harvey (Canada) Ltd.  
Northern Canada Supply Co.  
Canadian Explosives, Limited
- Blowers—**  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.
- Boilers—**  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.  
Can. Ingersoll-Rand Co., Ltd.
- Boxes, Cable Junction—**  
Standard Underground Cable Co. of Can., Ltd.
- Buckets—**  
Hendrick Mfg. Co.  
M. Beatty & Sons, Ltd.  
Northern Canada Supply Co.
- Cable—Aerial and Underground—**  
Fraser & Chalmers of Canada, Ltd.  
Northern Canada Supply Co.  
Standard Underground Cable Co. of Can., Ltd.
- Cableways—**  
Fraser & Chalmers of Canada, Limited.  
M. Beatty & Sons, Ltd.
- Cages—**  
Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.
- Cables—Wire—**  
Standard Underground Cable Co. of Canada, Ltd.
- Car Dumps—**  
Sullivan Machinery Co.
- Cars—**  
W. Fraser.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.
- Cement Machinery—**  
Northern Canada Supply Co.
- Chains—**  
Jeffrey Mfg. Co.  
Jones & Glassco  
Northern Canada Supply Co.  
B. Greening Wire Co., Ltd.
- Chemists**  
Canadian Laboratories.  
Campbell & Deyell.  
Thos. Heys & Sons.  
Milton Hersey Co.  
Ledoux & Co.
- Coal—**  
Dominion Coal Co.  
Nova Scotia Steel & Coal Co.
- Coal Cutters—**  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.
- Coal Dock Bridges—**  
Roberts & Schaefer Co.
- Coal Mining Explosives—**  
Curtis & Harvey (Can.), Ltd.  
Canadian Explosives, Limited
- Coal Mining Machinery—**  
Can. Ingersoll-Rand Co., Ltd.  
Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.  
Roberts & Schaefer Co.  
Sullivan Machinery Co.
- Coal Pick Machines—**  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.
- Coal Washeries—**  
Jeffrey Mfg. Co.  
Roberts & Schaefer Co.
- Coaling Stations—**  
Roberts & Schaefer Co.
- Compressors—Air—**  
Darling Bros., Ltd.  
Escher Wyss & Co.  
W. Fraser.  
Smart-Turner Machine Co.  
Fraser & Chalmers of Canada, Limited.  
Sullivan Machinery Co.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Concentrators and Jigs—**  
Fraser & Chalmers of Canada, Limited.
- Concrete Mixers—**  
Northern Canada Supply Co.
- Condensers—**  
Fraser & Chalmers of Canada, Limited.  
Smart-Turner Machine Co.  
Northern Canada Supply Co.
- Converters—**  
Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.  
Northern Canada Supply Co.
- Conveyor—Trough—Belt—**  
Jeffrey Mfg. Co.  
Hendrick Mfg. Co.
- Cranes—**  
Smart-Turner Machine Co.  
M. Beatty & Sons, Ltd.
- Crane Ropes—**  
Allan, Whyte & Co.  
B. Greening Wire Co., Ltd.
- Crushers—**  
Fraser & Chalmers of Canada, Limited.  
Lymans, Ltd.  
Jeffrey Mfg. Co.  
Mussens, Limited.
- Cyanide Plants—**  
Fraser & Chalmers of Canada, Limited.  
Roessler & Hasslacher.
- Derricks—**  
Smart-Turner Machine Co.  
S. Flory Mfg. Co.  
M. Beatty & Sons, Ltd.
- Diamond Drill Contractors—**  
Diamond Drill Contracting Co.  
Smith and Travers.  
Sullivan Machinery Co.
- Dredger Pins—**  
Armstrong, Whitworth of Can., Ltd.
- Dredging Machinery—**  
M. Beatty & Sons.
- Dredging Ropes—**  
Allan, Whyte & Co.  
Fraser & Chalmers of Canada, Limited.
- Drills, Air and Hammer—**  
Can. Ingersoll-Rand Co., Ltd.  
Jeffrey Mfg. Co.  
Sullivan Machinery Co.  
Northern Canada Supply Co.
- Drills—Core—**  
Can. Ingersoll-Rand Co., Ltd.  
Standard Diamond Drill Co.  
Sullivan Machinery Co.
- Drills—Diamond—**  
Sullivan Machinery Co.  
Northern Canada Supply Co.
- Drill Steel—Mining—**  
Armstrong, Whitworth of Can., Ltd.
- Drill Steel Sharpeners—**  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.  
Sullivan Machinery Co.
- Drills—Electric—**  
Can. Ingersoll-Rand Co., Ltd.  
Sullivan Machinery Co.
