

Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

Coloured covers/
Couverture de couleur

Coloured pages/
Pages de couleur

Covers damaged/
Couverture endommagée

Pages damaged/
Pages endommagées

Covers restored and/or laminated/
Couverture restaurée et/ou pelliculée

Pages restored and/or laminated/
Pages restaurées et/ou pelliculées

Cover title missing/
Le titre de couverture manque

Pages discoloured, stained or foxed/
Pages décolorées, tachetées ou piquées

Coloured maps/
Cartes géographiques en couleur

Pages detached/
Pages détachées

Coloured ink (i.e. other than blue or black)/
Encre de couleur (i.e. autre que bleue ou noire)

Showthrough/
Transparence

Coloured plates and/or illustrations/
Planches et/ou illustrations en couleur

Quality of print varies/
Qualité inégale de l'impression

Bound with other material/
Relié avec d'autres documents

Continuous pagination/
Pagination continue

Tight binding may cause shadows or distortion along interior margin/
La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure

Includes index(es)/
Comprend un (des) index

Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/
Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.

Title on header taken from:/
Le titre de l'en-tête provient:

Title page of issue/
Page de titre de la livraison

Caption of issue/
Titre de départ de la livraison

Masthead/
Générique (périodiques) de la livraison

Additional comments:/
Commentaires supplémentaires:

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.

10X	14X	18X	22X	26X	30X
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12X	16X	20X	24X	28X	32X

TWENTY-SECOND YEAR OF PUBLICATION

The CANADIAN MINING REVIEW

Established 1882

Vol. XXIII--No. VI.

OTTAWA, JUNE 30th, 1904.

Vol. XXIII--No. VI.

<p>AIR COMPRESSORS GAS</p>	<p>THE CANADIAN RAND DRILL CO SHERBROOKE, QUE. BRANCH OFFICES IN MONTREAL, QUE. TORONTO, ONT. HALIFAX, N.S. ROSSLAND, B.C. RAT PORTAGE, ONT. GREENWOOD, B.C. VANCOUVER, B.C.</p>	<p>ROCK DRILLS</p>
---	--	--------------------------------------



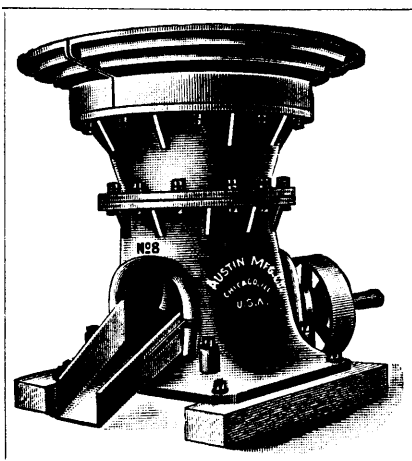
ALL KINDS OF

..RUBBER GOODS FOR MINING PURPOSES..

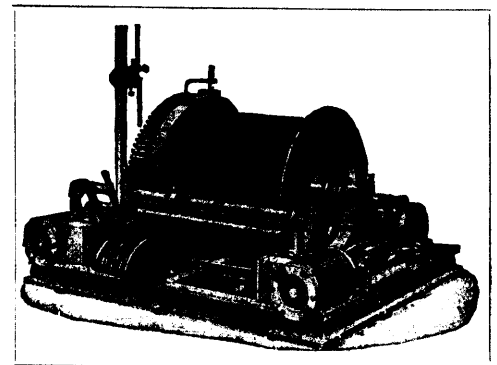
Steam and Air Hose, Rubber Bumpers and Springs, Fire Hose, Pulley Covering, Rubber Clothing and Boots.

..MANUFACTURED BY..

THE GUTTA PERCHA & RUBBER MFG. CO. OF TORONTO, Limited



WIRE ROPE
MINE HOISTS
ORE CRUSHERS



LIGHT LOCOMOTIVES
GENERAL MINE SUPPLIES
W.H.C. MUSSEN & CO.

Offices and Showroom 299 St. James St.

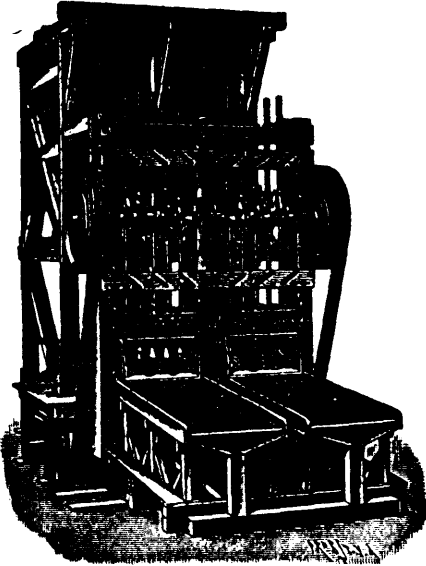
Warehouses 763-765 Craig St.

MONTREAL

FRIED. KRUPP AKTIENGESELLSCHAFT GRUSONWERK

Magdeburg-Buckau (Germany)

MINING MACHINERY



ORE CRUSHING:

Stone Breakers of specially strong construction, Roller Mills, Chilian Mills.

BALL MILLS

for dry and wet crushing, more than 1,800 at work.

STAMP BATTERIES

Shoes and Dies of Krupp's Special Steel.

AMALGAMATION:

Amalgamation Tables and Pans, Larslo's Gold Amalgamators, Settlers, etc.

SEPARATION and CONCENTRATION:

Separators, Exhaustors, Hydraulic Classifiers, Percussion Tables, Jiggers, Rotating Round Tables.

LEACHING PLANT.

Complete Gold Ore Dressing Plant

- a. For treating by the Wet Method with Stamp Batteries, Amalgamation and Concentration.
- b. For Dry Crushing by Ball Mills Dust Extraction, and Leaching.

COAL WASHING PLANT

Large Testing Station for Crushing and Dressing Ores at the Works.

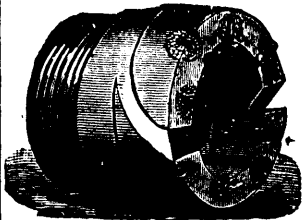
Agents:

For Canada: JAS. W. PYKE & Co., Merchants Bank Building, MONTREAL.

For the United States: THOS. PROSSER & SON, 15 Gold Street, NEW YORK.

For Mexico: PABLO BERGNER, Apartado 540, MEXICO.

For South Africa: UNITED ENGINEERING CO., Ltd., P.O. Box 1082, JOHANNESBURG, S.A.R.



GOODS SENT SUBJECT TO APPROVAL

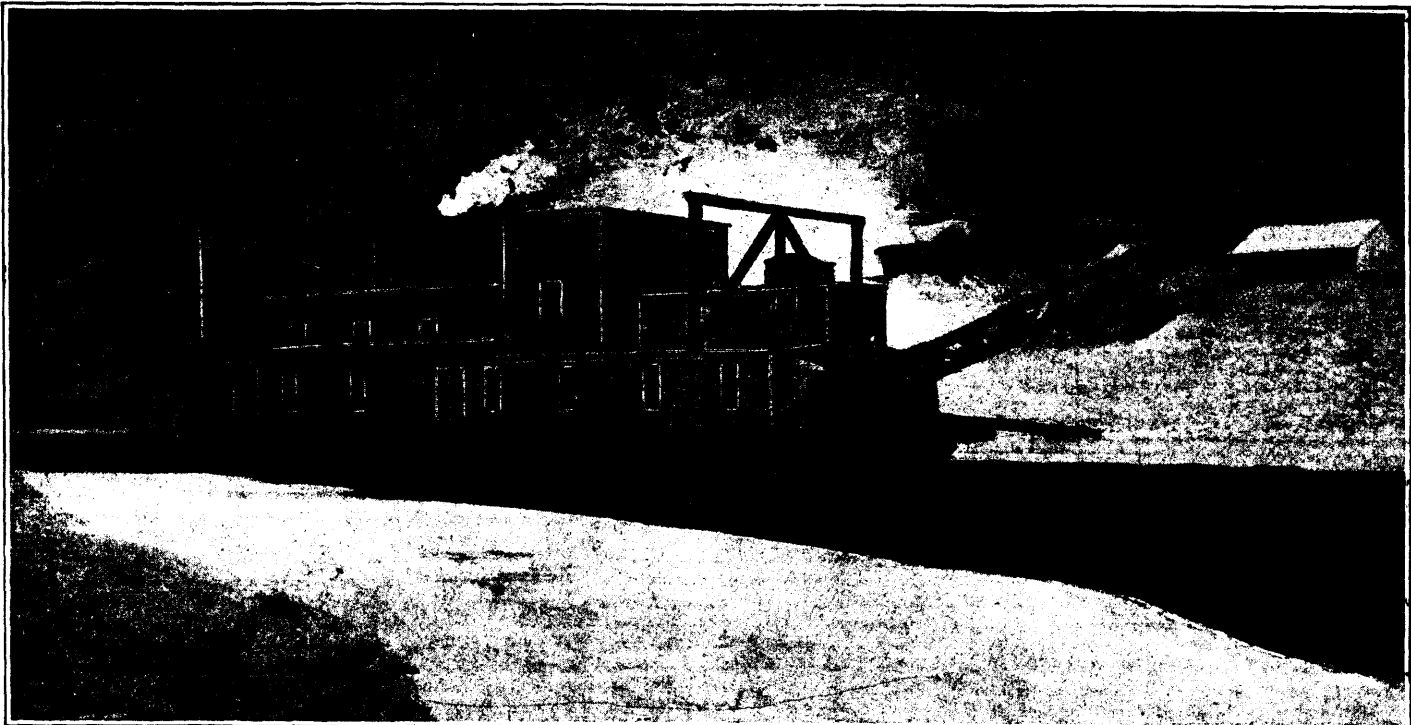
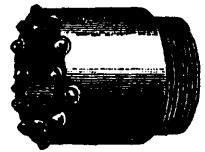
BERNARD BANDLER

IMPORTER OF

CARBONS AND BORTS

For Diamond Drills and all Mechanical Purposes

65 Nassau Street, NEW YORK, N.Y.



BLISS No. 1 GOLD DREDGE

Built by

Working on the Fraser River, B.C.

The Wm. Hamilton Mfg. Co. Limited

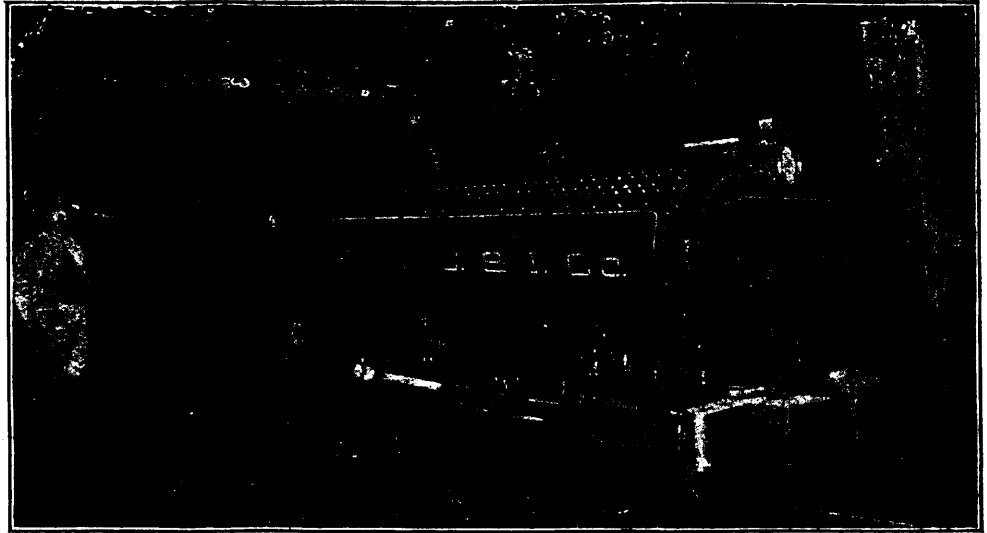
Branch Office: VANCOUVER, B.C.

PETERBOROUGH, Ont.

Baldwin Locomotive Works

Burnham, Williams & Co., Philadelphia, Pa., U. S. A.

Steam
Compressed Air
and
Electric



Baldwin Compressed Air Mine Locomotive

Locomotives FOR Mines and Furnaces

LOBNITZ GOLD DREDGERS ARE
AT WORK IN BRITISH NORTH
AND SOUTH AMERICA, AFRICA.
ASIA, &c.

LOBNITZ & CO., LIMITED,
MANUFACTURE DREDGE PLANT.
MOST IMPROVED DESIGN.
GOLD DREDGERS.
ALL PARTS MADE TO GAUGE
QUICK DELIVERY OF STANDARD SIZES.
ADDRESS LETTERS:
LOBNITZ & CO., LTD., RENFREW, SCOTLAND.

Telegraphic Address:
LOBNITZ, RENFREW Al Code used.

DIAMOND DRILLS

Our drills are of the latest design and represent the highest point of perfection yet reached. Operated by hand power, horse power, steam, air, and electricity.

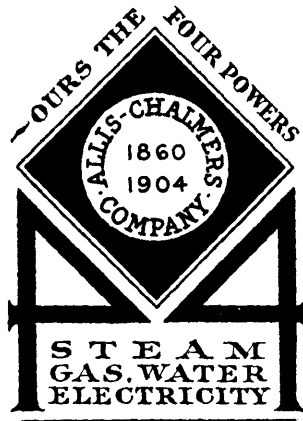
Send for Catalogue.

STANDARD DIAMOND DRILL CO.

431-3 Stock Exchange Building, Chicago, U.S.A.

Allis-Chalmers Co

CHICAGO



Bullock

Electrical Apparatus
for all purposes.

PROVINCE of QUEBEC

The attention of Miners and Capitalists in the United States
and in Europe is invited to the

GREAT MINERAL TERRITORY

Open for investment in the Province of Quebec.

Gold, Silver, Copper, Iron, Asbestos, Mica, Plumbago,
Phosphate, Chromic Iron, Galena, Etc.

ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

The Mining Law gives absolute security to Title, and has been
specially framed for the encouragement of Mining.

Mining concessions are divided into three classes:—

1. In unsurveyed territory (*a*) the first class contains 400 acres, (*b*) the second, 200 acres, and (*c*) the third, 100 acres.
2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (*a*) as a mining concession by purchase, or (*b*) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are \$5 and \$10 per acre for mining lands containing the superior metals* ; the first named price being for lands situated more than 12 miles and the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, \$2 and \$4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein ; in concessions for the mining of the inferior metals, those only may be mined for.

*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than \$500 if mining for the superior metals ; and not less than \$200 if for inferior metals. In default, cancellation of sale of mining lands.

(*b*) Licenses may be obtained from the Commissioner on the following terms:—Application for an exploration and prospecting license, if the mine is on private land, \$2 for every 100 acres or fraction or 100 ; if the mine is on Crown lands (1) in unsurveyed territory, \$5 for every 100 acres, and (2) in unsurveyed territory, \$5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

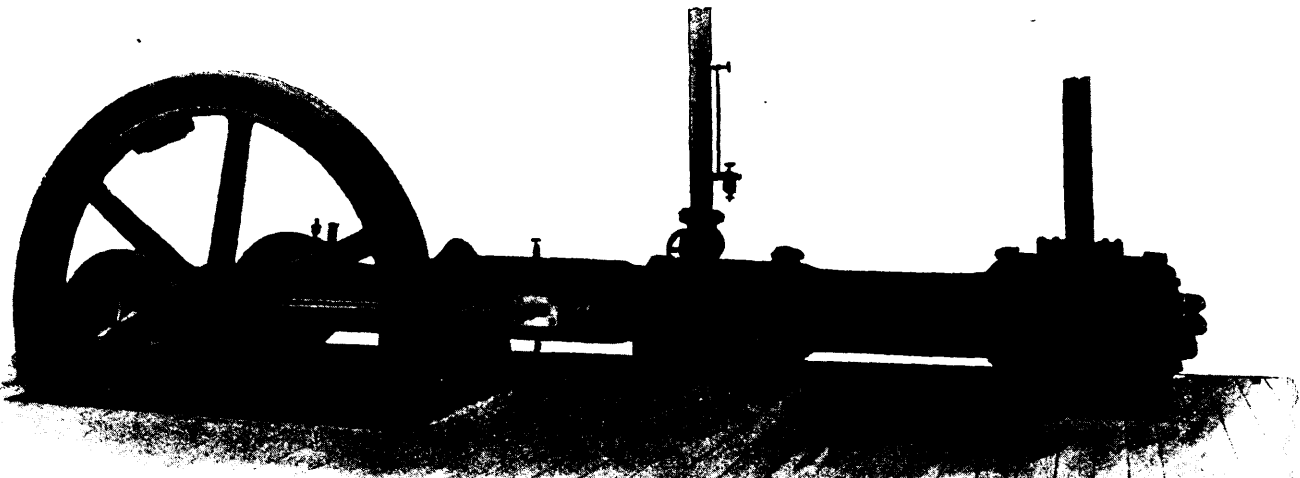
Licenses for mining are of two kinds : Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of \$5 and an annual rental of \$1 per acre. Each license is granted for 200 acres or less, but not for more ; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE MINISTER OF LANDS, MINES AND FISHERIES,
PARLIAMENT BUILDINGS, QUEBEC, P. Q.

THE CANADIAN RAND DRILL CO

LOOK AHEAD!



FIRST HALF RAND CLASS "B" COMPRESSOR

When installing an air compressor, provide for the future. Don't install a small machine, that you will have to sell at a loss, when you want a larger compressor. We recommend the installation of the first half of a duplex machine where there is a probability of more air being required later on.

The second half can be added at any time, making a complete machine, either duplex or compound.

SEND FOR CATALOGUE "A"

EASTERN BRANCHES
MONTREAL, QUE.
TORONTO, ONT.
HALIFAX, N.S.

HEAD OFFICE & WORKS.
SHERBROOKE,
QUEBEC.

WESTERN BRANCHES
ROSSLAND, B.C.
GREENWOOD, B.C.
VANCOUVER, B.C.
RATPORTAGE, ONT.

THE BENNETT FUSE



The Popular Fuse Throughout the Dominion

SOLE MANUFACTURERS

WM. BENNETT SONS & Co.

ROSKEAR SAFETY FUSE WORKS

Camborne, Cornwall, England.

AGENTS IN CANADA:

J. H. ASHDOWN, Winnipeg, Manitoba
CAVERHILL, LEARMONT & CO., St. Peter Street, Montreal
F. COCHRANE, Sudbury, Ont.

J. & H. YOUNG, Bridge Street, Quebec
J. S. MITCHELL & CO., Sherbrooke, Que.
WELLS & EMERSON, Port Arthur, Ont.

ROWLAND MACHIN, General Agent, Yates St., VICTORIA, B.C.

THE JOHN McDOUGALL

Caledonian Iron Works Co. Limited

MONTREAL, Que.

BOILERS

TANKS AND
WROUGHT IRON
WORK

HYDRAULIC AND MILL MACHINERY

GEARS, PULLEYS, HANGERS

IRON CASTINGS OF EVERY DESCRIPTION

GENERAL AND MANUFACTURING AGENTS IN CANADA FOR

WORTHINGTON PUMPS

We manufacture for sale and on order Pumps and Pumping Engines for liquids, air and gas, Condensers, Cooling Towers, and other apparatus and machinery under all Canadian Letters Patent owned or controlled by the International Steam Pump Co. and its companies including the following patents:

Nos. 40,235	47,168	52,155	53,629	62,005	70,612	74,319
75,359	76,520	77,066	79,001	80,482	82,040	82,041



Dominion of Canada

SYNOPSIS OF REGULATIONS

For disposal of Minerals on Dominion Lands in Manitoba, the North-west Territories and the Yukon Territory.

COAL.

Coal lands may be purchased at \$10 per acre for soft coal and \$20 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at the rate of ten cents per ton of 2,000 pounds shall be collected on the gross output.

QUARTZ.

Persons of eighteen years and over and joint stock companies holding free miner's certificates may obtain entry for a mining location.

A free miner's certificate is granted for one or more years, not exceeding five, upon payment in advance of \$7.50 per annum for an individual, and from \$50 to \$100 per annum for a company, according to capital.

A free miner, having discovered mineral in place, may locate a claim 1500 x 1500 feet by marking out the same with two legal posts, bearing location notices, one at each end on the line of the lode or vein.

The claim shall be recorded within fifteen days if located within ten miles of a mining recorder's office, one additional day allowed for every additional ten miles or fraction. The fee for recording a claim is \$5.

At least \$100 must be expended on the claim each year or paid to the mining recorder in lieu thereof. When \$500 has been expended or paid, the locator may, upon having a survey made, and upon complying with other requirements, purchase the land at \$1.00 an acre.

Permission may be granted by the Minister of the Interior to locate claims containing iron and mica, also copper, in the Yukon Territory, of an area not exceeding 160 acres.

The patent for a mining location shall provide for the payment of a Royalty of 2½ per cent. of the sales of the products of the location.

PLACER MINING.

Manitoba and the N. W. T., excepting the Yukon Territory.—Placer mining claims generally are 100 feet square; entry fee, \$5, renewable yearly. On the North Saskatchewan River claims are either bar or bench, the former being 100 feet long and extending between high and low water mark. The latter includes bar diggings, but extends back to the base of the hill or bank but not exceeding 1,000 feet. Where steam power is used, claims 200 feet wide may be obtained.

Dredging in the rivers of Manitoba and the N. W. T., excepting the Yukon Territory.—A free miner may obtain only two leases of five miles each for a term of twenty years, renewable in the discretion of the Minister of the Interior.

The lessee's right is confined to the submerged bed or bars of the river below low water mark, and subject to the rights of all persons who have, or who may receive entries for bar diggings or bench claims, except on the Saskatchewan River, where the lessee may dredge to high water mark on each alternate leasehold.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles, but where a person or company has obtained more than one lease one dredge for each fifteen miles or fraction is sufficient. Rental, \$10 per annum for each mile of river leased. Royalty at the rate of two and a half per cent collected on the output after it exceeds \$10,000.

DREDGING IN THE YUKON TERRITORY.

Six leases of five miles each may be granted to a free miner for a term of twenty years, also renewable.

The lessee's right is confined to the submerged bed or bars in the river below low water mark, that boundary to be fixed by its position on the 1st day of August in the year of the date of the lease.

