

C/190/4-
C.2

April 1, 1918

Single Copies 15 Cents

CANADIAN MINING JOURNAL

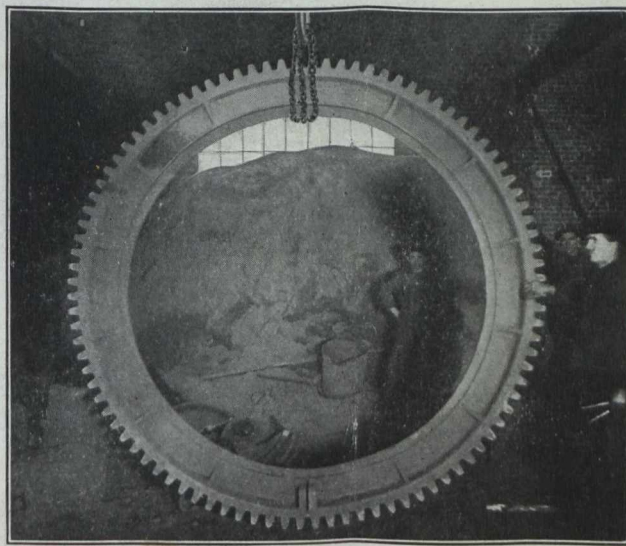
VOL. XXXIX

TORONTO

No. 7

“HISCO” means QUALITY MACHINE MOULDED GEARS

Any size and kind up to 18 feet in diameter. No patterns required.



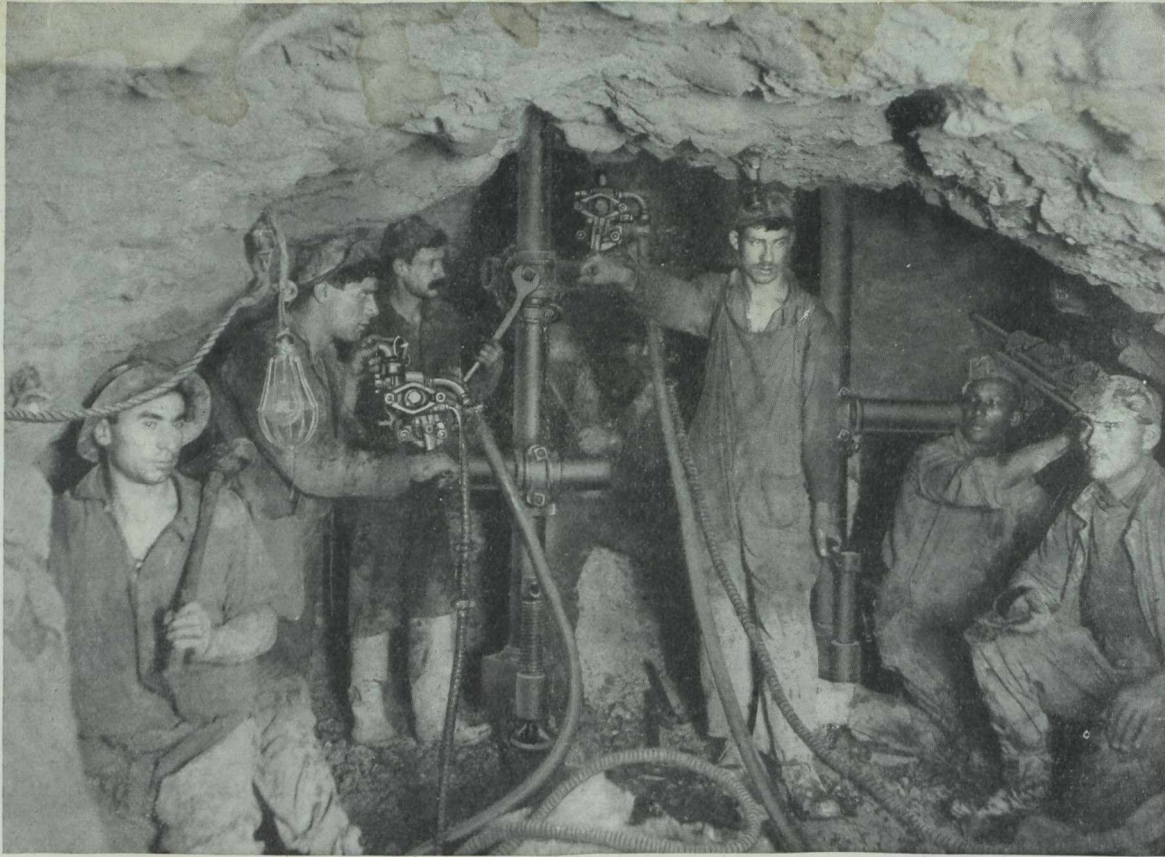
Tube Mill Gea.. Shipping weight 5800 lbs.

Chrome, Manganese and Chrome-Nickel Steel Shoes & Dies,
Tappets, Stamp Heads, etc.

Place your next order with us for quick service and reliable products.

HULL IRON & STEEL FOUNDRIES, LIMITED

HULL, - - QUE.



SPEED IN THE "U. V. X." TUNNEL

With Sullivan "DR6" Drills

640 feet of heading were driven at the portal end of the "U. V. X." extraction tunnel, Jerome, Arizona, during December. 58 shifts were worked, an advance of 11 feet of 11 x 10 ft. heading (and bench) per shift.

The contractors are the Potter Construction Co. They have averaged 524 feet per month since July.

This excellent progress is accomplished with three Sullivan "DR6" Water Jet Hammer Drills. Holes 13 feet deep are drilled in the hard, tight conglomerate, and are shot with 60 and 40 per cent. blasting gelatine.

Described fully in *Mine and Quarry*
No. 634—Send for your copy.

SULLIVAN MACHINERY CO.

122 So. Michigan Ave., Chicago

Algiers
Amsterdam
Boston
Christiania

Denver, Colo.
El Paso
Gijon, Spain
Ishpeming
Joplin, Mo.

Juneau
Knoxville
London
New York
Paris

Petrograd
Pittsburgh
Salt Lake City
San Francisco
Seattle

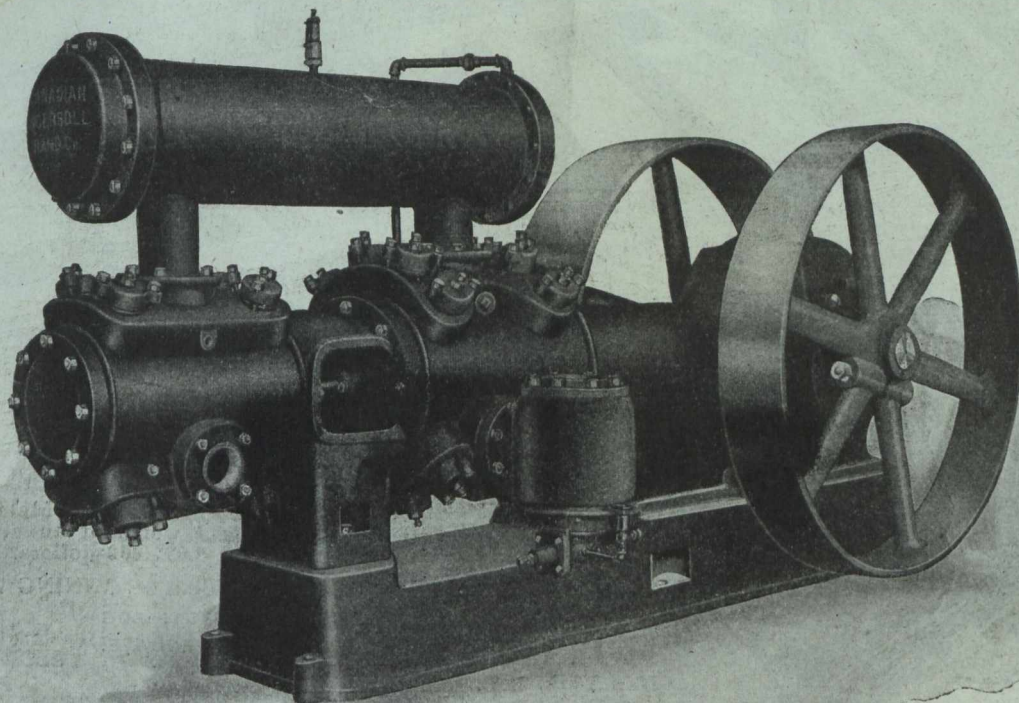
Shanghai
Spokane
St. Louis
Sydney, Aus.
Toronto

The Hague
Tokio
Turin, Italy
Vancouver
Wallace, Idaho



THE CIRCO PAGE

Illustrating Compressed Air Machinery, Tools, and Appliances



Class "EL-2" Air Compressor, Two-Stage Straight Line, with Intercooler. Powerful and Self-Contained.

Power-Driven, Two Stage Compressors

The type of Air compressor illustrated above is marked by great compactness, simplicity of installation, dust proof construction, automatic splash lubrication, and the lowest amount of attention required while running. With all these advantages there is com-

bined quick and easy access to all working parts, and high over-all efficiency is secured by ample intercooler surface and the use of "CIRCO" silent leaf valves.

Let us know your needs as regard compressed air equipment. Our long experience in this line is at your service.

Specifications and quotations will be promptly sent by any of our branches on request.

Canadian Ingersoll-Rand Company, Limited

General Offices: 260 St. James Street,

MONTREAL, QUE.

Branches: Sydney, Sherbrooke, Montreal, Toronto, Cobalt, Timmins, Winnipeg, Nelson, Vancouver

HOYT METALS

ABOVE ALL OTHERS

Sheer Merit has made it possible for Hoyt Metals to reach all parts of the civilized world at an annual turnover of more than 5,000,000 dollars.

WE SPECIALIZE IN BABBITS FOR THE MINING INDUSTRY

WRITE FOR OUR CATALOG

HOYT METAL CO., EASTERN AVE. Toronto, Canada
 New York, N.Y. and LEWIS ST. London, Eng. St. Louis, Mo.

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 licenses."

American Ore Reclamation Co.
 71 BROADWAY, N.Y.

**P.M.S.
 BELTING**

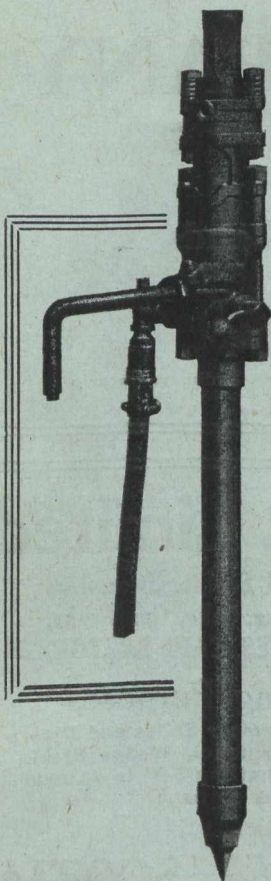
ASK THE MAN WHO HAS USED IT!

THE BELTING that gives
Absolute Satisfaction

FOR SALE BY

Northern Canada Supply Co.
 LIMITED

COBALT, HAILEYBURY, SOUTH PORCUPINE, TIMMINS



Conserve Your Man Power and Reduce Operating Expenses

The first is absolutely necessary from a patriotic standpoint—the second is the first thought of every successful business man. Both can be accomplished when you install the “New Cleveland” Stoper in your mine. It has speed, with staying power and efficiency, double that of any other drill on the market. It has lower operating expenses, because of its low air consumption, and its economy in repairs, through its drop forged parts of simple design which are practically unbreakable.

We can prove these facts by use if you will only write for our Bulletin No. 35A.

CLEVELAND PNEUMATIC TOOL COMPANY

Of Canada, Limited

TORONTO

ONTARIO

Used Mining Equipment for Immediate Delivery

SUBJECT TO INSPECTION

Blake Crushers.
Fraser Chalmers Tube Mill
and Motor.
Power and Mining Tube
Mill and Motor.
Hardinge Ball Mill.
Air Compressor with Motors
Oliver Filters.
Aiken Filters.

Pumps.
Tanks.
Belting.
Pulleys.
Boilers.
Steel Drills.
Sixteen-pound Rails.
Lighting Generators.

ZENITH COAL AND STEEL PRODUCTS LIMITED,
MCGILL BUILDING, MONTREAL

The University of Toronto and University College

with which are federated

VICTORIA TRINITY ST. MICHAELS
KNOX and WYCLIFFE COLLEGES

FACULTIES OF

Arts, Applied Science, Medicine,
Education, Household Science, Forestry.

For further information apply to the Registrar of the University or to the Secretaries of the respective faculties.

Announcement

We have started our new Plate Mill, and are Manufacturing Plate from $\frac{1}{4}$ in. to $\frac{3}{4}$ in. thick, 24 in. wide, any weight up to 500 pounds.

Dominion Steel Foundry Co., Limited

Hamilton, Ont.

E. J. LONGYEAR COMPANY

EXPLORING ENGINEERS

Diamond Drill Contractors and Manufacturers

Examination and Exploration of Mineral Lands
Shaft Sinking and Development

MINNEAPOLIS, MINNESOTA, U. S. A.

Tucson Arizona

Marquette, Michigan

St. Louis, Missouri

Sudbury, Ontario

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**

EVERITT & CO.

40 CHAPEL STREET, LIVERPOOL, ENGLAND

Tel. Address: "PERSISTENT"

Codes Used
A.B.C. 4th and 5th Editions.
A1 Code
Lieber's Code,
Western Union Code.
Moreing & Neal's Code
Bedford & McNeil's Mining Cod

BUYERS OF CANADIAN MINERALS, METALS, ALLOYS, METALLIC RESIDUES,
COBALT ORE, OXIDE, RESIDUES, NICKEL ORE, OXIDE, ETC.

MOLYBDENITE, WOLFRAM, SCHEELITE, MANGANESE ORE, CHROME ORE, CORUNDUM, GRAPHITE
METALS & ALLOYS

COBALT, TUNGSTEN, MOLYBDENUM, NICKEL, ALUMINIUM, FERRO - SILICON, FERRO - CHROME, ETC.
ASBESTOS—CRUDE, FIBRES, SHINGLE STOCK.

NICKEL




THE MOND NICKEL COMPANY, LTD

39 Victoria Street, London, S.W.

Also Makers of

Copper Sulphate,
Nickel Sulphate, and
Nickel Ammonium Sulphate

CARBIDE  LAMPS

SIZE OF FLAME ALWAYS THE SAME

The gas pressure in an I T P never goes below 2½ inches, and never above 4 inches—less or more than this means poor light or gas wasted. The pressure in hand regulated lamps fluctuates between 1 and 12 inches.

A postal will bring Catalog and Prices

Dewar Manufacturing Company, Inc.
100 Wellington St. West, Toronto, 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.

PLATINUM BOUGHT AND SOLD


GOLDSMITH BROS. SMELTING & REFINING CO. LTD.
24 Adelaide Street West
TORONTO

NEW YORK CHICAGO SEATTLE

WOOD TANKS

for all purposes

Goold, Shapley & Muir Co. Limited
BRANTFORD, ONT.



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.

American Zinc Lead and Smelting Co.

Purchasers of

ZINC and LEAD ORES

Address
1012 Pierce Building, St. Louis, Mo.

Exploration Department

For the purchase of

MINES

Gold - Silver - Lead - Zinc - Copper

Address
55 Congress Street, Boston, Mass.

CRUSHERS

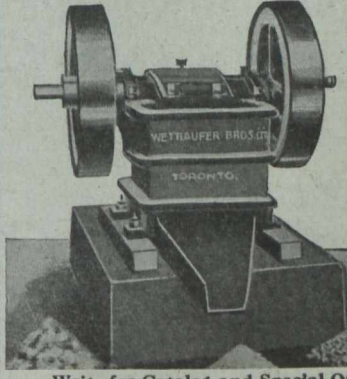
ALL SIZES AND STYLES AND GUARANTEED
HEART SHAPE MIXERS

Rolls, Brick, Block
Tile Machines
Hoists, Screens, etc.
Concrete Machinery.
Full line.

Made in Canada
by a Canadian Firm

Write for Catalog and Special Offers

WETTLAUER BROS. LIMITED - TORONTO, ONT



BERGER

Monitor Transits & Levels
FOR USE IN MINES
C. L. BERGER & SONS
BOSTON, MASS., U. S. A.





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**

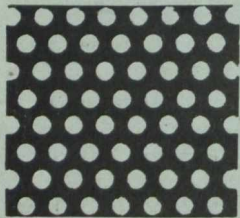
We are **SOLE PRODUCERS** of this natural, stronger-than-steel, non-corrodible alloy.

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.



THE INCOME WAR TAX ACT

Forms giving particulars of income for the year 1917, must be filled in and filed on or before the 31st March, 1918

Section 4 of the Act provides that all persons resident or ordinarily resident in Canada, shall pay a tax upon income exceeding \$1500 in the case of those single and widows and widowers without dependent children, and upon income exceeding \$3000 in the case of all other persons. It also provides that all Corporations and Joint Stock Companies, no matter how created, shall pay the normal tax upon income exceeding \$3000.

The Forms provided by the Department of Finance to be filled in with particulars of the 1917 income of all those whose incomes are liable under the Act, and by Trustees, Corporations and Joint Stock Companies, with information required of them, may be obtained from the District Inspectors of Taxation and from the Postmasters at all leading centres.

Forms to obtain and Special Features to observe

Individuals—Get Form T 1 to give particulars of their own incomes. In stating Dividends received, give the amount from each Company, listing Canadian and foreign Companies separately. Fill in pages 1, 2 and 3 only. Do not mark on page 4.

The following sample answers, (printed in italics) to questions asked on pages 2 and 3 of Form T 1, will help you to fill in correctly your copies of the Form.

PAGE 2. DESCRIPTION OF INCOME.	EXEMPTIONS AND DEDUCTIONS PAGE 3
GROSS INCOME DERIVED FROM—	
1. Salaries and wages..... <i>None</i>	
2. Professions and vocations..... <i>None</i>	
3. Commissions..... <i>from sale of Real Estate</i>	\$1000
4. Business, trade, commerce or sales or dealings in property, whether real or personal.....	7500
5. Farming (Horticulture, dairying or other branches) <i>None</i>	—
6. Rents.....	750
7. Dividends (A). <i>Canadian Corporations—</i>	
<i>Standard Transportation Company Ltd.</i>	25
<i>Rainbow Mining Company Ltd.</i>	150
(B) <i>Foreign Corporations—</i>	
<i>New York Trading Company</i>	15
<i>Albany Tool Company, Inc.</i>	66
8. Interest on notes, mortgages, bank deposits and securities other than reported in item 7—	
<i>Interest on Mortgages</i>	72
<i>Bank Interest</i>	21
<i>1200 Par Value Bonds of Jones Paint Co. Ltd.</i>	72
<i>1000 Municipal Debentures, Town of Midvale</i>	55
9. Fiduciaries, (Income received from guardians, trustees, executors, administrators, agents, receivers or persons acting in a fiduciary capacity)—	
<i>Income (not capital) from Estate of Andrew Doe (People's Trust Company, Executor)</i>	315
10. Royalties from mines, oil and gas wells, patents, franchises and other legalized privileges.....	—
11. Interest from Dominion of Canada Bonds, issued exempt from Income Tax \$3,000.....	150
12. Other sources not enumerated above—	
<i>½ Interest in Shaw Hardware Company Partnership</i>	750
13. Total Income.....	\$10,041
AMOUNT CLAIMED FOR—	
14. Depreciation... <i>On Store Building (not land), (Brick)</i> ..	\$ 125
<i>On Equipment, used in business</i>	140
<i>Store Fixtures</i>	100
15. Bad debts, actually charged off within the year.....	40
16. Allowance for exhaustion of mines and wells....	<i>None</i> —
17. Contributions actually paid to the Patriotic and Canadian Red Cross Funds and other approved War Funds.....	<i>Patriotic and Canadian Red Cross</i> 250
18. Interest paid on monies borrowed and used in the business.....	<i>Mortgage on Store Property, \$1,000</i> ... 60
19. Federal, Provincial and Municipal taxes on property used in the business—	
<i>General Municipal Taxes</i>	180
20. Interest from Dominion of Canada Bonds, issued exempt from Income Tax.....	150
21. Other claims for deductions must be specified in detail—	
<i>Business Operating Expenses</i>	4200
<i>Repairs (stating particulars)</i>	150
22. Total Exemptions and Deductions.....	\$5395
23. Amount paid under Business Profits War Tax Act, 1916, which accrued in the 1917 accounting period.....	<i>Year ending December 31, 1917—None.</i>

I hereby certify that the foregoing return contains a true and complete statement of all income received by me during the year for which the return is made.

Date..... 15th March, 1918.

Signature..... John Brown.

Corporations and Joint Stock Companies. Use Form T2—giving particulars of income. Also attach a financial statement. Under Deductions, show in detail amounts paid to Patriotic Fund and Canadian Red Cross or other approved War Funds.

Trustees, Executors, Administrators of Estates and Assignees use Form T3. Full particulars of the distribution of income from all estates handled must be shown as well as details of amounts distributed. A separate Form must be filled in for each estate.