- Drills—High Speed and Carbon—**  
Armstrong, Whitworth of Can., Ltd.
- Dynamite—**  
Curtis & Harvey (Canada), Ltd.  
Canadian Explosives.  
Northern Canada Supply Co.
- Ejectors—**  
Darling Bros., Ltd.  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Elevators—**  
Darling Bros., Ltd.  
Jeffrey Mfg. Co.  
M. Beatty & Sons.  
Sullivan Machinery Co.  
Northern Canada Supply Co.
- Engineering Instruments—**  
C. L. Berger & Sons.
- Engineers and Contractors—**  
Fraser & Chalmers of Canada, Limited.  
Roberts & Schaefer Co.
- Engines—Automatic—**  
Smart-Turner Machine Co.
- Engines—Gas and Gasoline**  
Fraser & Chalmers of Canada, Limited.  
Alex. Fleck.  
Sullivan Machinery Co.  
Smart-Turner Machine Co.
- Engines—Haulage—**  
Fraser & Chalmers of Canada, Limited.  
Can. Ingersoll-Rand Co., Ltd.
- Engines—Marine—**  
Smart-Turner Machine Co.
- Engines—Steam—**  
Fraser & Chalmers of Canada, Limited.  
Smart-Turner Machine Co.  
M. Beatty & Sons.
- Fans—Ventilating—**  
Fraser & Chalmers of Canada, Limited.  
Jeffrey Mfg. Co.
- Feeders—Ore—**  
Fraser & Chalmers of Canada, Limited.
- Flights—**  
Hendrick Mfg. Co.
- Forges—**  
Northern Canada Supply Co., Ltd.
- Forging—**  
M. Beatty & Sons.  
Smart-Turner Machine Co.
- Furnaces—Assay—**  
Lymans, Ltd.
- Fuse—**  
Curtis & Harvey (Canada), Ltd.  
Canadian Explosives.  
Northern Canada Supply Co.
- Gears—**  
Smart-Turner Machine Co.  
Northern Canada Supply Co.
- Hammer Rock Drills—**  
Mussens, Limited.
- Hangers—Cable—**  
Standard Underground Cable Co. of Canada, Ltd.
- Hand Hoists—**  
Darling Bros., Ltd.  
Fraser & Chalmers of Canada, Limited
- High Speed Steel—**  
Armstrong, Whitworth of Can., Ltd.
- High Speed Steel Twist Drills—**  
Northern Canada Supply Co.  
Armstrong, Whitworth of Can., Ltd.
- Hoists—Air, Electric and Steam—**  
Can. Ingersoll-Rand Co., Ltd.  
Jones & Glassco.  
M. Beatty & Sons.  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.
- Hoisting Engines—**  
Mussens, Limited.  
Sullivan Machinery Co.  
Fraser & Chalmers of Canada, Limited.  
Can. Ingersoll-Rand Co.  
M. Beatty & Sons.
- Hose—**  
Northern Canada Supply Co.
- Ingot Copper—**  
Canada Metal Co., Ltd.
- Insulating Compounds—**  
Standard Underground Cable Co. of Can., Ltd.
- Jacks—**  
Can. Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Lamps—Safety—**  
Canadian Explosives.
- Link Belt—**  
Northern Canada Supply Co.  
Jones & Glassco.
- Locomotives—**  
W. Fraser.
- Metal Merchants—**  
Henry Bath & Son.  
Geo. G. Blackwell, Sons & Co.  
Consolidated Mining and Smelting Co. of Canada.  
Canada Metal Co.  
C. L. Constant Co.
- Monel Metal—**  
International Nickel Co.
- Nickel—**  
International Nickel Co.
- Ore Sacks—**  
Northern Canada Supply Co.
- Ore Testing Works**  
Ledoux & Co.  
Can. Laboratories.  
Milton Hersey Co., Ltd.  
Campbell & Deyell.
- Ores and Metals—Buyers and Sellers of—**  
C. L. Constant Co.  
Geo. G. Blackwell.  
Consolidated Mining and Smelting Co. of Canada.  
Orford Copper Co.  
Canada Metal Co.
- Perforated Metals—**  
B. Greening Wire Co., Ltd.  
Fraser & Chalmers of Canada, Limited.  
Northern Canada Supply Co.  
Hendrick Mfg. Co.
- Pig Tin—**  
Canada Metal Co., Ltd.
- Pig Lead—**  
Canada Metal Co., Ltd.
- Pipes—**  
Canada Metal Co., Ltd.  
Consolidated M. & S. Co.  
Pacific Coast Pipe Co., Ltd.  
Northern Canada Supply Co.  
Smart-Turner Machine Co.
- Pipe Fittings—**  
Northern Canada Supply Co.
- Piston Rock Drills—**  
Mussens, Limited.
- Pneumatic Tools—**  
Can. Ingersoll-Rand Co., Ltd.  
Jones & Glassco.
- Prospecting Mills and Machinery—**  
Standard Diamond Drill Co.  
Fraser & Chalmers of Canada, Limited