The lessee shall have one dredge in operation within two years from the date of the lease, and one dredge for each five miles within six years from such date. Rental, \$100 per mile for first year and \$10 per mile for each subsequent year. Royalty, same as placer mining.

PLACER MINING IN THE YUKON TERRITORY.

Creek, gulch, river and hill claims shall not exceed 250 feet in length, measured on the base line or general direction of the creek or gulch, the width being from 1,000 to 2,000 feet. All other placer claims shall be 250 feet square.

Claims are marked by two legal posts, one at each end, bearing notices. Entry must be obtained within ten days, if the claim is within ten miles of mining recorder's office. One extra day allowed for each additional ten miles or fraction.

The person or company staking a claim must hold a free miner's certificate.

The discoverer of a new mine is entitled to a claim of 1,000 feet in length, and if the party consists of two, 1500 feet altogether, on the output of which no royalty shall be charged, the rest of the party ordinary claims only.

Entry fee, \$10. Royalty at the rate of two and one-half per cent on the value of the gold shipped from the Yukon Territory to be paid to the Comptroller.

No free miner shall receive a grant of more than one mining claim on each separate river, creek or gulch, but the same miner may hold any number of claims by purchase, and free miners may work their claims in partnership by filing notice and paying fee of \$2. A claim may be abandoned, and another obtained on the same creek, gulch or river, by giving notice and paying a fee.

Work must be done on a claim each year to the value of at least \$200.

A certificate that work has been done must be obtained each year: if not, the claim shall be deemed to be abandoned, and open to occupation and entry by a free miner.

The boundaries of a claim may be defined absolutely by having a survey made and publishing notices in the Yukon Official Gazette.

PETROLEUM.

All unappropriated Dominion Lands in Manitoba, the North west Territories and within the Yukon Territory are open to prospecting for petroleum, and the Minister may reserve for an individual or company having machinery on the land to be prospected, an area of 640 acres. Should the prospector discover oil in paying quantities, and satisfactorily establish such discovery, an area not exceeding 640 acres, including the oil well and such other land as may be determined, will be sold to the discoverer at the rate of \$1.00 an acre, subject to royalty at such rate as may be specified by order-in-council.

Department of the Interior,
OTTAWA, February, 1904.

JAMES A. SMART,
Deputy of the Minister of the Interior.

WALKER BROTHERS

WIGAN, ENGLAND

PATENT

AIR COMPRESSING ENGINES

310,000 IND. HORSE-POWER AT WORK

In Great Britain, France, Germany, Spain, Russia, Holland, Canada, South America, India, Japan, South Africa, China, Australia, New Zealand, &c., &c.

PATTERNS FROM 20 HORSE-POWER UP TO 2,000 HORSE-POWER.

WALKER BROTHERS have constructed 700 Air Compressing Engines, with Steam and Air Cylinders ranging from the smallest sizes to 72 in. diameter, including 350 from 30 in. to 70 in. diameters.

One installation, in process of construction, has four Steam Cylinders (Corliss type) and four Air Cylinders.

The Low-pressure Steam Cylinders are 64 in. diameter, the Low-pressure Air Cylinders are 58 in. diameter. Steam Pressure, 140 lb. per square inch; Air Pressure, 100 lb. per square inch.

EXTRACTED FROM CATALOGUE.

Messrs. WALKER BROS.,
Loftus Mines, Loftus in Cleveland, R.S.O.,
3rd December, 1901.

Dear Sirs,—I have much pleasure in stating that the air compressing machinery, supplied by you in 1891 and 1897, to Pease and Partners, Ltd., Loftus Ironstone Mines, has given every satisfaction.

The valves of the air cylinders are remarkably good, and have never given any trouble or needed repairs. The compressor is a double horizontal compound engine, steam cylinders, 28 in. and 48 in. diameters, air cylinders, 40 in. diameters by 72 in. stroke.

The compressed air is used for rock drilling, hauling, and pumping underground.—Yours faithfully,
For Pease and Partners, Ltd.,
W. MOORE, Manager.

[NOTE.—These engines have four steam cylinders and two air cylinders.—WALKER BROS.]

The United Alkali Co., Ltd., Chief Engineer's Office,
Widnes, 23rd December, 1901.

Messrs. WALKER BROS., Pagefield Ironworks, Wigan.

Dear Sirs,—In reply to your enquiry of the 29th November, we have pleasure in being able to state that your blowing engines have given us great service and satisfaction.

We have had for several years quite a number of your large blowing engines in operation, driven direct by both single and cross compound arrangement of steam cylinders.

We consider that the arrangement of the "Walker" valves on the compressor cylinders is a valuable one, possessing the merit of simplicity and efficiency, while giving a large throughway with a small clearance space.—Yours faithfully,
For the United Alkali Co.,
EDWARD J. DUFF, Chief Engineer.

[NOTE.—See the number and dimensions of the compressors referred to in the list of users in our catalogue. The steam and air cylinders are nearly 70 in number, from 20 in. to 50 in. diameter.—WALKER BROS.]

Barrow Hæmatite Steel Company, Limited,
Barrow-in Furness, 7th October, 1901.

Messrs. WALKER BROS., Pagefield Ironworks, Wigan.

Dear Sirs,—I have much pleasure in stating that after a long experience of your Bessemer blowing cylinders, extending over 15 years, we find the valves perform their work most satisfactorily, and they are most enduring; indeed, we cannot speak too highly of their performance or life.—Yours faithfully,
For Barrow Hæmatite Steel Company, Limited,
J. M. WHILE, General Manager.

[NOTE.—The various blowing engines (air compressing engine) referred to above include several air cylinders 48 in. diameter.—WALKER BROS.]

Messrs. The GLENGARNOCK STEEL AND IRON COMPANY write, in November, 1901, after 15 years' experience of Walker Bros' blowing engines, having air compressing cylinders 54 in. diameter by 6 ft. stroke:—"These engines have given us every satisfaction."

Messrs. DE WENDEL & CO., Hayange, Lorraine, after seven years' experience of air cylinders (four) 54 in. diameter by 6 ft. 6 in. stroke write:—"The working of the air cylinders you supplied leaves nothing to be desired."

S. PEARSON AND SON, Contractors,
Blackwall Tunnell Works, East Greenwich, S. E.,
May 10th, 1897.

Messrs. WALKER BROS., Pagefield Ironworks, Wigan.

Dear Sirs,—We are pleased to confirm what we told you verbally the other day, viz., that we consider the air cylinders and valves of your compressors to be the best for such work as we have been carrying out on the above contract.

One of your engines ran for almost a year without stopping, and it gives us great pleasure to thus testify to the good qualities of the plant which we purchased from you.—We are, Dear Sirs, yours faithfully,
(Signed) pro S. Pearson and Son, E. W. MOIR.

SOLE CANADIAN
REPRESENTATIVES

PEACOCK BROTHERS

CANADA LIFE BUILDING
MONTREAL

Chemical and Assay Apparatus



ZINC, CYANIDE and SULPHURIC ACID
FOR CYANIDE PROCESS.

COMPLETE ASSAY OUTFITS.

THE HAMILTON-MERRITT PROSPECTOR'S OUTFITS.

Becker's Balances and Weights.
Battersea Crucibles and Muffles.
Hoskins' Gasoline Furnaces.
Kavalier's Bohemian Glassware.
Munktell's Swedish Filters.

OUR 1897 CATALOGUE ON APPLICATION.

Lyman, Sons & Company

380, 382, 384 and 386 St. PAUL STREET

MONTREAL.

The Canadian Mining Manual

1904

FOURTEENTH
Y E A R

A Complete Mining Directory

ARRANGED ALPHABETICALLY
CLASSIFIED BY INDUSTRIES AND BY PROVINCES

FOR

The Mine Manager
The Capitalist and
The Manufacturer.

SUBSCRIBE FOR IT

ADVERTISE IN IT

BOUND IN CLOTH
PRICE FOUR DOLLARS

Write for Advertising Rates and space to

The Canadian Mining Review
OTTAWA, CANADA

THE CANADIAN MINING MANUAL

FOR 1904
14th Year

This standard work of reference to the MINERAL INDUSTRIES OF CANADA
will be issued in July, 1904. It is a

COMPLETE MINING DIRECTORY

to all BLAST FURNACES, COLLIERIES, METAL MINES, MILLS and SMELTERS of
the Dominion, and contains authentic details concerning the HISTORY, ORGANIZATION,
CAPITAL, OFFICERS, OPERATIONS, PLANTS, ACCOUNTS and DIVIDENDS of each
corporation.

ENDORSED BY THE GOVERNMENT AND THE FINANCIAL AND MINING PRESS

For advertising space and for advance copies address

THE CANADIAN MINING REVIEW, Ottawa, Canada.

NOVA SCOTIA STEEL & COAL CO. Ltd.

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, Tee Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel $\frac{3}{8}$ to $\frac{1}{4}$ " 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 $\frac{5}{8}$ to 5" true to $\frac{1}{1000}$ part of One 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, N.S.

DIAMOND

DEEP DRILLING

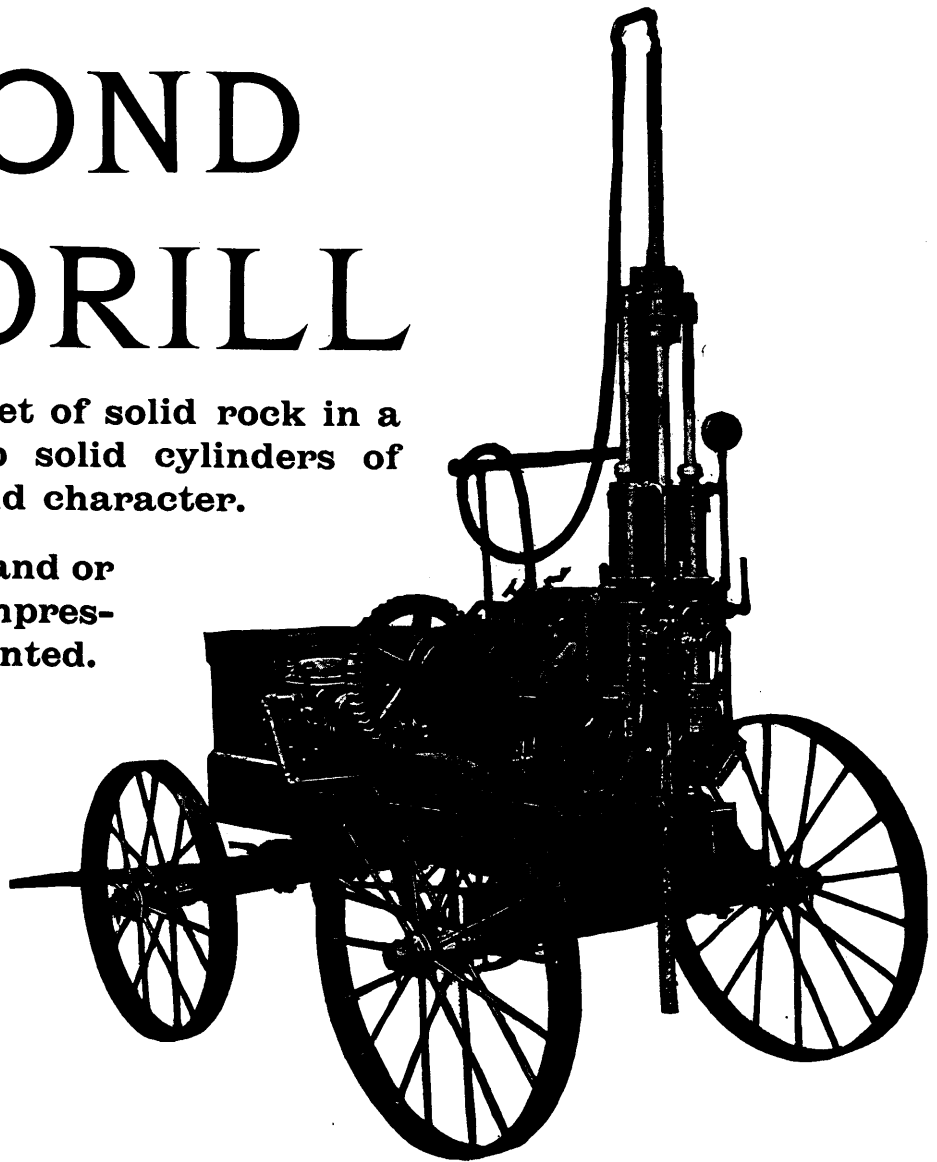
makes economical mining and the deepest hole can be drilled at the smallest cost by a

DIAMOND ROCK DRILL

It can cut through 2,500 feet of solid rock in a vertical line. It brings up solid cylinders of rock, showing formation and character.

Made in all capacities, for Hand or Horse-power, Steam or Compressed Air—mounted or unmounted.

You will find lots of information in our new catalogue—may we send it?



American Diamond Rock Drill Co.

95 Liberty St., NEW YORK CITY, U.S.A.

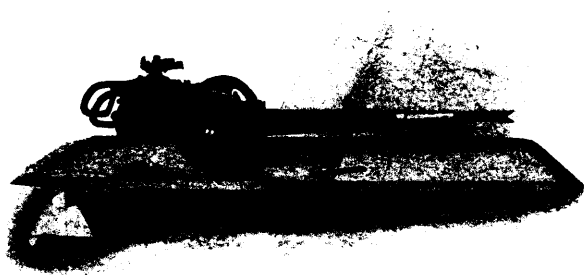
Cable Address, "Occiduous," New York.

ROCK DRILLS

SULLIVAN MACHINERY CO.

MANUFACTURERS OF

Modern Machines for Mining Coal



CATALOGUE No. 48

Sullivan "Punchers"

operated by compressed air, are provided with a positive valve motion, which enables them to cut more coal at less operating expense than any other machine of similar type. One Pennsylvania company uses 600 "Sullivans."

Air Compressors

of the Sullivan "Class W-B type—simple steam and two stage air cylinders—are economical and efficient for coal mining purposes. Meyer steam valve gear; Corliss intake valves, mechanically moved; ample cooling surfaces.



CATALOGUE No. 52-B.

DIAMOND PROSPECTING CORE DRILLS

ELECTRIC UNDERCUTTERS, Breast and Long-wall types

CHAMPION MINE VENTILATORS

AUTOMATIC CROSS-OVER CAR DUMPS

ROCK DRILLS

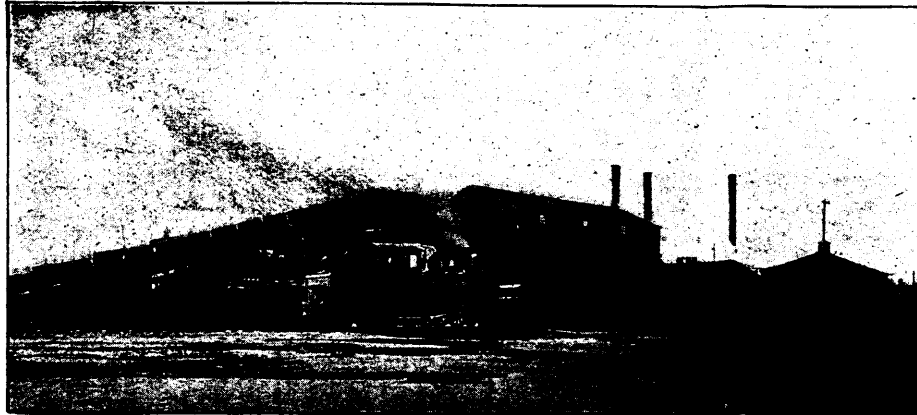
HOISTING ENGINES

QUARRY MACHINERY

CATALOGUES ON REQUEST

CLAREMONT N.H.	RAILWAY EXCHANGE	ST. LOUIS
NEW YORK	CHICAGO. U.S.A.	DENVER
PITTSBURG	EUROPEAN AGENTS 25 RUE RAFFET PARIS	EL PASO

DRUMMOND COAL



COLLIERIES AT WESTVILLE, NOVA SCOTIA.

The Standard of Excellence
in Bituminous Coal and Coke
for Blast Furnaces, Foundries,
Manufacturing and Domestic
Use

RELIABLE, UNIFORM and STRICTLY HIGH GRADE

Shipped from Pictou Harbour, Halifax, and all Points
on Intercolonial Railway and Connections by the

Intercolonial Coal Mining Co. Limited

AGENTS :

Hugh D. MacKenzie, Halifax.

Chas. W. Ives, Pictou.

Darrow, Mann & Co., Boston.

Arthur E. Scott, Quebec.

Head Office : MONTREAL, Que.

JAS. P. CLEGHORN,
President.

CHARLES FERGIE,
Vice-Pres. & General Manager.

D. FORBES ANGUS,
Secretary-Treasurer.

..COAL..

DOMINION COAL COMPANY, LIMITED

Glace Bay, C.B. Canada

MINERS OF

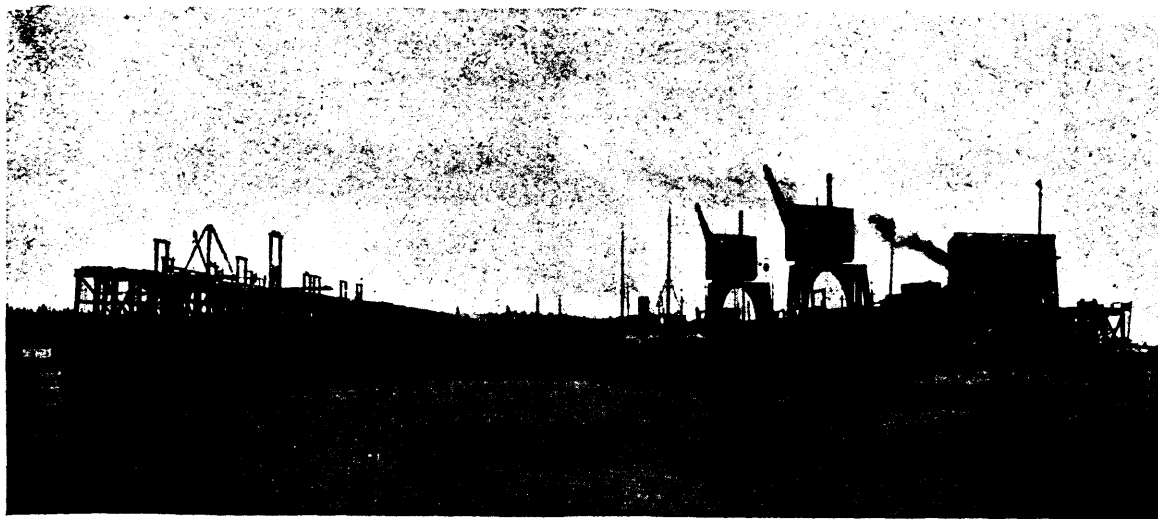
BITUMINOUS COALS

The celebrated "Reserve"
coal for Household use.

"INTERNATIONAL" GAS COAL

And the best steam coal from its
Collieries on the Phalen seam.

Yearly Output 3,000,000 Tons.



International Shipping Piers of the Dominion Coal Co. Limited, at Sydney, C.B.

Shipping facilities at Sydney and Louisburg, C.B., of most modern type. Steamers carrying 5,000 tons loaded in twenty-four hours. Special attention given to quick loading of sailing vessels. Small vessels loaded with quickest despatch.

Bunker Coal

The Dominion Coal Company has provided unsurpassed facilities for bunkering ocean-going steamers with dispatch. Special attention given to prompt loading. Steamers of any size are bunkered without detention.

By improved screening appliances, lump coal for domestic trade is supplied, of superior quality.

APPLICATIONS FOR PRICES, TERMS, &c., SHOULD BE MADE TO

ALEXANDER DICK, General Sales Agent, GLACE BAY, C.B.

KINGMAN & CO., Agents, Custom House Square, Montreal, P.Q.

M. R. MORROW, Agent, 50 Bedford Row, Halifax, N.S.

R. P. & W. F. STARR, Agents, St. John, N.B.

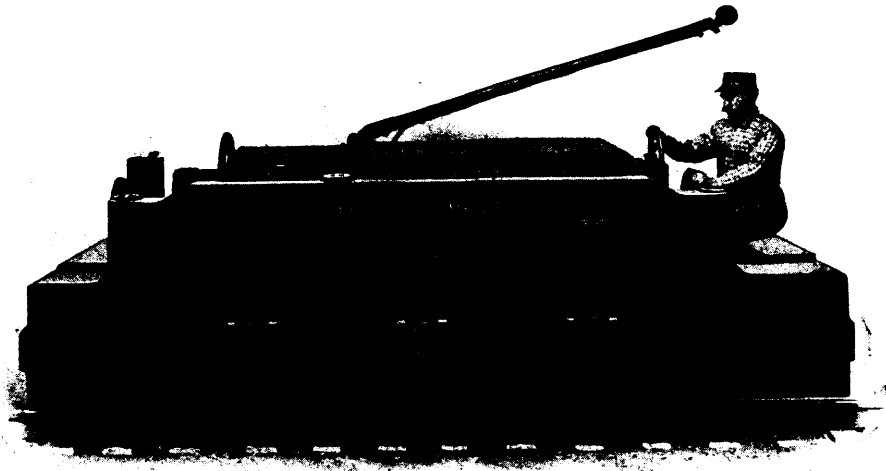
HARVEY & CO., Agents, St. Johns, Nfld.

COAL
CUTTERS

JEFFREY

ROCK
DRILLS

ELECTRIC
LOCOMOTIVES



JEFFREY T.M. 150 20-TON ELECTRIC MINE LOCOMOTIVE
DRAW BAR PULL 8000 LBS.

COMPLETE
MINING
EQUIPMENT

THE QUALITY OF OUR MANUFACTURES
IS UNQUESTIONED AND
OUR FACILITIES FOR FURNISHING WHAT
YOU WANT ARE UNEXCELLED.

Catalogues free.

The Jeffrey Manufacturing Company

COLUMBUS, OHIO, U.S.A.
NEW YORK
PITTSBURG

CHICAGO

CHARLESTON, W. VA.