Employers must use Form T4 to give names and amounts of salaries, bonuses, commissions and other remuneration paid to all employees during 1917 where such remuneration amounted in the aggregate to \$1000 or over.

Corporation Lists of Shareholders.—On Form T5 corporations shall give a statement of all bonuses, and dividends paid to Share-

holders residing in Canada during 1917 stating to whom paid, and the amounts.

Penalties.—Default in filing returns renders the person or persons liable on summary conviction to a penalty of one hundred dollars for each day during which the default continues. Any person making a false statement in any return or in any information required by the Minister of Finance shall be liable on summary conviction to a penalty not exceeding ten thousand dollars or to six months imprisonment, or to both fine and imprisonment.

In the case of Forms T1 and T2, keep one copy of the filled in Form and file the other two with the Inspector of Taxation for your District. In the case of T3, T4 and T5, keep one copy and file the other two, with the Commissioner of Taxation, Dept. of Finance, Ottawa.

Forms may be obtained from the District Inspectors of Taxation and from the Postmasters at all leading centres.

Postage must be paid on all letters and documents forwarded by mail to Inspector of Taxation.

Department of Finance
Ottawa, Canada

The Minerals of Nova Scotia

THE MINERAL PROVINCE OF EASTERN CANADA

COAL, IRON, COPPER, GOLD, LEAD, SILVER, MANGANESE, GYPSUM, BARYTES, TUNGSTEN, ANTIMONY, GRAPHITE, ARSENIC, MINERAL PIGMENTS, DIATOMACEOUS EARTH.

Nova Scotia possesses extensive areas of mineral lands and offers a great field for those desirous of investment.

Coal Over six million tons of coal were produced in the province during 1916, making Nova Scotia by far the leader among the coal producing provinces of the Dominion.

Iron The province contains numerous districts in which occur various varieties of iron ore, practically at tide water and in touch with vast bodies of fluxes. Deposits of particularly high grade manganese ore occur at a number of different locations.

Gold Marked development has taken place in this industry the past several years. The gold fields of the province cover an area approximately 3,500 square miles. The gold is free milling and is from 870 to 970 fine.

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

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

Government core-drills can be had from the department for boring operations.

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 on application to

HON. E. H. ARMSTRONG, - Halifax, N. S.

Commissioner of Public Works and Mines



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.

The Flotation Process

All patent and other rights to this process
in North America are now controlled by

Minerals Separation North American Corporation

who is the registered owner of the following Canadian patents: Nos. 76,621; 87,700; 94,332; 94,516; 94,718; 96,182; 96,183; 99,743; 127,397; 129,819; 129,820; 134,271; 135,089; 137,404; 142,607; 147,431; 147,432; 148,275; 151,479; 151,480; 151,619; 151,810; 157,488; 157,603; 157,604; 160,692; 160,693; 160,694; 160,846; 160,847; 160,848; 160,849; 160,850; 160,937; 163,587; 163,608; 163,707; 163,936; 165,390; 166,415; 167,474; 167,475; 167,476; 167 603.

On December 11, 1916, the SUPREME COURT OF THE UNITED STATES adjudged our basic patent for air-froth flotation to be valid, holding that this patent covers any process of froth flotation wherein the results obtained are such results as are secured by the use of a fraction of one per cent., on the ore, of an oily frothing agent in an ore-pulp, with agitation. Three of the thirteen claims which specified the use of "a small quantity of oil" and which the Court held to be invalid have since, by proper disclaimer, been brought within the scope of the Supreme Court's decision and, at a recent trial in the United States District Court at Butte, Montana, Judge Bourquin admitted these claims as amended.

On May 24, 1917, the UNITED STATES CIRCUIT COURT OF APPEALS at Philadelphia, in the case of Minerals Separation, Ltd., against Miami Copper Company, unanimously sustained the validity and broadly construed a second basic patent, owned by us, for the use of all "Soluble Frothing Agents." In the same opinion, the Court also validated a third patent for the use of cresols and phenols in the cold and without acid. The defendants, Miami Copper Company, endeavored to avoid infringement of these patents by using Callow pneumatic cells, but the Court held that the operations of the defendant company infringed all three patents.

Prospective users of our flotation processes are earnestly requested not to be misled by the mistaken views disseminated by interested parties that any of these BASIC PROCESS PATENTS can be evaded by a mere variation of apparatus for agitating and aerating the pulp, or by the simple addition of oils or other materials in excess of a fraction of one per cent. on the weight of the ore treated.

NOTICE

Notice is hereby given that we will enforce our patents and stop all infringements, but are prepared to grant licenses for the right to use all or any of our processes to those who wish to use them. To those who infringe or have infringed our patents, notice is given that a settlement for such infringement must precede the granting of licenses for the future use of same.

Notice is further given that no one is authorized to introduce our processes or apparatus into the United States, Canada or Mexico.

All applications should be made direct to

MINERALS SEPARATION NORTH AMERICAN CORPORATION

Head Office:
61 Broadway,
New York, N.Y.

Engineering Office:
Merchants' Exchange Building
San Francisco, California

or through

**Messrs. Ridout & Maybee, Patent Solicitors, 59 Yonge St.
TORONTO, CANADA**

**MANGANESE-STEEL WHEELS
CRUSHER PLATES
DIPPER TEETH**

**CANADIAN
STEEL FOUNDRIES
LIMITED**

General Offices:
Transportation Building, Montreal

Works:
Montreal and Welland

BRITISH COLUMBIA

The Mineral Province of Western Canada

Has produced Minerals valued as follows: Placer Gold, \$74,620,103; Lode Gold, \$91,350,784; Silver, \$41,358,012; Lead, \$36,415,124; Copper, 114,559,364; Other Metals (Zinc, Iron, etc.), \$7,730,178; Coal and Coke, \$165,829,315; Building Stone, Brick, Cement, etc., \$26,697,835; making its Mineral Production to the end of 1916 show an

Aggregate Value of \$558,560,715

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

Production During last ten years, \$284,916,993

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**

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.

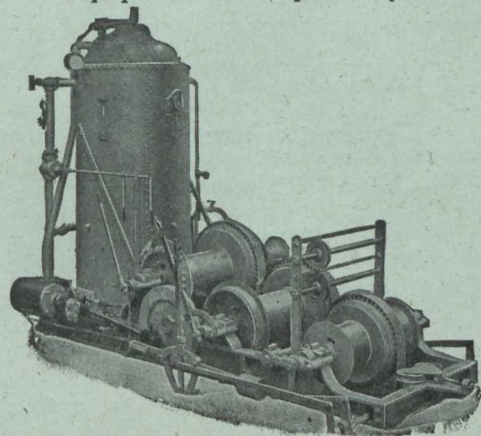
Buntain, Bell & Co., Charlottetown, P.E.I.

Hull, Blyth & Co., 1 Lloyds Ave., London, E.C.

Harvey & Co., St. John's, Nfld.

“BEATTY”

Hoists, Clamshells, Derricks and Material Handling Equipment of every description.



Standard Two-Drum Hoist with Swinger.

Engines for every kind of hoisting duty.

“BEATTY PLANT” on your work means uninterrupted service and complete satisfaction.

SEND FOR CATALOGUE TO-DAY

M. BEATTY & SONS, Limited

Welland, - Ontario

AGENTS:—H. E. Plant, 1790 St. James St., Montreal, Que.
E. Leonard & Sons, St. John, N.B.
Robert Hamilton & Co., Vancouver, B.C.
Kelly-Powell, Ltd., McArthur Bldg.,
Winnipeg, Man.

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



Flat Duplex Mining Machine Cable

For Mining Service

We manufacture a complete line of
Mining Machine Cables
Gathering Locomotive Cables
Bore Hole Cables
Cable Terminals, etc.

Standard Underground Cable Co. of Canada Limited

Montreal, Toronto, Hamilton, Seattle.

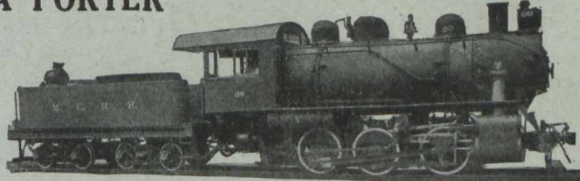
WANTED

Assayer, silver and gold. Must have, at least, elementary knowledge of chemistry.

Apply, stating experience, salary expected, and whether liable for military draft.

Box K, Canadian Mining Journal, Toronto, Ontario.

Reduce Your Haulage Costs With A PORTER



The safety and efficiency of compressed air haulage have been brought to the highest standard in Porter Locomotives. To these we have added an economy in cost and upkeep that no man interested in mine haulage can afford to disregard.

Write for full details to-day.

CANADIAN H. K. PORTER CO., 1218 UNION BLDG., PITTSBURG, PA.



is the trade-marked name for pasteurized separated
ONTARIO MILK

in dry form. Government Inland Revenue Bulletin No. 257 states that separated milk powder "contains no adulterants," "is true to the claims made for it" and is genuine."

Klim is the most economical form of milk. It bulks smallest and weighs less than any other form of milk, thus effecting over 50% saving in freight charges. It remains sweet and fresh indefinitely. Can be used from the tin as needed. No waste from spoiling. Mix dry with flour, sugar, etc., in cooking or dissolve in water for use as liquid.

A miner's wife writes: "I have used Klim for everything, with most satisfactory results."

Klim is sold in 1-lb. tins and 10-lb. tins. The larger size is more economical. Ten lbs. makes forty quarts of liquid with the natural milk taste.

Order from your Supply House

Canadian Milk Products, Limited

10-12 St. Patrick Street, Toronto
10 Ste. Sophie Lane, Montreal

W. H. Escott Co.
Winnipeg, Man.

Western Representatives—

Kirkland & Rose
Vancouver, B.C.

PUMPS

OF ALL KINDS

Steam and Motor Driven Outfits

Kinney Oil Pumps

MUSSENS LIMITED

MONTREAL
WINNIPEG
VANCOUVER

H. L. Osborne
COBALT
H. Turnbull & Co.
TORONTO

SUCCESSFUL FLOTATION OILS

SPECIAL COAL TAR LIGHT OILS (containing high
percentage of Phenols)

Shipments of Drums or Tankcars

DOMINION TAR AND CHEMICAL COMPANY
TAR DISTILLERIES : Sault St. Marie, Ont.
Sydney, Nova Scotia

Address all communications to Sales Office, Sault Ste. Marie, Ontario.

THE CANADIAN MINING JOURNAL

VOL. XXXIX

TORONTO, April 1st, 1918.

No. 7

The Canadian Mining Journal

With which is incorporated the
"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

Published 1st and 15th of each month by the
MINES PUBLISHING CO., LIMITED

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

Editor: **REGINALD E. HORE, B.A. (Toronto).**

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.

Single copies of current issue, 15 cents. Single copies of other than current issue, 25 cents.

The Mines Publishing Co. aims to serve the mining industry of Canada by publication of reliable news and technical articles. This company publishes the Canadian Mining Journal twice a month and the Canadian Mining Manual once a year.

ADVERTISING COPY.

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.

ADVERTISING.

The Canadian Mining Journal covers the Canadian mining field. Ask for advertising rates.

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, APRIL 1:

Editorial	111
Mineral Production of Ontario, 1917, by T. W. Gibson..	112
Mineral Production of Quebec, 1917, by T. C. Denis....	115
Canadian Placer Deposits, by J. B. Tyrrell.....	116
Magmatic Ore Deposits, Sudbury, Ont., by A. M. Bateman	118
Special Correspondence	122
Markets	126

The discovery of ore in the Violet property of La Rose Consolidated may well prove to be of great importance to the company. Prospecting has been carried on by the company without much success for some time, and it has been discouraging work. Persistency is, apparently, at last to be rewarded. We hope that development will prove the existence of deposits that will give La Rose a new lease of life. As yet, no rich ore is reported to have been discovered on the Violet property; but the chances have been much improved by recent developments.

The preliminary reports for 1917 of Thos. W. Gibson, Deputy Minister of Mines of Ontario, and of Theo. C. Denis, Superintendent of Mines of Quebec, extracts from which are published in this number, show that considerable progress was made during the year 1917, in spite of many handicaps.

The fuel problem has at last attracted almost as much attention as the food problem. Coal producers two years ago attempted to arouse the public to the necessity of recognizing coal as one of the most important munitions of war. Not until recently, however, has the public been willing to believe that the statements made by the operators in the early part of the war were justified.

The peat deposits of Canada have attracted much attention; but so far have contributed very little to our fuel supply. Experimental plants have been installed and the manufacture of peat carried on; but without noteworthy success. There seems to be reason to believe, however, that an economical process of manufacture may be found, and the tests to be carried on by the Dominion and Ontario Governments may have important results.

That classes for prospectors may be of great benefit to the country is indicated by the success of the evening classes at the University of Manitoba. Last fall, one of the members of the class made what may prove to be an important discovery of molybdenite. Recently another prospector brought in specimens which were identified as scheelite, an ore of tungsten.

In this issue, we publish a paper, by Mr. A. M. Bateman, on the origin of the Sudbury nickel-copper deposits. Since Mr. Bateman's paper was written, there has been published another paper dealing with this subject. We will publish in a later issue a summary of the conclusions of H. M. Roberts and R. D. Longyear. These two papers are important contributions to the discussions on the origin of the nickel ore of the Sudbury district.

Mr. James White threatens to have his good friend Mr. Sifton raise the question as to whether the Mining Institute should continue to receive the grant from the Dominion Government. Perhaps the money might be better devoted to the making and showing of moving pictures of Mr. White giving a characteristic speech in defence of the Commission of Conservation.

Development of one of the newer gold districts in Northern Ontario will be hastened by the decision to proceed at once with the exploration of the Otisse property in Powell township. Surface samples from a number of outcrops on this property show high gold values and careful testing is likely to result in a deposit of some size being proven. Information at present is fragmentary. Scattered outcrops of rich ore are known to occur. The structure of the deposits is as yet unknown. We are pleased to learn that this attractive prospect is to be explored without delay.

Mineral Production of Ontario, 1917

By T. W. Gibson.

Deputy Minister of Mines, Ontario.

In the following table, issued subject to revision, is summarized the mineral output of Ontario for 1917. Comparative figures for 1916 are included.

Discoveries of gold continue to be made in various parts of northern Ontario. Last year one of the most promising was in the township of Rickard, some 12

Product	Quantity	Value, \$	
		1916	1917
METALLIC:			
Gold.....	ounces	497,833	420,869
Silver.....	"	20,007,367	19,479,807
Copper.....	lbs.	157,138	542,878
Copper, in matte (a).....	tons	22,430	21,197
Nickel, in matte (b).....	"	41,299	41,887
Iron ore, exported.....	"	121,495	136,343
Pig iron (c).....	"	118,165	49,485
Cobalt (metallic).....	lbs.	328,563	396,395
Cobalt oxide.....	"	691,681	418,703
Nickel oxide.....	"	100,013	23,748
Nickel (metallic).....	"	42,411	225,480
Other Nickel and Cobalt Compounds.....	"	350,831	393,036
Molybdenite, concentrates.....	"	24,562	80,614
Lead.....	"	796,833	1,772,512
Metallic total.....			
NON-METALLIC:			
Arsenic, white, grey and other forms.....	lbs.	4,320,890	5,183,145
Asbestos.....	"	500	20,000
Brick, fancy and pressed.....	M	31,742	35,203
Brick, common.....	"	60,441	74,129
Tile, drain.....	"	15,931	13,421
Tile, hollow blocks.....	"	4,451	3,931
Cement, Portland.....	bbl.	2,143,949	2,063,231
Corundum.....	tons	67	188
Feldspar.....	"	12,965	6,167
Fluorspar.....	"	1,283	4,213
Graphite, refined.....	"	3,466	3,173
Gypsum, crushed, ground and calcined.....	"	36,668	48,656
Iron pyrites.....	"	175,593	257,369
Lime.....	bush.	1,453,254	1,179,062
Mica.....	tons	266	386
Natural gas.....	M. cu. ft	17,953,396	20,025,727
Petroleum, crude.....	Imp. gal.	6,890,681	7,104,700
Pottery.....	"		87,025
Quartz.....	tons	133,684	174,155
Salt.....	"	128,935	138,528
Sand and gravel.....	cu. yds.	1,265,973	1,142,481
Sewer pipe.....	"		216,749
Stone, building, trap, granite, etc.....	"		755,313
Talc, crude and ground.....	tons	11,810	16,076
Total, non-metallic.....			
Add metallic.....			
Grand Total.....			

(a) Copper in the matte valued at 18½ cents per pound.
 (b) Nickel in the matte valued at 25 cents per pound.
 (c) Production from Ontario iron ore only.

Gold.

The adverse effects of the war fell with greater force upon the mining of gold than upon any other branch of the industry. The result of scarcity and higher cost of labor as well as of all necessary supplies cannot be transferred, as in other departments of mining, to purchasers of the product, because of the fact that gold has a fixed price. The output was consequently less by 76,935 ounces than in 1916. At the Dome mine, one of the leading Porcupine producers, milling was discontinued in November, and the difficulties of the situation doubtless diminished the output at other properties. Nevertheless, the position of the gold mining industry is essentially sound, and the lessening of production can only be regarded as temporary, pending the return of more normal times. Meanwhile, great progress is being made in the development of ore bodies, and the milling capacity at Porcupine was increased during the year by 1,500 tons daily.

The production according to source was as follows:

Source	Ore Milled tons	Gold Recovered		Gold Extraction per ton \$
		Ounces	Value \$	
Porcupine.....	1,177,928	398,257	8,229,744	6.99
Kirkland Lake.....	49,955	19,608	405,230	8.11
Rognon, St. Anthony, Croesus, Miller-Independence and Cordova Mines.....	2,656	2,974	62,636	....
Gold in copper ore.....		59	1,221	....
Total.....	1,230,539	420,893	8,698,831	....

miles west of Lake Abitibi, where a Finn named John Raty, staked out a claim on lot 7 in the fourth concession. At 5 feet in depth, the vein shows very coarse gold accompanied by tellurides and other minerals in a milky-white quartz. Another excellent prospect was located by a prospector named Cochenour near the head waters of the Lightning River, a small stream falling into Lake Abitibi from the south. The gold area in Powell and Cairo townships, about 3 miles west of Fox rapids on the Montreal river, has attracted considerable attention. Adjoining the Davidson claims, where the original discovery was made, some stakings made by Sam Otisse contain, it is reported, very wide bands of schist and porphyry, both highly auriferous. In all these areas there is likely to be much activity next season, although the expansion of the gold fields of the Province is to some extent awaiting the return of the prospectors who in large numbers offered their services to their country, and are now somewhere in France.

In addition to the recovery given above, the gold ores yielded 76,223 ounces of silver worth \$61,274, and 2,032 pounds of copper valued at \$552.

The total yield of gold in Ontario to the end of 1917 amounted to \$42,362,479.

The chief producers in 1917 are enumerated in the following table:

Company	Ore milled tons	Gold recovered	
		ounces	value \$
Hollinger Consolidated Gold Mines, Limited.....	514,301	204,810	4,233,777
McIntyre-Porcupine Mines, Limited.....	175,893	81,827	1,696,126
Dome Mines Company, Limited.....	359,570	71,193	1,471,705
Porcupine-Crown Mines, Limited.....	39,111	18,180	375,766
Tough-Oakes Gold Mines, Limited.....	38,695	16,384	338,593
Porcupine V.N.T. Gold Mines, Lrd.....	34,971	10,416	208,350
Schumacher Gold Mines, Limited.....	37,323	9,551	197,413
Teck-Hughes Gold Mines, Limited.....	11,257	3,181	65,753

Silver.

As the table of production shows, the Cobalt mines fell short of the yield of 1916 by about 500,000 ounces, a much smaller falling-off than in the latter year, when the decrease as compared with 1915 was 4,800,000 ounces. On the other hand, the decided increase in the price of silver made the return to the mine owners greater than in 1916 by nearly 3½ million dollars. The increase in the value of silver has naturally been of great advantage, not only to the mining companies at Cobalt, but also to their employees, whose wages automatically advance with the price.

Mining Corporation of Canada now leads in production by virtue of the rich system of veins situated in part beneath the streets and buildings of the town of Cobalt. Nipissing, which maintains its production well, follows, succeeded by Kerr Lake. The mines shipping over one million ounces were Mining Corporation, Nipissing, Kerr Lake, Crown Reserve, O'Brien, Miller Lake-O'Brien and McKinley-Darragh-Savage. The first mentioned shipped 4,546,065 ounces. A new shipper was Adanae, situated southwest of the Temiskaming. Developments at a near neighbor, the Ophir, lying south of the Adanae, are encouraging.

Since the discovery of silver at Cobalt in 1903 shipments from the camp and outlying silver areas have been as follows:—

Year	Average price, cents per ounce	Ounces	Value \$
1904.....	57.2	206,875	111,887
1905.....	60.4	2,451,356	1,360,503
1906.....	66.8	5,401,766	3,667,551
1907.....	67.5	10,023,311	6,155,391
1908.....	52.9	19,437,875	9,133,378
1909.....	51.5	25,897,825	12,461,576
1910.....	53.5	30,645,181	15,478,047
1911.....	53.3	31,507,791	15,953,847
1912.....	60.8	30,243,859	17,408,935
1913.....	57.8	29,681,975	16,553,981
1914.....	54.8	25,162,841	12,765,461
1915.....	49.69	24,746,534	12,135,816
1916.....	65.661	19,915,090	12,643,175
1917.....	81.417	19,401,893	16,131,013
Total.....		274,724,172	151,960,561

It will be noted from the above figures that the decline in silver production since 1911 has been much less rapid than the rise prior to that date.