When Answering Advertisements please mention THE CANADIAN MINING JOURNAL.



## Canadian Miners' Buying Directory.—(Continued from page 14.)

|  |   |   |   |
|--|---|---|---|
| <b>Pulleys, Shafting and Hangings—</b><br>Fraser & Chalmers of Canada, Limited<br>Jeffrey Mfg. Co.<br>Northern Canada Supply Co.   | Canadian Ingersoll-Rand Co., Ltd.<br>Fraser & Chalmers of Canada, Limited   | <b>Screens—</b><br>B. Greening Wire Co., Ltd.<br>Jeffrey Mfg. Co.<br>Northern Canada Supply Co.<br>Fraser & Chalmers of Canada, Limited<br>Roberts & Schaefer Co. | <b>Steel Drums—</b><br>Smart-Turner Machine Co.   |
| <b>Pumps—Boiler Feed—</b><br>Darling Bros., Ltd.<br>Smart-Turner Machine Co.<br>Northern Canada Supply Co.<br>Canadian Ingersoll-Rand Co., Ltd.<br>Fraser & Chalmers of Canada, Limited                              | <b>Pumps—Vacuum—</b><br>Darling Bros., Ltd.<br>Smart-Turner Machine Co.   | <b>Screens—Cross Patent Flanged Lip—</b><br>Hendrick Mfg Co.  | <b>Steel—Tool—</b><br>N. S. Steel & Coal Co.<br>Armstrong, Whitworth of Can., Ltd.  |
| <b>Pumps—Centrifugal—</b><br>Darling Bros., Ltd.<br>Escher Wyss & Co.<br>Mussens, Limited.<br>Smart-Turner Machine Co.<br>M. Beatty & Sons.<br>Can. Ingersoll-Rand Co., Ltd.<br>Fraser & Chalmers of Canada, Limited | <b>Quarrying Machinery—</b><br>Sullivan Machinery Co.<br>Can. Ingersoll-Rand Co., Ltd.  | <b>Separators—</b><br>Darling Bros., Ltd.<br>Smart-Turner Machine Co.   | <b>Surveying Instruments—</b><br>W. F. Stanley.<br>C. L. Berger.  |
| <b>Pumps—Electric—</b><br>Darling Bros., Ltd.<br>Smart-Turner Machine Co.<br>Canadian Ingersoll-Rand Co., Ltd.<br>Fraser & Chalmers of Canada, Limited   | <b>Rails—</b><br>W. Fraser.   | <b>Sheet Lead—</b><br>Canada Metal Co., Ltd.  | <b>Tanks—Cyanide, Etc.—</b><br>Fraser & Chalmers of Canada, Limited<br>Hendrick Mfg. Co.<br>Pacific Coast Pipe Co., Ltd.              |
| <b>Pumps—Pneumatic—</b><br>Darling Bros., Ltd.<br>Smart-Turner Machine Co.<br>Can. Ingersoll-Rand Co., Ltd.<br>Sullivan Machinery Co.  | <b>Roasting Plants—</b><br>Fraser & Chalmers of Canada, Limited   | <b>Sheets—Genuine Manganese Bronze—</b><br>Hendrick Mfg. Co.  | <b>Tipples—</b><br>Roberts & Schaefer Co.   |
| <b>Pumps—Steam—</b><br>Can. Ingersoll-Rand Co., Ltd.<br>Darling Bros., Ltd.<br>Mussens, Limited.<br>Northern Canada Supply Co.<br>Smart-Turner Machine Co.   | <b>Rolls—Crushing—</b><br>Fraser & Chalmers of Canada, Limited  | <b>Shovels—Steam—</b><br>M. Beatty & Sons.<br>W. Fraser.  | <b>Transits—</b><br>C. L. Berger & Sons.  |
| <b>Pumps—Turbine—</b><br>Darling Bros., Ltd.<br>Smart-Turner Machine Co.   | <b>Roofing—</b><br>Northern Canada Supply Co.   | <b>Smelting Machinery—</b><br>Fraser & Chalmers of Canada, Limited  | <b>Tube Mills—</b><br>Fraser & Chalmers of Canada, Limited  |
|  | <b>Rope—Manilla and Jute—</b><br>Jones & Glassco.<br>Northern Canada Supply Co.<br>Allan, Whyte & Co.                                       | <b>Stacks—Smoke Stacks—</b><br>Hendrick Mfg. Co.  | <b>Turbines—</b><br>Escher Wyss & Co.<br>Fraser & Chalmers of Canada, Limited   |
|  | <b>Rope—Wire—</b><br>B. Greening Wire Co., Ltd.<br>Allan, Whyte & Co.<br>Northern Canada Supply Co.<br>Fraser & Chalmers of Canada, Limited | <b>Stamp Mills—</b><br>Fraser & Chalmers of Canada, Limited   | <b>Winding Engines—</b><br>Canadian Ingersoll-Rand Co., Ltd.  |
|  | <b>Samplers—</b><br>C. L. Constant Co.<br>Ledoux & Co.<br>Milton Hersey Co.<br>Thos. Heys & Son.  | <b>Steel Barrels—</b><br>Smart-Turner Machine Co.   | <b>Wire Cloth—</b><br>Northern Canada Supply Co.<br>B. Greening Wire Co., Ltd.  |
|  |   | <b>Steel Drills—</b><br>Sullivan Machinery Co.<br>Northern Canada Supply Co.<br>Can. Ingersoll-Rand Co., Ltd.   | <b>Wire (Bare and Insulated)—</b><br>Standard Underground Cable Co. of Canada, Ltd.<br><b>Zinc Spelter—</b><br>Canada Metal Co., Ltd. |