DENVER

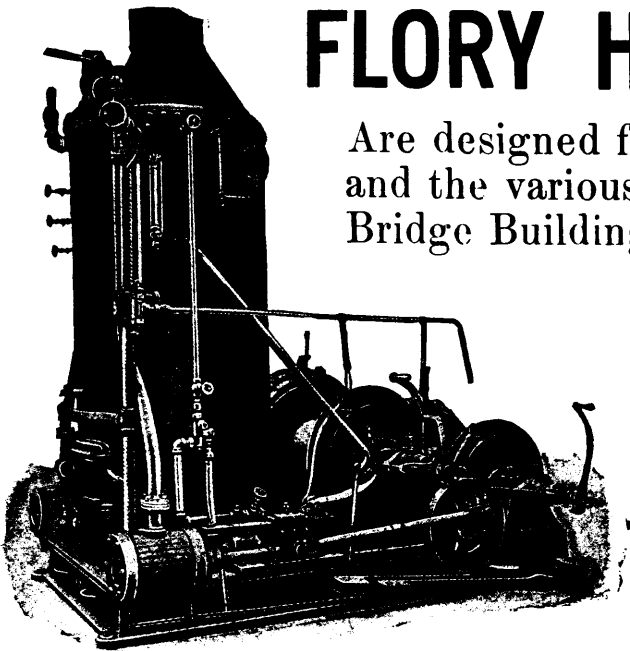
POWER
TRANSMISSION

MACHINERY

ELEVATING
CONVEYING

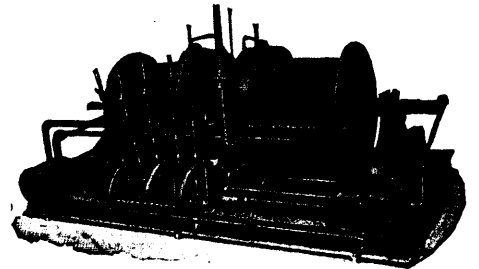
FLORY HOISTING ENGINES STEAM AND ELECTRIC

Are designed for "STRENUOUS" duty. In Mines, Quarries, and the various requirements for Contractors: Pile Driving, Bridge Building and general Hoisting Purposes



The **FLORY CABLEWAY**
and **TRAMWAY SYSTEM**
IS UNEQUALLED

Slate Mining and Working Machinery



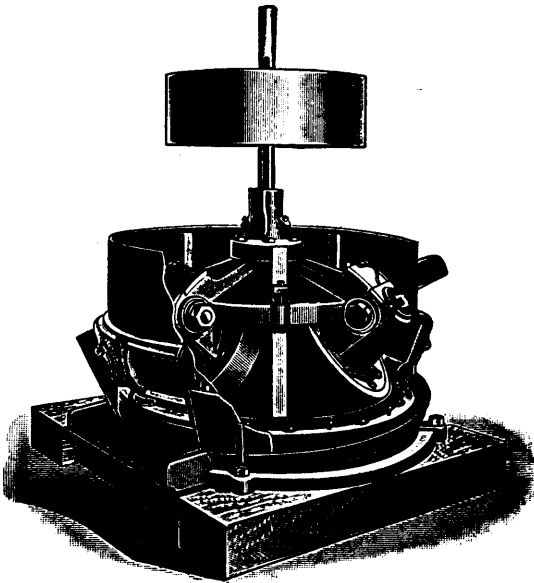
SALES AGENTS—
I. MATHESON & CO.,
New Glasgow, N.S.
W. H. C. MUSSEN & CO.,
Montreal.

S. Flory M'f'g. Co.

ASK FOR OUR CATALOGUES.

Office and Works: **BANCOR, Pa., U.S.A.**

THE GRIFFIN THREE ROLLER ..ORE MILL..



The Griffin Three Roller Ore Mill is a simply constructed Mill, suitable for working all kinds of ores that require uniformly fine crushing by the wet process. This Mill is a modification of the well-known Chilian Mill, but the rollers run upon a crushing ring or die, which is inclined inwardly at an angle of about 30 degrees, the rollers themselves also being inclined to the central shaft of the Mill, thus utilizing the centrifugal force, as well as the weight of the rollers themselves as a crushing agent. The Griffin Three Roller Ore Mill is therefore a Mill of great strength, and has few wearing parts. We construct these Mills, with extreme care, using only the best of raw materials, which are most carefully worked by men who are specialists as mill builders. We sell the Griffin Ore Mill on its determined merits, and will gladly supply full information regarding it to any one.

Send for free illustrated and descriptive catalogue to

Bradley Pulverizer Co. BOSTON, MASS.

MORRIS MACHINE WORKS

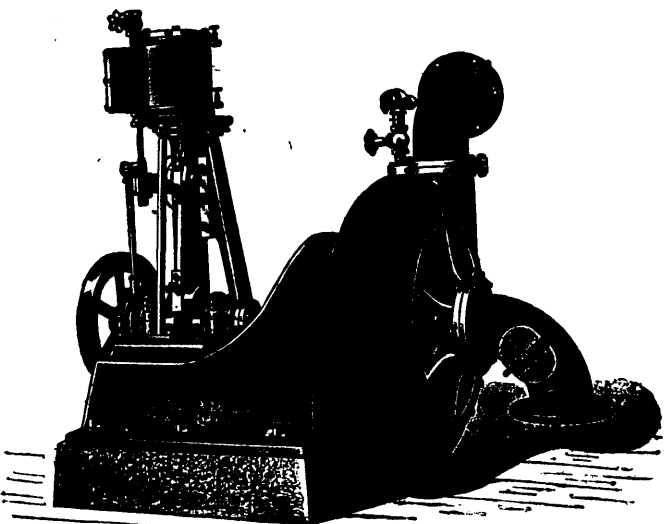
BALDWINVILLE, N.Y.

Centrifugal Pumping Machinery for various Industrial Purposes

We are building a special solid steel lined pump for handling tailings or slimes in gold mining. Estimates furnished upon application for pumping outfits for special purposes. Write for catalogue. New York office—39-41 Cortlandt St.

AGENCIES—

- Henion & Hubbell, 61-69 North Jefferson St., Chicago, Ill.
- Harron, Rickard & McCone, San Francisco, Cal.
- Zimmerman-Wells-Brown Co., Portland, Oregon.
- Mitchell, Lewis & Staver Co., Seattle, Washington.

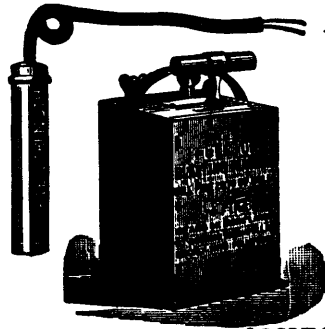


For
Miners
Pit Sinkers**DYNAMITE AND EXPLOSIVES**For
Quarrymen
Contractors

... Manufacturers and Dealers in ...

ELECTRIC BLASTING APPARATUS, FUSE, CAPS, &c.DAN'L SMITH,
President.
C. A. MACPHERSON,
Sec.-Treas.**ONTARIO POWDER CO. Limited**

115 BROCK STREET

Kingston, Ont.**Electric Blasting Apparatus.**

Adapted for Firing all kinds of Explosives used in Blasting.

Victor Electric Platinum Fuses.

Superior to all others for exploding any make of dynamite or blasting powder. Each Fuse folded separately and packed in neat paper boxes of 50 each. All tested and warranted. Single and double strength with any length of wires.

Blasting Machines.

The strongest and most powerful machines ever made for Electric Blasting. They are especially adapted for submarine blasting, large railroad quarrying, and mining works.

Victor Blasting Machine.

Fires 5 to 8 holes; weighs 15 lbs., adapted for prospecting, etc.

Insulated Wires and Tapes,

Blasting Caps, Fuse, Etc.

MANUFACTURED
ONLY BY**JAMES MACBETH & CO., 128 Maiden Lane, New York, U.S.A.**SEND FOR
CATALOGUE**Hamilton Powder Company****Manufacturers of Explosives**

Office: 4 Hospital Street, Montreal.

Branch Offices throughout Canada.

**Iron and Steel Structures for Collieries,
Metal Mines and Smelting Works. . . .**

Steel Bridges for Railways and Highways. Steel Piers and Trestles. Steel Water Towers and Tanks. Steel Roofs, Girders, Beams, Columns, for Buildings.

A LARGE STOCK OF

ROLLED STEEL BEAMS, JOISTS, GIRDERS, CHANNELS, ANGLES, TEES, Z BARS AND PLATES

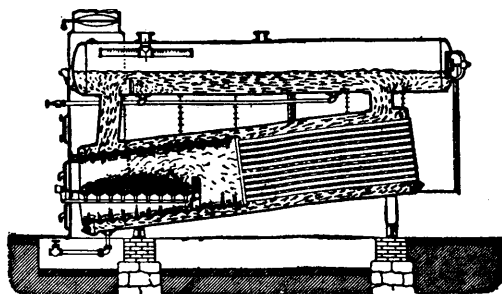
ALWAYS ON HAND, IN LENGTHS TO THIRTY-FIVE FEET

Tables, giving Sizes and Strength of Rolled Beams, on application.

Post Office Address, - MONTREAL.

Dominion Bridge Co., Ltd.,Montreal and
Machine Locks, P.Q.**MILL AND MINING MACHINERY****Shafting, Pulleys, Gearing, Hangers, Boilers, Engines, Steam
Pumps, Chilled Car Wheels and Car Castings. Brass and Iron
Castings of Every Description. Light and Heavy Forgings.****Alex. Fleck, Limited - Ottawa**

NO HEAT WASTED



The Robb-Mumford boiler is internally fired and no heat is wasted by radiation as in an externally fired boiler.

The furnace is long and of large diameter with greatest height at the back, giving good combustion.

The boiler is built with a sheet steel case, ready for use when it leaves our works, or for bricksetting if preferred.

Robb Engineering Co., Limited
AMHERST, N.S.

AGENTS } WILLIAM MCKAY, 320 Ossington Avenue, Toronto.
WATSON JACK & COMPANY, Montreal.
J. F. PORTER, 355 Carlton St., Winnipeg.

THE
Canadian Pacific Railway

IS THE MOST DIRECT ROUTE
 TO THE

**Great Mining
 Regions**

OF

**British Columbia, the
 Yukon and Alaska.**

2

Through Express Trains

**EVERY DAY
 EACH WAY**

BETWEEN

**MONTREAL
 AND
 VANCOUVER**

COMMENCING

**JUNE 13th
 1904**

WESTBOUND

The Imperial Limited
 The Pacific Express

C. E. McPHERSON,
 General Passenger Agent,
 Western Lines,
 WINNIPEG, Man.

ROBERT KERR,
 Passenger Traffic Manager,
 MONTREAL.

EASTBOUND

The Imperial Limited
 The Atlantic Express

C. E. E. USHER,
 General Passenger Agent,
 Eastern Lines,
 MONTREAL.

SCHOOL of MINING

Affiliated to
 Queen's University

Kingston, Ontario.



THE FOLLOWING COURSES ARE OFFERED

1. THREE YEARS' COURSE FOR A DIPLOMA in
 - (a) Mining Engineering.
 - (b) Chemistry and Mineralogy.
 - (c) Mineralogy and Geology.
 - (d) Chemical Engineering.
 - (e) Civil Engineering.
 - (f) Mechanical Engineering.
 - (g) Electrical Engineering.
 - (h) Biology and Public Health, and
2. FOUR YEARS' COURSE FOR A DEGREE (B.Sc.) in the same.
3. COURSES IN CHEMISTRY, MINERALOGY AND GEOLOGY for degrees of Bachelor of Arts (B.A.) and Master of Arts (M.A.)
4. POST-GRADUATE COURSE FOR THE DEGREE OF Doctor of Science (D.Sc.)

For further information see the Calendar of Queen's University.

For further information see the Calendar of Queen's University.

**Next Session begins
 Sept. 28th, 1904.**

**MATRICULATION EXAMINATIONS HELD AT QUEEN'S UNIVERSITY
 SEPTEMBER 15TH.**

THE SCHOOL is provided with well equipped laboratories for the study of Chemical Analysis, Assaying, Blowpiping, Mineralogy, Petrography and Drawing. It has also a well equipped Mechanical Laboratory. The Engineering Building is provided with modern appliances for the study of mechanical and electrical engineering. The Mineralogy, Geology and Physics Building offers the best facilities for the theoretical and practical study of those subjects. The Mining Laboratory has been remodelled at a cost of some \$12,000 and the operations of crushing, cyaniding, etc., can be studied on a large scale.

For Calendar of the School and further information, apply to

The Secretary, School of Mining, Kingston, Ont.

THE CANADIAN MINING MANUAL

1903

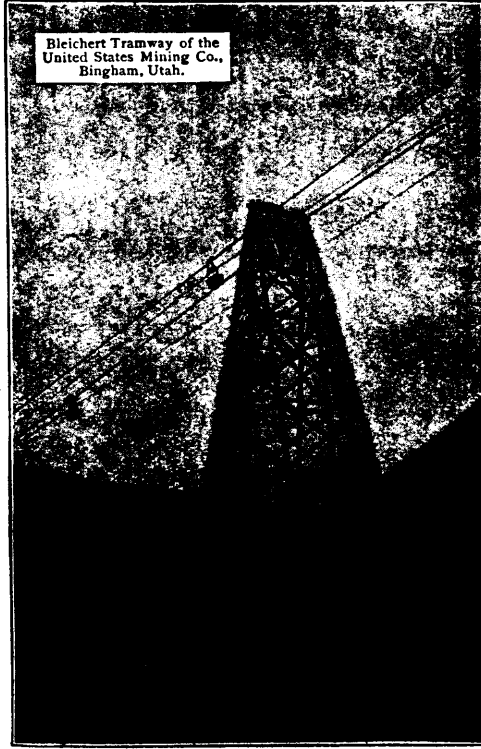
BY
B. T. A. BELL

Editor, "Canadian Mining Review"

A FEW COPIES LEFT

Price \$4.00

CABLE HOIST-CONVEYORS



MANUFACTURED BY
THE TRENTON IRON CO.
TRENTON, N. J.

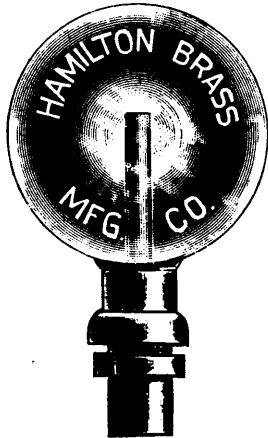
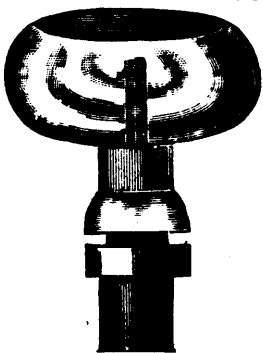
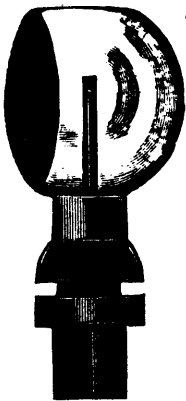
Engineers and Contractors, and sole licensees in North America for the Bleichert System.
Also, Wire Rope Equipments for Surface and Underground Haulage.
Illustrated book upon application.

New York Office—17 Burling Slip

Chicago Office—1122 Monadnock Building

IMPROVED NEEDLE LUBRICATORS.

On a PATENT PNEUMATIC and SELF-ACTING PRINCIPLE, IN GLASS



INSTRUCTIONS for FITTING and ADVANTAGES

The Lubricators being carefully fitted by enlarging the oil hole to fit the plug part of stopper, or otherwise by reducing the plugs to fit existing oil holes, the needle must be perfectly round, smooth and clean, so as to work freely in the tube, the flattened end reaching about half-way up the inside of Lubricator, while the other end rests on the shaft or axle, will produce the following results, viz. :—

- 1st.—Free working of the machinery by perfect lubrication.
- 2nd.—A saving of more than 75 per cent. in oil.
- 3rd.—Corresponding economy in steam-power and coals.
- 4th.—Cleanliness, and consequent saving in labor, engineers' stores, etc.

ALL OUR LUBRICATORS ARE FITTED WITH BRASS TUBES.

IMPROVED STEAM TUBE CLEANER.



THE CLEANER THAT CLEANS CLEAN.

No Moisture.

No Scale.

Saves Cost Quickly.

WRITE FOR PRICES TO

THE HAMILTON BRASS MFG. CO., Limited.

HAMILTON. ONT.

"NOT AN EXPERIMENT: IN GENERAL USE THROUGHOUT THE WORLD"

The New Jackson Hand Power Rock Drill

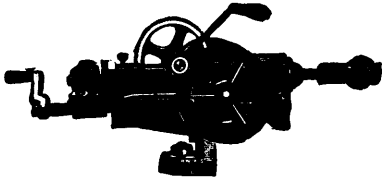
Handled and operated by ONE MAN, will accomplish work of THREE MEN drilling with Bits and Hammers

WILL WORK IN ANY POSITION, IN ANY ROCK.

It Saves Steel,

It Saves Labor,

It Saves Money.



Write for Catalogue.

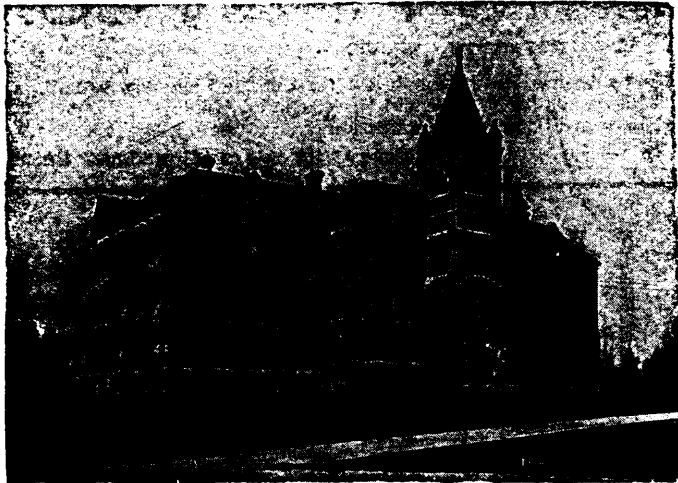


H. D. CRIPPEN, 25 Broad Street, New York City, N.Y.

SCHOOL OF PRACTICAL SCIENCE, TORONTO

ESTABLISHED 1878.

THE FACULTY OF APPLIED SCIENCE AND ENGINEERING OF THE UNIVERSITY OF TORONTO.



DEPARTMENTS OF INSTRUCTION:

- 1—CIVIL ENGINEERING
- 2—MINING ENGINEERING
- 3—MECHANICAL & ELECTRICAL ENGINEERING
- 4—ARCHITECTURE

Special Attention is directed to the Facilities possessed by the School for giving Instruction in Mining Engineering.

LABORATORIES.

- 1—CHEMICAL
- 2—ASSAYING
- 3—MILLING AND ORE TREATMENT
- 4—STEAM
- 5—METROLOGICAL
- 6—ELECTRICAL
- 7—TESTING

A Calendar giving full information, and including a list showing the positions held by graduates, sent on application.

A. T. LAING, Registrar.

J. & J. TAYLOR

(TORONTO SAFE WORKS)

TORONTO, ONTARIO

MANUFACTURERS OF

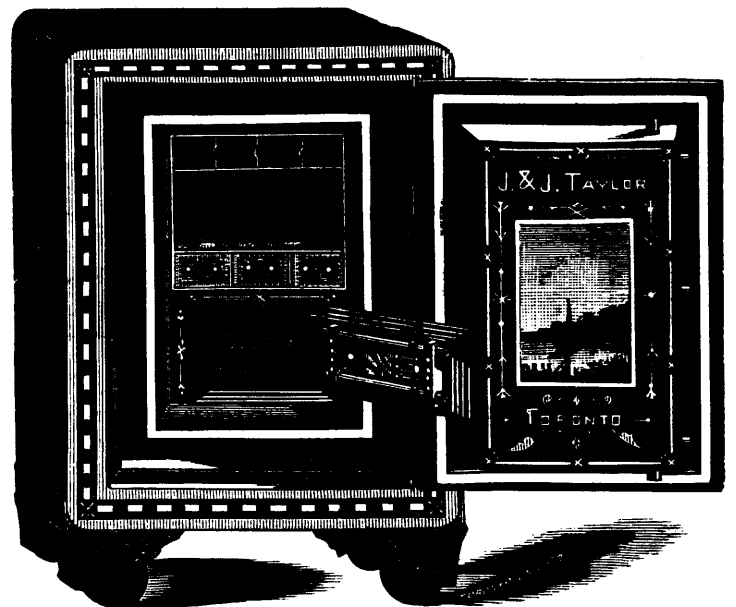
Bankers' Steel Safes

Fireproof Safes

Jewellers' Safes

Vault Doors

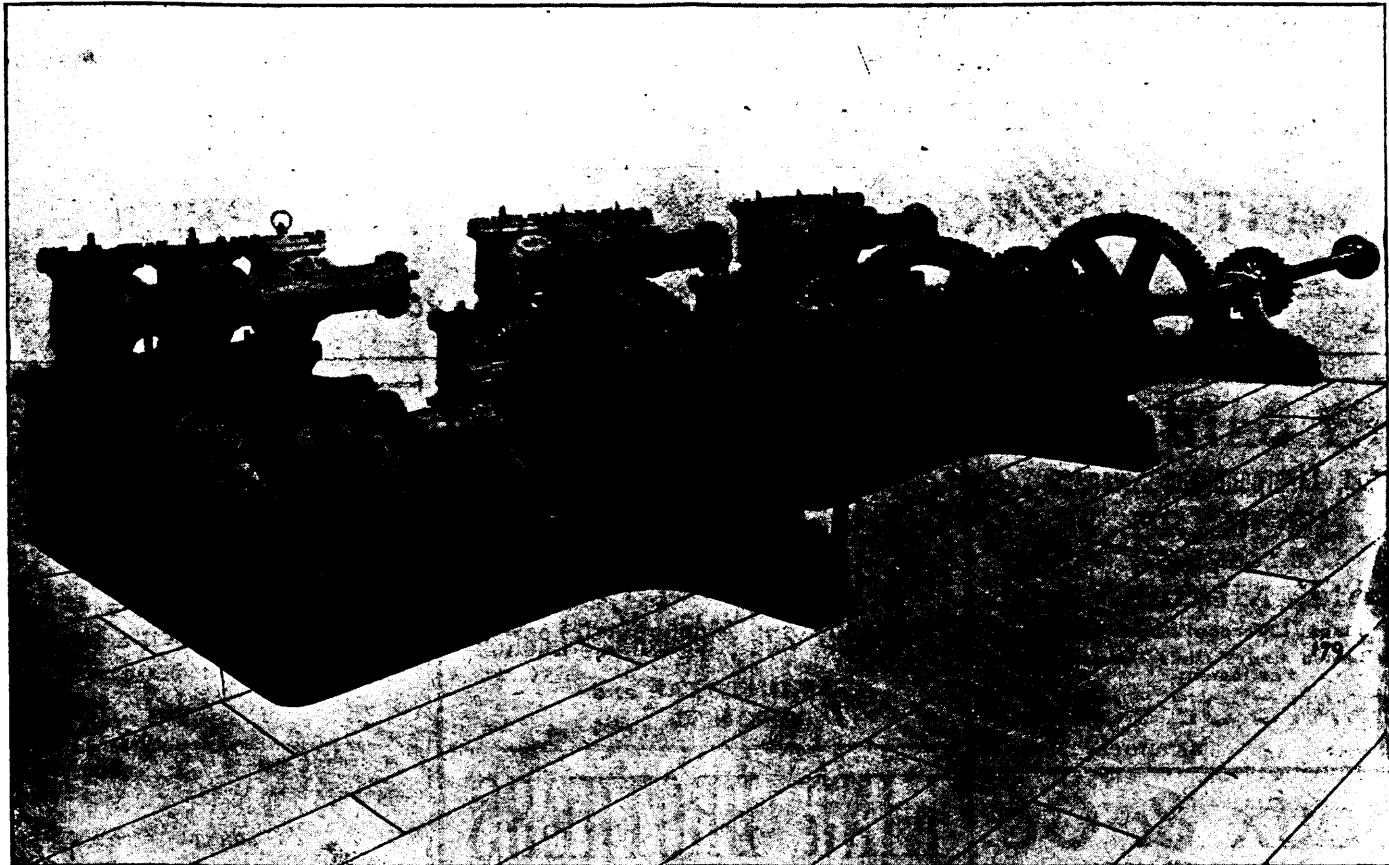
Prison Work, &c.