The production according to source was as follows:—

Source	Ounces
Cobalt.....	18,327,258
South Lorrain.....	10,000
Gowganda.....	1,064,635
Silver recovered from gold and copper ores.....	77,914
Total.....	19,479,807

Ontario's Leading Gold Producers in 1917.

Some properties at which operations had ceased came again into production; these include the Trethewey and Cobalt Provincial. The lower diabase contact reached at depth in the Temiskaming and Beaver mines showed some ore, but on the whole was disappointing. In Gow-

ganda the Miller Lake-O'Brien mine produced largely from the high-grade vein opened up in 1916, and this has led to development work being undertaken on nearby locations. A new find of rich silver ore was made by Hugh Miller Kell in the township of Corkill, some 12 miles southeast of the Gowganda deposits. This discovery has not yet been fully developed.

The flotation process for the concentration of dump and low-grade ore is now pretty well established at Cobalt, although there has been some reaction against it. The results so far have been unequal, and the reduction of the concentrates offers difficulties; besides, the position as regards the alleged German ownership of the patents and the excessive royalties with which the mining companies feared they were to be saddled, has not yet been satisfactorily cleared up.

Refineries.—Shipments abroad of ore and concentrates are on the decline. In 1917 United States refineries treated 1,912 tons of ore and 4,396 tons of concentrates, producing therefrom 2,914,267 ounces of silver. The proportion of the silver output refined in the Province was therefore about 80 per cent.

The Deloro, Thorold and Welland refining plants treated 7,964 tons of silver-cobalt-nickel arsenides, recovering 6,450,075 ounces of silver worth \$5,288,739. Year by year a larger proportion of cobalt and nickel oxides are being treated for production of the metals, and also for a variety of cobalt and nickel salts. The figures given for cobalt metal include 81,068 pounds used in the manufacture of stellite, a cobalt-chromium-tungsten alloy used for making high-speed cutting tools. Nickel sulphate and cobalt, both as carbonate and sulphate, are produced by Metals Chemical, Limited. Nickel sulphate is coming into important use for the hydrogenization of oils and fats in the manufacture of soap, oleomargarine, etc. Unseparated cobalt and nickel oxides were marketed in small quantities only. The great use of cobalt as coloring in the ceramic trade, bids fair to be rivalled by its new employment in the metallic form.

Nickel and Copper.

The output of nickel-copper matte in 1917 was 78,897 as compared with 80,010 tons in 1916. The nickel content, 41,887 tons, was greater, but the copper content, 21,997 tons, less than in that year, which may be explained by the fact that the bulk of the Canadian Copper Company's production was from the Creighton mine, the ore of which is well known to contain much more nickel than copper. During the year, 1,453,661 tons of ore were smelted at the Copper Cliff and Coniston smelters. Besides the Creighton mine, the Canadian Copper Company operated the Crean Hill and No. 2, while the Mond Company drew ore from Victoria, Garson, Levaek and Worthington; also silicious copper ore from Bruce Mines. Alexo shipped its output to the Mond Company.

The Royal Ontario Nickel Commission in its report on the nickel industry, issued early last year, estimated the known reserves of nickel ore as 70 million tons, but it is believed that the results of diamond drilling since

the issue of the report have added nearly 100 per cent. to the quality. Explorations at the Levaek, Frood Extension, Murray and Falconbridge deposits have much extended the limits of the ore bodies. The refinery of the International Nickel Company of Canada at Port Colborne is well on the way to completion. It will have a capacity of about 10,000 tons of nickel per annum, and a relative quantity of copper.

Although the nickel-copper mines of Sudbury are the chief source of copper in Ontario, there are other deposits of non-nickeliferous copper ore from which shipments of ore and concentrates were made in 1917 to the extent of 4,173 tons, containing 431,402 pounds of copper, valued at \$89,380. Shippers were H. H. Wood, Mine Centre; Hudson Copper Company, Havilah; Kenyon Copper Mines, Massey; Tip-Top Mine, Kashabowie; Jos. Errington, Gogama station, Can. Nor. Ry.; and Sudbury Copper Company, Iron Bridge. In addition, 110,476 pounds were recovered from silver ore and gold slag treated in United States refineries. On the Hudson Copper Company's property in Galbraith township a handsome showing of copper glance has been uncovered. The average price of copper in 1917 was 27.18 cents (Eng. and Mining Journal) as compared with 27.20 cents in 1916. Since 21st September the price has been as fixed by the United States government, 23½ cents per pound f.o.b. New York.

Iron Ore and Pig Iron.

From three producing mines there were raised and marketed 176,833 tons of iron ore. Of this quantity, 136,343 tons were exported to the United States, the remainder being sent to blast furnaces in the Province. The mines raising ore were Moose Mountain, Magpie and Helen, the first-named belonging to the company of that name, and the last two to Algoma Steel Corporation, Limited. The Helen mine ships to the Magpie, where the ores from the two mines are mixed and treated in the roasting furnaces to produce a Bessemer grade of ore. From Moose Mountain shipments were in the form of concentrates and briquettes.

Blast furnaces at Sault Ste. Marie, Hamilton, Port Colborne and Deseronto smelted 94,318 tons of Ontario ore and 1,221,881 tons of imported ore, the product being 691,233 tons of pig iron valued at \$14,201,695. It may be stated that only 7.15 per cent. of the value of the pig iron output can be credited to domestic ore.

Molybdenum.

Molybdenum ore treated in 1917 at the concentrators of the International Molybdenum Company at Renfrew, Renfrew Molybdenum Mines at Mount St. Patrick, and the Mines Department at Ottawa, totalled 692 tons. From this ore 80,614 pounds of concentrates were produced worth \$108,501. The molybdenum contents of the concentrates varied from 52.9 to 93.5 per cent. of MoS₂.

From the plants of the International Molybdenum Company at Orillia and Tivani Electric Steel Company at Belleville, there was a production of 149,000 pounds of ferro-molybdenum valued at \$348,775.

Molybdenum is one of the metals to which, because of its use for making high-speed tool steel, the war has lent much importance. During 1917 there was an embargo on shipments of molybdenum from Canada to the United States. At the beginning of 1918, this was lifted, and shipments may now be freely made under license permit. Prices ruling in the United States have been much higher than those paid by the Imperial Munitions Board. It is hoped that the better market will stimulate production.

Non-Metallic.

The value of the output of non-metallic products for 1917 was greater than in any preceding year except 1913, when it amounted to \$15,724,376. Of the 24 items in the non-metallic list only five, compared with 1916, show decreased production in quantity, namely, drain tile, hollow building blocks, graphite, lime, sand and gravel. In valuation, decreases are shown by graphite, sand and gravel, sewer pipe and stone. For practically all products prices have advanced materially; this has notably been the case with arsenic, fluorspar and iron pyrites. The Northpines and Gondreau mines of the Nichols Chemical Company each shipped over 100,000 tons of iron pyrites. Fluorspar is in great demand by the steel plants, the entire production being from Madoc. Building was quiet in 1917, hence the output of construction materials was about the same as in 1916.

The yield of crude petroleum exceeded that for 1916 by 214,019 imperial gallons, this being the second year since 1907 that has shown an increase over the one previous. The output from the older parts of the oil region in Lambton county and neighborhood continued slowly to decline; but the falling-off was more than offset by the production from the new field in the township of Mosa, Middlesex county. Oil was struck there in the Corniferous limestone by Mr. J. F. Carman of Petrolia about 1st February. Some 40 producing wells have been drilled, and 13 dry holes. Oil is obtained at a depth of 300 to 375 feet, and the production up to the end of the year was 21,000 barrels. The oil has a gravity of 33 degrees, and is piped or hauled in tank wagons to North Glencoe. The pool so far as defined is on lots 5 to 8 in the fifth, sixth, and seventh concessions.

The output of the natural gas wells was the highest yet recorded. The large well struck in the Trenton, Dover township, has not maintained its original flow, and is now yielding considerable oil. Owing to widespread distress caused by the partial failure of the gas supply during the present winter, the Legislature has placed the entire natural gas industry under the control of the Ontario Railway and Municipal Board.

Miscellaneous.

Four gold mining companies paid out in dividends \$1,699,542.45, and 13 silver mining companies \$5,886,945.94, a total of \$7,586,488.39, being a decrease of \$4,064,061.70 as compared with 1916. There was an increase in the dividends by silver mining companies, but a decided decrease in those by gold companies. The total dividend distributions by silver and gold companies combined up to the end of 1917 was \$82,663,283.

A deposit of euxenite, a rich radium mineral, was found near Maberley in a feldspar quarry in South Sherbrooke township. It does not, however, appear to be present in commercial quantity.

ENEMY GETS CAUCASUS MANGANESE.

By the surrender by Russia of the new area to Turkey, Germany is assured of all the manganese ore she will require during the period of the war and forever afterward, as adjacent to Batum are the largest known deposits of high-grade manganese ore in the world. Germany has been in such straits to obtain manganese that she is now utilizing ore that contains as little as five per cent. manganese, at a prohibitive cost probably. Large quantities are required in war ordnance. Batum and Poti are the export ports of all this ore from the Black Sea. Germany has now secured control of a district that produced about one-third of the world's manganese ore in 1913.

Mineral Production of Quebec, 1917

By Theo. C. Denis.
Superintendent of Mines, Quebec.

The total value of the mineral production of the Province of Quebec during 1917, as shown by the provisional compilation of returns received at the Department of Colonization, Mines and Fisheries, amounted to \$16,051,188. This is an increase of \$2,764,164 as compared with the previous year, or 20.8 per cent.

In the table given below the "building materials" have been kept separate from the "products of the mines." As in the three previous years, the building materials show a decrease, whereas the products of the mine show an increase of 33 per cent.

The mineral production of the province of Quebec for 1917 (Figures for 1917 are subject to revision)

SUBSTANCE	Quantity	Production 1917	
		Value	Value in 1916
Asbestos.....Tons.....	137,242	\$7,198,558	\$5,182,905
Asbestic.....".....	17,210	42,139	28,252
Chromite.....".....	35,726	495,981	312,901
Copper and Sulphur ore....."	122,822	1,205,242	1,259,064
Feldspar and kaolin....."	2,028	19,969	38,260
Glass sand.....".....	.....	.....	24,140
Gold.....Oz.....	1,116	22,570	13,041
Graphite.....Lb.....	1,078,000	99,024	75,776
Iron Ore.....Tons.....	11,593	31,365	.....
Magnesite.....".....	58,090	728,275	525,966
Mica.....Lb.....	961,237	282,153	177,814
Mineral waters.....Gals.....	39,318	6,541	18,574
Mineral Paint (ochre).....Tons.....	9,252	69,536	62,875
Molybdenite.....Lb.....	207,286	158,096	129,267
Phosphate, Titaniferous iron ore, Quartz.....Tons.....	7,547	30,995	14,242
Silver.....Oz.....	96,620	78,880	38,113
Zinc and Lead ores.....Tons.....	4,618	242,778	107,348
Structural Materials			
Brick.....M.....	55,699	503,688	762,689
Cement.....Bbls.....	2,079,404	3,264,664	2,525,841
Granite.....".....	.....	137,159	292,270
Lime.....Bush.....	1,274,868	280,527	276,245
Limestone and Marble.....".....	.....	739,228	978,945
Sand.....".....	.....	131,465	168,891
Sandstone.....Tons.....	.....	7,475	8,190
Slate and Flagstone.....Square.....	1,422	7,885	6,223
Tile drain and sewer pipe, pottery, etc.....".....	.....	266,995	259,192
		16,051,188	13,287,024

Steady Increase in Value of Output.

The following table gives the total figures of the province for each year since 1900. It may be seen that in eighteen years the value of the mineral production of the province has grown from 2½ million dollars to 16 million dollars, a proportional increase of 540 per cent.

Year	Value	Year	Value
1900.....	\$2,546,076	1909.....	\$5,552,062
1901.....	2,997,731	1910.....	7,323,281
1902.....	2,985,463	1911.....	8,679,786
1903.....	2,772,762	1912.....	11,187,110
1904.....	3,023,568	1913.....	13,119,811
1905.....	3,750,300	1914.....	11,732,783
1906.....	5,019,932	1915.....	11,465,873
1907.....	5,391,368	1916.....	13,287,024
1908.....	5,458,998	1917.....	16,051,188

Asbestos.

Both in value and in tonnage the production of asbestos reached record figures in 1917. The demand was very keen, but, as in the previous year, the shortage of labor was felt. As compared with 1916 the proportional increase in tonnage was 3.0 per cent., and in value 38.9 per cent. The average price per ton rose to \$52.45. In 1916, this was \$38.87; for the previous years the figures were \$31.33 in 1915; \$26.96 in 1914 and \$28.04 in 1913.

The total quantity of asbestos-bearing rock mined and hoisted was 2,634,410 tons. The value of the asbestos extracted from it, counting stocks on hand at the end of the year, was \$8,120,409. This represents a value of \$3.08 of asbestos extracted from each ton of rock. In 1916, 1915 and 1914, these values were \$2.13, \$1.46 and \$1.44 respectively.

Copper and Sulphur Ore.

The shortage of mine labor and transportation difficulties seriously interfered with the production of copper and sulphur ore in the Eastern Townships. The ore is a copper-bearing iron pyrites, which is used for the manufacture of sulphuric acid, the resulting cinders being sent to copper smelters.

In 1917, the quantity of copper-sulphur ore extracted from Quebec mines was 122,822 tons, valued at \$1,205,242. This is a decrease, both in tonnage and value as compared with 1916, and much below what was expected, considering the keen demand for pyrite.

Zinc and Lead Ore.

The production of zinc and lead ores of the Province of Quebec amounted to 4,618 tons, valued at \$242,778.

PRODUCTION OF ASBESTOS IN THE PROVINCE OF QUEBEC FOR 1917.

Designation of Grade	Shipments and Sales			Stock on hand Dec. 31st, 1917	
	Tons	Value	Average Value per Ton	Tons	Value
Crude No. 1.....	1,761	\$1,370,740	\$778.38	580	\$470,923
Crude No. 2.....	3,603	1,374,387	381.46	746	269,766
Mill Stock No. 1.....	13,197	1,318,387	99.90	1,089	206,124
Mill Stock No. 2.....	54,072	1,988,197	36.77	3,346	141,344
Mill Stock No. 3.....	64,609	1,146,847	17.75	7,447	124,735
Total.....	137,242	7,198,558	52.45	13,208	1,212,892
Asbestic.....	17,210	42,139	2.45	263	805
Total.....	154,452	7,240,697	.....	13,471	1,213,697

Quantity of rock mined during the year 1917, 2,634,210 tons.

The whole production comes from the mines of Montauban township, in the county of Portneuf, but a great deal of development work was effected on the blende-galena deposits of Gaspe, at the head of the Cascapedia river. It is likely that shipments from these deposits will begin in the course of 1918.

Chromite.

The total production of chromite in 1917 shows record figures. From the Coleraine-Black Lake district, and from the new deposit worked in the Danville district, 35,726 tons were shipped, representing a total value of \$495,981. In 1916, the figures were 27,952 tons valued at \$312,901.

Molybdenite.

The Province of Quebec possesses the largest individual producing mine of molybdenite in the world in the Moss mine, in Onslow township, operated by the Dominion Molybdenite Company. This company has a large concentrator, of a capacity of 150 tons of rock a day, using the Callow process for the separation. During 1917, extensive diamond drilling operations were carried on, which blocked out large reserves of ore.

Magnesite.

The shipments of magnesite, crude, calcined and dead burned, reached 58,090 tons, representing a value of \$728,275. As compared with 1916 this is a proportional increase in value of 38.5 per cent. This increase is to some extent due to the fact that two producing companies are now making dead-burned magnesite. For this purpose, these companies are using the kilns of cement works in Montreal and in Hull, which were not operating on the manufacture of cement during the year.

6,311 Men Employed in Quebec Mines.

During the calendar year 1917, the number of men employed in the mines, quarries and concentrating mills was 6,311 as compared to 6,601 for the preceding year. These figures are on the basis of 300 days work. The work in the mines has been unusually active, notwithstanding the very rainy weather. Although a large number of men new to conditions of the mines have found employment, the total number of accidents has been much less than last year. The number of fatalities is notably less than that of the twelve preceding months, being 4 against 18. The total number of accidents reported to the Bureau of Mines during 1917 was 172.

The proportion of fatalities per 1,000 year men of 300 days work is 0.6. Only accidents resulting in a loss of time of more than 10 days are reported to the Bureau of Mines.

RUSSIAN AND ROUMANIAN OIL FIELDS.

Petroleum men, discussing the benefits to accrue to Germany from possession of the Russian and Roumanian oil fields, agree that despite the difficulties of transportation and the high cost of working the fields, Germany has been placed in a much better position to continue the war. Trustworthy reports indicate that Germany's weakest spot had been in the military transport system, which the reports said was threatened with complete collapse owing to lack of oil for motor trains. With new supplies available, Germany would be quick to replenish stocks whatever the cost. None of the oil men was inclined to minimize the gain to Germany of peace with Russia and Roumania.

CANADIAN PLACER DEPOSITS*

In the discussion of a paper by Dr. Mellor on the conglomerates of the Witwatersrand, Mr. J. B. Tyrrell made the following remarks with reference to some of the placer deposits of Western Canada:

I wish to join in thanking Dr. Mellor for his splendid presentation of the characteristics of the conglomerates of the Witwatersrand, with the gold which they contain, and for his most interesting discussion of the methods which Nature may have adopted in forming these beds of conglomerates, and in placing gold in them.

The occurrence of a conformable sedimentary series five miles in thickness, like that of the Witwatersrand, is not in itself a matter for very particular comment, for such series occur in other parts of the world, especially along the flanks of important mountain ranges, and the coarseness or fineness of the sediments in them depends largely on the strength of the currents, whether caused by winds, tides, or rivers, by which the sediments were distributed. If small particles of gold, as well as pebbles of quartzite or other similar rock, were being supplied to the moving waters at the same time, they would be distributed together, but large particles or nuggets of gold would not be carried by water and dropped along with small or medium-sized pebbles of quartzite, etc., for the currents that would easily carry the latter would not move the former.

Gold in Edmonton Sandstones.

In Western Alberta, in a great series of conformable Mesozoic and Tertiary sediments, gold occurs in a finely divided state in the Edmonton sandstones at top of the Cretaceous. These beds were laid down near an old shore line, and the fossils contained in them prove that they were deposited in brackish water. No beds holding a sufficient quantity of gold to pay for mining have yet been discovered in these sandstones, but the streams which now drain the country east of the Rocky Mountains cut down into them in many places, and concentrate the gold derived from their sandstone banks into the gravel bars in the rivers, whence it is collected by simple methods of alluvial washing. The gold so obtained is in very minute particles which, under the microscope, may be seen to be well rounded like most other particles of placer gold. I believe that it is also in the form of such minute rounded particles in the Edmonton sandstones, from which it is derived, for no matter how near the gravel bars which now contain it may be to its probable source in the sandstone itself, the gold always presents the same rounded appearance.

Whether the gold is confined to certain definite strata in the series or not I do not know, but I have definitely determined its presence in, or in the immediate vicinity of, some of the beds of lignite which are interstratified with the sandstone.

In this particular instance the source of the gold is reasonably certain, for it was undoubtedly transported from the granite mountain range away to the west within the confines of the province of British Columbia, and was carried 200 miles or more before it finally settled near the shore of the brackish sea. Though nowhere concentrated into rich pockets or beds the total quantity so carried from the mountains must have been large.

In a disseminated placer, in which the gold has been distributed by tidal currents over a sea floor, no "pay-streak" such as is commonly found in stream placers,

*Extract from the Transactions of the Institution of Mining and Metallurgy, Vol. 25, 1916, pp. 320-323.

would be looked for; but if actual beaches should be discovered, paystreaks might reasonably be expected to occur, for the gold would have been concentrated in them by the waves. In this connection the distribution of the conglomerates in the Far East Rand, described by Dr. Mellor in his paper, and illustrated by him in Fig. 48, strongly suggests the presence of such beaches formed on a gently sloping shore which was at the same time slowly and regularly sinking beneath the sea. Such a method of formation would account perfectly for the local parallelism of these bands of conglomerate.

Stream Placers of the Klondike District.