## ALPHABETICAL INDEX TO ADVERTISERS

|   |  |  |
|---|--|--|
| <b>A</b>  | <b>D</b>   | <b>L</b>                                     |
| American Zinc Lead & Smelting Co. . . . . 5                 | Dept. of Mines, Canada . . . . .                 | Ledoux & Co. . . . . 11                      |
| Armstrong, Whitworth of Can., Ltd. . . . . 10               | .....Inside Front Cover                          | Lymans, Ltd. . . . . 6                       |
| <b>B</b>  | Deloro Mining & Reduction Co. . 13               | <b>M</b>                                     |
| Bath, Henry & Son . . . . . 13                              | Diamond Drill Contracting Co. . . 4              | Mines Handbook . . . . . 2                   |
| Balback Smelting & Refining Co. 13                          | Dominion Coal Co., Ltd. . . . . 9                | Murphy, Chas. J. . . . . 11                  |
| Beatty, M. & Sons . . . . . 9                               | Dominion Engineering & Inspection Co. . . . . 11 | Mussens, Ltd. . . . . 1                      |
| Beatty, Blackstock, Fasken, Cowan & Chadwick . . . . . 12   | Dorr Co. . . . . 11                              | 0  |
| Berger, C. L. & Sons . . . . . 9                            | Dwight & Lloyd Sintering Co., Inc. 7             | <b>N</b>                                     |
| Blackwell, Geo. G., Sons & Co. . 13                         | <b>F</b>   | Nova Scotia Steel & Coal Co. . . . 4         |
| British Columbia, Province of. . . 7                        | Ferrier, W. F. . . . . 11                        | Nova Scotia, Province of. . . . . 8          |
| Buffalo Mines, Ltd. . . . . 4                               | Fleck, Alex. . . . . 9                           | Northern Canada Supply Co., Ltd. 7           |
| <b>C</b>  | Forbes, D. L. H. . . . . 11                      | <b>O</b>                                     |
| Campbell & Deyell, Ltd. . . . . 11                          | Fraser & Chalmers, Ltd. . . . . 4                | Ontario, Province of . . . . .               |
| Canadian Copper Co. . . . . 6                               | Fuller, A. S. & Co. . . . . 12                   | .....Inside Back Cover                       |
| Canadian Explosives, Ltd. . . . . 14                        | <b>G</b>   | <b>Q</b>                                     |
| Canadian Industry, Commerce and Finance. . . . . 3          | Gartshore, J. J. . . . . 4                       | Quebec, Province of . . . . . 8              |
| Can. Ingersoll-Rand Co., Ltd. . . . 1                       | <b>H</b>   | <b>S</b>                                     |
| Canadian Inspection & Testing Laboratories, Ltd. . . . . 11 | Hassan, A. A. . . . . 11                         | School of Mining . . . . . 5                 |
| Canadian Laboratories, Ltd. . . . . 11                      | Hendrick Mfg. Co. . . . . 6                      | Segsworth, R. F. . . . . 12                  |
| Canada Metal Co. . . . . 12                                 | Hersey, Milton Co., Ltd. . . . . 11              | Smith & Durkee Diamond Drill Co. . . . . 11  |
| Cohen, S. W. . . . . 11                                     | Heys, Thomas & Son . . . . . 11                  | Smith & Travers Diamond Drill Co. . . . . 12 |
| Concentrating Ores by Flotation                             | Hitchcock, C. H. . . . . 11                      | Smith, Sydney . . . . . 11                   |
| Consolidated Mining & Smelting Co. . . . . 13               | <b>I</b>   | Spearman, Chas. . . . . 11                   |
| Coniagas Reduction Co., Ltd. . . . 13                       | Imperial Bank of Canada . . . . . 6              | Sullivan Machinery Co. . . . . 2             |
| Constant, C. L. & Co. . . . . 13                            | Industrial & Technical Press. . . . .            |  |
| Curtis's & Harvey . . . . .                                 | ..... outside back cover                         | <b>T</b>                                     |
| .....Outside Back Cover                                     | International Molybdenum Co. . . . 6             | Tyrrell, J. B. . . . . 11                    |
|   | International Nickel Co. . . . . 6               |  |
|   | <b>J</b>   |  |
|   | Johnson, Matthey & Co. . . . . 11                |  |