THIS CUT SHOWS SUITABLE SAFE FOR MINING COMPANIES

PUMPING MACHINERY

FOR MINES AND WATERWORKS



3 SETS OF GEARED THREE-THROW HORIZONTAL RAM PUMPS
 9 RAMS EACH 10 INS. DIAMETER X 20 INS. STROKE.

HATHORN DAVEY & Co. Ltd. LEEDS ENGLAND

Sole Canadian Representatives **PEACOCK BROTHERS** Canada Life Building MONTREAL

ADAMANTINE SHOES & DIES ALSO CHROME CAST STEEL.



THE CANADA PATENT SELF-LOCKING CAM

TAPPETS, BOSSES, ROLL SHELL and CRUSHER PLATES.

Also Rolled Parts for Huntington and other Mills.

These castings are extensively used in all the Mining States and Territories throughout the World. Guaranteed to prove better and cheaper than any others. Orders solicited subject to above conditions. When ordering send sketch with exact dimensions. Send for Illustrated Catalogue to

CHROME STEEL WORKS,
 KENT AVENUE, KEAP AND HOOPER STREETS.
BROOKLYN, N.Y., U.S.A.



Canda Cam.

F. E. CANDA, President.

C. J. CANDA, Vice-President.

F. MORA CANDA, Secretary.

T. I. JONES, Treasurer.

POGSON, PELOUBET & CO.
 CERTIFIED PUBLIC ACCOUNTANTS

NEW YORK - - - 42 Broadway
 CHICAGO - - - Marquette Building
 ST. LOUIS - - - Chemical Building
 BUTTE - - - Hennessy Building

Audits of Books and Accounts,
 Systems of Bookkeeping or Costs,
 Financial Examinations, Etc.

Are You Confronted with a
 Difficult Ore-Separating Problem ?

THE WETHERILL MAGNETIC SEPARATING PROCESS

May Prove the Solution

...APPLY TO...

WETHERILL SEPARATING CO., 52 Broadway, New York

Manufacturing Agents for Canada, ROBERT GARDNER & SON, Montreal, P.Q.

NICKEL

THE CANADIAN COPPER COMPANY.

NICKEL FOR NICKEL STEEL

THE ORFORD COPPER COMPANY.

WRITE US FOR PARTICULARS AND PRICES.

General Offices: 43 Exchange Place, NEW YORK.

HENRY BATH & SON, SADLER & HAWORTH

London, Liverpool and Swansea,
BROKERS.

All Description of
Metals, Mattes, Etc.
Warehouses, Liverpool and Swansea.
Warrants Issued under their Special Act of
Parliament.

NITRATE OF SODA.

Cable Address: BATHOTA, LONDON.

LEDOUX & Co.
99 JOHN ST., NEW YORK.

Sample and Assay Independent Ore
Ores and Metals. Sampling Works
at the Port of
New York. Only
two such on the
Atlantic seaboard

We are not Dealers or Refiners, but Receive
Consignments, Weigh, Sample and Assay them,
selling to highest bidders, obtaining advances when
desired, and the buyers of two continents pay the
highest market price, in New York Funds, cash
against our certificates.

**MINES EXAMINED AND SAMPLED.
ALSO ANALYZE EVERYTHING.**

OLDEST EXPERTS IN

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

Talo,
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, Liebers
Code and Mullers Code.

ESTABLISHED 1869.

SADLER & HAWORTH

TANNERS AND
MANUFACTURERS OF

Oak Leather Belting
Hydraulic and Mechanical Leather

MONTREAL and
TORONTO.

KING BROTHERS

15 Bell's Lane
QUEBEC.

Lumber
Asbestos
Chromic Iron

Mills at River Ouelle, Lyster, Kingsburg,
Pabos, Cedar Hall.

ASBESTOS—Crude, Fibreized and Paper
Stock Hampden Mine, Thetford.

CHROMIC IRON MINE—Black Lake.

LICENSES TO PROSPECT

or work Minerals on any of their Lands and Reserva-
tions covering nearly a quarter of a million acres in
Eastern Ontario, and principally within the belts con-
taining Iron, Phosphate, Gold, Galena, Plumbago,
Mica, Marble, Building Stone, and other valuable
minerals, are issued by

The Canada Company

For list of lands and terms apply to the Company's
Mining Inspector and Agent

ANDREW BELL, C.E., D.L.S., Etc.
ALMONTE, ONT.

L. VOGELSTEIN

90-96 WALL STREET, NEW YORK

REPRESENTING

ARON HIRSCH & SOHN
Halberstadt, Germany

Copper, Argentiferous and Auriferous Copper Ores,
Mattes and Bullion, Lead, Tin, Antimony, Spelter.
Copper and Brass Rolling and Tubing Mills in Europe.

AGENTS OF THE

DELAMAR COPPER REFINING WORKS
Carteret, N.J.

S. DILLON-MILLS, M. Ex.

SPECIALTIES :

Minerals of Huronian and Laurentian areas.

Twenty years' experience superintending
furnaces and mines.

538 HURON STREET

TORONTO - - - ONTARIO

FRITZ CIRKEL

CONSULTING MINING ENGINEER

Dip. Graduate Royal Technical Academy, Aachen,
Germany.

Eighteen years' experience in Exploratory
Work and Mining in Germany, Belgium,
Eastern and Central Canada, British Colum-
bia and the Pacific States.

EXAMINATION OF MINES.

Reports in English, French and German.

Office, 80 STANLEY ST. MONTREAL, CAN.

DIRECTORY OF MINING ENGINEERS, CHEMISTS, ASSAYERS, ETC.

JOHN E. HARDMAN, S.B.
CONSULTING
MINING ENGINEER

Room 3 Windsor Hotel MONTREAL

Twenty years' experience in the Mining and Reduction of Gold, Silver, Lead and Copper. Thirteen years as a Specialist in Gold Mining and Milling.

JOHN B. HOBSON
CONSULTING MINING ENGINEER
Manager Con. Cariboo Hyd. Mining Co., Limited
BULLION, BRITISH COLUMBIA.

28 years' experience in the equipment and operation of large Hydraulic, Deep Gravel, Drift and Gold Quartz Mines, in California and British Columbia.

Telegraphic and Cable Address:
"HOBSON," ASCHROFT, B.C.

J. B. TYRRELL

Late of the Geological Survey of Canada.

MINING ENGINEER

DAWSON YUKON.

Telegraphic Address—Tyrrell, Dawson.
Code used—Bedford McNeil's.

MILTON L. HERSEY, M.Sc. (McGill)
CONSULTING CHEMIST OF THE C. P. R.
OFFICIAL ASSAYER APPOINTED FOR PROV. OF QUEBEC.

146 St. James Street MONTREAL

ASSAYS OF ORES.

CHEMICAL AND PHYSICAL TESTS OF ALL MATERIALS.

MINERAL PROPERTIES EXAMINED.

J. BURLEY SMITH
CIVIL AND MINING ENGINEER
30 Years Experience.

RAT PORTAGE ONTARIO.

Undertakes the Prospecting of Mines and Mineral Lands. Diamond Drill Borings made by contract for all minerals (earthy and metalliferous), Artesian Wells and Oil Springs, also Deep Soundings for Harbors, Rivers, Canals, Tunnels and Bridge Foundations. Quarry Sites and Clay Fields tested. Plans and Sections made showing result of Borings—Gold Drifts tested to Ledge by the new Pneumatic and Hydraulic Tube System and the yield ascertained—Flumes, Ditches, Monitors and Placer Mining Plant generally designed and constructed. Properties Examined and Reported on, Assays made.

F. HILLE

MINING ENGINEER.

Mines and Mineral Lands examined and reported on. Plans and Estimates on Concentrating Mills after the Krupp-Bilharz system.

PORT ARTHUR, ONT.
CANADA.

J. T. DONALD

ASSAYER AND MINING GEOLOGIST.

112 St. Francois-Xavier St.,
MONTREAL.

Analyses and Assays of Ores, Fuels, Furnace Products, Waters, etc. Mines and Mining Properties examined and valued.

FRANK B. SMITH, B.Sc.

CIVIL AND
MINING ENGINEER

Certificated Colliery Manager Great Britain and British Columbia.

REPORTS ON MINING PROPERTIES.

CALGARY, ALTA.

FRANK C. LORING

MINING
ENGINEER

601 Empire State Bdg.

SPOKANE, WASH.

JOHN ASHWORTH
CONSULTING MINING ENGINEER

Of the firm of

ASHWORTH & MORRIS

Civil and Mining
Engineers.

Surveyors and
Valuers.

8-KING STREET-8
MANCHESTER, ENGLAND.

CHARLES BRANDEIS

A. M. AMER. INST. E.E.—A. M. CAN. SOC. C.E.
MEM. AMER. ELECTRO-CHEMICAL SOC., ETC.

CONSULTING ENGINEER

Estimates, Plans and Supervision of Hydraulic and Steam-Electric Light, Power and Railroad Plants. Electric equipment of Mines and Electro-Chemical Plants. Specifications, Reports, Valuations, etc.

Long Distance Telephone Main 3256.
Cable Address: Brandeis-Montreal.
W. U. Code, Univ-Edition.
Liverpool & London
& Globe Building MONTREAL

CHAS. BRENT

MINING ENGINEER AND METALLURGIST

Rat Portage, Ont.

Examines and reports on Mining Properties. Superintends the erection of Mining and Milling Plants.

J. C. GWILLIM, B.Sc.

MINING
ENGINEER

KINGSTON - Ont.

ERNST A. SIOSTEDT, M. E.

MINING AND
METALLURGICAL ENGINEER

Mem. Can. Mining Institute.
Mem. Am. Inst. of Mining Engineers.
Mem. Am. Electro-Chem. Society.
Mem. Swe. Teknologforeningen.

SAULT STE. MARIE, ONT.

DeMOREST & SILVESTER

CIVIL AND MINING ENGINEERS.
ONTARIO LAND SURVEYORS.

Surveys. Reports. Development. Installation.

Cable address, "DEMORSIL, SUDBURY."
Codes, Lieber's and Bedford McNeil's.

SUDBURY, ONTARIO.

WM. BLAKEMORE

MINING
ENGINEER

Consultation. Reports. Development.

NELSON - B. C.

A. W. ROBINSON, M. Am. Soc. C.E., M. Am. Soc. M.E.

MECHANICAL ENGINEER

DREDGING MACHINERY.

PLANT FOR PUBLIC WORKS.

GOLD DREDGES.

14 PHILLIPS SQ., MONTREAL

CANADA.

The Canadian Mining Manual

14th EDITION

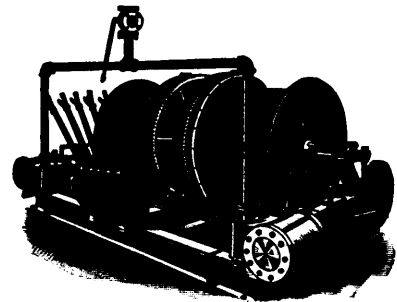
WILL ISSUE IN JULY 1904

Subscriptions solicited

Price \$4.00 postpaid

M. BEATTY & SONS

Welland, Ontario.



MANUFACTURERS OF

Dredges, Ditchers, Derricks and Steam Shovels for Dredging, Dykeing, Ditching, GOLD MINING, Etc., of various Styles and Sizes to Suit any Work.

MINE HOISTS, HOISTING ENGINES
HORSE POWER HOISTERS,
SUSPENSION CABLEWAYS,
STONE DERRICKS, GANG STONE SAWS,
Submarine Rock Drilling Machinery.

Centrifugal Pumps for Drainage Works,
Pumping Sand, Gold Mining,
Contractor's Use, &c.

WIRE ROPE AT MARKET PRICES.

AGENTS:

E. LEONARD & SONS

MONTREAL, QUE.

ST. JOHN, N.B.

THE B. GREENING WIRE CO. LTD.
PERFORATED METALS.

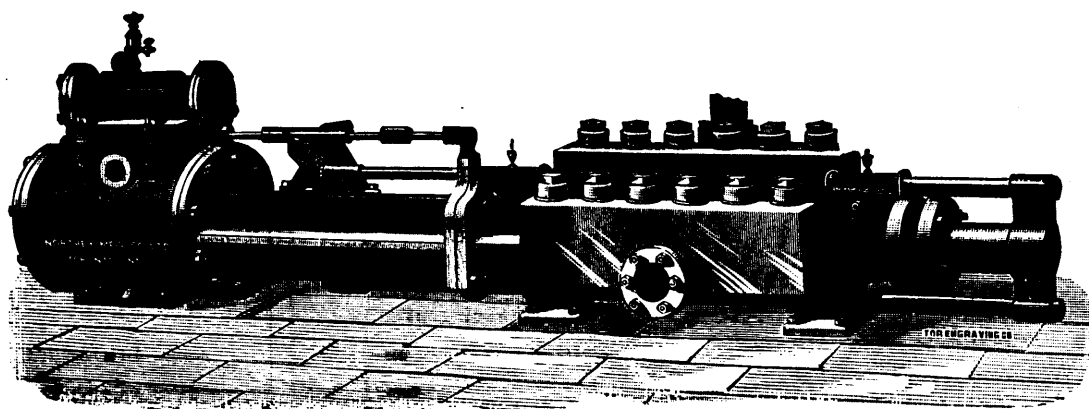
WIRE SCREENS FOR EVERY CLASS OF MATERIAL
PERFORATED METAL OF STEEL, COPPER, BRASS,
ZINC FOR ALL PURPOSES

SPECIAL ATTENTION GIVEN TO MINERS' REQUIREMENTS

The B. Greening Wire Co. Limited

HAMILTON, ONT.

MONTREAL, QUE.



MINING PUMPS—SOLID CYLINDER PLUNGER PATTERN

Very efficient where heavy pressure and gritty water have to be contended with.
Pumps of all styles and patterns for all kinds of work.

SEND FOR CATALOGUE.

CANADA FOUNDRY COMPANY, LIMITED

Head Office and Works—TORONTO.

District Offices—MONTREAL

HALIFAX

OTTAWA

WINNIPEG

VANCOUVER

VICTORIA

ROSSLAND

CANADIAN MINING REVIEW

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN THE DOMINION OF CANADA.

The REVIEW PUBLISHING CO., Proprietors.

PUBLISHED MONTHLY.

Office: Orme's Building, Ottawa.

VOL. XXIII., No. 6.

JUNE, 1904.

VOL. XXIII., No. 6.

Address all business to THE CANADIAN MINING REVIEW, Ottawa, Canada.

Subscription, payable in advance, \$3.00 per year, including postage.

Notice to discontinue should be written to the Ottawa Office.

Advertising copy must reach the REVIEW Office not later than the 16th of each month to secure insertion in current issue.

CONTENTS.

	PAGE
EDITORIAL NOTES.....	99
EDITORIAL:	
The Sydney Strike and the Iron Industry.....	100
The Northport Smelter.....	101
A Rossland Merger.....	101
CORRESPONDENCE:	
Incompetent Management.....	102
The Dominion Iron and Coal Properties.....	102
The Lead Bounty.....	103
PAPERS:	
Mica Deposits—By Fritz Cirkel, M.E.....	104
Exhaust Steam Boiler Feed-Water Heaters; Hot Water Pumps and Pumps—By W. D. L. Hardie, C.E., M.E.....	108
Undeveloped Mineral Resources of Ontario—By Willet G. Miller, Provincial Geologist.....	110
On a Mineral Containing Radium in the Province of Quebec—By J. Obalski, M.E., Inspector of Mines.....	114
The Percussive Theory.....	116
Some Recent Developments in Gold Dredges.....	116
The Matane Copper Deposits.....	117
Pig Iron Statistics.....	117
Book Notices.....	118
Mining Notes.....	118
Industrial Notes.....	119
Electrical Notes.....	120

At the moment of going to press the REVIEW is advised that, the so-called Treadgold Syndicate, composed of Messrs. Treadgold, Orr-Ewing and Barwick, which, under the concession of an order in Council, claimed extraordinary privileges in the Yukon District, has withdrawn all its applications, and will confine itself in the future to the legitimate working of the claims it owns. The remonstrances attending this concession were the occasion for the appointment of the recent Royal Yukon Commission, whose report will now be of diminished interest to the miners of Dawson and vicinity.

Advices from the St. Louis Fair tell us the Mining Exhibit from Canada is something of a surprise to visitors. The Canadian Government is fortunate in the representative of the Geological Survey Department, Mr. R. L. Broadbent, who is in charge of the Government exhibit, and who is thoroughly competent.

The display from British Columbia will do an immense amount of good to that province; the exhibits from the other provinces are very attractive but are not so complete. One

of Ontario's interesting and unique exhibits is the collection of black marble samples which came from the two localities of Madoc, in Hastings County, and Cornwall, in Glengarry County.

The forestry exhibit is also remarkably good, the giant trees from British Columbia attracting much attention. Industrially, Canada does not make a good exhibit.

The re-organization of the various "Soo" enterprises is a matter of congratulation to all concerned, and one fraught with important consequences for Canadians in general and Ontarians in particular. The Dominion and Provincial Governments have both taken a hand in the work of resuscitation. The former by the "dumping" clause which is specially designed to protect the steel industry, and the latter by guaranteeing the interest on the bonds. It now remains to be seen what the new Company will do. The available Capital, \$4,000,000 is small and only gives \$1,000,000 actual cash, the balance being made up of liquid assets, \$1,500,000, and first mortgage bonds, \$1,500,000. If, as is stated in the press, it is intended to revive all the various industries, it is difficult to see how the working capital can be considered adequate. If a judicious selection of some of them is made, the Lake Superior Corporation may do much to redeem the failure of its predecessor.

The granting of licenses to original locators on blocks 4934 and 4935 East Kootenay, carries an important issue one stage further, in that it determines the attitude of the British Columbia Government in the matter. These are the blocks which were, by order in Council, ceded to the C. P. R. two years ago as a grant for constructing the Columbia and Western Railway, but were afterwards recovered by the Government in consequence of a dispute which caused the resignation of two ministers, and the passing of what may be called "remedial legislation." The value of these lands is in the coal deposits which they are known to contain, and the oil which it is hoped will be found in the southerly or "Flathead Block." As to the former it will be wanted some day, but certainly not within the next 100 years. The mines already opened up at the Crow's Nest Pass and Blairmore

districts will have difficulty in finding a market for half their capacity of production and they are more accessible than the "Flathead." As to oil, that is entirely problematical with a leaning to the improbable. Meanwhile the principal result of granting the licenses will be to start a vigorous crop of litigation as to titles, since there are literally thousands of claimants and the bulk of the area is staked over several times.

The Sydney Strike and the Iron Industry.

The strike at Sydney, C.B., of the employees of the Dominion Iron & Steel Company, has resulted in the management closing down all the works for "an indefinite period." From the language which has been used by Mr. Frederick Nichols, the Vice-President of the Company, this "indefinite" period means, approximately, from six to seven months, or a length of time sufficient to complete the smaller rail mill and the finishing mill, which were building at the beginning of the strike. Many well-informed men are of the opinion that the strike will be of short duration and will be ended by the submission of the strikers, but if the programme indicated by Mr. Nichols, and said to have been approved by President Plummer, is carried out, the tables will probably be turned on the strikers for some time, or until the Steel Company has completed such portion of its plant as is necessary to supply the market it has at present.

At the beginning of June the only product the works were producing to sell was steel billets, for which the price has ruled so low (for nearly a year now) that the shipments made yielded little, or no, profit. At the beginning of the year, when the new Director of Works took charge, he did not view with favor the large rolling mill formerly determined upon, and a smaller mill, with the bulk of its trains adapted to the rolling of merchantable bar iron, of circular and rectangular sections, was decided upon; to include, however, rolls for certain shapes and sections of rails for which the home market furnished a demand at profitable figures.

The announcement of the Finance Minister, in his Budget Speech, of contemplated duties on rails to prevent the surplusage of foreign nations being dumped into Canada, may, however, be sufficient ground for reconsidering the plant determined upon at the beginning of the year. The future needs of the Grand Trunk Pacific, combined with the heavy protection afforded by a bounty of \$7.00 per ton and a possible 15% ad. val. duty, would give to Canadian rails not only a steady market for several years, but an advantage of something like \$10 per ton over any imported rails. It is well known that the Pennsylvania Steel Company and the United States Steel Company have quoted to our Canadian railways this year, prices for rails delivered in Montreal, ranging from \$20.50 to \$22.50 per ton, whereas the price for the same rails in the United States remains at about \$28 per ton.