Stream and ocean placers have some common characteristics, and it may be interesting to refer to one or two of these. In the Klondike District, where I was mining placers for a number of years, the gold-bearing gravels occur in the bottoms, or what were once the bottoms, of river valleys. They are essentially of two ages, namely, Older Pliocene gravels and Newer Recent gravels. The former occur in the bottoms of wide, mature valleys, with gently sloping sides on which the underlying rock has decayed to such an extent that naked cliffs and escarpments are unknown; while the latter are in the bottoms of narrow, immature, and often gorge-like valleys cut in the bottoms of the old Pliocene valleys. These newer valleys are thus cut down through the older gravels, sometimes one or two hundred feet into the underlying hard granitoid gneiss or schist, and what remains of the older gravels may lie along the top of the steep banks of the newer valleys. In both these gravel deposits, wherever gold is present, it is concentrated in a thin, but ill-defined, layer just above bedrock and in the fissures of the underlying bedrock. The total average thickness of the gold-bearing layer might be put at 3 ft., 1 ft. of this being gravel and 2 ft. bedrock, though this thickness varies greatly in different places. In some parts of Dominion Creek the "pay," though very rich, was confined to a few inches of gravel just above bedrock, and the underlying bedrock was barren; while on a mining claim on Hunker Creek, which yielded a large quantity of gold, there was scarcely any gold in the gravel or in the upper foot of bedrock, for it had sunk as much as 7 or 8 ft. into the cracks of this bedrock.

The Newer Recent Gravel.

In the Newer Recent gravel the gold-bearing layer lies below the water level of the stream in the valley of which it occurs, and associated with the gold there is usually an abundance of "black sand," composed chiefly of small grains of magnetite and ilmenite, with some hematite and a little impure cassiterite or tinstone, all more or less thoroughly rounded. This black sand lies loose in the gravel or in the cracks of the bedrock, being distributed much in the same way as the gold. On some mining claims crystals of pyrites were collected in considerable quantity with the gold in the sluice boxes. The crystals were always beautifully sharp and angular; I do not remember to have seen any that were rounded or waterworn. On closer investigation these crystals were invariably found to have been broken out of the underlying bedrock, and not to have been derived from the gravel. One claim which I was operating on Hunker Creek yielded large quantities of these crystals from a bedrock of dark graphitic schist.

The gold itself, both in the gravel and in bedrock, was always in more or less rounded and waterworn

nuggets and particles, known collectively as "dust." Even where originally in elongated or thread-like forms, these particles had been pounded and bruised, so that their points and angles had been rounded off. No new crystals or crystalline films of gold had been formed anywhere since this Recent gravel had assumed its present position.

With regard to the older Pliocene gravels, wherever they were well situated for examination, as on the tops of the banks of the newer valleys, they were found to contain neither magnetite nor pyrites. If either of these minerals had ever been present they had been leached out.

Recrystallization of Gold in the Older Pliocene Gravels.

In these older gravels most of the contained gold was in the form of well-rounded particles similar to those in the newer gravels. But in addition to such rounded particles or grains there were many pieces which showed beautiful sharp crystalline structure, either in moderately stout forms, or in delicate feathery shapes such as it would be difficult or almost impossible to move without crushing or destroying. In many cases this gold was in the form of thin crystalline films, between layers of the schistose bedrock, while, in one instance, Mr. McConnell, now Deputy Minister of Mines of Canada, drew my attention to a very delicate film of gold adhering to the outside of a pebble in the gravel.

Such crystals had never been mechanically transported along with sand and gravel by water, but had evidently been formed just where they were found. The gold would seem to have been first dissolved, probably by the action of water on the surrounding "dust," and then to have been precipitated from the solution, but in no instance did I find any evidence that pyrites took any part in this action, or was precipitated with the gold. Possibly the gold had not been carried any appreciable distance in solution, for the beautiful, fragile crystals above referred to were always found within the narrow limits of the original thin gold-bearing layer of gravel and bedrock, and not in the gravel above it or in the bedrock below it.

If the process of solution and precipitation which gave rise to these crystals were carried far enough it is quite conceivable that it might completely destroy the rounded character of the particles of gold usually found in placer deposits, and give rise to forms and characteristics similar to those found in the conglomerates of the Witwatersrand.

In the final summing up of the discussion, Dr. Mellor made these comments on Mr. Tyrrell's remarks:

"It is interesting to see that Mr. Tyrrell, whose experience with placer deposits is so extensive, finds no difficulty in accepting the gold of the Edmonton sandstones as alluvial, although it is so finely divided and so far from its source; and he also thinks it reasonable that large particles or nuggets of gold should hardly be expected in a deposit of medium-sized pebbles. Both these features in the Rand conglomerates appear to have given difficulty to those who limit their comparison to river gravels and similar alluvial deposits.

"Mr. Tyrrell's example of the solution and recrystallization of gold in Pliocene gravels is particularly interesting, especially as recrystallization seems to have taken place without any extraordinary conditions of temperature or pressure on the action of any particular solvent, such as are frequently demanded by those who find difficulty in accepting the recrystallization of the Rand gold."

Magmatic Ore Deposits, Sudbury, Ontario

By Alan M. Bateman.

The following is an abstract of a more extended paper published in *Econ. Geol.* Vol. 12, p. 391, 1917. Some articles relating to the Sudbury deposits have appeared since this paper originally went to press, and unfortunately are not included in it. They are: "Geology of the Sudbury Area," Royal Ont. Nickel Commission, 1917; "Magmas and Sulphide Ores," by Coleman, A.P., *Econ. Geol.*, Vol. 12, p. 427, 1917; "Quantitative Measurements of Minerals of the Nickel Eruptive at Sudbury," by Dresser, M.A., *Econ. Geol.*, Vol. 12, p. 563, 1917.

No other types of deposit have perhaps excited more scientific interest than those for which a syngenetic magmatic origin has been claimed. This is especially true for deposits of sulphides supposed to be of magmatic origin. Geologists have had little difficulty in accepting a magmatic origin for deposits in which the ore minerals are also common rock-forming minerals, such as magnetite deposits. On the other hand, there has been hesitancy in accepting a like origin for deposits in which the ore minerals are not common accessory minerals of rocks, such as sulphides. For this reason the Sudbury deposits have attracted more than usual interest—an interest increased by the fact that these ore bodies constitute the greatest nickel deposits in the world and because both a magmatic and hydrothermal origin have been claimed for them.

In his investigation of the literature of the subject the writer encountered certain conclusions supported by convincing evidence, and also opposing conclusions supported by equally convincing evidence, suggesting that a more correct conclusion would be one which includes some of the evidence presented by each side. Such a conclusion has been presented by one investigator.* A modification of this conclusion is presented by the writer, and it is believed that it is supported by convincing evidence on both sides and meets some of the objections advanced by different investigators.

Field Relations.

Rock Formations—The Sudbury nickel-copper deposits are intimately associated with a norite-micropegmatite intrusion, called by Coleman† the "Nickel Eruptive." It is in the form of a great spoon 36 miles in length and 15 miles in width. The centre of the spoon is filled by 9,000 ft. of sediments of Upper Huronian Age and rests upon a great thickness of crystalline and sedimentary pre-Cambrian rocks. All supposedly older than the nickel eruptive. Knight‡ has recently shown that a part of the granite footwall of the norite on the south side of the spoon is not older than the norite but intrusive into it. The latest phase of igneous activity is represented by numerous large diabase dikes which cut the norite and ore and are themselves cut by small granite dikes.§

Ore Deposits—The Sudbury district is the source of the world's greatest nickel supply and is also an important producer of copper. Platinum and small amounts of silver, gold, and palladium are won from the ores, and iridium and osmium have also been noted. The present ore reserves indicate a supply for many years to come, and development and exploratory work are continually exposing more orebodies. Geologic conditions indicate that future work will add greatly to the present reserves so that a long life may be expected for the district.

Coleman* distinguishes two main varieties of ore-

*Ernest Howe, "Petrographical Notes on the Sudbury District," *Econ. Geol.*, Vol. XI, p. 503, 1914.

†Coleman, A. P., The Sudbury Laccolithic Sheet, *Jour. Geol.*, Vol. 15, p. 252, 1907.

‡Knight, Origin of the Sudbury Nickel Deposits, *Eng. & Min. Jr.*, Vol. 101, p. 811, 1916.

§Coleman, A. P., The Nickel Industry, Can. Dept. of Mines, Mines Branch No. 170, p. 11, 1913.

bodies, "marginal" and "offset" which he summarizes as follows:

Marginal (a) dipping toward the axis of the basin, ores with comparatively little rock and more than twice as much nickel as copper. (b) Faulted marginal—irregular in shape and character—usually mixed with much rock and carrying as much copper as nickel, or sometimes more.

Offsets: (a) Columnar offsets, roughly cylindrical bodies nearly vertical and going to great depth. Ore usually rich in copper and the precious metals. (b) Parallel offsets—not columnar, but sheet-like, dipping inward toward the basic edge. Ore like that of the usual marginal deposits.

Of these, the marginal deposits are the most important. They occur at the basic margin of the norite so that the norite forms the hanging wall and the adjoining country rock the footwall. Coleman states that orebodies may have a distinct foot-wall or may penetrate it along fissures and enclose blocks of it. He considers the hanging wall to merge gradually into a blending of rock and ore called pyrrhotite-norite, and then into pure norite with blebs of ore. Howe's‡ description of the Creighton differs from that of Coleman in that he considers the change from ore to norite to be less gradual and the "graduation to be due to a mechanical mixture of sulphides and norite in the transition zone, and not to a graduation in a mineralogical sense."

The offset deposits§ are like masses of ore and rock that extend outward from the main norite mass into the underlying older rocks, or more or less separate bodies having no visible connection with the main norite body. The columnar offsets as at Copper Cliff and Victoria mines are pipe-like bodies, somewhat resembling the Kimberley diamond pipes, from 50 ft. to 200 ft. in diameter.

Of the minerals that compose the Sudbury ores pyrrhotite, chalcopyrite, and pentlandite are the most important. Of these pyrrhotite is abundant, chalcopyrite is common, and pentlandite is common but is rarely seen with the naked eye. Less commonly pyrite, galena, and zincblende occur associated with quartz and carbonate and are usually in veins which, according to Coleman|| are later than the main ore bodies.

Previous Views of the Origin of the Sudbury Ores.

The scientific interest attached to the celebrated Sudbury deposits is due not only to their unique character but to the problem of origin they present. The previous investigators may be divided broadly into two schools; those favoring an origin by means of hydrothermal agencies, and those by magmatic differentiation. Some modifications of both hypotheses have been advanced.

The earlier views have been so excellently summarized by A. E. Barlow¶ that it is necessary only to refer to them without further discussion. Barlow states that the first investigators, Collins, Merritt, and Bell, ascribed a hydrothermal origin to these deposits; the same origin was adopted later by Emmons, Bush, Argall, and others.

The first to advocate an igneous origin for the Sudbury deposits was Barlow. Somewhat later Vogt advanced a similar origin to explain the Norwegian deposits. Since that time Barlow's views have been advocated by Adams, Browne, Kemp, Walker, and

*Coleman, A. P., The Nickel Industry, Mines Branch, No. 170, 1913, from which the descriptions here given are drawn.

†Idem, p. 34.

‡Howe, Ernest, *Econ. Geol.*, Vol. 9, p. 514, 1914.

§Op. cit. 35.

¶Op. cit., p. 27.

¶Econ. Geol., Vol. 1, p. 454, 1906.

others. In later years Coleman has carried on extensive work in the Sudbury district and is perhaps the strongest advocate of the views of Barlow. After Barlow's explanation appeared there was no dissenting opinion until C. W. Dickson* concluded that the sulphides were deposited from solution. A similar study led Beck† to the same conclusion. Later Campbell and Knight‡ investigated the problem by a metallographic study and supported Dickson's views.

In 1911 Ernest Howe and J. D. Irving visited the Sudbury region and Howe§ advocated a modified igneous origin for the Sudbury deposits by which differentiation took place in the magmatic reservoir and the sulphides were intruded as such, in a molten state. In 1916 a preliminary article appeared by C. W. Knight|| in which he shows that the age relations of some of the intrusive rocks are different from what had hitherto been considered, and he concludes the ores are of hydrothermal origin. The latest publication dealing with the Sudbury deposits is that by Tolman and Rogers¶ in which the ores are believed to have been formed by replacement of the norite by the action of "mineralizers."

Discussion of Recent Views.

Magmatic Segregation—Coleman's summary of the arguments in favor of magmatic segregation are:**

1. Universal association of ore and norite of a single eruptive sheet.
2. Intimate admixture of ore and norite and gradation from norite with scattered particles of ore, to pyrrhotite-norite with equal amounts of each, to almost pure ore with few rock minerals.
3. The adjoining footwall rocks are not spotted by ore nor do they surround separated bodies of ore; they are penetrated by veinlets of ore and included as blocks within the ore. This feature is due to shattering at the time of the norite intrusion and the heavier and probably more fluid sulphides filled all the spaces thus opened. Clean walls of country rock abut against large bodies of pure ore.
4. The freshest norite is generally close to orebodies and often spotted with ore. No considerable rearrangement caused by water could have taken place without altering so susceptible a mineral as hypersthene.
5. Absence of hydrothermal or pneumatolitic action in marginal orebodies; no banded cavity fillings or concentric structures typical of hydrothermal deposition. Scarcity of usual hydrothermal minerals.
6. Uniformity of deposits, regardless of the nature of the foot-wall rocks, throughout the entire norite margin indicates a single source, the norite.
7. Largest orebodies occur where bays of norite project into the country rock or on offsets from such funnel like bays; paucity of deposits along a straight margin. This is intelligible if the ore settles into the hollows underneath the molten sheet, but not so if formed from solutions.

Coleman's first argument of invariable association of ore and norite favors magmatic segregation. This same association holds true throughout the world, and there is no conclusive evidence against sulphides forming a part of an igneous rock, and passing through a

*The Ore Deposits of Sudbury, Ont., T.A.I.M.E., Vol. 34, pp. 1-65, 1903.

†Nature of Ore Deposits, p. 41, 1903.

‡Microstructure of Nickelliferous Pyrrhotites, Econ. Geol., Vol. 2, p. 350, 1907.

§Econ. Geol., Vol. IX, p. 503, 1914.

||Eng. & Min. Jour., Vol. 101, p. 811, 1916.

¶Magmatic Sulphide Ores, Leland Stanford University Publications, 1916.

**Op. Cit., p. 18. Condensed from original.

molten condition. Magmatic sulphides have been noted in many rocks from many localities.

Coleman's second argument is one of the strongest advanced by the advocates of a magmatic segregation, and if true is one of the strongest points in favor of magmatic segregation as opposed to a hydrothermal origin. Howe*, however, has shown that in the Creighton mine this is a mechanical fading out and not a petrographic one as contended by Coleman. Specimens examined by the writer support a part of Coleman's contentions and indicate that while the main bodies fade out mechanically, beyond them there is a pyrrhotite norite in which the pyrrhotite gives every appearance of being an original constituent. Knight† states that the footwall rocks are also spotted with sulphides in a manner similar to the pyrrhotite norite. The statements by Howe and Knight invalidate to considerable extent the strength of the argument of fading out as a proof of magmatic segregation, and investigation indicates that while most of the transition is a mechanical one, there is also a small amount of petrographic transition.

The first part of Coleman's third argument is directly contradicted by Knight‡ who states that granite, greenstone, and graywacke are also spotted by ore, and that some of the orebodies are actually impregnations of the footwall rocks. A latter part of Coleman's third argument is given as an explanation for the ore in veinlets in the footwall rocks but is opposed to magmatic segregation for such spaces, which he states were formed by the intrusion, would have been filled by undifferentiated magma, and probably chilled, long before differentiation would have proceeded far enough to allow of any segregation of molten sulphides at the bottom of the norite. There is no evidence of any undifferentiated magma at Sudbury.

Coleman§ similarly explains the offset deposits, but the same objections apply.

Coleman's fourth argument pertaining to the freshness of the hypersthene in the norite is strongly opposed to a hydrothermal origin for these deposits, and while suggestive of a magmatic segregation, it cannot be used exclusively for it. Many investigators have found that there is considerable alteration of the norite and that in the large orebodies it is greater adjacent to the ore. Many pages have been written minutely describing the nature of such alteration.

In the fifth argument, the scarcity of typically hydrothermal ore-forming minerals is a further indication that these deposits are not to be classed as entirely of hydrothermal origin, but neither is it proof of magmatic segregation. Also the lack of banding, concentric and preserved structures suggests an origin other than hydrothermal but can no more be used as an argument in favor of magmatic segregation, as is done by Coleman and others, than of contact metamorphic deposits.

Coleman's sixth argument is suggestive of an igneous origin. It is opposed to a hydrothermal origin, for it is difficult to understand how ores deposited from solutions with fluctuating conditions of composition, concentration, temperature, and pressure could be so uniform all around the norite intrusive. It is, however,

*Howe, Ernest, Petrographic notes on the Sudbury Nickel Deposits. Econ. Geol., Vol. 9, p. 503, 1914.

†Eng. & Min. Jour., Vol. 101, p. 811, 1916.

‡Loc. City. The reader is also referred to Knight's latest contribution (not incorporated in the original of this paper) in which this point is thoroughly discussed.

§Can. Dept. of Mines, Mines Branch No. 170, p. 36, 1913.

¶These points are discussed more fully in the original paper, pp. 408-410.

no stronger an argument for Coleman's magmatic theory.

Coleman's contention, in the seventh argument, that the settling of the molten sulphides into the hollows of the footwall under the molten sheet can be explained only by an hypothesis of magmatic segregation, is decidedly upset by Knight's evidence.* He states "Clearly then the molten sulphides could not have settled to the bottom of the norite magma for the very good reason that the granite was not there when the norite was erupted."

Probably the strongest argument in favor of a magmatic segregation is the marginal position of the orebodies with respect to the intrusive. It is difficult to explain this position by any other hypothesis.

The breccia of footwall rocks enclosed in ore and norite is construed by Coleman in favor of a magmatic segregation.† He considers it to have been formed by the molten sulphides and norite on the bottom of the intrusion tearing off and enclosing fragments of the footwall on its way to its present position.‡ This would assume the sulphides to have been already segregated on the bottom of the norite while the intrusion was reaching its present position, a condition impossible in view of the length of time that must elapse before differentiation could proceed far enough for sulphides to accumulate at the bottom. The breccia, in the view of the writer, is opposed to magmatic segregation, but is readily and simply explained by Howe's hypothesis.

While certain evidence suggests that a minor amount of magmatic segregation took place, it would appear that a great array of conclusions is opposed to it as an adequate explanation of the Sudbury ores. Some other hypothesis must then be sought.

Hydrothermal Origin.

Dickson§ found several features irreconcilable with a magmatic origin. He found evidence of solutions in (1) the replacement of rock forming minerals by sulphides, (2) by development of secondary hornblende, greater where ore replacement had been greater, (3) widespread brecciation and shearing with ore filling the shear planes and acting as a cement to the rock fragments, (4) angular shape of included rock fragments, and (5) abrupt changes from massive sulphides to barren rock. Dickson produces many arguments which oppose magmatic segregation but do not necessarily uphold the hydrothermal origin. In fact many of them support Howe's modified magmatic hypothesis equally well. He also produces evidence which indicates that hydrothermal solutions have been a factor in the formation of the ores.

Campbell and Knight|| think that the sulphides have replaced each other, traversed rock and silicates occur in definite order, thereby indicating hydrothermal origin.

Knight shows (1) that the sulphides could not have segregated upon the granite footwall for it was not there (2) that they mix with the older greenstone and graywacke and younger granite as they do with the norite. (3) The occurrence of hydrothermal minerals in the Worthington mine is emphasized. Since ore penetrates the granite and Knight shows that the granite cuts the norite, it is clear that the ore is both later than the granite and norite, and cannot, therefore, be a segregation from the norite.

*Loc. Cit., p. 811.

†Opp. Cit., pp. 34-36.

‡Op. Cit., pp. 34, 36.

§Op. Cit.

||Microstructure of Nickelliferous Pyrrhotite, Econ. Geol., Vol. 2, p. 350, 1907.

The writer agrees with Knight in so far as he shows magmatic segregation to be untenable, but fails to find in his arguments positive evidence actually supporting a hydrothermal origin for all of the deposits. Because his structural relations deal a fatal blow to magmatic segregation, it does not necessarily follow that because a rival view is vanquished, the conclusion of a hydrothermal origin is the only alternative, for it supports Howe's modified theory as well.

The writer thinks that the advocates of a hydrothermal origin produce certain evidence to show that it has played some part in the ore formation, but that it does not conclusively prove that all of the deposits have been formed by this means. While a certain amount of hydrothermal rock alteration is present, the profound hydrothermal alteration found in most deposits of unquestioned hydrothermal origin, is absent from the Sudbury deposits, otherwise the norite would not be dark, but light in color.

Modified Magmatic Origin.

Howe* found that the intimate mixture of granite, greenstone and norite in the ore precludes a hydrothermal origin and that microscopic work indicates that the sulphides were introduced in a molten state. He proposed his modified magmatic hypothesis, which accounts for the ore as having been introduced in a molten condition through a differentiation in the magmatic reservoir, after the norite had cooled. Thus the deposits would be magmatic, though no segregations.

Knight's later finding, that at the Creighton mine the granite intrudes the norite, does not invalidate the principle of Howe's hypothesis, for his supposed intrusion of sulphides can just as well be regarded as having taken place after the granite intrusion.