When Answering Advertisements please mention THE CANADIAN MINING JOURNAL.



# Ontario's Mining Lands

---

Ontario, with its 407,262 square miles of area, contains many millions of acres in which the geological formations are favourable for the occurrence of minerals, 70 per cent. of the rocks being of pre-Cambrian age.

The phenomenally rich silver mines of Cobalt occur in these rocks ; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Helen, Magpie and Moose Mountain mines.

Many other varieties of useful products are found in Ontario :—cobalt, iron pyrites, arsenic, quartz, graphite, talc, feldspar, mica, corundum, molybdenite, platinum, palladium, actinolite, apatite, fluorite, salt, gypsum, petroleum and natural gas.

Building materials, such as cement, brick, marble, limestone, sandstone, trap, lime, sand and gravel, are abundant.

Ontario in 1915 produced over 44 per cent. of the total mineral production of Canada, or more than twice that from any other Province. The preliminary report of the Ontario Bureau of Mines shows the output of the mines and metallurgical works of Ontario for the year 1915 to be worth \$57,532,844, of which the metallic production was \$47,721,180. There were 79 producing mines, 62 of which operated at a profit.

The prospector can go almost anywhere in the mineral regions in his canoe ; the climate is invigorating and healthy, and there is plenty of wood and good water.

A miner's license costs \$5.00 per annum and entitles the holder to stake out in any or every mining division three claims of 40 acres each.

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

**HON. G. H. FERGUSON,**

Minister of Lands, Forests and Mines,

**Toronto, Canada.**



# Printing and Publishing

We wish to draw the attention of mining, metallurgical, and development corporations to our excellent facilities for compiling, arranging, illustrating, printing and distributing Annual Statements, Special Reports, Descriptive Pamphlets, etc.

We guarantee our work in all respects. In letter-press, half-tone engravings and reproductions in colour, we are prepared to give entire satisfaction.

We shall be glad to furnish estimates to enquirers.

ADDRESS

**Industrial and Technical Press Ltd.,**

263-5 ADELAIDE ST. WEST,  
TORONTO

OR

**Canadian Mining Journal,**

263-5 ADELAIDE ST. WEST,  
Toronto

---

---

## MINING EXPLOSIVES

### SEMI-GELATINIZED DYNAMITE

All the Advantages:—

Absence of Fumes;

Density of Loading;

Impervious to Water;

with none of the disadvantages of regular gelatine

## CURTIS'S & HARVEY

(CANADA) LIMITED

400 St. James St.

MONTREAL

Also Magazines at

Cobalt

Timmins

Halifax