On a 15% import duty the above prices would average to the consumer, say, \$24.75, and with the bounty would throw him into the hands of Canadian makers, of which there are

only two possible in sight—the Dominion Iron & Steel Company, who might be in the field at the end, say, of 1904; and the Lake Superior Company at Sault Ste. Marie, which could be able to deliver rails within thirty days, provided it can purchase its ore or billets in the U.S.; its supply of native ore is not certain and is likely to be most irregular.

Such conditions, known and thoroughly appreciated by the Directors of the Dominion Iron & Steel Company, would be quite sufficient inducement for them to disregard, if not welcome, the present strike. The strike will give them time to set their house in order for a four or five years steady market for heavy rails, and also time to complete the equipment for turning out bar and rod iron.

The REVIEW wishes it could take the same hopeful view of the future of the reconstructed Lake Superior Company, which has both its rail mill and also the furnace plant in order, but which has no definite and assured *native* supply of raw materials. Some money, and more time, is required to fully ascertain what quantity of suitable ore can be depended upon from the Josephine and Helen mines, and from the other possible deposits of that iron range in Ontario. On the directorate of the Lake Superior Company are one or two men (Canadians) who are no rash boomsters but men of experience and sound judgment in the iron trade, and who may be depended upon for energy and to make the best of every opportunity that is afforded. Were it not for the legacy of litigation which is assured to follow the reconstruction, and the uncertainty as to the supply of ore from its Ontario iron mines, the Lake Superior Company might be regarded as an anchor to the Canadian Iron Trade; the REVIEW, however, hopes that the adverse information which it has is misleading, but proof is yet required.

As to the Western country, the Canadian Pacific Railway, owners of the best ore on the Pacific coast (in the shape of the Kitchener properties) wisely determines that the trade there does not demand present exploitation of the resources which it holds; nor will it, in all probability, for ten years to come.

The collapse of the unwieldy aggregation at the Sault brought great disaster to the locality, but greater yet to the shareholders in the States, and the strike at Sydney will cause losses to many Canadians. The closing of the works at Sydney means also the closure of the mines on Bell Island, Newfoundland, the closure of the limestone quarries at Marble Mountain and Georges River, C.B., and also the suspension of work by the subsidiary concern known as the Dominion Tar & Chemical Co. In all, some 4,000 people are thrown out of employment, and the Island of Cape Breton with the mainland of Nova Scotia will indirectly feel the loss of business and of the money which these industries put into circulation.

As to the possible involvement of the Dominion Coal Co. through the Provincial Workman's Association—we do not regard such an event as probable. The P.W.A. has already levied on its members an assessment of \$100,000 for the relief of the strikers, but experience has shown how far a relief fund will go. Moreover, a sympathetic strike among

the coal miners would diminish tremendously the chances of collecting any assessments imposed by the P.W.A.

Late advices from President Plummer at Sydney indicate that sufficient labor is obtainable to discharge the ore steamers lying at the docks and to do the necessary yard work about the plant. A despatch also advises that certain departments of the works are ready to start whenever sufficient labor is obtained; it is significant that many additional workmen are being enrolled on the pay list each day.

The D. I. & S. Company has had troubles enough in its short career to dishearten several managers and to stagger financial men; but it has never had as experienced and capable men at the heads of its technical and financial departments as at present. Leaving entirely to one side the question of the possibility of large profits, there is no doubt in the mind of the REVIEW that the corporation can live and pay its fixed charges in spite of this last strike; with the great measure of protection already alluded to, it should be able to distribute something to shareholders also.

The Northport Smelter.

The readers of the REVIEW may not have forgotten the trip to England which was taken by Messrs. Gooderham and Blackstock something like three years ago, when one or two of the well-informed newspapers hinted at a *rapprochement* between the War Eagle and the Le Roi. We speak whereof we know in saying that the present rumors of consolidation in Rossland are due to the continued efforts of the Vice-President of the Centre Star Corporation. We also believe we are within the truth in saying that, at the moment of writing, the question of merging has not come before the Boards of any of the three Companies officially.

The REVIEW therefore thinks the time opportune to call Messrs. Blackstock and Kirby's attention to facts which they *know* very well, but which they may perhaps overlook. These facts relate to the unwisdom of sending the raw minerals of B.C. across the line to be smelted in furnaces which draw their fuel supply also from B.C., when there are Canadian stacks which can, and do, smelt for less money than is possible at Northport.

The coke furnished costs more by reason of a longer haul and a duty, the labor rates are higher and the labor troubles infinitely worse. The difficulties which the Northport plant have already had with the labor question must have cost fully half a million dollars. In addition there have been fyled many suits at law involving the entire water supply of the smelter.

Compared with the Kootenay smelters, Northport has to burn coal to furnish its power, Trail and Nelson both have electric power, and the cost per H.P. used is much less for electric power than for the steam power used at Northport. Briefly, let the gentlemen in charge of the possible merger consider that here is a case of a Canadian mine, employing Canadian labor, sending its ore across the boundary line to a smelter which it owns, where all costs are higher, where the

labor question is more difficult, and where only American labor can be employed.

The REVIEW submits that, on commercial grounds alone, it is advisable to drop a policy the operation of which is more expensive than its alternative.

A Rossland Merger.

In our issue for May we commented upon the alleged condition of affairs at the Le Roi as disclosed by telegraphic despatches to the home office from Mr. J. H. MacKenzie and Mr. A. J. McMillan. The following weeks were full of developments and announcements; Mr. S. F. Parrish resigned his position as General Manager, the Managing Director, Mr. A. J. McMillan, made no new appointment to the vacant office, but engaged Mr. J. H. MacKenzie of the San Francisco firm of MacKenzie and Bradley, Consulting Engineers, on a temporary appointment; the concentration of the low grade ore was recommended; a lease of the "O-K" stamp mill was obtained, and Mr. Thos. Mitchell, the builder of several silver-lead concentrators in the Slocan, was engaged as concentration expert. Incidentally Mr. McMillan intimated that the Northport Smelter might be closed after the reserve ore, amounting to between 30,000 and 40,000 tons, had been smelted. The Managing Director also stated that the Le Roi was then putting out about 160 tons a day, but admitted that permanent smelting required large deliveries of custom ore to make economic fluxing possible, and intimated that relief could only come from the use of Boundary ores, as the supply of other fluxing ores would be too irregular for permanent and continuous smelting. He did not say anything about the resources of the Snowshoe mine in the Boundary, for which he is to be commended.

Meanwhile Mr. S. F. Parrish is too ill to tell his side of the story or to transact any business whatever, and the despicable slur of the London *Financial Times* that this illness is of "a diplomatic character" is not only a plain falsehood but intensifies the local and general Canadian disgust for English corporations and English press comment. Mr. Parrish's local popularity is unlimited, and his personal reputation for integrity unblemished. Mr. Robbins, the assayer at the mine, denies any fault in the assaying, and until Mr. Parrish's health permits him to make a statement the story cannot be closed.

Immediately upon this *melange* came the rumor of a merger for the Le Roi Company with the Centre Star and Consolidated War Eagle corporations. Mr. T. G. Blackstock appears opportunely in Rossland and is in conference with Mr. McMillan; Mr. Kirby and Mr. McMillan jointly spend much time in going over the Rossland Power Company's concentrating mill.

It is to be hoped that all these observed facts will bear fruit in the shape of a combination of interests and of management, although it is difficult to perceive any financial basis which will be satisfactory to the three corporations. The Le Roi Mining Company has a capital of £1,000,000

stg., all issued and fully paid, and a floating debt of about \$130,000, fully covered by the ore in the bins at Northport. The Centre Star has a capital of \$3,500,000 with a surplus of cash in hand. The War Eagle Consolidated Mining and Development Company has an issued capital of \$1,750,000, and a liability of over \$200,000.

The last making up price of Le Roi shares was 15s, or 15% of par, Centre Star has ruled about 26c or 26%, and War Eagle 12c or 12% of par. The respective market values of the three properties therefore are, approximately :

Le Roi.....	\$ 750,000
Centre Star.....	910,000
War Eagle.....	210,000

Total present market value of...\$1,870,000

The Le Roi claims a valuation of \$1,000,000 for its smelting plant at Northport, but we fancy no informed and dispassionate accountant would allow much, if anything, for the smelter as an *asset* of the Le Roi Company. From the day it was started to the present time, there has been a continuous story of waste, incompetency, dishonesty, and expense; a story of legal and labor warfare, and an inheritance of adverse decisions and disputed judgments. It is equally well known that the best men of previous managements have advised the Board of Directors to close the smelter as being a voracious consumer of the profits the mine could make.

If any merging agreement should be found to be feasible, which we admit is yet a doubtful matter, the control will probably be put in the hands of the Centre Star people. We need not say that such a consummation would be most acceptable to the people of Rossland, and to Canadians generally. The management of Pacific Coast properties from the Atlantic seaboard is always difficult and expensive; the management of Red Mountain mines from London, 5,000 to 6,000 miles distant, is folly.

CORRESPONDENCE.

Incompetent Management.

TO THE EDITOR.

SIR:—

Having regard to the very pessimistic way in which mining investors now look on Canadian properties, it may not be out of place to record some observations of several "failures" which have assisted them to that opinion.

The particular section which the writer has in view runs for about 90 miles East from Sault Ste. Marie along the line of the C. P. R. and north along the line of the Algoma Central Railway; it will be noted that I do not include the Sudbury field where the only important mining of the District is done.

Concerning the former Consolidated Lake Superior Co. you do not need any observations of mine; the papers of the U. S. and Canada have supplied the public with sufficient details. Numerous links in that long chain, both large and small, were weak and broke in consequence of the weight of the whole chain. Other links were sound and strong in themselves, but useless when included in a chain with weak links.

Probably the next largest expenditure was made at the Bruce Mines, where there was an exception to the general conditions which obtain about the re-opening of old mines. The owners and shareholders in this case were "seasoned" mining men who ceased operations *not* because of lack of funds or disappointment with the property, but because of a disagreement, or disagreements, between the shareholders and the Directors. The Bruce Copper Mines, Ltd. is a close corporation, owned in England, with no shareholders on this side; the closure of operations therefore affects this country only in *morale*.

Suspension of the Rock Lake Mining Co., Ltd. was due primarily to insufficiency of funds, and perhaps also to inexperienced management. The Directors do not appear to have exercised unusual business acumen, and the result is a suspension of active operations.

To generalize from the above cases we may say that money has been raised from men who have made their money in other lines of business, and that this fact is one of the causes of the resulting failure. While such men deserve credit for their enterprise in selecting such a venture, they do not deserve any credit for repeating the very common error of considering the promoter the best man to continue the actual management of the property.

In many cases the employment of competent engineers in the place of promoters would have given if not a measure of success at least a diminished expenditure; in fact in many cases it would have resulted in the expenditure of no money at all.

Your readers must, each one of them, remember many cases where the employment of an engineer to examine, or to manage, has been considered far too extravagant, and therefore the company has expended thousands of dollars to no useful purpose, but with the result of giving another "black eye" to Canada.

A.

SAULT STE. MARIE, June 10th, 1904.

The Dominion Iron and Coal Properties.

TO THE EDITOR.

SIR:—

Anyone who has followed your articles on these properties, spread over the last four years must have been prepared for the denouement which has been reached. By common report the practical collapse of the Iron and Steel enterprise is due to two causes, incompetency and stock-jobbing. As to the first cause there is now no doubt that the inception of the Company was characterized by that reckless extravagance which has too often marked the launching of legitimate industrial enterprises but which is the unerring precursor of their doom. No sense of the requirements of the enterprise, no adaptation of means to end, no conception of the possibilities of the market, no intelligent test of the materials available for manipulation—these were some of the deficiencies of the pioneers of Canada's "greatest industry." Given cheap coal and cheap ore, both in abundance, they jumped to conclusions which have been falsified by experience, that they could manufacture the cheapest and best steel in the world, and that the world was waiting to take all they could produce. As to the cheapness, the original estimate of \$5 for pig requires to be doubled, as to the quality, the "cheap" ore requires a higher grade to mix in large quantities, and as to market, your original prediction that only in times of inflated trade and high priced material abroad would Sydney be able to sell in foreign markets, has been fulfilled to the letter. To-day the Company looks—as it will always have to look—to the home demand—and even that is beyond its grasp unless the cost of production can be greatly reduced. The Company has no

reason to complain of the generous treatment it has received at the hands of the Canadian Government; and the recent statesmanlike provision introduced into Mr. Fielding's budget, to prevent dumping at slaughter rates, disposes of the last hindrance to a successful home trade so far as legislation can assist.

That the Steel Company has reached a crisis in its history must be admitted, and no better opportunity could have occurred to put its house in order. For more than a year, in fact ever since Mr. Plummer took charge of its financial affairs, voluntary liquidation has been advised and it is believed that the President favoured this course from the first. This suggestion was discarded for various reasons, chiefly that no basis could be found which would give any approach to the existing market quotations for the various securities of the concern. Still it is greatly to be regretted that the course suggested was not adopted since it would have relieved the financial strain which has become intolerable. The same objection cannot now be urged. Iron Common has fallen from 78 to 7, Preferred from 60 to 22, and bonds from 100 to 55. In view of present developments the former is practically wiped out and need not be taken into account. Re-organization on the basis of Bonds at 50, Preferred at 20, and Common entitled to subscribe for new stock at 25 would be about fair and in this way, if \$5,000,000 were raised, there would be sufficient in the Treasury to pay the pressing liabilities, finish construction and provide working Capital. The strictest economy would have to be practised, a supply of non-phosphoric ore secured, and the Canadian market assiduously cultivated. Under these conditions a moderate result might be attained and, as the country develops, trade would expand and, ultimately, steel making at Sydney become a permanent industry. The unqualified success of the Nova Scotia Steel Co., shows what can be accomplished along conservative lines. It has proceeded by slow and steady steps from a small venture to a gigantic enterprise, but the management has been practical and the policy wise. Trade has been sought and increased little by little, and quality has been the first consideration. This is the way of the Old World, and of the New, and it will have to be followed by the Dominion Steel Company if it ever rises from the ashes of its humiliation.

Dominion Coal is in a different case. Its value and possibilities have never been doubted and in spite of over-capitalization and excessive expenditure it will pull through if the present policy is maintained. Coal is slowly but surely emerging from a dangerous impasse; the modest and eminently practical development at Big Glace Bay furnishes a remarkable contrast to the reckless and ridiculous extravagance of Dominion No. 2, that final and perpetual monument of blind incompetency. I do not hesitate to say that this \$3,000,000 mine if charged with the modest interest of 6% upon Capital will never produce coal within 20 cents a ton of Dominion No. 1, Caledonia, Reserve or Big Glace Bay. The latter will be fully equipped for one tenth of the outlay.

On this economic development Mr. Ross and his staff are to be congratulated. The policy of establishing a deep mine like Dominion No. 2 where there is slope coal for the next fifty years could never be seen and there is little doubt that the lines on which the concern is now being worked—the old lines—will lead towards the production of 80 cent coal, which so cheered the Directors under the old régime in 1896-7.

Still there are breakers ahead and the good ship will need careful handling. If the steel works should not soon resume coal will lose its largest, best and most convenient customer. It must never be forgotten that Mr. Whitney started steel to help coal to a constant market. Trade outside has been good and prices inflated. There is a turn in the tide, prices are falling, production will be less this year than last,

every Colliery Company showing a decrease. At the beginning of the last financial year there was predicted a sale of 3,000,000 tons by the Dominion Coal Company and a profit of 65 cents a ton. This year it is doubtful if the tonnage will exceed the same estimate, and the profit will certainly be less, probably \$1,500,000. It is rumored that Mr. Ross has made arrangements in London for floating bonds to replace the present high-priced bonds and preference stock and that by the transaction something like \$200,000 a year will be saved. This is good news, and, if true, will be of material assistance. With good management Dominion Coal has nothing to fear from any source, whether competitive or otherwise, but in this case good management involves passing the dividend altogether this year, more modest expectation in the future, and an absolute cessation of capital expenditure. If this course is pursued there is no reason why common stock should not be permanently maintained about 60 which on this class of investment would yield a reasonable return.

MONTREAL, June 15th, 1904.

The Lead Bounty.

THE REVIEW is in receipt of the following telegram:—

"CANADIAN PACIFIC RAILWAY COMPANY'S TELEGRAPH.

From PAYNE MINE, B.C., via SANDON,

June 27, 1904.

TO EDITOR,

CANADIAN MINING REVIEW,

Ottawa Ont.

In the interest of mine owners and justification of smelters please withdraw your April and May editorials claiming that smelters directly or indirectly obtain part of lead bounty. This statement positively cannot be substantiated, and may cause trouble. Explanatory letter for publication mailed to-day.

ALFRED C. GARDÉ,

President Associated Silver-Lead Miners of B.C."

The REVIEW desires, above all other things, to present truth and facts *only* to its readers; it, therefore, willingly publishes the above telegram and sincerely regrets the non-receipt of the explanatory letter before going to press. We have held the last form open to the last minute in the hope that we could print Mr. Gardé's letter. It will appear in our July issue.

In our April issue appeared an editorial on "B.C. and the Lead Bounty," which was printed as an authoritative and credible article as it came from one who is not only familiar with the subject but who is himself personally interested in the Silver-Lead industry. A private letter remonstrating against the assertion that the smelters ever received any portion of the bounty was communicated to the writer, who asserted again the truth of his statements, which appeared in our May issue.

We hope to present, fully, all the facts connected with the present bounty in our next issue when Mr. Gardé's letter will, we hope, have arrived.

EDITOR, MINING REVIEW.

During the month there have been heard before Mr. Justice Martin, sitting at Nelson, B. C., six test suits for damages against the Crow's Nest Pass Coal Company. These six cases were selected from a large number filed in consequence of the disastrous explosion which occurred on the 22nd of May 1902. The hearing has been a long one, and a number of expert witnesses were examined, amongst others, the REVIEW's esteemed correspondent in B. C., Mr. Wm. Blakemore.

Mica Deposits.

By FRITZ CIRKEL, M. E.,
(Continued from May Issue.)

India ranks foremost amongst the mica producing countries of the world. It employs more persons in this class of mining than any other, while the area covered by mica deposits is the largest so far known. The mines have supplied most of the world's market since the application of mica in electricity.

In the year 1902 (Rept. Insp. of mines Calcutta 1902) there were employed in mica mining 9500 persons, while the production and sales in the same year were 1685 tons valued at \$507,770. This output is supposed to come from over 200 mines, which means a production of only 8 tons per mine. From this fact it is evident that, mining operations are not carried on on a substantial basis; most of the mica de-

banners, toys, tapestry, flowers etc. have been mining mica for centuries. The mines near Patna & Delhi are the oldest in the country. Dr. P. Breton visited these mines in 1826 and found as many as 5000 natives working in the different mines. In 1849 Dr. McClelland records an output of 800,000 lbs. and the first exports of mica were made in 1863, from Bengal, of about 7500 lbs. From this time the exports have steadily increased, and it was not until the use of mica in electricity, that the mining of mica assumed such large proportions. According to A. Melvyn Smith* the mines in Bengal are situated between 85° to 86° 30' east longitude and 24° 25' to 25° north latitude; they are distributed over a large series of parallel ranges of low hills, some 400 ft. above surrounding country and about 1200 ft. above sea level. They form the boundary between the Hazaribagh district on the south and the Gaya and Monghyr districts on the north, being part of the Bengal Presidency—India. The direction of these ranges is east-west.—

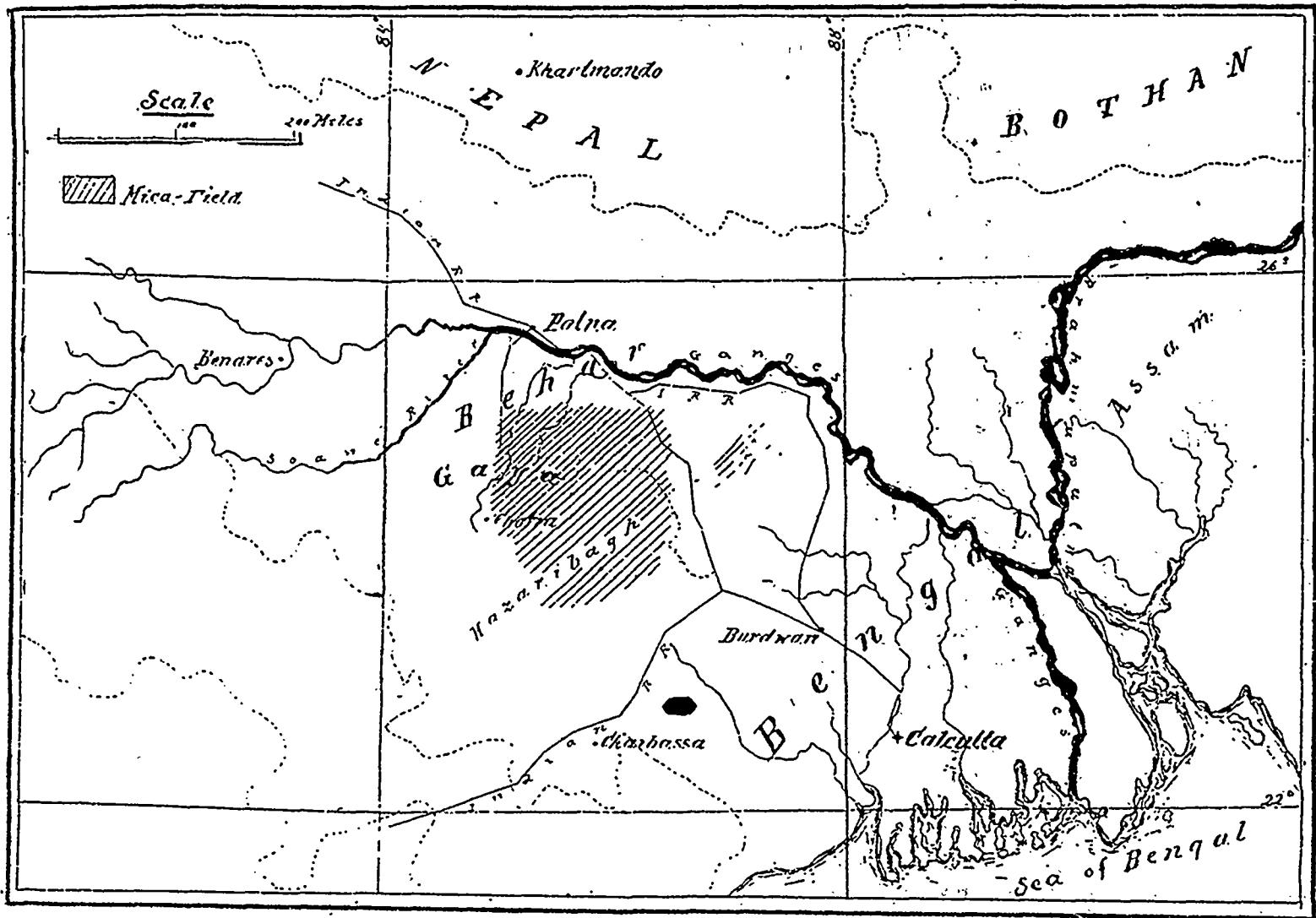


FIG. 6.—The Mica Field in Bengal, India.

posits are of a pockety nature. As a whole their occurrence is very irregular, and taking also the shortness of the season into consideration—work is only conducted during the dry months—it is clear that mining resembles a perpetual shifting of operations from one place to another. However, in spite of all these drawbacks, the cheapness of labor and the richness of the individual deposits makes mining profitable, and if the present slow native methods of mining were replaced by those of Europe or America, there is no doubt that at least half of the labor employed could be dispensed with.