As Howe's paper deals chiefly with petrographical notes he offers little discussion in support of his hypothesis; consequently there is no explanation as to how his hypothesis reconciles the marginal position of the orebodies. This theory, in the belief of the writer, accounts for the Sudbury conditions more accurately than any previously advanced.

Modified Hydrothermal Origin.

Tolman and Rogers† believe that the ores are magmatic, yet formed by means of "mineralizing solutions" or mineralizers. They state that the sulphides surround, cut across, and replace rock silicates, and they present microscopic evidence which they interpret to indicate that the sulphides were formed before the hydrothermal alteration of the rock silicates. They would thus place the period of mineralization after the consolidation of the norite, and before the hydrothermal solutions, which emanated as an after effect of the intrusion. They consider that the ores are not magmatic in the usual sense, because they are later than and replace the rock silicates, and that they were deposited by "mineralizing solutions"; but they do not consider them to be ordinary hydrothermal deposits because the formation of the sulphides is thought to precede the hydrothermal alteration of the rock silicates. They re-define "magmatic ores" to fit in with their interpretation, and assume a definition for hydrothermal not usually accredited, i.e., the ores must be accompanied by alteration of the rock minerals. In view of findings of other authors and the writer, the abundant evidence of replacement noted by Tolman and Rogers cannot be typical of all the Sudbury ores. Their age relation between the formation of the sulphides and the alter-

*Op. Cit.

†Tolman, C. F., and Rogers, A. F., Magmatic Sulphide Ore. Leland Stanford, Jr., Univ. Publications, 1916.

ation of the rock silicates upon which they base their new type is also seriously open to question.*

In view of the evidence shown by others it is incorrect to apply broadly the theory of replacement to explain all of the Sudbury ores. The writer is unable to see in what way the arguments of Tolman and Rogers present any but a hydrothermal origin for the Sudbury ores.

One point seems clear, and that is that the ores could not all have been formed by magmatic segregation, and that they were introduced later than the norite. The problem of origin, then, concerns itself chiefly with the agencies of transportation by which the ores were brought to their present place, whether hydrothermal or igneous intrusion of sulphides.

Suggest Modified Hypothesis for Origin of Sudbury Ores.

The above discussion indicates that the genesis of the Sudbury ores is complex and that there is much conflict of opinion both as to interpretation of data and observations. The opposing hypotheses set forth an array of arguments and facts that is persuasive when one hypothesis alone is considered. All of them present plausible and convincing points which are not explained or set aside by the opposing arguments and are worthy to stand in any consideration of origin of the Sudbury deposits.

It thus appears to the writer that an hypothesis which would embrace the convincing arguments of the opposing views, if in agreement with other observations, would be a correct one. Accordingly he presents a modified hypothesis, which follows Howe's and embraces and comprises some of the features of the others:

In a magmatic reservoir beneath the Sudbury region differentiation took place, but before completion a portion of it was extruded to form the "Nickel Eruptive." The extruded portion continued to differentiate in the upper chamber and gave rise to the micropegmatite-norite transition. The sulphides present became segregated to the bottom of the norite thereby accounting for the pyrrhotite norite and perhaps a minor part of the orebodies. In the meantime differentiation continued in the remainder of the magma below, and it may be considered to have divided itself into an acid and basic portion. A further intrusion then injected the acid portion between the already solidified norite and the greenstones, forming the granite described by Knight. Following this, the process as conceived by Howe may be considered to have taken place and an expulsion took place of a magma overloaded by sulphides, which, upon consolidation, formed the greater part of the orebodies. Still later expulsion gave rise to the dikes which cut the ore and previously intruded rocks. As an after effect of the igneous activity, magmatic waters, similar to those which emanate from most ore deposits, traversed the previously formed deposits, super-imposing upon them those hydrothermal effects described by Dickson, Knight, Tolman and Rogers, and others. The solutions then wandering farther from the norite contact formed those outlying deposits, such as the Worthington, whose hydrothermal characteristics are unquestioned. Thus there was completed a sequence of igneous activity of which the formation of the ore deposits was a part.

This modified hypothesis would explain the ores by magmatic segregation, magmatic differentiation in the magmatic reservoir, and hydrothermal action, but the

greater part of the larger orebodies would be accounted for by differentiation in the reservoir and intrusion as a heavily charged sulphide magma.

Relation of Proposed Hypothesis To Other Hypotheses.

The proposed hypothesis would account for the pyrrhotite norite and for the sulphide particles so widely distributed along the margin of the norite by the first phase of the mineralization. The main marginal deposits, as the Creighton, and the offset deposits, would be accounted for chiefly by the second phase of mineralization, or the intrusion of sulphides and some rock matter. Thus the objection raised by Coleman that* Howe's hypothesis does not explain the pyrrhotite norite, is met by the first phase of mineralization, while the second phase would account for the ore breccia with fragments of rock surrounded and penetrated by sulphides. This breccia cannot adequately be explained by the segregation hypothesis since the granite is later than the norite and the ore is later than the granite. The filling of all cracks and like openings by ore, so difficult to account for by segregation, is readily explained by the hypothesis proposed.

The observations of Dickson† are explained by Howe's part of the hypothesis, but not by the segregation theory. Dickson uses his points to uphold the hydrothermal theory, but the angularity of the fragments suggests inclusion by intrusion rather than nuclei of unreplaced rock. The abundant evidence presented by Dickson and others of sulphide veinlets seaming rock fragments and penetrating mineral cleavages would be expected from sulphide intrusion as well as from hydrothermal action, so that the proposed hypothesis combines those features advocated for the hydrothermal origin and antagonistic to the segregation theory.

The comparative freshness of the norite surrounding the ore is readily understood if the ore be an intrusion, but not if all the ore were formed by hydrothermal agencies, for, as Coleman points out, the susceptible hypersthene would surely succumb to alteration. While some hydrothermal alteration is present, notably in the offset deposits, it is nothing as compared to the extensive alteration accompanying ores of unquestionable hydrothermal origin. Another point that suggests igneous origin is the absence of the gangue minerals that usually accompany hydrothermal ores. With an igneous origin the only gangue to be expected is the accompanying rock, such as is found in the ores. The order of succession of sulphides is advanced in support of deposition from solutions, but the mineral succession in a granite does not imply solutions. Howe suggests that the order would seem to be better explained by the nearly simultaneous cooling of the different sulphides that had previously separated as distinct mineral compounds, non-miscible, though still molten." In this way the last to crystallize would penetrate the earlier sulphides.

Certain features, such as the alteration of the pyroxene and the occurrence of typically aqueous minerals are clearly indicative of hydrothermal origin and are to be attributed to the hydrothermal phase of mineralization in the proposed hypothesis. The writer believes that only a minor part of the orebodies has been contributed by solutions and that their work had been chiefly a slight alteration and contribution of ore with a certain amount of enrichment and rearrangement of some of the previously formed sulphides. It may be seen that hydrothermal mineralization of this nature

*See also more recent paper by M. A. Dresser, *Econ. Geol.*, Vol. 12, p. 563, 1917.

†*Econ. Geol.*, Vol. 10, p. 390, 1915.
†*Op. Cit.*, p. 59.

super-imposed upon previously formed ores would confuse characteristics of the previous processes, and a study of those places most affected would give rise to the impression that all of the ores had been formed by hydrothermal agencies. The hydrothermal origin of the Sudbury ores has attained in the literature a position hardly justified, because observations antagonistic to the segregation theory have been applied as convincing arguments in support of a single working hypothesis when they are capable of more than one interpretation if applied to multiple working hypotheses.

SPECIAL CORRESPONDENCE

BRITISH COLUMBIA.

The policy of the Provincial Government in increasing taxation of the mineral industry is meeting with protest from some of its own friends as well as from most mining men. Recently the Victoria Daily Times, which is the leading newspaper supporter of the Government, printed an account of a debate in the Legislative Assembly in the course of which it reported a prominent supporter of the Government to have stated that "the mineral world is smarting under an injustice in the matter of its taxation. He quoted much statistical data, and pleaded the case of the concern mining low-grade ore. One operator would spend \$1,000,000 to take out \$1,250,000, while his neighbor would spend but \$500,000 with a similar result, and yet both were subjected to the same taxation method. The point he was anxious to drive in was that the mining world should be taxed on an entirely fresh basis. He would advocate a policy that would say to the capitalist who wished to mine in British Columbia, 'Come in and develop the minerals, and just so soon as you show that you are mining at a profit that will be the stage at which British Columbia will step in and ask you to pay a just due on account of that profit.'"

The Daily Colonist, the oldest morning newspaper published in British Columbia, has displeased some of those who have in recent months been busily engaged in advocating the establishment of an iron and steel industry in British Columbia. In the course of some timely editorial comment the Colonist observed: "When British Columbia's delegates go to Ottawa to place before the Government this Province's claim to assistance in establishing an iron and steel industry on the coast, probably they will be subjected to a series of questions which we hope they will be in a position to answer in a way which will be satisfactory to the Federal power. They will have to be able to say what capital is already available for the establishment of such a plant. Very naturally they will be asked about labor conditions in this Province, the wages that prevail, the supply of skilled workers for such an industry, and the permanence of the economic situation. A subject of conversation with the Government will also be the extent to which the Provincial authorities are prepared to aid the enterprise." This frank expression of opinion is not pleasing to some prominent members of the Victoria Rotary Club, which has taken the lead in the agitation of the last few months with the object of trying to induce the Federal Government to practically establish the desired industry, consequently the Colonist has come in for sharp criticism.

EAST KOOTENAY.

There has been a substantial increase in the quan-

tity of ore shipped to the smelting works at Trail from East Kootenay mines since the beginning of the current year. The total of ore receipts at Trail from this district for the month of January was 5,843 tons; for February it was 8,069 tons, and for the first week of March 2,289 tons, together 16,201 tons to March 7, inclusive. Of this total, 14,897 tons was from the Consolidated Mining and Smelting Co.'s Sullivan mine—14,765 tons of zinc ore and 132 tons of lead ore. While the same company's St. Eugene mine sent in 162 tons of lead ore. The Paradise mine, in Windermere mining division, shipped 1,078 tons of silver-lead ore, and three small mines the remaining 64 tons.

WEST KOOTENAY.

Ainsworth.—While the largest shipper from Ainsworth mining division so far this year has been the Consolidated Co.'s No. 1 mine, with an output of 1,337 tons of silver ore, several other mines have resumed production, among them the Bluebell with an output of 203 tons of lead ore, and the Florence which late in February shipped 209 tons from its concentrating mill. Of half a dozen other shippers, the largest individual total was that of the Montezuma, on South Fork of Kaslo Creek, which shipped 106 tons from an old dump, the mine not having been worked in recent years.

Slocan.—Slowly shipment of ore from Slocan mines to Trail is being resumed. Total of 1918 receipts to March 7 was 2,501 tons, of which 1,242 tons was from the Surprise, in the neighborhood of Sandon, and 889 tons of zinc ore from the Lucky Jim, in the eastern part of the division. Half a dozen or more of the smaller producers are also on the shipping list. The Standard has shipped zinc concentrate to the United States and has stored its lead product. The Galena Farm is preparing to make a considerable output this season. The several mines being worked by the Clarence Cunningham syndicate are in a position to produce silver-lead ore in quantity whenever conditions shall be less disadvantageous than of late. Development work is being continued on other properties, preparatory to production later.

Nelson.—The Emerald mine, near Salmo, in the southern part of Nelson division, has shipped to Trail about 200 tons of lead ore, and two or three small lots of ore from other properties in that part of the district have also been received there. The Consolidated Co.'s Molly Gibson mine, at the head of Kokanee creek, and the Beasley-Monarch, also on the north side of the Kootenay river, have both shipped ore this year. The total output of ore from mines in this division, though, is disappointingly small.

Rossland.—Rossland mines are maintaining a comparatively large output, their total to March 7 of ore received at Trail having been 40,266 tons, of which the Le Roi shipped 18,656 tons, the Centre Star group 17,866 tons, the Le Roi No. 2 Ltd.'s Josie group 2,803 tons, and the White Bear 941 tons.

Trail.—Ore receipts at the Consolidated Mining and Smelting Co.'s smeltery here during the week ended March 7 totalled 8,958 tons, this quantity bringing the total receipts for the year to that date up to 70,351 tons, of which 61,047 tons was ore from mines operated by the company and 9,304 tons was of custom ores.

BOUNDARY.

Little news of operations at the Boundary district mines and smelting works of the Canadian Copper Corporation and Granby Consolidated M. S. & P. Co., re-

spectively, is being made public, so that there is nothing to chronicle other than that both companies are continuing to work their mines and that ore-smelting is being continued at their smelting works.

The Consolidated Co. is maintaining a fairly large output of copper-gold ore from its Emma mine, situated in Summit camp, two miles from Eholt. This year's receipts at Trail to March 7 show a total of 6,697 tons.

Vancouver men have taken the Union mine, in Franklin camp, north of Grand Forks, under bond and option of purchase. Transportation conditions are at present unfavorable to any considerable output of ore being made from mining properties in that camp.

GENERAL NOTES.

A Vancouver mining company, known as the New Hazelton Gold Cobalt Co., is reported to have shipped to Vancouver for treatment there three tons of molybdenite ore.

A measure before the Provincial Legislature has for its object giving prospectors the right to locate mineral claims in Strathcona Park, an extensive area on Vancouver Island in which the location of such claims has heretofore been prohibited.

Representatives of the chief coal-mining companies of British Columbia recently waited on the Provincial Minister of Mines and urged upon him that a proposed act he is submitting for the consideration of the local legislature, to provide for a general 8-hour day for all mine employes, both above and below ground, will result in a decreased production of coal at a time when the cry is for increased output to offset the threatened shortage of coal east of the Great Lakes.

The cost of production of coal had increased since 1907 by \$1.10 per ton, Mr. Nicol Thompson, deputy fuel controller for British Columbia, stated. While production has increased 28 per cent., wages alone had advanced 35 per cent. The average cost of coal now was \$4.50 per ton at the mine.

That 52½ per cent. of the labor employed in and about the mines on Vancouver Island is Chinese was a statement made, operators having difficulty in getting white men in view of the great labor shortage.

The Minister of Mines said the Government was anxious to increase output, but, he stated, the eight-hour day is surely coming. The Dominion Government was expecting 2,500,000 tons more this year from the West to offset the shortage in the East. He promised to give the representations every consideration.

NORTHERN ONTARIO.

Hohenour.

Work on the Hohenour claim in the Kirkland Lake district has been suspended. This property is under option to the Temiskaming Mining company. Whether or not the option is to be given up has not been officially announced as yet, but the work has been completely suspended. The plant which has been used in working the Hohenour claims was that formerly in operation at the North Dome property of the Temiskaming.

High Grade Ore at Chambers-Ferland.

The recent strike of high grade ore at the Chambers-Ferland property of the Aladdin-Cobalt Mining company is growing in importance and already a considerable amount of high grade ore has been bagged from the new vein which has been drifted on for a distance of about thirty five feet. The high grade portion of the vein is about five inches in width and carries silver

values of as much as five thousand ounces to the ton in places. The discovery of the vein was made on the 280-ft. level.

Otisse and Davidson Claims Optioned.

Two large mining deals have been made in the Fort Matachewan district recently. The Otisse claims have been taken under option by New York interests and, according to reports, the same interests have also acquired an option on the Davidson claims. The latter were the first group in this district on which gold in spectacular quantities was encountered, and their exploration will have a more or less vital bearing on the entire field.

Kirkland Lake Gold

The general opinion of those usually well informed in matters concerning the Kirkland Lake Gold Mines, Limited, are of the opinion that work on the property will be resumed in the near future. Provided arrangements are made for the resumption of operations early this spring, the mine should be in the list of producers by late summer. The concrete foundations for the mill were placed last fall and a good deal of the machinery has arrived at the property, so that it would be possible to commence work on the milling plant within a very short time. Already there is approximately \$1,000,000 in ore reserves blocked out. One of the first developments on the re-opening of the mine will be the sinking of the new central shaft to the lower workings, which have now reached a depth of seven hundred feet. This will centralize the work and facilitate the handling of the ore more efficiently than was possible through the smaller working shaft.

Elliot-Kirkland.

Commercial ore has not yet been encountered in the lower workings of the Elliot-Kirkland, although indications are good. The proving of ore at the 400-foot level of the Elliot-Kirkland property would be significant in that it points to the possibility of the auriferous zone continuing further west than was heretofore expected. The developments on this property have also a vital bearing on the Kirkland Lake Gold, proving almost conclusively that the ore-bodies of the latter continue consistently across the property. Indeed, the persistency of the main fracture lends still further to the belief of not a few mining men that ore may be expected to continue to much greater length than as yet proven in the Kirkland Lake area.

Hollinger.

As the work of tuning up the new milling equipment at the Hollinger is progressing and working forces at the big mine increase, it is not unreasonable to expect more rapid increase in the production from this mine in the near future. So far the new milling equipment has proven highly satisfactory in every detail.

O'Donald Property Optioned.

The O'Donald property at Boston Creek has been optioned to large Detroit mining and manufacturing interests for a sum of \$250,000. This property consists of 200 acres situated between the Boston Creek Mining Company's property and that of the Patricia Syndicate and a number of veins have been encountered on the surface. Before the deal was closed sixty days' examination of the property was made by representatives of the company purchasing the property. Development work is to commence immediately and a substantial sum will be spent monthly. A portion of the claims are located in Boston Township, while the

balance runs into the township of Pecaud, and it is anticipated that some of the veins of the Patricia Syndicate and Boston Creek Mines will be picked up in the O'Donald group.

Developing Walsh Claims.

The Crown Reserve Mining Company of Cobalt is making good time in the work of developing the Walsh claims at Gowganda, on which the Crown Reserve has an option. The shaft has reached a depth of one hundred feet and a station is being cut preparatory to the commencement of lateral work.

Trethewey Orders Groch Machines.

Three Groch oil flotation machines are to be installed at the Trethewey mill, the order having been placed for the equipment this week. During recent months the installation of tube mills and other equipment has been going on and the flotation machines will be the final addition. It is anticipated that delivery will have been made by the first of May and the entire new installation will be pressed into service immediately. The new plant is designed to treat about one hundred and fifty tons per day. The impounded tailings on the Trethewey amount to 66,000 tons and the silver content runs between four and five ounces to the ton, thus it is anticipated that about 300,000 ounces will be recovered. From the treatment of this huge dump not far short of \$70,000 net profit is expected to result, although the president of the Trethewey Mining Company has estimated these profits at anywhere from \$30,000 to \$70,000.

Installing Plant at Peterson Lake.

The preparatory work for the installation of the oil flotation plant on the Peterson Lake property is under way. Excavation for the foundations and the laying of same have been commenced. Slightly used machinery has been purchased and is now being transported to the property. It is the aim of the management to have the equipment installed and in operation by June, when the work of treating the tailings from the Seneca Superior ore will be carried out.

Lake Shore Mill in Operation.

The new mill at the Lake Shore Mine at Kirkland Lake is now running on the first month's production. While awaiting the arrival of delayed portions of the equipment other portions of the plant were tuned up, so no time was lost in placing the plant in operation once the delayed portions arrived. So far everything has been found to run smoothly. The mill for the present will be treating about sixty tons per day, but provision has been made for adding to the equipment at short notice so as to almost double this capacity. A large tonnage of ore is already broken down, and the underground developments are well in advance of requirements for the present milling facilities.

Discoveries in Eby Township.

Eby Township, which corners on Teek, would appear to be in line for considerable attention this coming summer. Late last fall a discovery of gold was reported on the Adair-Sturgeon claims, since which time development work has been carried on with satisfactory results. Considerable stripping has been done on the veins and a test pit has been put down a depth of about ten feet. Channel assays taken across a satisfactory stoping width are said to assay \$3.50 per ton in gold and around eighteen ounces of silver to the ton.

McKinley-Darragh.

It is expected the annual report of the McKinley-Darragh Mining Company will be out next month. The company started the year 1917 with a cash surplus of \$264,942. It was at that time intimated by an official of the company that the satisfactory conditions at the mine tended to indicate that the year would end with the company in still further improved conditions. While the liquid assets of the company are expected to show a decline, the new flotation equipment which will be in operation on the old tailings dump will offset to a considerable degree the lower estimates of ore. The total production of silver for the year 1917 will show about 1,000,000 ounces. As silver averaged about 82 cents per ounce, which would place a value of approximately eight hundred thousand dollars. Development work at the mine is going on as usual and the physical condition of the property is far from weak.

Adanac.

Recent developments at the Adanac mine have been of a highly encouraging nature. Heretofore everything was favorable to the deposition of silver in commercial qualities, with the exception of there being insufficient shearing of the formations. At a number of points, the formation gave evidence of disturbance, in which cases silver sometimes occurred in considerable quantities and permitted of the bagging of some high-grade ore. For some time past, under the advice of Mr. Alfred R. Whitman, the eminent geologist, drifting operations have been carried towards the portion of the property a little south from the Temiskaming boundary. Conditions met with have proved almost identical with the forecast of Mr. Whitman, and the shearing now in evidence is very pronounced. According to mining men in the camp, the encountering of commercial ore in substantial quantities is not unreasonable to expect. Recently, the capitalization of the company was increased by 500,000 shares, 228,000 shares of this increased issue have been disposed of at 10 cents per share, which will afford sufficient funds for the completion of the development programme outlined by the management, and will finance the company for the balance of the year 1918.