Mica Mining in India has its history. We hear that the Hindus, who use the better qualities of mica for ornamental purposes, as for

The mines at present of most importance are all situated in the districts of Hazaribagh and Gaya in Behar. The mineral is also found in certain parts of Manbhoem, but all attempts to work these mines to advantage have failed. The principal mines in the Hazaribagh district are Dumcho Gharanchi, Bochagta, Salboya and Kadama, most of these mines are situated in the Koderma Government estate, both inside and outside the Government reserve forests, the rest being scattered through other parts of the pargana of Kharakdiha. In the Hazaribagh district, Province of Bengal, there were employed in 1902-

*Institution of Mining and Metallurgy 1898. P. 168.

6254 persons in 61 mines, producing 768 tons of mica, 628 tons being mined by one company. In the districts of Nellore, North Arcot and Nilgris in the Province of Madras, there were, in 1902, 69 mines in operation, employing 2965 persons and producing 228 tons of mica. In Gaya the mines worked are Singur, Vita, Chatkari, Bind, Govind-pore and Korarama. The government leases out land at a fixed rate of 50 rupees per acre, while private lands are leased by arrangement. In the beginning of 1902 the Madras Board of Revenue amended the law* for mica mining in the Nellore district to conform to the general mining rules of the Government of India. This action was made necessary by the fact, that speculators had obtained mining leases, which they had no intention of working and held for merely speculative purposes to the detriment of the genuine operators of the district. With each application for mining leases a deposit of 500 rupees must be made, or such sums as the Government may determine at its discretion.

As to the geology of the country, in the Hazaribagh district, large tracts of gneiss grading into mica schist can be noticed. We find also in immediate contact with the mica deposit tourmaline schists, hornblende rocks, quartzites with intrusive dikes of a fine grained diorite. The hornblende rocks resemble the diorite, and it is not uncommon to find a mica deposit between the two rocks. The mica met with in the schists is of the muscovite variety, while also black mica (biotite) and a red mica (lepidolite) is found. The mica schists are highly schistose in breaking up into thin laminae and consist principally of small mica sheets cemented together with an admixture of feldspar and quartz. It is this rock, that is generally mined for mica and yields the mica sheets of commerce. The gneisses are

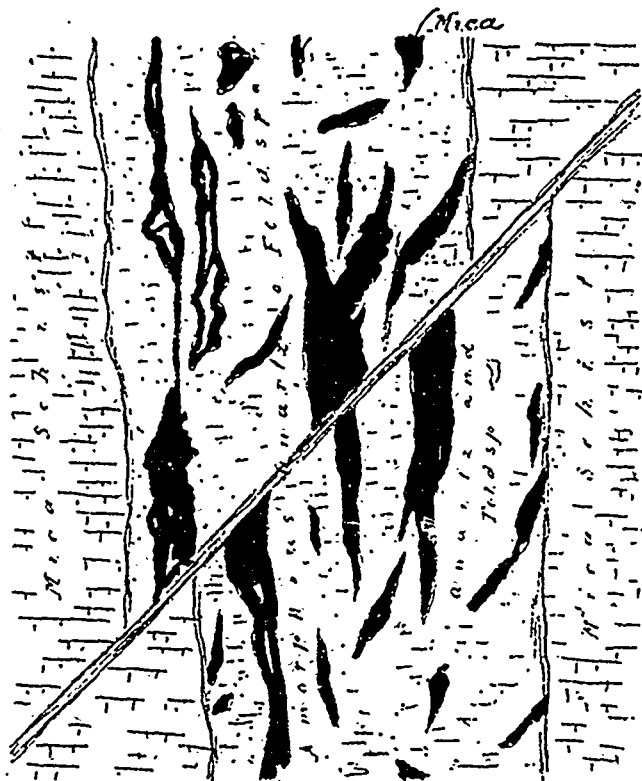


FIG. 7.—Mica vein in mica schist, Hazaribagh, India.

classed in Indian geology as among the younger members of the Archaean formation. They have nearly an east and west strike and underlie to the north at an angle of about 75°.

The mica of commerce occurs almost exclusively in pegmatite veins, running with the bedding of the schists from east to west, and varying in width from a few inches up to 20 ft. The country rock is

often faulted or thrown out of its normal strike, the veins are subjected to the same faulting and frequently at the point of faulting so called cross-courses of great width have been formed.

The pegmatite veins consist of amorphous masses of quartz, large crystals of orthoclase feldspar and crystals or books of muscovite mica. Generally speaking their contents in mica and the quality of the same depends to a large degree upon the nature of the adjacent rock. We find the richest and the best mica, where the including rock consists of mica schists (see fig 7). Near to the quartzite the main constituent of the vein is quartz, while little mica and feldspar generally is met with (see fig 8). Where the adjacent rock is highly feldspathic, feldspar crystals of a pink color predominate in the lode, while the occurrence of mica is insignificant (fig 9). These facts are very important for the miner and prospector, inasmuch as one can discriminate between rich and poor mica lodes.

In addition to the above constituents of the pegmatite veins many accessory minerals are met with like tourmaline, garnet and columbite. The tourmaline is at times largely developed, near to the tourmaline schisto large massive crystals of black tourmaline are numerous in the vein, occasionally crystals of tourmaline penetrate the mica books across the laminae and render the latter unfit for use.

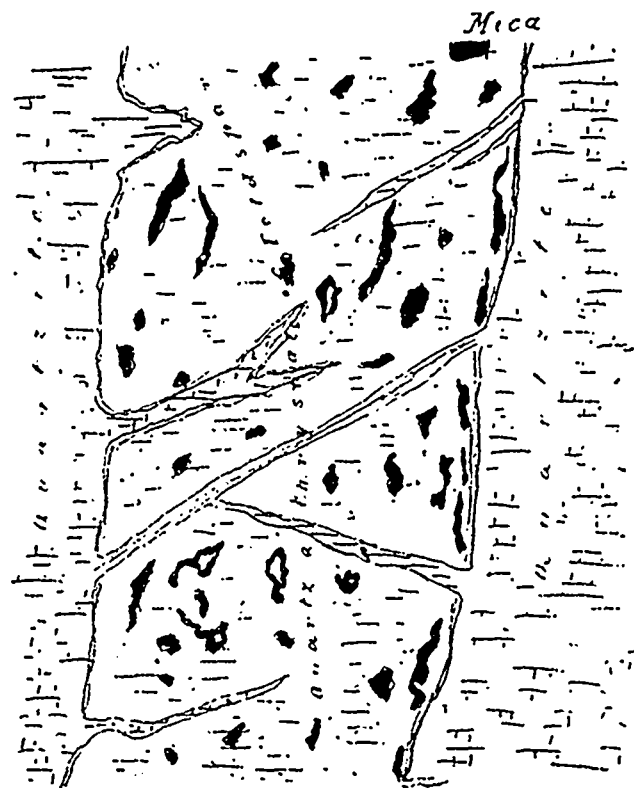


FIG. 8.—Mica vein in quartzite, Hazaribagh, India.

The native mines are of the most original and primitive character. No system of any kind being followed, the deposits are simply exploited in the simplest way. There is no machinery of any kind. Open cuts along the outcrops of the veins, where mica crystals are found, change with cross cuts at right angles through the vein formation. These cuts have a depth of from 20 to 50 feet and as the sides, on account of the decomposed nature of the veins near the surface, are very dangerous no timber of any kind being used, accidents are very frequent, and the miners are buried often beneath the fallen sides of the vein. In an exceptionally rich deposit, the work of exploitation differs somewhat from the above; the vein is followed to greater depth—up to 200 feet sometimes, by inclines—in a zig-zag form. Long rows of native women are placed on these inclines for the lifting of the mined mica to the surface or for draining the pits. These

*Mineral Ind. 1902, P. 458.

women are placed near one another in two rows from the water level to the surface. They hand baskets filled with mica to one another, or pitchers filled with water up to the surface, the full receptacles are handed up one line and the empties the other. As many as seventy women are sometimes placed in these zig-zag inclines to remove the water or rock from the bottom of the mine, the vertical depth however does not exceed 35 feet. The decomposition of the vein or adjacent rock very often goes down two hundred feet or more, and it is here that the largest operations are carried on. In order to ventilate the inclines and draw out the mica waste material, perpendicular shafts of 2 feet in diameter are put in. Sometimes as many as 30 of these circular shafts can be counted along the strike of the vein and within a few feet from each other. Work is conducted only in the dry months from November to May. The miners are a local tribe called the "Bandathis", men, women and children are all working at the mine, when they have no agricultural work in the field. As soon as the rainy season commences they return to their work in the field. Work is conducted only during the day beginning at 8 a.m. and is ended at dusk. No explosives of any kind are used and, where the vein is hard but sufficiently rich to pay for the labor, large fires are kindled against the face of the lode, and when the walls are sufficiently heated, water is thrown on to it, this sudden cooling causes the rock to shrink and crack. Wedges of soft iron are then driven into these cracks and in this way large boulders are detached. These tools are manufactured in a primitive way from the magnetite ores commonly found in the vicinity of the mines. The exposed crystals are chiseled out, taken to the surface in the manner above described, and split into sheets of about one eighth of an inch in thickness. All the rough edges are trimmed off by means of a sharp sickle, called "hasawah,"

vogue. As mentioned above, work in the mines is suspended while the heavy rains last, and this interval is used exclusively for prospecting purposes. Men are sent out to search for likely looking outcrops of mica. The mica shists being softer than the other members of rock formation, are eroded into valleys—the quartzose beds making the ridges of hills, and a certain amount of humus from the adjacent hills covers the valleys. After exceptionally heavy rains the surface deposits are washed off and with it the decomposed feldspar of the pegmatite veins, leaving exposed tufts of partially decomposed mica. The natives call these tufts "foo-foo" and believe that they grow during the rains, as they cannot account for their exposure at the surface after heavy rains, where there was nothing to be seen before the rain. Having discovered several of these "foo foo" spots, these are marked for mining operations as soon as the dry season begins. Parties, made up of men, women and children are set to work on these outcrops and the books of mica dug out, packed in loads of about 30 pounds and brought in at dusk to the central store. Here skilled workmen are seated on the floor, trimming the mica coming from the different diggings and mines. Before each man is a stout peg, driven firmly into the ground and protruding about 18 inches. The mica crystals are split by means of sharp sickles into plates of one eighth of an inch in thickness, the point of the knife being used for opening these sheets. Imperfect laminae are peeled off the plates till both surfaces show a clean even face. The plate is drawn against the side of the peg and the sickle drawn downwards to trim off the jagged ends and irregularities along the edge of the mica sheets. After trimming, the plates are sorted for the European market, England and the United States being the chief buyers. The sheets are sorted according to quality, four kinds being recognized by the dealers: 1 ruby mica, hard and tough; 2 white transparent mica; 3 discoloured and smoked; black mica and flawed. If 8 represents the value of ruby mica, 4 would be paid for white, 2 for discoloured, and 1 for black and flawed sheets of equal size. The sizing is as follows:

No. 1	Sheets measuring from 36 to 50 square inches.
No. 2	" " " 24 to 36 "
No. 3	" " " 16 to 24 "
No. 4	" " " 10 to 16 "
No. 5	" " " 6 to 10 "
No. 6	" " " 4 to 6 "

Prices for above qualities in London are

	s	d
Best Ruby No. 1 per pound.....	6	8
" No. 2 "	4	0
" No. 3 "	2	0
" No. 4 "	1	0
" No. 5 "	0	4
" No. 6 "	0	2

The sheets are trimmed irregularly into any shape they will take, to clear them of flaws. For square, rectangular, or diamond shaped sheets extra prices are wanted. The sheets are packed into boxes of 100 lbs. and transported on carts to the nearest railway station. The distance of the mines from the railways varies between 30 and 140 miles. From thence it goes to Calcutta and is shipped to London or New York.

As to the quantity of mica available in India there is no doubt that the pegmatite veins are numerous, and compared with those of other countries of large size, while the quantity of mica in some places is very abundant. Melvyn Smith, who visited a great many mines in the northern part of India in 1898, reports that some of the mica deposits are of a very large extent. But the method of working these

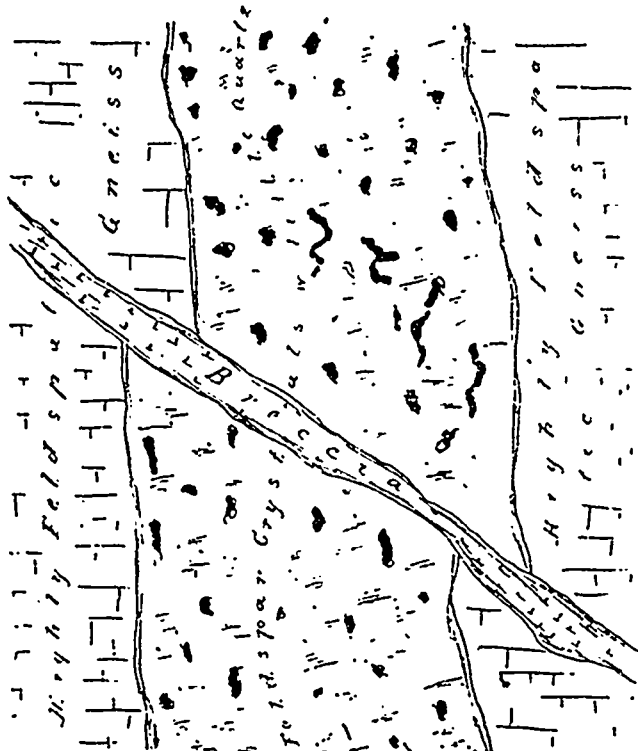


FIG. 9.—Mica vein in gneiss, Hazaribagh, India.

and then sorted according to color or size. The sheets are in some cases very large, 24 in. by 18 in.; in the Hakuri mine, Nellore district, Machas, plates 60 in. by 40 in. have been obtained. Although in the last few years Europeans have taken up the mica industry mining, with a few exceptions, is conducted on purely native methods as above described. In the majority of the mines the same slow and wasteful system, as practised by the natives for over a hundred years, is still in

mines is wasteful in the extreme and fully 90% of the mica mined is injured and rendered unfit for use. Whatever the statements regarding the richness of the deposits are, there appear to be no question that before long, modern methods of mining must be adopted, in order to make mining more profitable. Wages are very low; women get 3 pence a day, while good natives work for 4 pence. A first class native foreman—and only such can be employed under the circumstances—receives from 8 to 10 pence per day. On account of the absence of any machinery, it is difficult to follow the deposits beyond 100 feet in depth, many a mine has been abandoned, which shows at the bottom immensely rich mica deposits. There cannot be the slightest doubt that, with the introduction of modern mining methods, the cost of production will be materially reduced, the waste of mica will be much less, a better quality will be secured, while the life of a mine is prolonged until the complete exhaustion of the deposits. At present only the decomposed or partially decomposed parts of a vein are mined and it is evident that the mica at the same time must have undergone a certain partial decomposition. Mining towards the depth in the hard vein material would yield hard and no decomposed mica and in this way would increase the efficiency of the mine, both as to quality and quantity. Associated with the ruby mica, is biotite or black mica, which is used in powdered form by the Hindus and Mohammedans as efficacious in cases of dysentery.

Some interesting mineralogical features are often observed in the India mica. The sheets are at times queerly marked, in places one half of each sheet will be muscovite and the other half biotite, the line of division between the two colors being a perfectly straight line, while there is no other apparent change beyond the color in the uniformity of the sheet. Other plates again are chequered in black lines, the lines being due to magnetite. Again dendritic inclusions of quartz between the laminae may be found. Of course all these defects have an influence upon prices paid. The most valued colors are pure ruby, amber, light green and transparent white. There is also a silver white color, which the natives prize for ornamental inlaid work.

II. PHLOGOPITE.

The occurrence of workable phlogopite deposits appears to be confined solely to Canada and more especially to the country near Ottawa and to the townships of Burgess and Lanark, Province of Ontario. Reports have come from German South East-Africa of the discovery of a dark mica, probably phlogopite, and that mica mines are in actual operation, but so far nothing is known of the extent of the deposits. Since the application of mica for electrical purposes the production of this mineral has attracted, on account of its abundant occurrence in Canada the attention of mining men and capitalists of the Dominion. Canada has long been known to be rich in economic mica deposits. More than 40 years ago Sir William Logan (Geol. of Canada 1863 pp. 494 and 795) referred to the Phlogopites of Grenville Que. and in North and South Burgess, Ont. in all of which says Sir William, the mica is obtained in large sheets, which, being transparent and free from flaws; are wrought and employed for the same purposes as the muscovite or potash varieties. "A crystal from Grenville was so large as to furnish sheets measuring twenty-four by fourteen inches." Good mica, we are told, was found on the 10th lot of the 5th range and on the 1st lot of the 10th range of Grenville, as well as further to the westward of this township. On the 17th lot of the Township of North Burgess large crystals of magnesian mica were found in abundance in a bed of pyroxenic rock. The mica was traced for about 300' and considerable quantities were extracted. It appears, says Logan, that in this region and in Grenville, sufficient quantities of mica could be obtained for a larger demand. Another early producer of

phlogopite was the Sydenham Mica Mining Co. in the Kingston district, while large quantities of mica were raised in connection with phosphate mining at the Blackburn mine at Perkins Mills, P. Q. from the year 1875 up. Practically speaking an impetus to mica mining was given by the extensive operations in the phosphate mines of Ottawa county. During these operations mica was more or less a dominant factor in the mineral raised, in some cases so much so that the quality of phosphate was seriously impaired. As mica was then unsaleable it was thrown into the dump as useless, and it was only in the year 1890 that the demand for this particular mineral commenced. Experience was gained as the mode of occurrence in connection with phosphate mining and this experience aided considerably, when operations for mica were seriously attempted. Many phosphate mines were worked both for mica and for phosphate, but the peculiar character of the mica deposits did not admit of mining profitably two minerals. Phosphate mines gradually turned into mica mines, the phosphate being only mined, when in immediate vicinity of the mica deposits. As to the geological occurrence of mica deposits, it must be stated that, as the latter appear to have the same relation to the pyroxene rock in which they occur, as the phosphate of lime or apatite, we must reasonably suppose that, many data, concerning the geological deposition of phosphate are good also for mica deposits, especially in their genetic relation to the containing formation. We find that the Laurentian formation in which the phosphate and mica deposits are so largely developed, consists

1. Of red, grey and white orthoclasegneiss in great variety, distinctly banded.
2. Black hornblende and mica gneiss, often garnetiferous and cut by veins of white and red oligoclase.
3. Pyroxenic gneiss, banded.
4. Large bands of crystalline limestone

These rocks may be considered the typical rocks of the great Laurentian formation; they are distinctly stratified and dip generally at all angles from almost horizontal to vertical. In the country north of the Ottawa river and in the vicinity of the Lievre river all the members of the Laurentian are represented and are characterized by the intrusion of large pyroxenic dikes. The intrusive character of these dikes was clearly recognized by the many openings which have been made in the apatite and mica deposits of the Gatineau and Lievre districts. We find that generally the strike of the limestone is east of north 150°, the strike of pyroxene, quartz, feldspar and other dike like intrusions at right angles, but sometimes conforming with the bedding of stratified rocks.* The deposits of apatite and phlogopite mica are confined entirely to these pyroxene dikes, while it is erroneous to suppose that mica occurs also in limestone, as has been asserted by many practical miners. Near the contact with the grayish gneiss, an irregular development of calcite, generally of a reddish or pink color, occurs and while it is true that good crystals of mica, mostly of a perfect form, are found in this calcite, it must be borne in mind that the latter occurs only in small irregular pockety deposits in the intrusive pyroxene. The horizon of these apatite and mica deposits is confined to the upper portion of the Laurentian silicious rocks which underly the large bands of massive limestone so frequently met with in the Ottawa Valley. These gneisses are of grey or reddish grey appearance, contain reddish or hornblendic bands, generally with a large percentage of quartz. These beds occasionally penetrate calcareous layers into the massive crystalline limestone formation. In the Lievre and Templeton districts apatite and mica are rarely found in dikes cutting through the limestone strata, but in the Gatineau area

*Dr. Ellis, Geol. Society of North America, 1893.

many large dikes of pyroxene cut the limestone and contain mica deposits of commercial value.