McIntyre.

Developments at the McIntyre mine are stated to be the most favorable in the history of the mine. Making profits of close to twenty-five per cent. on the \$3,600,000 issued capital and carrying on the most extensive development campaign in its time, it is an agreeable revelation to learn that development work had reached its highest degree of importance. Before long, the main drive through the McIntyre-Extension to the Jupiter will be completed, and all these workings will be connected up at the 1,000-foot level. A miniature electric railway will be run along this drift at a depth of 1,000 feet, and regulation mine cars will be loaded from the workings above this level, as the 1,000-foot level is the main haulage way of the mine, and the ore from the upper levels finds its way through the various chutes to the cars waiting to receive their load. As far as possible, the mechanical equipment will replace manual labor in all branches of the work with an appreciable lowering of operating costs. The milling equipment at present has a capacity of about 600 tons per day. It has, however, been intimated that, at no distant future, the equipment will be increased to 1,000 tons per day. With facilities for handling 1,000 tons per day, the output of the mine would approximate \$10,000 per day, as the grade of ore being handled is

running slightly above \$10 to the ton. This production would total \$3,650,000 per year or amount to 100 per cent. on the issued capital of the company. Net profits at this mine have been running about fifty per cent. of the gross production. Thus the announcement of a further increase in the milling capacity of the mine will be reason for much satisfaction to the shareholders.

Boston Creek.

The number one shaft of the Patricia property at Boston Creek has reached a depth of over 150 feet. At the 100-foot level, upwards of 200 feet of lateral work has been done. The shear zone in which the vein occurs is wide, however, the pay streak has a width of approximately forty inches. The number two shaft has reached a depth of 100 feet and lateral work at this point is also in progress. Excavation has been commenced for the foundations of the new mill, and it is expected the mill, with a capacity of from forty to fifty tons per day will be in operation within the next three months. The average grade of ore at the property is high. About forty men are on the pay-roll of the mine.

McIntyre-Newray.

According to recent rumors, it would appear possible that McIntyre Mines of Porcupine may possibly take an option on the Newray property on a working basis. The McIntyre lies about half a mile from the Newray, with the Plenaurnum property, which is now under option to the McIntyre lying between the two. Were this to become a reality, the McIntyre property would then have a length of one and a quarter miles. The plan of development and exploration of the Newray by the McIntyre would perhaps take the form of extending the drift from the 1,300-foot level of the property through the Plenaurnum and into Newray ground, as it has recently been stated that the best possibilities of Newray will be in deep mining. The diamond drilling so far carried out on the Plenaurnum property has not been as favorable as expected, however, the exploration of this property is so far very incomplete. At the present time, all that can be said of these rumors is that the plan is feasible.

Larder Lake.

The development of the property of the Associated Goldfields Mining Company at Larder Lake is being conducted energetically. The main workings of the mine have reached a depth of 500 feet and are said to be in commercial ore. At the 100-foot level, the ore body is 130 feet in width. It is planned to crosscut at the 500-foot level for the purpose of developing the ore body at this depth. It is the intention of the management to increase their working force in the early spring to 150 men. The Associated Goldfields includes several properties and is 2,000 acres in extent. At Ravens Falls, the company have a power plant, where about 1,600 h.p. is being generated, and the head developed is sufficient to increase this by several times its present capacity. The management have not made any definite arrangements for the construction of a mill, awaiting the further development of the property to determine the equipment which will be necessary for the handling of the ore.

Otisse.

The work of breaking a road to the Otisse property is one of the first steps to be taken by the purchasers of this property. Men are being taken in for the erection of camp buildings. Mining equipment for the thorough exploration of the property is now on order, and it is hoped delivery will be made in time to permit

of using the winter road for transportation of this to the property. The company also intend diamond drilling the ore body at depth.

Craig.

Arrangements are being made for the formation of a company to explore the Craig claims in the township of Cairo, of the Fort Matachewan district. Supplies sufficient to meet the summer's requirements are also being taken in, with the intention of developing the property.

Gowganda.

The Crown Reserve Mining Company of Cobalt, working the Walsh claims in Gowganda, is reported to be meeting with favorable results. The shaft has reached a depth of 100 feet and is being continued to deeper levels. A force of about thirty men is engaged in the work, and development is being pushed ahead vigorously.

Three Stars.

A new company, known as the "Three Stars," is now developing the old Calumet and Montana mine. The old workings have been pumped out, and active operations are now under way. The main shaft of this property was formerly driven below the 200-foot level, and more or less encouraging results were met with. It is said the new company is well financed for the carrying on of aggressive development.

Work Suspended at Croesus.

Operations at the Croesus mine in Munro township have been indefinitely suspended. This announcement came as a considerable surprise to everyone, as the property is said to be the richest gold mine in the world. The decision to close down is said to be due to the fact that the mine is privately owned and the owners prefer to leave the gold unmined until economic conditions improve, when the profits will be infinitely larger than at the present time. One of the chief handicaps under which the Croesus mine has to work is the fact that coal for motive power must be hauled from the railway at Matheson, a distance of about twelve miles, and another is that the price of wood has recently been increased by the settlers in the neighborhood from whom a large supply was being obtained. It would not be surprising were the owners of this rich mine to build a transmission line to the property, possibly from the Kirkland Lake camp, pending the time when operations at the mine will again be resumed.

Hill Gold Mines.

Further additions to the machinery at the Hill Gold Mines property at Painkiller Lake have been made recently, with a view to speeding up development at the property. Like the Croesus, the main vein is not very wide, but contains highly satisfactory values. In some places the gold is visible to the naked eye, and sometimes it occurs in the form of tellurides. This company also owns a number of claims in the Boston Creek district on which considerable work has been done, with more or less encouraging results.

The La Rose Discovery.

Developments on the Violet property of the La Rose mining company, east of the O'Brien mine, are of a very important nature. The main shaft has been driven to a depth of 430 feet. At a depth of 410 feet considerable lateral work has been done. The formation is made up of diabase and Keewatin, the former overlying the latter. As is well known, the best chances of encountering ore of a commercial grade is in the horizon below where the two formations meet, and it is at this point where the LaRose is conducting the exploration and de-

velopment campaign on the Violet. So far three veins of varying depth and composition have been encountered. These veins are of a substantial width and mineralization. No intelligent estimate of their future relation to the production of the mine can at present be made. However, even in the initial stages of development the results are intensely significant, indicating the great possibility of the veins being a continuation of the auriferous zone which has yielded such a large amount of silver on the O'Brien mine. The fact that the zone carries a series of veins would appear to indicate the possibility of the veins being consistent. Further lateral work is being conducted, including the driving of a crosscut to the south.

NEW NOVA SCOTIA MANAGEMENT.

Nova Scotia Steel results in 1917 were decidedly disappointing if taken at their face value. The net for dividends of \$1,340,477 represents a heavy decline of \$764,001 or 36.4 per cent. from the previous year. Added to this is the fact that the common stock was increased 100 per cent. during the year, half by sale of new stock at par and half through a common stock dividend. In 1916 the company earned \$33.70 per share on \$7,500,000 common. In 1917 common share profits on the \$15,000,000 stock now outstanding were but \$8.40 per share, which would allow none too large a margin over the \$5 dividend rate.

The explanation of the poor showing last year lies entirely in the fact that the new management has been house-cleaning. All the cob-webs have been brushed down, the walls scrubbed and the corners bored out. The result is that the company has charged off a lot of dead items, has sweetened up its inventories, its accounts receivable, its depreciation accounts and has put its accounting system on a thoroughly modern basis.

The actual net profits of Nova Scotia Steel in 1917 were in excess of the \$2,104,478 earned in 1916. The charge-offs, however, cut down the balance for dividends to \$1,340,477.

The company has plenty of orders and unless further occasion exists to charge heavily this year Nova Scotia should make a materially better record in 1918.—Boston News Bureau.

U. S. COAL PROBLEMS.

Chicago—George H. Cushing, editor of Black Diamond, says: "The first great mistake of our war period, as to coal, has been trying to solve the problems by rule of thumb or capricious, dogmatic and academic experimenting before understanding the problems separately, or in relation to one another. We have increased coal production 110,000,000 tons over 1914. The increase should have been 75,000,000 tons more last year to satisfy all needs. In 1918 we must retain the 110,000,000 tons gained, add the 75,000,000 tons needed and to that 50,000,000 tons more to be needed, a total of 665,000,000 tons. To do this we have to get along with 125,000 fewer miners than at end of 1916, the total being 430,000, estimating a loss of 75,000 last year and 50,000 more this year. They have been drafted, or have drifted to industrial centres, where munitions and other plants pay higher wages. To offset the loss of miners we have only 50 working days available this year in excess of 250 working days we had last year, when labor disturbances were an important influence. Car supply has not increased, while the strain upon it has.

"Vice-Pres. Schoyer of Pennsylvania, after study of the car situation, assures us that only alleviation, not

correction, is possible this year, that it will take the railroads until the end of the war to catch up with their traffic. When East a few weeks ago he looked over the Pennsylvania's records and found only 100 cars hauled over the Alleghenies in one day, compared with a normal movement of 6,000. There were 5,900 actual or potential carloads piling up to dam the next day's freight current.

"Apart from direct coal requirements, we must supply from American coal enough by-products to support 1,500,000 troops shooting away the powder. We can do that quite well. We can get along without potash by using common salts, nitrates and coal tar products. But the question of coal production and distribution is very serious."

TUNGSTEN ORE DISCOVERED IN MANITOBA.

Scheelite has been found in the Falcon Lake district, Manitoba, near the molybdenite deposits discovered last fall. This tungsten ore was found by a prospector who had attended the evening classes for prospectors at the University of Manitoba. The ore was brought to the instructor, Mr. J. S. DeLury, by Mr. J. MacMillan and was identified as scheelite. It is noteworthy that the molybdenite discovery last fall was also made by a prospector who attended the evening classes at the University.

IRON AND STEEL PRICES.

Iron Age says: New York conference of iron and steel manufacturers on March 1, attended by about 75 representatives of the industry, brought out plainly the divergent interests of large and small producers as affected by government prices. While the Steel Corporation and some of the larger independent companies would probably accept without complaint a continuance of present prices, smaller producers in several lines, notably plates, show advances in costs on which they contend strongly for higher government prices after March 31.

WILL BUILD STEEL PLANT IN B.C.

Ottawa, March 16.—Arrangements have been completed by New York capitalists for the establishment of a steel plant in British Columbia. The lease has been signed in Ottawa for a tract of the Indian Reserve on the north arm of the Fraser River near New Westminster. The lease is for twenty-one years, renewable for twenty-one years more.

Work on the plant is to start in sixty days and the company is to commence with fifty tons of steel a day, the output to be increased to one hundred. Steel billets, rods, plates, etc., will be rolled. The electrical process will be used in the manufacture.

EXPECTS TO RECOVER MONTREAL MARKET FOR COAL.

Montreal, March 18.—The pessimistic views of the Hon. Mr. Armstrong, Minister of Mines, of Nova Scotia, regarding the future prospects of the Dominion Coal Company in the St. Lawrence market are not shared by Mark Workman, president of the company.

Mr. Workman, in discussing the outlook said to-day that the Dominion Coal Company would have little difficulty starting in where they left off in the St. Lawrence market, just as soon as tonnage was available to bring the coal here. He said that it was true that the business had disappeared for the present, but the quality of the Dominion Coal made it popular here, and always brought a better price here than American coal.

ORE SHIPMENTS.

During the month of February ten Cobalt companies shipped an aggregate of 26 cars of ore containing approximately 2,128,376 pounds of ore. The following is a summary of the February record:—

Shipper.	Cars.	Pounds.
Buffalo	11	928,625
Dominion Reduction	4	322,000
McKinley-Darragh	3	280,520
La Rose	2	190,764
Coniagas	1	88,000
Hudson Bay	1	82,313
Aladdin	1	66,000
O'Brien	1	64,830
Penn Canadian	1	52,909
Kerr Lake	1	52,408
Total	26	2,128,376

TORONTO MARKETS.

Cobalt oxide, black, \$1.50 per lb.
 Cobalt oxide, grey, \$1.65 per lb.
 Cobalt metal, \$2.25 per lb.
 Nickel metal, 45 to 50 cents per lb.
 White arsenic, 17 cents per lb.
 Mar. 25, 1918—(Quotations from Canada Metal Co., Toronto).
 Spelter, 10½ cents per lb.
 Lead, 9½ cents per lb.
 Tin, 98 cents per lb.
 Antimony, 16 cents per lb.
 Copper, casting, 38 cents per lb.
 Electrolytic, 31 cents per lb.
 Ingot brass, yellow, 20 cents; red, 26 cents per lb.
 Mar. 25, 1918—(Quotations from Elias Rogers Co., Toronto).
 Coal, anthracite, \$10.00 per ton.
 Coal, bituminous, nominal, \$9.50 per ton.

SILVER PRICES.

	New York cents.	London pence.
Mar. 7	85½	42½
Mar. 8	85½	42¾
Mar. 9	85½	42¾
Mar. 11	86	42¾
Mar. 12	86½	43
Mar. 13	86½	43
Mar. 15	86½	43
Mar. 18	87	43¼

Mar. 19	87¼	43¼
Mar. 20	88¼	43¾
Mar. 21	89⅞	44½
Mar. 22	90⅞	45

STANDARD MINING EXCHANGE.

Messrs. J. P. Bickell & Co. report the following closing quotations on the Standard Stock & Mining Exchange, March 22, 1918:

	Gold.	Bid.	Asked.
Apex . . . . .	.05¾	.05½	
Boston Creek . . . . .	..	.20	
Dome Extension . . . . .	.09¾	.10¼	
Dome Lake . . . . .	.24½	.25	
Dome Mines	8.25	8.55	
Imperial . . . . .	.015⅞	.02	
McIntyre	1.36	1.37	
Hollinger	5.10	5.15	
New Ray . . . . .	.18	.18½	
Porcupine Crown . . . . .	.16	.18	
Vipond . . . . .	.20	.22½	
Preston East Dome . . . . .	.03	.03½	
Teck-Hughes . . . . .	.48	.51	
West Dome . . . . .	.13¼	.13½	

Silver.

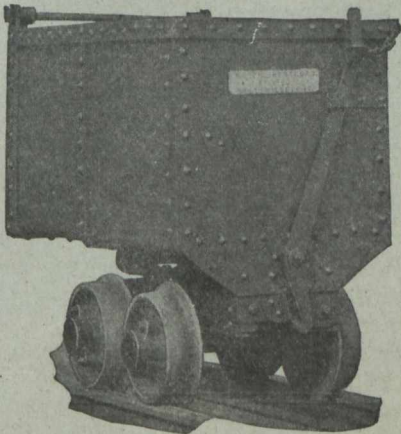
	Bid.	Asked.
Adanac . . . . .	.08½	.09½
Bailey . . . . .	.04¼	.05
Beaver . . . . .	.26	.27
Buffalo . . . . .	..	1.00
Ferland . . . . .	.09½	.10½
Coniagas	3.05	3.25
Crown Reserve . . . . .	.20	.25
Gifford . . . . .	..	.02¾
Great Northern . . . . .	.03	.04
Hargraves . . . . .	.07	.07½
Hudson Bay	35.00	37.00
Kerr Lake . . . . .	..	5.35
La Rose . . . . .	.62	.63
McKinley . . . . .	.44	.45
Nipissing	8.50	8.55
Peterson Lake . . . . .	.09	.09½
Right of Way . . . . .	.03½	..
Seneca Superior . . . . .	..	.02
Temiskaming . . . . .	.26	.26½
Tretheway . . . . .	.15¾	..
Wettlaufer . . . . .	.05	.05½
Provincial . . . . .	.51½	.53
Mining Corporation	3.40	3.55
Silver, .90%		

ROTARY MINE CARS

WILL DUMP EITHER END OR EITHER SIDE

We make these cars to order only, and to suit the customer.
 We make and test two standard types, with a choice of eight sizes and shapes in each type.
 We also make any other style to customer's specifications.
Prices reasonable; Delivery good.
 Our general catalogue shows many other varieties of mine cars, end dump, side dump, or rotary to dump either way. Let us send you a copy.
 We also make Mine Hoists, steam, electric, or belt drive; Buckets, Skips, Mine Cages, etc.

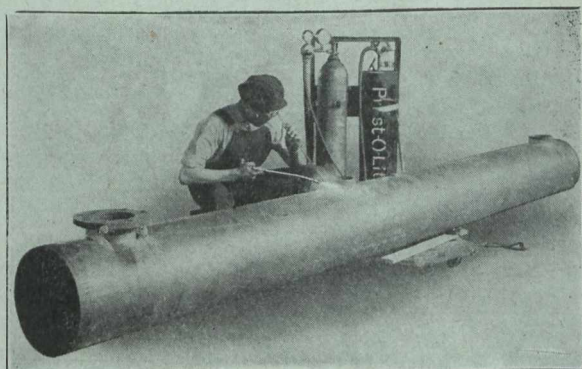
MARSH ENGINEERING WORKS Limited, Belleville, Ont.
 (Formerly MARSH & HENTHORN, Limited)



NEW YORK MARKETS.

Connellsville Coke—
 Furnace, *6.00.
 Foundry, *7.00.
 Crushed, over 1-inch:
 Beehive, *7.30.
 *Fixed under Lever Act.
 Straits Tin, spot, f.o.b. none offering.
 Copper—
 Prime Lake, 23.50.
 Electrolytic, 23.50.
 Casting, 23.50.
 Lead, Trust price, 7.25.
 Lead, outside, nominal, 7.25 to 7.37½.
 Spelter, prompt western shipment, 7.42½ to 7.55.
 Antimony—
 Chinese and Japanese, nominal, 12.75 to 13.00.
 Aluminum—Government price, carload lots, f.o.b. plant:
 98-99% Virgin, 32.10.
 98-99% remelt, 32.10.
 No. 12 Aluminum Co., 32.30.
 No. 12 remelt, 32.30.
 Powdered aluminum, 65.00 to 70.00.
 Metallic Magnesium—99% plus \$2.00 to 2.50.
 Nickel—Shot and ingot, 50.00.
 Electrolytic, 55.00.
 Cadmium, nominal, \$1.45—1.50.
 Palladium, \$115.00.
 Quicksilver, nominal, 125.00.
 Platinum (pure), \$105.00.
 10 per cent. Iridium, \$113.00.
 Cobalt (metallic) \$3.25 to \$3.50.
 Tungsten—
 Scheelite, 20.00—24.00.
 Wolframite, 20.00 to 24.00.
 Gravel Flourspar: f.o.b. mines—
 Prompt, \$35.00 to \$40.00.
 Contract, year 1918, \$25.00 to \$28.00.
 Silver (official), 89¾.
 Metal Products.—The following quotations represent mill prices and are strictly nominal except in the case of lead sheets and sheet zinc:
 Sheet copper—Base prices.
 Hot rolled, 31.50 to 33.00.
 Cold rolled, 32.50 to 34.00.
 Copper bottoms, 39.50 to 41.00.
 (Shipments from stock 2c per lb. extra).
 Copper rods—Base prices.
 Round, 32.50.
 Sq. and rectangular, 33.50.
 Copper wire—Base prices.
 nominal, 26.25—26.75.
 Brass Products—Base prices.
 High brass—
 Sheets and wire, 26.75 to 27.50.
 Rods, 24.75 to 26.75.
 Low brass—
 Sheets and wire, 30.00 to 32.00.
 Rods, 30.75 to 32.75.
 Brazed tubing—
 Brass, 34.75 to 36.75.
 Bronze, 39.75 to 41.75.
 Seamless tubing—Base prices.
 Brass, 35.50 to 37.50.
 Copper, 38.00 to 40.00.
 Bronze, 42.50 to 43.50.
 Full lead sheets, 9.25.
 Cut lead sheets, 9.50.
 Sheet zinc, f.o.b. smelter, 15.00.

Oxy-Acetylene Welding and Cutting



Prest-O-Lite operator welding 6-inch nipples into seam header 14 inches in diameter.

Welded Pipe Joints Prevent Leakage

The welding of nipples into pipes, instead of using threaded fittings, is now standard practice in many plants. Welded joints are positively and permanently leak-proof, and cost less.

In repair work of all kinds, the Prest-O-Lite Process saves time and money. Repaired parts are made strong as when new, and one repair, by preventing a serious tie-up, will probably repay you the entire cost of the outfit.

Prest-O-Lite
PROCESS

employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Acetylene is backed by Prest-O-Lite Service, which insures prompt exchange of full cylinders for empty ones. Provides dry, purified gas, insuring better welds, quicker work and lower operating cost.

Apparatus consists of an equal pressure blow pipe, automatic regulators and gauges, and all necessary equipment. Adaptable for oxy-acetylene cutting by the addition of special cutting blow-pipe.

Thorough instructions are furnished free to every user of Prest-O-Lite Dissolved Acetylene. Any average workman who understands metals can learn the welding process quickly and easily.

We will gladly send illustrated literature and interesting data showing actual instances of savings made by others. It may suggest valuable ideas to you. Write for it.