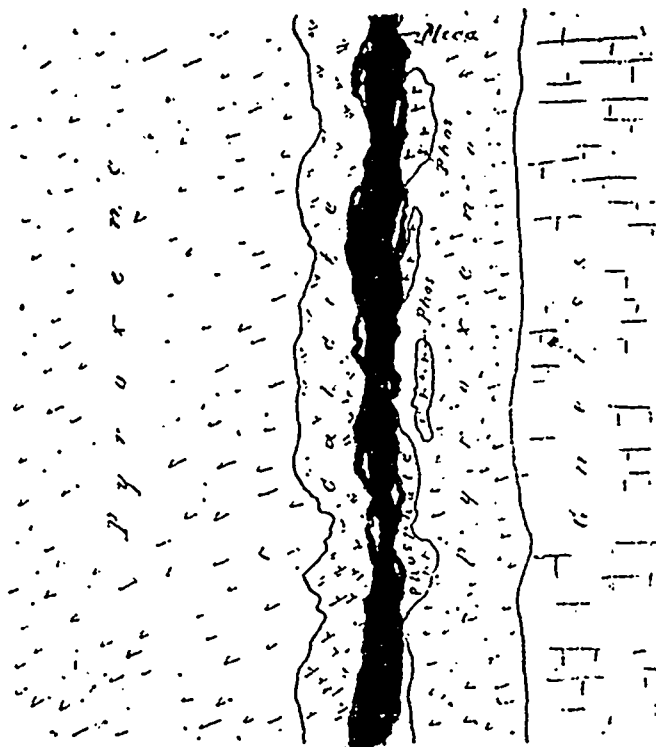


FIG. 10.—Mica vein, Wallingford Mine, Township of Templeton, P.Q.

Mica deposits occur in pockety masses, composed of mica crystals and micaceous matter either in pyroxene or on the contact between this rock and the adjacent gneiss. Where the mica occurs as a contact deposit, pocket of irregular bunches of calcite are associated with the pyroxene. Generally speaking the mica crystals found in calcite are of perfect crystallization and basal cleavage and yield a fine commercial product. Crystals of apatite are frequently met with in association with the mica and penetrate occasionally the latter. Inclusions of calcite are found very often between the laminae, destroying however the quality of the mica to a large extent.

(To be continued.)

Exhaust Steam Boiler Feed-Water Heaters; Hot Water Pumps and Pumping.

By W. D. L. HARDIE, C.E., M.E., Lethbridge, N.W.T.

(Continued from May issue)

DESCRIPTION.

Cast iron, copper and brass are used for all parts exposed to steam and water, because they do not quickly deteriorate from corrosion and acids. This will present itself in many accommodations but may be said to be absolutely necessary.

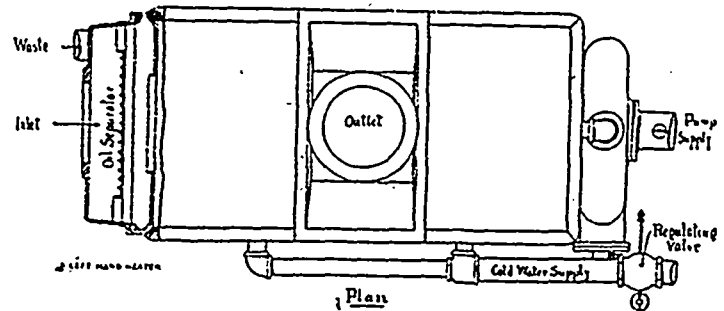
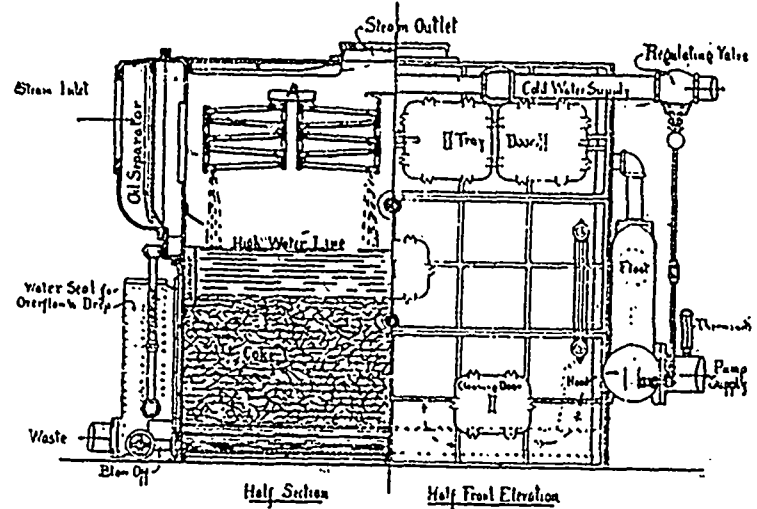
The form of this heater is shown by the illustrations. Each side is formed of one or more strongly ribbed parts bolted together at the flanges and made steam and water tight with rust joints calked from the inside. Suitable stay tubes and bolts are used in the large sizes, so that the shell being strong and rigid will not be affected by the pulsations of the exhaust steam.

The top and bottom plates are also of cast iron, the latter being either dished or set at a slight angle to permit of complete drainage through the blow-off pipe.

The oil separator through which the exhaust steam enters the heater is bolted on the outside of the shell and is shown sufficiently clear in the above cuts to require no further explanation.

The upper portion of the heater contains the trays which are interchangeable and removable. Each is inclined, and the edge over which the water flows is serrated, or saw-toothed, for breaking up the water.

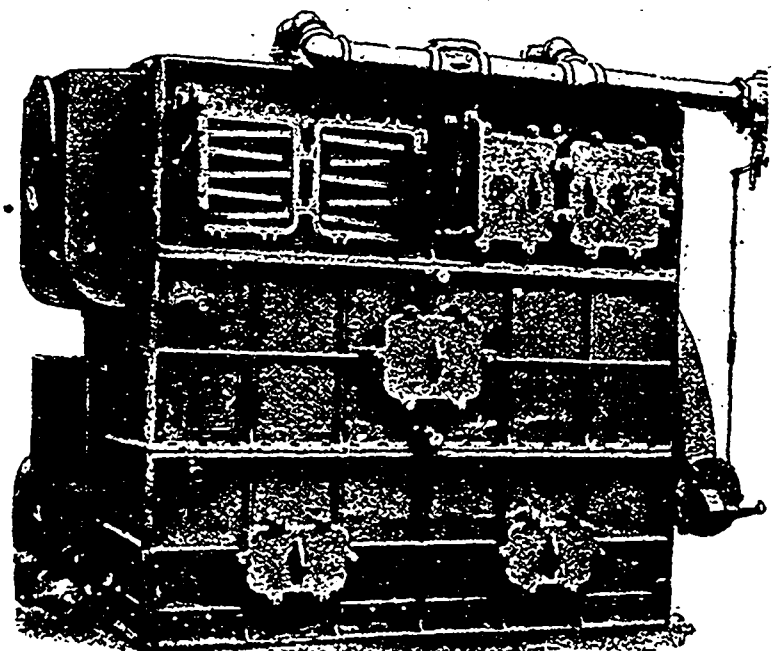
The trays are held in place by the cast iron guides, securely



ILLUSTRATING HEATERS OF 2000 H. P. CAPACITY AND UPWARDS

bolted to the shell of the heater in such a manner that they can not be dislodged by the pulsations of the exhaust, though they can be readily removed through the clearing door openings.

Each set of trays is suspended in the steam space, with passages between the tray supports and the sides of the heater giving far greater area for the passage of any surplus exhaust steam through the heater than the area of the exhaust inlet open-



ELEVATION.

ing. This arrangement provides for delivering steam *by induction*, through the openings in the tray guides to the water, as it flows from tray to tray.

A brass pipe (with ell and nipple at end), from the opening on the heater through which the cold water enters, conducts the water to an open distributing box or trough extending across and above the trays. Slots are provided in the bottom of this box through which the water flows on to the upper tray.

Outside the heater on the inlet pipe, is placed a double disc or balanced valve for regulating the cold water supply, which valve is controlled by a ventilated copper float carried in the heater. Any change in the level of the water raises or lowers this float, opening or closing, by crank and lever connections, the regulating valve, thus keeping supplied the demands that are being made upon the heater for hot water and preventing any waste of water through the overflow.

The ventilation of the float is accomplished by using a hollow brass stem connected to a hollow axis, the end of which projects without the heater. Any water that may accumulate in the float from sweating through the copper or from breakage will be shown on the stem outside the heater.

Just above the working level of the water is placed the *skimmer*, extending the width of the heater which, in addition, furnishes the overflow opening. This trough is drained through an opening in the side of the heater into the water seal or trap, which seal, while of ample size, and perfectly open, carries a sufficient head of water to withstand a pressure of about one pound per square inch. This arrangement effectually seals the opening and prevents the entrance of air into the heater when *drawing* the steam supply without using a check valve.

To provide for carrying additional depositing surface in the form of a filter bed, heaters should be furnished with perforated cast iron plates or shelving on which the material used is placed, thereby ensuring the passage of all the water through the filtering bed, and providing an easy course to the pump suction via the hood. These plates form a false bottom, being set about four inches above the bottom of the heater.



Showing vented hood protecting pump suction.

Covering the outlet to the pump and extending down to the coke shelving is a hood, open at its under edge for the passage of water and vented by a pipe at the top to prevent possible air logging and consequent interference with the flow to the pump. This pipe also prevents a syphoning of the water from the heater, thus maintaining the seal for keeping the floating impurities from the pump suction.

It will, perhaps, have been noticed that some attention has been paid in the construction of all the heaters described, excepting the one shown in Fig. 4, to the induction, or vacuum, principle. This principle we regard as one of the highest importance in exhaust steam heaters.

We think we have perhaps already devoted too much attention to the subject of the first part of the title of this paper—"Exhaust

Steam Boiler Feed Water Heaters", and will now briefly take up the latter part—"Hot Water Pumps and Pumping."

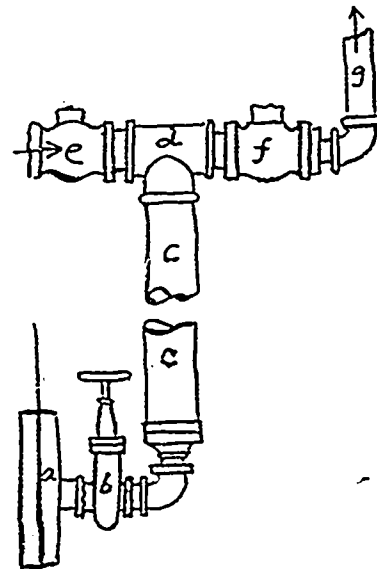
When water gets to 110°F it is not safe to depend on any of the injector or inspirator types of feeding pumps, and the water must be delivered into the boiler by a force pump of positive action.

Pumping hot water is a very difficult problem, and its limitations of lift and temperature are very positive. As a general proposition, it may be fairly said that, at sea level, a pump will not lift any water at 200°F. For boiler feed purposes, at sea level, the pump should be set at least 2 feet below the supply, and the greater the distance the pump is set below the supply the greater will be the satisfaction in the pump's operations.

In designing pumps it is customary to allow a flow of 200 ft. per minute in the suction pipe, 300 ft. per minute in the discharge pipe and a piston speed of 100 ft. per minute in water cylinder, making allowance in the cubic area of the cylinder for 25% of slip, but this rule when pumping hot water must be modified if good results are to be had. It is a safe rule to give the suction water a flow of 100 ft. per minute and reduce the piston speed to 35 ft. per minute. The writer has gone through a wide range of experience, and while he would not say that this rule should not be departed from, he does affirm that it is the only rule that will guarantee a steady supply of hot water to the boiler if the plant is large, and meet emergencies satisfactorily.

In connection with the suction there should be an open stand pipe, the open end being about 2 ft. above high water mark in the heater. This will allow some of the vapour to pass off in the passage from the heater to the pump, and also offers a ready cold water connection to the pump by enabling one to turn a stream of cold water from the tank into the stand pipe. The writer has also found it advisable to put a small pipe, say 1/2", in the suction close to the pump, which can be used to reduce the pressure of the vapour which sometimes is so great that the pump does not get a full supply of water into the cylinder and immediately begins to jump or hammer. A very little water through the 1/2" pipe corrects this without a perceptible reduction in the temperature of the feed water.

There is also the difficulty of furnishing sufficient air chamber area to prevent hammer in the delivery pipe which is very effectually overcome by the automatic air pump shown in cut below. This cut and description of its action is taken from "Pumping Machinery," by Wm. M. Barr.



A piece of 2½" wrought iron pipe (c) about 30" long is connected to the end of the pump cylinder (a) in a vertical position, by means of a gate valve (b) or cock. A 2½" tee (d) at the upper end of the pipe is connected at one end of the run with a 1¼" check valve (e) opening inwards, and at the other end with a ¾" check valve (f) that opens outwards. The valve (f) is connected with the air chamber through the pipe (g).

The air pump is operated as follows:—When the pump is working, open the valve (b) to fill the pipe (c) with water; then partially close (b) until the check valves (e) and (f) begin to work. This is easily determined by the check of the check valves when seating.

Its working may be described thus:—When the valve (b) is opened, water fills the pipe (c) from the pump cylinder (a) during the discharge stroke of the pump. By partly closing (b) when (c) is full, the pump during the suction stroke will draw a part of the water from (c) and air will flow on through (e) to take its place. During the next discharge stroke of the pump, more water is forced into (c) driving the air out through (f) and (g) into the air chamber. If (b) is opened too wide all the water will be drawn out of (c) during the suction stroke and air will be drawn into the pump cylinder from (c); but by properly regulating the opening, a column of water is kept in (c) which acts as a piston that moves with the strokes of the pump and pumps air into air chamber.

Such an air pump will be sufficiently large to supply pumps with air that are delivering up to a million and a half gallons of water in 24 hours.

The water, by the use of this automatic air pump has got practically silent running in a pump that would have hammered itself and connections all loose in a short time without it.

On the discharge line there should be placed a relief valve so that when the water is shut off, or partly shut off, at the boilers, the pressure will open the relief valve, which has a connection into the open stand pipe on suction before referred to, and allow the water to flow back into the pump suction. If there is not a man in attendance upon machinery close by, the pump may advantageously be equipped with a speed governor.

Having settled all the foregoing points, it is now a matter of making a proper selection of pump and valves.

The writer, after 25 years intimate experience with high pressure pumping, has become very partial to double acting outside packed plunger pumps, with both suction and discharge valves put in the top of the pump, pot fashion, and held in position by glands. In such a pump individual valves can be examined without taking any other piece of the pump apart. The plungers being outside and outside packed, and the valves outside, there is never any cause for doubt as to what part of the water end is out of order when the pump will not do its duty. The writer uses the outside packed plunger pump to the exclusion of all others, but for low resistance in discharge line he uses the common style of plunger water end and valves; but for high duty he always uses the pot shaped valve.

Such a pump is more costly when purchased, but is much cheaper in the end. There is a pump of this kind which has been under the writer's charge for nearly eight years and up to date it has only cost \$50.00 for repairs, and has not failed for a single hour in all that time to meet every requirement. It pumps regularly against the head equal to 150 lbs. per square inch.

Such pumps may be either single or duplex. The duplex has the advantage of steadier flow, but the stroke of the one piston is dependent for its steam on the stroke of the other piston, and on this account presents some difficulties that may not balance the steadier flow.

Undeveloped Mineral Resources of Ontario.*

By WILLET G. MILLER, Provincial Geologist, Toronto, Ont.

Complaints, whether just or unjust it is not our province to determine, are often heard to the effect that our neighbors to the south have usually gotten the better of us in the various treaties and conventions which have been held between the two countries from 1776 onwards, but it is recognized by few that certain natural agencies, even before the time of Adam, were working in behalf of our neighbors, in an agricultural sense at least, and against us. A large part of the soil, which undoubtedly covered our new rocky areas at the end of the Mesozoic era, was transported to the southward, across what is now the international boundary, in the succeeding era by the ice sheet which completely covered the territory which we now call Ontario. What would have become, long ere this, prosperous homesteads and rich agricultural communities, were forever rendered impossible by the movements southward of the great glaciers, whose effects, greater than those produced by the greatest of invading armies, are to last through all time. While the Canadian agriculturist may regret that many a fertile plain and valley in the Republic owes its prosperity to the stealing of our soil by the ice kings, his brother, the miner, rejoices that old mother nature in that far distant time was working for his benefit. By carrying away the soil she exposed the ore-bearing rocks to his view.

We hear a great deal of what heated waters and volcanic action have accomplished in the formation of ore deposits but no one has yet come forward to champion the glaciers, to whose action in many parts of the world the mineral industry is so much indebted. They seem to have concentrated the gold in the far famed Klondike; they have scoured many a mountain and plain exposing the treasures in the rocks beneath; they have furnished us with many a lakelet and water fall, and have rendered picturesque many a region whose landscape would otherwise have remained monotonous and unattractive.

It is difficult to state definitely what part of the 220,000 square miles embraced in the territory of Ontario possesses a rocky surface and is not adapted to agriculture. It probably is about one half. Over this broken region there are what have been roughly classed as two great groups of rocks, the Laurentian and the Huronian. We have been educated in the belief that the Huronian is *par excellence* the mineral-bearing system of the two, and that the Laurentian, with the exception of the crystalline limestone and associated rocks of the Grenville series, was to be considered of little economic importance. Much of what we call the Laurentian system is composed of acid plutonic and metamorphic rocks, granites, syenites and gneisses. We have been told that these particularly, which occupy vast areas, were of very little importance, as the store houses of economic minerals. Prospecting and development work during late years have, however, disproved the old beliefs concerning this series. In fact I look forward to some most interesting mineral discoveries being made in these maligned rocks. Mica, which with the advancement in electricity is likely to become still more important, is found in what appear to be economic quantities in many coarse grained granite. Heretofore the mica mined in this Province has been practically all of the phlogopite variety, which is found associated with apatite, calcite and pyroxene. The greater part of the muscovite used on this continent has been imported from India. One of the chief electrical firms in the United States is now planning the development of muscovite deposits in Ontario to replace that from India now used by them. This promises to become an important industry as white mica is found in many

*Paper presented at the Sixth Annual Meeting of the Canadian Mining Institute, March, 1904.

localities from the western boundary of Quebec to the eastern border of Manitoba. Micanite has brought about the use of smaller sheets of mica than could be used a few years ago and many of the muscovite deposits considered of no value at that time, now contain merchantable material. Then these Laurentian granites are known to be the store houses of many rare minerals, some of which have at present economic uses and others may be expected to have at no distant date. The only specimen of wolfram, the ore of the metal tungsten which is used in a steel alloy, ever found in this Province was attached to a boulder of the heretofore much despised Laurentian granite. Again the only deposit of Columbite, a mineral which has recently come into commerce, occurs in a coarse grained granite dike. Within the last few years an important corundum industry has sprung up in one of these formerly so called barren granite districts; the mineral has been found at numerous points in belts of these rocks which have a known length in the Province of about 100 miles. Other examples could be given to show that the larger, hitherto neglected, Laurentian granite areas are well worthy of the attention of the prospector. Enough has, however, been said to show that these rocky areas are not to be left unconsidered when estimating the value of our undeveloped mineral resources. They already furnish us with a greater variety of economic minerals than the Huronian and younger formations which in years gone by were the favorites of the prospectors. Our mineral-bearing areas are therefore much more extensive than they were formerly thought to be.

To worthily justify its title this paper should possess the size of a large volume. Our undeveloped mineral resources are extremely varied in character.

The writer showed in a paper published in Vol. V. of the Journal of this Institute* that Ontario produced as great a variety of minerals as probably any other area of the world of like extent. My object, however, is not to attempt a detailed description of these resources, even had time permitted, but to give a rough outline of the field that lies waiting for the mining man in this Province. In order to do this systematically, but briefly, I shall use a classification, which has long been adopted by the Geological Survey, and divides the useful minerals and rocks into several groups.

I.—METALS AND THEIR ORES.

The ores of the following metals have been profitably mined in the Province, gold, silver, platinum, iron, nickel, copper, lead, zinc. A small amount of molybdenum ore has also been produced. Most of the other metals, both common and rare, which are used in the arts are found here. For example the richest ore of aluminum, corundum, is found, as already stated, over a large territory. This substance, however, brings a higher price as an abrasive material than as an ore, and is consequently not used for the extraction of the metal. Titanium, which appears to be destined to play an important part in alloys, occurs in numerous, at present undeveloped, deposits. Tin has been found in small quantities in the vicinity of Sudbury and in Renfrew county. Mercury has been found at one locality, Silver Islet, in very small amounts. The metal tungsten, as already stated, has been found only in a boulder. Arsenic, the chief use of which is not in the metallic form, and other metals, which are employed in the arts in the form of oxides or other compounds, will be discussed under other headings.

Considering the extent of territory over which gold deposits occur in the Province, and the numerous areas in which prospectors have done more or less work on them, it must be admitted that we have large undeveloped resources in this metal. The present state of our

gold mining industry is due chiefly to incompetent management, stock-jobbing and other speculative factors—the parasites which attack the industry in all countries while it is in a weak, undeveloped state. It is to be expected, however, that after the epidemic has spent its force, like those which at times attack our bodies, the industry will be in a sounder condition and will soon reach such a state of healthy development that parasites will be ineffectual to injure it. Our President has stated that the most promising gold prospect he examined while in the service of the Geological Survey, in the Lake of the Woods area 21 years ago, has lain untouched ever since, being tied up through the belief of the owners that they could make a profit through some one else's expenditure. Mr. Carter shows in his paper that we have nothing to fear from the deep development of our gold mines.

Such factors give us confidence that the undeveloped state of our gold deposits is not due to the quality and amount of ore. We have, therefore, reason to place a value on our gold fields of the Hastings districts, Wahnapiatae, Michipicoten, Thunder Bay and Rainy River, as promising to be important assets in the future. Then there are the placer deposits which stretch for many miles along the Vermillion river, and those of Sturgeon Lake which cover a large area. Under more favorable conditions some at least of these areas should be worked at a profit.

In the district surrounding the head of Lake Superior we have had one great silver mine, and a group of others which have produced a considerable amount of the metal. Five hundred miles to the east of this, across a region, much of which is difficult to access, and practically unexplored, very promising silver deposits have recently been discovered. It is not reasonable to conclude that the great intervening region, over a large part of which similar rocks occur, contains probably numerous undiscovered deposits.

The metal platinum, which is frequently associated with the noble metals gold and silver, in nature, is found in the Sudbury ores. Unfortunately the most promising deposit of this metal yet discovered has lain dormant since its discovery for 15 years or more, owing to differences among shareholders—a cause which is primarily responsible for the undeveloped state of other important ore bodies in this Province.