Address Dept. C-108.

The Prest-O-Lite Co., Inc.

Canadian General Offices :

Prest-O-Lite Building
 (or Elm St. and Centre Ave.
 TORONTO

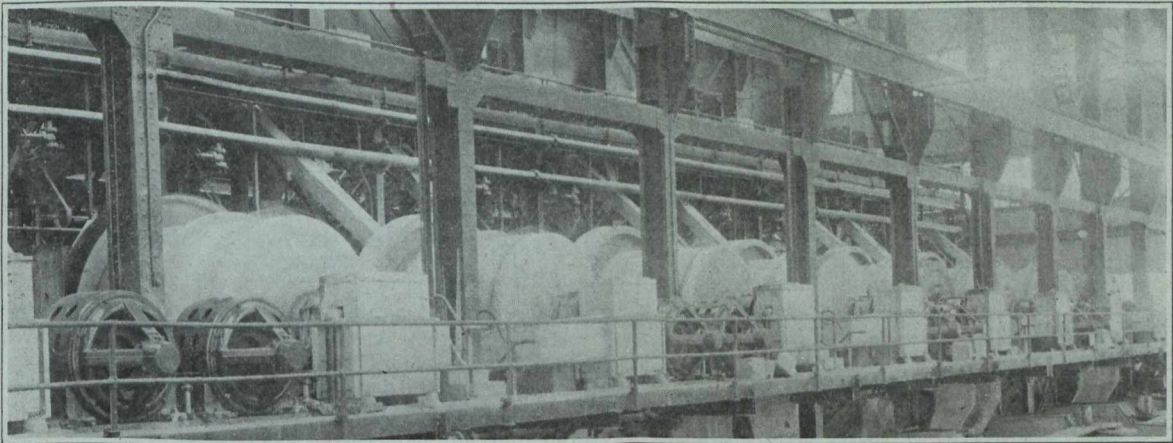
Direct Factory Branches; Canadian Plants;

Toronto, Ont.	Toronto, Ont.,
Montreal, Que.	Merritton, Ont.,
Merritton, Ont.,	St. Boniface, Man.,
Winnipeg, Man.	Shawinigan Falls, Que.



World's Largest Makers of Dissolved Acetylene

We Have Always Advocated "No Rolls" Just "One Easy Step"



AN INSTALLATION OF NO. 86 MARCY BALL-MILLS

MARCY MILL

CRUSHING
"ONE
EASY
STEP"

The modern, heavy-duty roll is an efficient ore crusher when reducing from 3 inches to 1/2-inch. Actual operating cost for such work will be found to run from 6c. to 12c. per ton.

But—in crushing for concentration or flotation, rolls preceding the Marcy Mill will not increase its capacity more than 10%. To operate these rolls will cost at least one-third as much as to operate the Marcy Mills.

Therefore there is no gain in operating rolls before Marcy Mills. Save the money you would put in rolls for other purposes.

Since the Marcy Mill was introduced in 1915, two hundred mills have been manufactured and sold. Marcy Mills are now crushing more than 50,000 tons daily in nearly one hundred plants in Alaska, Canada, United States, Mexico, West Indies and South America, with entire satisfaction to their owners.

Send us your crushing problem—our engineers will gladly co-operate with you

The Mine and Smelter Supply Company
 Denver Salt Lake City El Paso

New York Sales Office: 42 Broadway

Willey Tables, Marcy Mills, Assay and Laboratory Equipment and Supplies, Electric Apparatus, General Mining Machinery, Mill Equipment

CANADA

DEPARTMENT OF MINES

HON. MARTIN BURRELL, Minister.

R. G. McCONNELL, Deputy Minister.

MINES BRANCH

Recent Publications

- Iron Ore Occurrences in Canada, Vol. 1. Compiled by E. Lindeman, M.E., and L. L. Bolton, M.A., B.Sc. Introductory by A. H. A. Robinson, B.A.Sc.
- The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.
- Building and Ornamental Stones of Canada (Western Provinces). Vol. IV., by W. A. Parks, Ph.D.
- Feldspar in Canada. Report on, by H. S. de Schmid, 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 Mineral Production Reports, by J. McLeish, B.A.
- The Coal-fields and Coal Industry of Eastern Canada, by F. W. Gray.
- The Value of Peat Fuel for the Generation of Steam. Bulletin No. 17, by John Blizard, B.Sc.
- Cobalt Alloys with Non-corrosive Properties. Report on, by H. T. Kalmus, B.Sc., Ph.D.
- Mining of Thin Coal Seams of Eastern Canada, by J. F. K. Brown.
- The Mineral Waters of Canada. Vol. I., by John Satterly, M.A., D.Sc., and R. T. Elworthy, B.Sc.

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

- Fuel Testing Laboratory.**—Testing value of Canadian fuels for steam raising and production of power gas; analyses, and other chemical and physical examinations of solid, liquid and gaseous fuels are also made.
- Ore-Dressing Laboratory.**—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.
- Chemical Laboratory.**—Analysing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.
- Ceramic Laboratory.**—Equipment is such that complete physical tests on clays and shale of the Dominion can be made, to determine their value from an economic standpoint.
- Structural Materials Laboratory.**—Experimental work on sands, cements and limes is also undertaken.
- Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to **The Director, Mines Branch, Department of Mines, Ottawa.**

GEOLOGICAL SURVEY

Recent Publications

- Memoir 92. Part of the District of Lake St. John, Quebec, by John A. Dresser.
- Memoir 93. The Southern Plains of Alberta, by D. B. Dowling.
- Memoir 95. Onaping Map-Area, by W. H. Collins.
- Memoir 96. Sooke and Duncan Map-areas, Vancouver Island, by C. H. Clapp.
- Memoir 97. Scroggie, Barker, Thistle and Kirkman Creeks, Yukon Territory, by D. D. Cairnes.
- Memoir 98. Magnesite Deposits of Grenville District, Argenteuil County, Quebec, by M. E. Wilson.
- Memoir 99. Road material surveys in 1915, by L. Reinecke.
- Memoir 101. Pleistocene and recent deposits in the vicinity of Ottawa, with a description of the soils, by W. A. Johnston.
- Memoir 102. Espanola district, Ontario, by Terence T. Quirke.
- Map 63A. Moncton Sheet, Westmorland and Albert Counties, New Brunswick. Topography.
- Map 154A. Southwestern Yukon.
- Map 157A. East Sooke, Vancouver Island, British Columbia. Topography.
- Map 161A. Beaverton Sheet, Ontario, York and Victoria Counties, Ontario. Topography.
- Map 162A. Sutton Sheet, York and Simcoe Counties, Ontario. Topography.
- Map 163A. Barrie sheet, Simcoe county, Ontario. Topography.
- Map 167A. East Sooke, Vancouver Island. Geology.
- Map 168A. Deposits of stone and gravel available for a highway between Ottawa and Prescott, Ontario.
- Map 1662. Ottawa, Carleton and Ottawa counties.
- Map 1665. Stone available for road material, Hull to Grenville, Quebec.
- Map 1667. Slocan Mining Area, Kootenay District, B.C.
- Map 1677. Coleraine Sheet, Megantic and Wolfe Counties, Quebec.
- Map 1692. Amisk and Athapapuskow lakes, Saskatchewan and Manitoba.
- Maps 1697 and 1698. Explored routes in a belt traversed by the Canadian Northern Ontario railway,—in two sheets: Sheet 1 Gogama to Missonga, Sudbury district; Sheet 2 Oatland to Penhurst, Algoma district, Ontario.
- 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.
- Communications should be addressed to **The Director, Geological Survey, Ottawa.**

JONES & GLASSCO

(REG'D)

ENGINEERS

MONTREAL AND TORONTO

Specialists in

POWER TRANSMISSION CHAINS

CANADIAN AGENTS FOR

"RENOLD"

Patent Silent and Bush Roller Chains

"MORSE"

Rocker Joint Silent Chains

Chain Drives from 1/4 HP to 5000 HP in successful operation

Write for particulars to

Head Office:

St. Nicholas Building
MONTREAL

Branch Office:

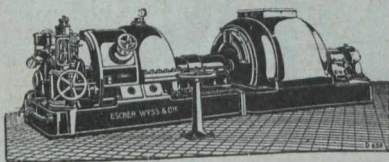
1204 Traders Bank Building
TORONTO

48

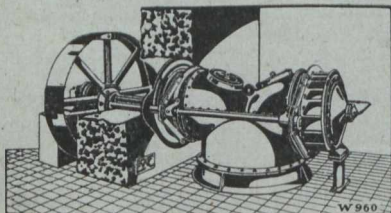
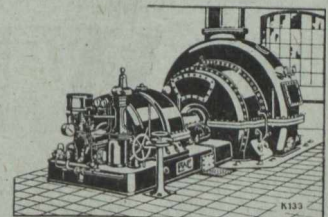
ESCHER WYSS & C^{IE}.S.A.

Zurich
Switzerland

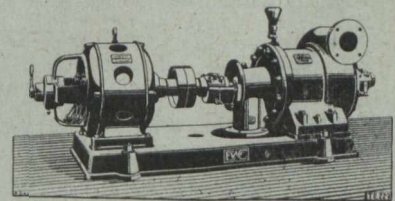
A 173



Steam Turbines
Air Compressors



Centrifugal Pumps
Water Wheels



Montreal Office - - 211 Coristine Building



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

HARRIS HEAVY PRESSURE

The Aristocrat of Babbitts

St. Lawrence Paper Mills Co., Limited
Mille Roches, Ont.

The Canada Metal Co., Ltd., Fraser Ave., Toronto, Ont.
Dear Sirs:

We feel like putting in a good word for your Heavy Pressure Babbitt. We installed a very heavy machine some time ago, which had all brass boxes. The shafts weigh six tons each with a top roll weighing four tons, also a lever pressure making a total pressure of about fourteen tons. The brass boxes wore out in four weeks. We then put in Heavy Pressure Babbitt and am pleased to say that we have no more trouble. We put in Heavy Pressure in a very heavy machine eighteen months ago and there seems to be no perceptible wear.

We thank you for supplying us with a babbitt that gives such good results. Yours truly,
Per C. F. BUSS, Superintendent.

THE CANADA METAL COMPANY, Limited

Head Office and Factory TORONTO

Branch Factories: HAMILTON, MONTREAL, WINNIPEG, 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.

: 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 605, Dom. Express Bldg. Montreal
 General Manager,
 Crown Reserve Mining Co. Ltd.

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 Lagachetiere St. West.
Toronto
 24 Adelaide St. East.
Winnipeg
 806 Union Trust Bldg.

THE DORR COMPANY

Hydrometallurgical and Industrial Engineers
 DENVER NEW YORK LONDON E.C.
 1009 17th St. 17 Battery Place 16 South St.

FERRIER, W. F.

Consulting Mining Engineer and Geologist
 204 LUMSDEN BLDG., TORONTO, ONT.

ROGERS, JOHN C.

Mining Engineer
 Examination and Exploration of Mining Properties with a View to Purchase.
 COPPER CLIFF ONTARIO

ROBERT H. STEWART

Mining & Metallurgical Engineer
 VANCOUVER BLOCK
 VANCOUVER, B.C.

MURPHY, CHAS. J.

Min. & Met. Engineer
 Consultation, Examinations, Reports
 ST. CATHARINES, - - - ONT.

JAMES McEVOY

Mining Engineer and Geologist
 (Specialty Coal Mining)
 210 POPLAR PLAINS ROAD, TORONTO, ONTARIO
 Phone Hillcrest 1461

Phone Main 4427

The Toronto Testing Laboratory, Ltd
 160 Bay Street, Toronto

ASSAYERS & CHEMISTS
 "PROMPT AND ACCURATE SERVICE GUARANTEED."

TYRRELL, J. B.

Mining Engineer,
 534 Confederation Life Building,
 TORONTO, - - - CANADA.

GEO. R. ROGERS

MINING ENGINEER
 905 TRADERS BANK BUILDING
 TORONTO
 Examinations, Sampling and Reporting on Mines and Prospects
 Telephone M. 2625

A. A. HASSAN

Mining Geologist and Consulting Engineer
 SUITE 203-204 RIGGS BLDG.,
 WASHINGTON, D.C.

Smith & Travers Diamond Drill

Company, Limited
 Box 169, SUDBURY, ONT.
 All classes of Diamond Drilling done.
 Engineer's Reports on All Work, Furnished.

For information concerning

Mining Companies Operating in Canada
 consult the
Canadian Mining Manual

Cable Address: "Linsey" Codes: Broomhalls 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

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 1878.

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 5008

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

LAWYERS

Telephone Main 3813 Cable Address: "Chadwick" Toronto Western Union Code
 E. M. Chadwick, K.C. Fasken, Robertson, Chadwick & Sedgewick
 David Fasken, K.C. Barristers, Solicitors, Notaries
 M. K. Cowan, K.C. Offices: Bank of Toronto, Cor. Wellington & Church Sts.
 Harper Armstrong
 Alexander Fasken
 Hugh E. Rose, K.C. 58 Wellington St. East
 Geo. H. Sedgewick. Toronto
 James Aitchison

J. M. CALLOW
President

GENERAL ENGINEERING COMPANY

E. B. THORNHILL
Manager

(Canadian Branch)
CONSULTING ENGINEERS
363 Sparks St. Ottawa, Ont.

CALLOW PNEUMATIC SYSTEM OF FLOTATION
Complete Laboratory at 363 SPARKS ST., OTTAWA, ONTARIO, for the testing of Gold
Silver, Copper, Lead, Zinc, Molybdenum, and Other Ores.
HEAD OFFICE, - - SALT LAKE CITY, UTAH, (U.S.A.)

VICTOR C. ALDERSON

JOHN M. BAKER
PAUL W. GAEBELEIN

HAMILTON W. BAKER

ALDERSON, BAKER & GAEBELEIN

Consulting Mining Engineers

Standard Bank Building,
Toronto, Ont.

185 Devonshire Street,
Boston, Mass.

**Hardy Patent
Pick Handles.**

We make a specialty of
these handles.

And are the only manu-
facturers in Canada.

Write for prices.

St. Marys Wood Specialty Co., Ltd.
St. Marys, Ont.

Copper Properties Wanted

A corporation with sound financial backing
is desirous of making examinations of
copper properties either fully or partly de-
veloped with a view to purchase. Address
Box B-3, c/o Doremus & Co., Advertis-
ing Agents, 44 Broad St., New York.

PATENTS
TRADE MARKS AND DESIGNS
PROCURED IN ALL COUNTRIES

Special attention given to Patent Litigation
Pamphlets sent free on application

RIDOUT & MAYBEE

Cor. YONGE AND COLBORNE STS., TORONTO ONT.,

RAILS

New or Relaying
12 to 80 pound per yard

Locomotives,
Switches, Turntables,
Dump Cars,
Portable Track, Etc.

JNO. J. GARTSHORE

58 Front St. West - Toronto, Ont.

**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.

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 State-
ments, Special Reports, Descriptive Pamphlets, etc.

We guarantee our work in all respects. In letter-press, half-
tone engravings and reproductions in color, 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

BUYERS AND SELLERS OF METALS

The Consolidated Mining and Smelting Company

OF CANADA, LIMITED

Smelting and Refining: Trail, British Columbia

BUYERS OF

Gold, Silver, Copper, Lead and Zinc Ores

SELLERS OF

Tadanac Brand Pig Lead—Copper—Zinc
Electrolytic—Highest Grade

Eastern Sales Office: C.P.R. Building, Toronto

CAPPER PASS & SON, LTD.

Bedminster Smelting Works, BRISTOL
ENGLAND

SELL

Antimonial Lead
Antimony Alloys
Tin Alloy

BUY

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

For Information Concerning
Mining Companies Operating in Canada

Consult The

Canadian Mining Manual

The Coniagas Reduction Company, Limited.

St. Catharines, - - - Ontario

Smelters and Refiners of Cobalt Ores

Manufacturers of

Bar Silver, Arsenic—White and Metallic.

Cobalt Oxide and Metal.

Nickel, Oxide and Metal.

Telegraphic Address:
"Coniagas"

Codes: Bedford McNeill,
A.B.C. 5th Edition

Bell Telephone 603, St. Catharines

**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

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 METALS, MATTES, Etc.

OF

Warehouses, LIVERPOOL and SWANSEA.

Warrants issued under their Special Act of Parliament.

NITRATE OF SODA. Cable Address, BATHOTA, London

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

Deloro Smelting and Refining Co., Ltd.

Manufacturers of

Cobalt Oxide and Metal

Nickel Oxide and Metal

Refined White Arsenic

"STELLITE"

High Speed Tool Metal

Head Office and Works: DELORO, Ont.

Branch Offices: 200 King Street West, Toronto

315 Craig Street West, Montreal

CXL EXPLOSIVES

Do your blasting with CXL. explosives.

Your blasting problems are ours.

None are too small or too large for us.

Accessories marked CXL. are reliable.

Metal miners get results with "Forcite."

Insist on CXL. products and insure results.

Tamp well your shots, use CXL. tamping bags.

Enlist now, amongst our regular users.

Canadian Explosives Limited

Head Office: MONTREAL, P.Q.

Main Western Office: VICTORIA, B.C.

DISTRICT OFFICES:

NOVA SCOTIA:

QUEBEC:

ONTARIO: Toronto,

MANITOBA:

ALBERTA:

BRITISH COLUMBIA:

Cobalt,

Timmins,

Sudbury,

Vancouver,

Victoria,

Nelson,

Halifax

Montreal

Ottawa

Winnipeg

Edmonton

Prince Rupert

Factories at

Beloeil, P.Q.

Waverley, N.S.

Northfield, B.C.

Vaudreuil, P.Q.

James Island, B.C.

Bowen Island, B.C.

Windsor Mills, P.Q.

Nanaimo, B.C.

Parry Sound, Ont.

The Canadian Miners' Buying Directory.

- Air Hoists—**
Canadian Ingersoll-Rand Co.
Ltd., Montreal, Que.
- Amalgamators—**
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.
Koering Cyaniding Process
Company.
- Assayers' and Chemists Sup-
plies—**
C. L. Berger & Sons, 37 Wil-
liam St., Boston, Mass.
Lymans, Ltd., Montreal, Que.
Stanley, W. F. & Co., Ltd.
Koering Cyaniding Process
Company.
Mine & Smelter Supply Co.
- Babbitt Metals—**
Canada Metal Co., Ltd.
Can. B. K. Morton.
Hoyt Metal Co.
- Balances—Heusser—**
Mine & Smelter Supply Co.
- Ball Mills—**
Hull Iron & Steel Foundries,
Ltd.
Mine & Smelter Supply Co.
- Belting—Leather, Rubber and
Cotton—**
Northern Canada Supply Co.
Jones & Glassco.
Can. B. K. Morton.
- Blasting Batteries and Sup-
plies—**
Canadian Ingersoll-Rand Co.
Ltd., Montreal, Que.
Northern Canada Supply Co.
Canadian Explosives, Ltd.
- Blowers—**
Northern Canada Supply Co.
- Bollers—**
Northern Canada Supply Co.
Canadian Ingersoll-Rand Co.
Ltd., Montreal, Que.
Can. Allis-Chalmers, Ltd.
Marsh Engineering Works.
- Boxes, Cable Junction—**
Standard Underground Cable
Co. of Canada, Ltd.
- Buckets—**
Hendrick Mfg. Co.
M. Beatty & Sons, Ltd.
Marsh Engineering Works.
Northern Canada Supply Co.
- Cable—Aerial and Under-
ground—**
Northern Canada Supply Co.
Standard Underground Cable
Co. of Canada, Ltd.
- Cableways—**
M. Beatty & Sons, Ltd.
Can. Allis-Chalmers, Ltd.
- Cages—**
Northern Canada Supply Co.
- Cables—Wire—**
Standard Underground Cable
Co. of Canada, Ltd.
- Car Dumps—**
Sullivan Machinery Co.
- Cars—**
Northern Canada Supply Co.
MacKinnon, Holmes & Co.
Marsh Engineering Works.
Mine & Smelter Supply Co.
- Car Wheels and Axles—**
Marsh & Henthorn, Ltd.
- Cement Machinery—**
Northern Canada Supply Co.
Hull Iron & Steel Foundries,
Ltd.
Can. Allis-Chalmers, Ltd.
- Chains—**
Jones & Glassco.
Northern Canada Supply Co.
- Chemical Apparatus—**
Mine & Smelter Supply Co.
- Chemists—**
Canadian Laboratories.
Campbell & Deyell.
- Thos. Heys & Sons.
Milton Hersey Co.
Ledoux & Co.
- Classifiers—**
Mine & Smelter Supply Co.
- Coal—**
Dominion Coal Co.
Nova Scotia Steel & Coal Co.
- Coal Cutters—**
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.
Ltd., Montreal, Que.
- Coal Mining Explosives—**
Canadian Explosives, Ltd.
- Coal Mining Machinery—**
Canadian Ingersoll-Rand Co.
Ltd., Montreal, Que.
Sullivan Machinery Co.
Marsh Engineering Works.
- Coal Pick Machines—**
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co.
Ltd., Montreal, Que.
- Compressors—Air—**
Escher Wyss & Co.
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co.
Ltd., Montreal, Que.
Northern Canada Supply Co.
Can. Allis-Chalmers, Ltd.
- Concrete Mixers—**
Northern Canada Supply Co.
Wettlaufer Bros.
Can. Allis-Chalmers, Ltd.
- Condensers—**
Smart-Turner Machine Co.
Northern Canada Supply Co.
Can. Allis-Chalmers, Ltd.
- Concentrating Tables—**
Mine & Smelter Supply Co.
- Converters—**
Northern Canada Supply Co.
- Conveyer—Trough—Belt—**
Hendrick Mfg. Co.
- Cranes—**
Smart-Turner Machine Co.
M. Beatty & Sons, Ltd.
- Crane Ropes—**
Allan, Whyte & Co.
Can. B. K. Morton.
- Grinding Plates—**
Hull Iron & Steel Foundries,
Ltd.
- Crucibles—**
Mine & Smelter Supply Co.
- Crushers—**
Lymans, Ltd.
Mussens, Limited.
Hull Iron & Steel Foundries,
Ltd.
Wettlaufer Bros.
Can. Allis-Chalmers, Ltd.
Mine & Smelter Supply Co.
- Cyaniding Process—**
Koering Cyaniding Process
Co.
Can. Allis-Chalmers, Ltd.
- Derricks—**
Smart-Turner Machine Co.
M. Beatty & Sons, Ltd.
Can. Allis-Chalmers, Ltd.
Marsh Engineering Works.
- Diamond Drill Contractors—**
Diamond Drill Contracting
Co.
Smith & Travers.
Sullivan Machinery Co.
- Dredger Pins—**
Armstrong, Whitworth of
Canada, Ltd.
- Dredging Machinery—**
M. Beatty & Sons.
- Dredging Ropes—**
Allan, Whyte & Co.
Can. B. K. Morton.
- Drills, Air and Hammer—**
Canadian Ingersoll-Rand Co.
Ltd., Montreal, Que.
Sullivan Machinery Co.
Northern Canada Supply Co.
Can. Allis-Chalmers, Ltd.
- Drills—Core—**
Canadian Ingersoll-Rand Co.
Ltd., Montreal, Que.
Standard Diamond Drill Co.
- Sullivan Machinery Co.
Can. Allis-Chalmers, Ltd.
- Drills—Diamond—**
Sullivan Machinery Co.
Northern Canada Supply Co.
- Drill Steel—Mining—**
Armstrong, Whitworth of
Can., Ltd.
Can. B. K. Morton.
- Drill Steel Sharpeners—**
Canadian Ingersoll-Rand Co.
Ltd., Montreal, Que.
Northern Canada Supply Co.
Sullivan Machinery Co.
- Drills—Electric—**
Canadian Ingersoll-Rand Co.
Ltd., Montreal, Que.
Sullivan Machinery Co.
- Drills—High Speed and Car-
bon—**
Armstrong Whitworth of
Can., Ltd.
Can. B. K. Morton
- Dynamite—**
Canadian Explosives.
Northern Canada Supply Co.
- Ejectors—**
Canadian Ingersoll-Rand Co.
Ltd., Montreal, Que.
Northern Canada Supply Co.
- Elevators—**
M. Beatty & Sons.
Sullivan Machinery Co.
Northern Canada Supply Co.
Wettlaufer Bros.
- Electrical Supplies—**
Can. Gen. Electric Co., Ltd.
- Electric Mine Locomotives—**
Can. Gen. Electric Co., Ltd.
- Engineering Instruments—**
C. L. Berger & Sons.
- Engineers & Contractors—**
Foundation Co., Ltd., of
Montreal.
- Engines—Automatic—**
Smart-Turner Machine Co.
- Engines—Gas and Gasoline—**
Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.
Can. Allis-Chalmers, Ltd.
- Engines—Haulage—**
Canadian Ingersoll-Rand Co.
Ltd., Montreal, Que.
Can. Allis-Chalmers, Ltd.
Marsh Engineering Works.
- Engines—Marine—**
Smart-Turner Machine Co.
- Engines—Steam—**
Smart-Turner Machine Co.
M. Beatty & Sons.
Can. Allis-Chalmers, Ltd.
- Fans—Ventilating—**
Can. Allis-Chalmers, Ltd.
- Forges—**
Northern Canada Supply Co.
Ltd.
- Forging—**
M. Beatty & Sons.
Smart-Turner Machine Co.
- Furnaces—Assay—**
Lymans, Ltd.
Mine & Smelter Supply Co.
- Fuse—**
Canadian Explosives.
Northern Canada Supply Co.
- Generators—**
Can. Gen. Electric Co., Ltd.
- Gears—**
Smart-Turner Machine Co.
Northern Canada Supply Co.
Hull Iron & Steel Foundries,
Ltd.
- Hammer Rock Drills—**
Mussens, Limited.
Can. Allis-Chalmers, Ltd.
- Hangers—Cable—**
Standard Underground Cable
Co. of Canada, Ltd.
- High Speed Steel—**
Armstrong, Whitworth of
Canada, Limited.
- High Speed Steel Twist Drills—**
Northern Canada Supply Co.
Armstrong, Whitworth of
Canada, Ltd.
- Hoists—Air, Electric and
Steam—**
Can. Ingersoll-Rand Co., Ltd.
Ltd., Montreal, Que.
Jones & Glassco.
M. Beatty & Sons.
Marsh Engineering Works.
Northern Canada Supply Co.
Wettlaufer Bros.
Can. Allis-Chalmers, Ltd.
- Hoisting Engines—**
Mussens, Limited.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.
M. Beatty & Sons.
Can. Allis-Chalmers, Ltd.
Marsh Engineering Works.
- Hose—**
Northern Canada Supply Co.
- Ingot Copper—**
Canada Metal Co., Ltd.
Hoyt Metal Co.
- Insulating Compounds—**
Standard Underground Cable
Co. of Canada, Ltd.
- Jacks—**
Can. Ingersoll-Rand Co., Ltd.
Ltd., Montreal, Que.
Northern Canada Supply Co.
- Kiln Linings—**
Hull Iron & Steel Foundries,
Ltd.
- Kominuters—**
Hull Iron & Steel Foundries,
Ltd.
- Laboratory Machinery—
Mine & Smelter Supply Co.
- Lamps—**
Can. Gen. Electric Co., Ltd.
- Lamps—Safety—**
Canadian Explosives.
- Link Belt—**
Northern Canada Supply Co.
Jones & Glassco.
- Motors—**
Can. Gen. Electric Co., Ltd.
- Machinists and Founders—**
Hull Iron and Steel Found-
ries, Ltd.
- 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.
Hoyt Metal Co.
- 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.
Hoyt Metal Co.
- Perforated Metals—**
Northern Canada Supply Co.
Hendrick Mfg. Co.
- Pig Tin—**
Canada Metal Co., Ltd.
Hoyt Metal Co.
- Pig Lead—**
Canada Metal Co., Ltd.
Hoyt Metal Co.

Canadian Miners' Buying Directory.—(Continued from page 24.)

<p>Pipes— Canada Metal Co., Ltd. Consolidated M. and S. Co. Northern Canada Supply Co. Smart-Turner Machine Co.</p> <p>Pipe Fittings— Northern Canada Supply Co.</p> <p>Piston Rock Drills— Mussens, Limited. Can. Allis-Chalmers, Ltd.</p> <p>Pneumatic Tools— Can. Ingersoll-Rand Co., Ltd. Jones & Glassco.</p> <p>Prospecting Mills and Machinery— Standard Diamond Drill Co. Can. Allis-Chalmers, Ltd. Mine & Smelter Supply Co.</p> <p>Pulleys, Shafting and Hangings— Northern Canada Supply Co.</p> <p>Pulverizers—Laboratory— Mine & Smelter Supply Co.</p> <p>Pumps—Boiler Feed— Smart-Turner Machine Co. Northern Canada Supply Co. Can. Ingersoll-Rand Co., Ltd. Wettlaufer Bros. Can. Allis-Chalmers, Ltd.</p> <p>Pumps—Centrifugal— Escher Wyss & Co. Mussens, Limited. Smart-Turner Machine Co. M. Beatty & Sons. Can. Ingersoll-Rand Co., Ltd. Can. Allis-Chalmers, Ltd. Mine & Smelter Supply Co.</p>	<p>Pumps—Electric— Smart-Turner Machine Co. Can. Ingersoll-Rand Co., Ltd. Can. Allis-Chalmers, Ltd.</p> <p>Pumps—Sand and Slime— Mine & Smelter Supply Co.</p> <p>Pumps—Pneumatic— Smart-Turner Machine Co. Can. Ingersoll-Rand Co., Ltd. Sullivan Machinery Co.</p> <p>Pumps—Steam— Can. Ingersoll-Rand Co., Ltd. Mussens, Limited. Northern Canada Supply Co. Can. Allis-Chalmers, Ltd. Smart-Turner Machine Co.</p> <p>Pumps—Turbine— Smart-Turner Machine Co. Can. Ingersoll-Rand Co., Ltd. Can. Allis-Chalmers, Ltd.</p> <p>Pumps—Vacuum— Smart-Turner Machine Co. Can. Allis-Chalmers, Ltd.</p> <p>Quarrying Machinery— Sullivan Machinery Co. Can. Ingersoll-Rand Co., Ltd. Can. Allis-Chalmers, Ltd.</p> <p>Roofing— Northern Canada Supply Co.</p> <p>Rope—Manilla and Jute— Jones & Glassco. Northern Canada Supply Co. Allan, Whyte & Co.</p> <p>Rope—Wire— Allan, Whyte & Co. Northern Canada Supply Co. Can. B. K. Morton</p>	<p>Steel—High Speed— Can. B. K. Morton</p> <p>Samplers— C. L. Constant Co. Ledoux & Co. Milton Hersey Co. Thos. Heys & Son. Mine & Smelter Supply Co.</p> <p>Screens— Northern Canada Supply Co. Hendrick Mfg. Co.</p> <p>Screens—Cross Patent Flanged Lip— Hendrick Mfg. Co.</p> <p>Separators— Smart-Turner Machine Co.</p> <p>Sheet Lead— Canada Metal Co., Ltd.</p> <p>Sheets—Genuine Manganese Bronze— Hendrick Mfg. Co.</p> <p>Shovels—Steam— M. Beatty & Sons.</p> <p>Smoke Stacks— Can. Allis-Chalmers, Ltd. Hendrick Mfg. Co. MacKinnon, Holmes & Co. Marsh Engineering Works.</p> <p>Steel Barrels— Smart-Turner Machine Co.</p> <p>Steel Drills— Sullivan Machinery Co. Northern Canada Supply Co. Can. Ingersoll-Rand Co., Ltd. Can. B. K. Morton.</p> <p>Steel Drums— Smart-Turner Machine Co.</p>	<p>Steel—Tool— N. S. Steel & Coal Co. Armstrong, Whitworth of Can., Ltd.</p> <p>Surveying Instruments— C. L. Berger.</p> <p>Switchboards— Can. Gen. Electric Co., Ltd.</p> <p>Tanks—Steel— Marsh Engineering Works.</p> <p>Tables—Concentrating— Mine & Smelter Supply Co.</p> <p>Tanks—Cyanide, Etc.— Hendrick Mfg. Co. Pacific Coast Pipe Co., Ltd. MacKinnon, Holmes & Co. Can. Allis-Chalmers, Ltd.</p> <p>Transits— C. L. Berger & Sons.</p> <p>Transformers— Can. Gen. Electric Co., Ltd.</p> <p>Turbines— Escher Wyss & Co. Can. Allis-Chalmers, Ltd.</p> <p>Twist Drills—High Speed— Can. B. K. Morton Co.</p> <p>Winding Engines—Steam and Electric— Can. Ingersoll-Rand Co., Ltd. Can. Allis-Chalmers, Ltd. Marsh Engineering Works.</p> <p>Wire Cloth— Northern Canada Supply Co. B. Greening Wire Co., Ltd.</p> <p>Wire (Bare and Insulated)— Standard Underground Cable Co., of Canada, Ltd.</p> <p>Zinc Spelter— Canada Metal Co., Ltd. Hoyt Metal Co.</p>
---	--	---	--

ALPHABETICAL INDEX TO ADVERTISERS

<p>A</p> <p>Alderson, Baker & Gaebelen ... 21</p> <p>Allan, Whyte & Co. 19</p> <p>American Zinc Lead & Smelting Co. 5</p> <p>B</p> <p>Bath, Henry & Son 22</p> <p>Balbach Smelting & Refining Co. 22</p> <p>Beatty, Blackstock, Fasken, Cow- an & Chadwick 20</p> <p>Beatty, M. & Sons 11</p> <p>Berger, C. L., & Sons 5</p> <p>Blackwell, Geo. G., Sons & Co. 22</p> <p>British Columbia, Province of... 10</p> <p>Burns & Roberts 20</p> <p>C</p> <p>Callow, J. M. 18</p> <p>Campbell & Deyell, Ltd. 20</p> <p>Canadian General Electric Co., Limited.....Outside Back Cover</p> <p>Canadian Explosives, Ltd. 23</p> <p>Canadian H. K. Porter, Ltd. 11</p> <p>Canadian Ingersoll-Rand Co., Ltd., Montreal, Que. 1</p> <p>Canadian Inspection & Testing Laboratories 20</p> <p>Canadian Laboratories, Ltd. 20</p> <p>Canada Metal Co. 19</p> <p>Canadian Milk Products, Ltd. ... 12</p> <p>Canadian B. K. Morton Co., Ltd. .....Outside Back Cover</p> <p>Canadian Steel Foundries, Ltd.... 10</p> <p>Capper Pass & Son, Ltd. 22</p> <p>Cohen, S. W. 20</p> <p>Consolidated Mining & Smelting Co. 22</p> <p>Coniagas Reduction Co., Ltd. ... 22</p> <p>Constant, C. L. & Co. 22</p> <p>Cleveland Pneumatic Tool Co. of Canada, Ltd. 3</p> <p>D</p> <p>Deloro Smelting & Refining Co. 22</p> <p>Department of Mines, Canada .. 17</p> <p>Dewar Mfg Co. 5</p>	<p>Diamond Drill Contracting Co... 5</p> <p>Dominion Coal Co., Ltd. 11</p> <p>Dominion Engineering & Inspec- tion Co. 20</p> <p>Dominion Steel Foundry, Ltd. ... 3</p> <p>Dominion Tar & Chemical Co. 12</p> <p>Dorr Co. 20</p> <p>Dwight & Lloyd Sintering Co., Inc. 2</p> <p>E</p> <p>Escher, Wyss & Co. 18</p> <p>Everett & Co. 4</p> <p>F</p> <p>Ferrier, W. F. 20</p> <p>Fleck, Alex. 11</p> <p>Foundation Co. of Montreal</p> <p>G</p> <p>Gartshore, John J. 21</p> <p>General Engineering Co. 21</p> <p>Goldsmith Bros. Smelting & Re- fining Co., Ltd. 5</p> <p>Goold, Shaply & Muir Co., Ltd... 5</p> <p>H</p> <p>Hassan, A. A. 20</p> <p>Hamilton Gear & Machine Co.... 20</p> <p>Hendrick Mfg. Co. 6</p> <p>Hersey, Milton Co., Ltd. 20</p> <p>Heys, Thomas & Son 20</p> <p>Hitchcock, C. H. 20</p> <p>Hull Iron & Steel Foundries, Ltd. Front Cover.</p> <p>Hoyt Metal Co. 2</p> <p>I</p> <p>Imperial Bank of Canada 6</p> <p>Industrial & Technical Press.... 21</p> <p>International Molybdenum Co. ... 5</p> <p>International Nickel Co. 6</p> <p>J</p> <p>Johnson, Matthey & Co. 20</p> <p>Jones & Glassco 18</p> <p>L</p> <p>Ledoux & Co. 20</p> <p>Lindsey, G. G. S. 20</p> <p>Longyear, E. J. Co. 4</p>	<p>Lymans, Ltd. 6</p> <p>M</p> <p>MacKinnon, Holmes & Co.</p> <p>Marsh Engineering Works, Ltd... 14</p> <p>McEvoy, Jas. 20</p> <p>Mine & Smelter Supply Co. 16</p> <p>Minerals Separation North Ameri- can Corporation 9</p> <p>Mond Nickel Co. 4</p> <p>Murphy, Chas. J. 20</p> <p>Mussens, Limited 12</p> <p>N</p> <p>Northern Canada Supply Co., Ltd. 2</p> <p>Nova Scotia Steel & Coal Co.... 4</p> <p>Nova Scotia Government 8</p> <p>O</p> <p>Ontario, Province of..... .....Inside Back Cover</p> <p>P</p> <p>Prest-O-Lite Co., Inc. 15</p> <p>Q</p> <p>Quebec, Province of 8</p> <p>R</p> <p>Ridout & Maybee 21</p> <p>Rogers, John C. 20</p> <p>Rogers, Geo. R. 20</p> <p>S</p> <p>Smart-Turner Machine Co. 3</p> <p>Smith & Travers Diamond Drill. 20</p> <p>Smith & Durkee Diamond Drill Company. 21</p> <p>Standard Underground Cable Co. of Canada, Ltd. 11</p> <p>Stewart, Robert H. 20</p> <p>Sullivan Machinery Co. .... .....Inside Front Cover</p> <p>T</p> <p>Toronto Testing Laboratory, Ltd. 20</p> <p>Tyrrell, J. B. 20</p> <p>U</p> <p>University of Toronto</p> <p>W</p> <p>Wettlaufer Bros., Ltd. 5</p>
---	--	---

Ontario's Mining Lands

Ontario, with its 407,262 square miles of area contains many millions of acres in which the geological formations are favorable 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 useful minerals, both metallic and non-metallic, are found in Ontario:— actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, mica, molybdenite, natural gas, palladium petroleum, platinum, quartz, salt and talc.

Building materials, such as marble, limestone, sandstone, granite, trap, sand and gravel, meet every demand. Lime, Portland cement, brick and tile are manufactured in quantity within the Province.

Ontario in 1917 produced 46 per cent. of the total mineral output of Canada. Preliminary returns made to the Ontario Bureau of Mines show the output of the mines and metallurgical works of the Province for the year 1917 to be worth \$71,060,942, of which the metallic production was \$56,845,788.

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. After performing 240 days' assessment work on a claim, patent may be obtained from the Crown on payment of \$2.50 or \$3.00 per acre, depending on location in surveyed or unsurveyed territory.

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

UNIFORMITY

USED THE WORLD OVER

SATISFACTION



Atlas Babbitts



MADE IN CANADA

AMACOL

:::

ATLAS TIN TOUGHENED

:::

ATLAS

Specially Recommended For Mining Machinery

These Babbitts are the result of years of experience and have a World-wide reputation for uniformity and reliability.

NO SHOCK TOO SEVERE --- NO LOAD TOO HEAVY --- NO SPEED TOO GREAT

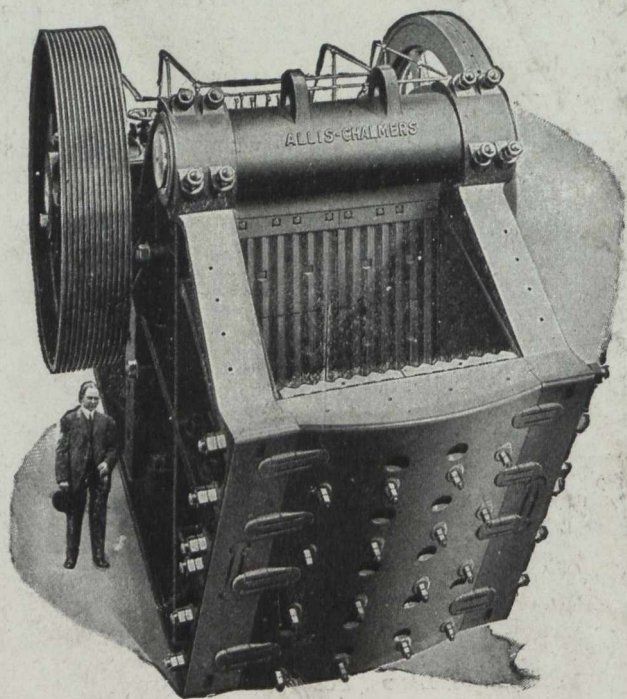
ATLAS METAL & ALLOYS COMPANY OF CANADA, LIMITED, MONTREAL

Sales Agents:

The Canadian B. K. Morton Co., Limited

MONTREAL: 49 Common Street.

TORONTO: 86 Richmond Street East.



ALL STEEL

JAW CRUSHERS

built in 3 standard sizes, 36 in. x 24 in.—48 in. x 36 in. and 60 in. by 48 in. For special requirements we furnish the 84 in. x 66 in. Vertical Swing Jaw Crusher here shown. It is similar to the smaller crushers except that the swing jaw is vertical and the stationery jaw inclined about 25 degrees.

For further particulars see Bulletin No. 1810.

CANADIAN ALLIS - CHALMERS

LIMITED

Offices: Toronto, Montreal, Halifax, Sydney, Ottawa, Cobalt, South Porcupine, London, Winnipeg, Calgary, Edmonton, Nelson and Vancouver