The areas occupied by rocks which give promise of containing workable iron deposits occupy a greater extent of territory than those in which there are fairly definite indications of any other metal. Neglecting for present consideration the older explored areas in south-western Ontario, the iron range formations which surround the Ontario side of Lake Superior and extend westward towards Manitoba, and eastward to the Quebec boundary have an aggregate length of several hundred miles. As many parts of these ranges possess characteristics similar to those in the Lake Superior regions of the United States it must be admitted that this Province in all likelihood possesses vast undeveloped iron resources. It is to be hoped that they will not be tied up like some other of our mineral deposits. In the northern and western parts of the Province there is only one iron mine which has been a producer of importance. This deposit owes its development largely to favorable situation. As facilities for transportation are supplied to more remote fields others will undoubtedly become producers.

Their magnetic properties distinguish iron, nickel and cobalt from all other elements. The iron-bearing formations of Ontario are not less in extent than those of any other part of the earth of equal areas. The Province has only one competitor as a nickel producer, and her undeveloped resources in this metal appear to be unequalled. The deposits which have been developed form only a small percentage of those known to exist in the Sudbury area.

*Eastern Ontario: A region of varied Mining Industries Journal Can. Min. Inst.—Vol. V., P. 233.

Cobalt does not come into commerce as a metal but as an oxide. It is found in Ontario in deposits richer than are known to occur elsewhere. If the promise which the recently discovered deposits give is fulfilled no country will be able to compete with this Province in the production of cobalt. The market for the oxide of the metal is restricted, and our ores being so much richer than those found elsewhere should control the market.

Is there not something strange in the fact that this group of three metals—iron, nickel and cobalt—which possess properties different from all other elements should be found in unsurpassed quantities in this Province? Have magnetic influences had something to do with their concentration? Or is it owing to the fact that in our Province a large area of the oldest known rocks are exposed? Probably during the early period of the earth's history these magnetic metals occurred abundantly near the surface. More recent formations have been formed by the breaking down of these earlier formed rocks and the metals, especially nickel and cobalt, have been scattered. It may be said that our deposits of the three metals do not occur in our oldest rocks but in rocks which are of Animikie or later ages. The eruptives, whether massive or fragmental, which are associated with the deposits, were formed, in all probability from material which existed not far from the early surface and had not been worked over by agents of denudation.

Copper deposits are numerous in the territory bounded by the lower end of Lake Superior and the upper end of Lake Huron. Considerable development work has been done on these deposits during the last few years and it would appear that a fair percentage of them will become producers. During the last decade, or more, copper has been produced in association with the nickel ores of Sudbury. All these nickel deposits carry copper and Ontario will in the years to come be credited with a considerable amount of the metal from the nickel mines, now so much in demand for electrical and other uses. Another copper mine, that of Massey Station, has recently become a producer and the Province has, chiefly, to thank the tireless energy and skill of that veteran metallurgist of this Institute, Major Leckie, for this much to be desired consummation.

Outside of the district embraced in the southern portion of Algoma and western Nipissing the only copper property which has received serious attention is that which is now known as the Tip Top mine, west of Port Arthur. This mine has reached a stage of development which the owners consider warrants them in erecting a smelter.

The success already achieved in the copper industry, together with the knowledge that many deposits over a large territory, are as yet untested, should lead us to conclude that the Province has a good future ahead as a copper producer.

The metals lead and zinc are commonly found associated in nature. Most of the deposits of these metals throughout the world are in rocks younger than the Archean, and from what I have said concerning the magnetic metals it might be inferred that lead and zinc would not be found in the Province in large amounts. These metals show a tendency however to make their abode in limestones wherever they can find them. In our Grenville series crystalline representatives of these rocks are found, occupying large areas and the metals occur at numerous points. The character of the deposits of these metals is, however, characteristically difficult to determine, and they are often hidden, owing to the softness and easy weathering of the limestone. Hence there is reason to believe that many of these ore bodies are yet awaiting discovery. Zinc deposits have been worked in both the eastern and western parts of the Province. Work on Lake Superior deposits ceased a couple of years ago but a mine in Frontenac county has been producing ore in small quantities for two or three years, and can, apparently, continue as a producer for years to come. This latter

mine illustrates what I have said about the difficulty often experienced in discovering deposits of the metal. It is situated in a cleared field in a part of the country which has been prospected for years without the deposit being located. That metamorphic or Archean areas are not to be avoided by those in search of zinc is shown by the fact that the great deposits of New Jersey are in limestones similar in character to those of our Grenville series. And although the great Missouri zinc-bearing rocks are not of Aachean age still they are rather clearly connected with those rocks. In that State, isolated knobs, representing peaks of mountains which rose from the Archean surface, project through the later sedimentary formations.

The lead deposits of Ontario are similar to those of zinc, and what has just been said will apply to them. We have, in Hastings county, one working lead mine, with a small smelter, and it is not unreasonable to suppose that other deposits, both known and unknown, will be worked in the future.

Having made this rapid survey of our metallic resources I shall now rapidly review the other groups of economic minerals found in the Province.

II.—MINERALS USED FOR GRINDING AND POLISHING.

I have shown that Ontario has unsurpassed resources in iron and nickel, which form an alloy which is to be the metal of the 20th century. In the manufacture of machinery, utensils, and other articles composed of metal, a substance is needed to smooth down the rough castings and forgings. Mother Nature in furnishing us with these great metal deposits did not forget to supply us with the mineral needed to polish the metal and put it into marketable form. Hence, she gave us the great belt of corundum-bearing rock that is found in south-eastern Ontario. Already two plants have been erected to extract corundum from these rocks and there is room for others. One of these plants, which is just completed, is surpassed in size in comparatively few districts in which concentration is being carried on.

Formerly it was the custom to use the lathe almost exclusively in shaping up and reducing the parts of machinery and other metallic articles. The lathe is now being replaced by wheels of abrasive material, which do the work more cheaply and accurately. In working the harder metals and alloys corundum has been proved to have no equal, either among minerals or artificial abrasive materials. Hence it is natural to conclude, when we consider the development already done and the numerous deposits still lying dormant, that Ontario has very valuable assets in this abrasive substance.

III.—REFRACTORY MATERIALS.

Possessing the wealth in water powers that we do it is fortunate that there are found in the Province large deposits of graphite or plumbago, a mineral which is of great importance as a furnace lining. Deposits of this substance are known to occur in several localities. Two are being worked and others have had preliminary tests made on them recently. Soapstone and other substances said to withstand the heat are also to be found. Ontario's graphite exhibit was one of the striking features in the mines building at the Buffalo Exposition.

IV.—MINERALS USED AS PIGMENTS.

Pigments or paint materials are produced from a number of minerals, some of which, lead and zinc, have already been mentioned. Our cobalt deposits, however, promise to give us the highest standing as producers of metallic material, used for coloring purposes. The ore bodies recently found in the vicinity of Haileybury contain ore running 16 per cent in cobalt. The present supply of the metal comes chiefly from New Caledonia, and the ore as mined there does not run a quarter of this per-centage. Other mineral pigments occur in the Province but do not need special mention.

V.—GEM STONES.

Stones of this class have not been found in the Province, although the opaque variety of the ruby and sapphire (corundum) as already shown, is abundant. Common beryls are also found, but, as yet, not the gem varieties, emerald and aqua marine. Several minerals which when cut and polished have a handsome appearance have been used to some extent. Several writers have drawn attention to the fact that diamonds likely occur in our northern districts. Judging from the facts that these stones are found in drift deposits to the south of the international boundary, and that carbon, e.g., the Sudbury coal, and graphite elsewhere, are found in close association with basic eruptives, there seems to be good reason to believe that diamonds may yet be discovered in northern Ontario.

VI.—MINERALS USED IN CERTAIN CHEMICAL MANUFACTURES.

Probably no chemical manufacture is more important than that of sulphuric acid. There are two working iron pyrites mines in Hastings county. These mines are on deposits which have been known for years, but lay dormant till recently. The mineral is found in promising amounts in many other localities. The great length of the iron-bearing range has been mentioned. Belts of rock carrying iron pyrites run parallel to these and appear to carry pyrites in important amounts. Near the Helen mine a large deposit of pyrites has been tested by the diamond drill. Some hundreds of miles to the north-westward a pyrite deposit, situated near the iron claim on the Steep Rock Lake has also been drilled into. Pyrites is found in considerable abundance near Lake Temagami. Mr. Sjostedt in a paper read at this meeting describes a method of manufacturing sulphuric acid from pyrrhotite, our deposits of which are of large size and numerous.

Molybdenum and other minerals which have been mentioned come under this heading to some extent, as they are used in chemicals.

VII.—MINERALS USED IN AGRICULTURE.

Our phosphate deposits which are found over a large area in south-eastern Ontario have lain idle since the discovery of the lower grade but more cheaply worked deposits of the southern States. A large supply of gypsum, another mineral of value to the agriculturalist, is found in abundance along the Grand river in older Ontario, and on the banks of the Moose in the north the substance appears to occur in considerable quantities.

VIII.—FUELS AND ILLUMINATING MATERIALS.

For years past the south-western peninsula of Ontario has been an important producer of petroleum. During the last two or three years the supply has declined. That this part of the Province still has important deposits of oil admits of little doubt. Heretofore this substance has been looked for practically only in the Corniferous formation, in which the first wells drilled happened to occur. Within two or three months oil has been struck in promising quantities in two other formations, which up to the present have received little attention from those interested in the industry. One of these formations lies 700 or 800 feet below the horizon from which oil is obtained, and the other is still older.

In that great, practically unexplored, region of the Province which occupies the James Bay slope, the Corniferous rocks are said by Dr. Robert Bell to occupy a greater extent of territory than is embraced in the whole of the south-western peninsula of Ontario. Is it not more than likely that both oil and gas will be found in the northern region when it is rendered accessible by the building of railways? Niagara and other formations also occur there. In fact it presents practically the same geological conditions, but on a larger scale, as the older part of the Province which has already proved to be productive.

New gas pools have been exploited recently and what has been said concerning oil applies to this very useful substance.

After years of experimenting the problem of briquetting peat in a form suitable for our market seems to have been solved. If this is the case the numerous large deposits of this fuel in older Ontario will add very materially to our annual income. When the more northern territory is opened up deposits enormous in extent will be rendered available.

It will be admitted, I think, from what I have said that the Province has very large undeveloped resources in these three important substances.

IX.—MATERIALS FOR BRICK, POTTERY AND GLASS.

Materials suitable for brick making are found in abundance in older Ontario, and beyond the height of land, in the great clay belt of 16,000,000 acres, bricks should be a very popular material in the settlements that are to come.

The pottery industry is only in its infancy in Canada, and there is likelihood of great development. Feldspar is a mineral which is in great demand for use in the manufacture of pottery. During the last three or four years one of the largest known deposits of feldspar has been opened up in Frontenac county. The quality is such that it is in much demand in the United States. It may be added that feldspar, of which there are many promising undeveloped deposits in the Province, is one of those minerals which are found in the formerly much despised Laurentian.

Our glass industry is in much the same position as that of pottery. Even the common raw materials, such as lime and quartz sand, have always been imported for use in our only two working factories, although raw materials of the right quality are to be found here.

X.—CEMENT.

The Portland or artificial cement industry has made rapid strides in this Province within the last decade, and there now seems to be little need of drawing on foreign supplies of this material. All of our working cement factories use marl as the raw material for the lime in their mixtures although a high percentage of the factories in New York state and elsewhere employ solid limestone, which, it is said, makes a saving in the cost of manufacture. It apparently was not known that Ontario had limestone in abundance pure enough for use in cement. One of the factories now being erected is to use limestone. The northern unsettled agricultural region tributary to James Bay is well supplied with this raw material required in the cement industry.

Cement is affecting some of the older industries and trade in some materials is now in a transition state. Cut stone for use in canal work and other structures is being largely replaced by concrete. Lime for use as a mortar is of less importance than formerly, Portland cement taking its place, especially in buildings which are erected in frosty weather. It is said that in Germany Portland cement has entirely replaced natural rock cement and it is probable that the same thing will occur here. Cement blocks, when further improved, will also affect the brick industry.

XI.—STONE.

The stone industry of the Province is in what may be called a pioneer state. We import all our granite for monumental and other purposes, although there is probably no country which possesses a greater variety of granite, either as to size of grain, color or other qualities, than Ontario. Trade prejudices are to some extent responsible for this. Scotland has for years been an important producer of granite for monumental purposes, and it has been the ambition of most Scotchmen to be buried under an Aberdeen stone. Of late years the Scotch granite has met competition in New Brunswick and elsewhere,

but the stone is probably passed off as the Aberdeen, and many a son of old Scotia sleeps his long sleep as peacefully under one of these as if it were the genuine.

Marble stands in about the same category as granite. Trade prejudices and the competition of large foreign quarries have prevented the development of the numerous and varied resources in this material which are to be found in Eastern Ontario. Attempts have been made to work marble at a number of points in the Province but the works have never got down to depths sufficient to be below the influence of surface agencies, and the quarries have been given up practically untested. Renfrew is the only locality which produces marble at the present time. Some wealthy and patriotic citizen of Toronto or some other of our cities would be doing a good service to the country if he would erect a residence of marble and thus show that we have material as good as is to be found elsewhere. There is a marble residence in Brockville but the material was brought from New York State. Marble should also be used in some of our public buildings. What an advertisement it would be if considerable marble had been used in the Science building now being erected in this city! How long, having the resources we do, shall we continue to import our marble from Maine, Georgia and other States?

Jasper, Agates, Porphyries and other rocks and minerals used for decorative purposes are found in considerable variety here but little use is made of them. The tourist on Lake Superior who buys a polished agate, for the reason that it is said to be found on the shores of that inland sea, and he desires it as a memento of his trip, often "gets taken in." Most of these agates originate in South America. They are taken to Germany where they are polished and stained, and shipped abroad to be sold to gullible tourists. These agates are about on a par with specimens that formerly were sold to tourists at Niagara Falls. The hawkers used to solemnly affirm that the rocks represented the solidified foam which gathers at the base of the Falls.

Limestones enters into probably more industries than does any other rock or mineral. The uses to which they, or their constituents, are put are almost innumerable, and the varieties of these rocks which are required by one industry or another are numerous. The older part of Ontario contains limestones adapted to use in any industry. We have those which are practically pure calcium carbonate. These are found among the rocks of the Laurentian series, the Grenville, and in the Cambro Silurian; the Chazy, Bird's Eye, and Black River, and Trenton, being normally of this character as are those of the Devonian, the Corniferous and Hamilton and recent marls. While others of the Grenville series and of the Upper Silurian system—the Clinton, Niagara, Guelph and Onondago—contain magnesia in varying percentages up to those which carry the highest amount of magnesia possible for a limestone, as distinguished from magnetite.

Limestones carrying a high percentage of calcium carbonate are a necessity in an important group of industries which have already been started in the Province and are sure to reach large dimensions in the future. Having no domestic coal some of our metallurgical industries, especially in the north, will be dependent to a considerable extent on charcoal, in the manufacture of an important by-product of which a pure limestone is a necessity. In beet sugar manufacture pure lime is also an essential; Portland cement manufacture requires limestone free from magnesia and certain impurities. In the manufacture of calcium carbide, an industry which is peculiarly adapted to this country, and as a flux for furnaces a pure limestone is also desirable. In the manufacture of sulphite pulp, on the other hand, a rock as high in magnesia as it is possible to obtain it is the most suitable. The fact that such rock is to be found here is important when we consider the field there is for the manufacture of pulp in the Province.

In many other industries lime or limestone is essential, and our supplies of this rock, of all kinds, is of greater economic importance than most people probably realize.

CONCLUSION.

That we should be optimistic of the future is shown by what has been accomplished in the mineral industry during the last decade. I shall conclude this paper by giving a comparative table, which speaks for itself, of our mineral productions ten years ago, and at the present time.

ONTARIO'S MINERAL PRODUCTION.

A RECORD OF TEN YEARS.

	1893	1903
Iron Ore.....	\$ 0	\$ 450,099
Pig Iron	0	1,491,696
Steel	0	304,580
Corundum	0	87,600
Arsenic	0	15,420
Feldspar.....	0	20,046
Iron Pyrites.....	0	21,695
Graphite.....	0	20,636
Zinc Ore.....	0	17,000
Pig Lead.....	0	1,500
Talc.....	0	2,625
Molybdenite.....	0	1,375
Calcium Carbide.....	0	144,000
Nickel.....	454,702	2,499,068
Copper.....	115,200	716,726
Gold.....	32,960	188,036
Silver.....	2,500	8,949
Bricks, etc.....	1,684,873	—
Stones, etc.....	721,000	—
Rock Cement.....	63,567	69,319
Portland Cement.....	63,848	1,182,799
Gypsum.....	7,363	7,910
Lime.....	364,000	520,000
Mica.....	8,600	102,205
Natural Gas.....	238,200	196,535
Petroleum, etc.....	2,188,690	1,586,674
Salt.....	149,850	388,097
Unclassified, etc.....	9,600	—
Total.....	\$6,105,953	\$12,870,593

On a Mineral Containing Radium in the Province of Quebec.*

By J. OBALSKI, M.E., Inspector of Mines, Quebec.

Since the new element "Radium" has been discovered, much attention has been called to the minerals containing it, so far, it appears that the Uranium ores are the only ones in which it has been found.

In our Laurentian formation Uraninite, composed of oxide of Uranium and other rare metals, has been met with in the pegmatite dikes which have been operated as producers of white mica (muscovite), and we have the records of the Villeneuve Mine, in Ottawa County, as to Monazite and Uraninite, and of the Maisonneuve Mine, in the County of Berthier, with Samarskite; we have also several other white mica mines and prospects in the Saguenay district, but so far Uranium ores from these have not been noted.

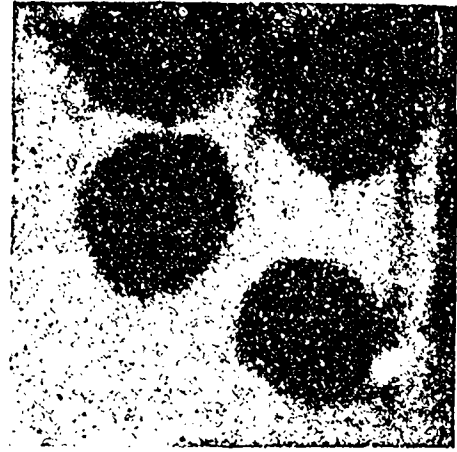
About ten years ago, I found in a white mica mine of the Saguenay district, then operated by the Canadian Mica Co., a remarkable specimen which I identified as "Cleveite," and which is shown in the accompanying photograph.

*Paper presented at the Sixth Annual Meeting of the Canadian Mining Institute, March, 1904.



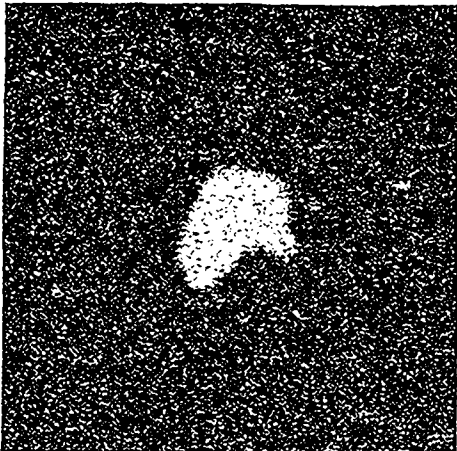
No. 1.

This specimen has a specific gravity of 8.43 and weighs 375 grams, or about 12 ounces, it is well crystallized in dodecahedron form, deriving this from the isometric system. A complete analysis has not yet been made, but the specimen contains 70.71% of Uranium oxide.



No. 4.

light. Nos. 2, 3 and 4 were taken through wood, with a nine hour exposure, and No. 4 is a radiograph of silver coins; No. 5 is also a radiograph of silver coins but through galvanized iron and after a 26 hours exposure; No. 6 is an impression of the crystal of Cleveite itself after a nine hours exposure, and Nos. 7 and 8 are impressions of other specimens of the same material after exposures of nine hours.



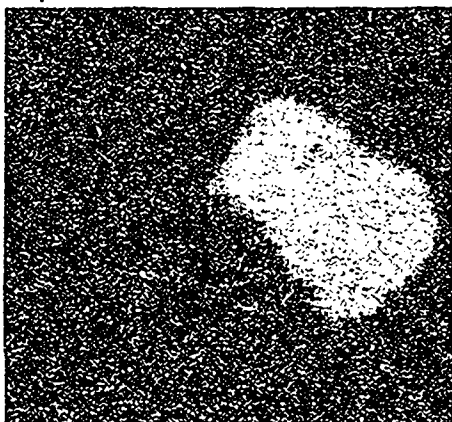
No. 2.

Radium having been discovered and found to exist mostly in connection with Uranium ore, I experimented with the above mentioned crystal, and found it affected photographic plates strongly, as shown by the accompanying radiographs (figures 2 to 8), which were taken exclusively by the radio active rays without the assistance of

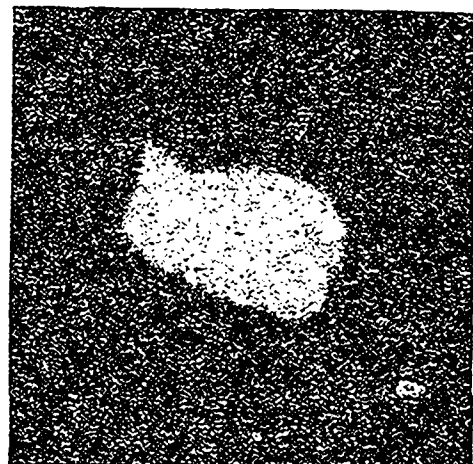


No. 5.

The specimen has also a well marked action on the electroscope. I, therefore, came to the conclusion that it contained Radium, and to have my opinion confirmed, I showed the specimen to Professor Rutherford of McGill University, who, after testing it, stated that its radio-activity was equal to four or five times the activity the crystal would have if it was entirely composed of Uranium, and that it con-



No. 3.



No. 6.

tained one-tenth of a milligram of Radium, making it comparable with the best pitchblende so far operated for the production of Radium.

This crystal may be an accidental one, although I have found other small pieces of the same mineral in this vein.

I have also found in this vein a carbonaceous material burning quite easily, and leaving a large proportion of ashes, containing oxide



No. 7.

of Uranium. Specimens of the above mentioned coal have been tested by Mr. Milton L. Hersey of Montreal, with the following results:

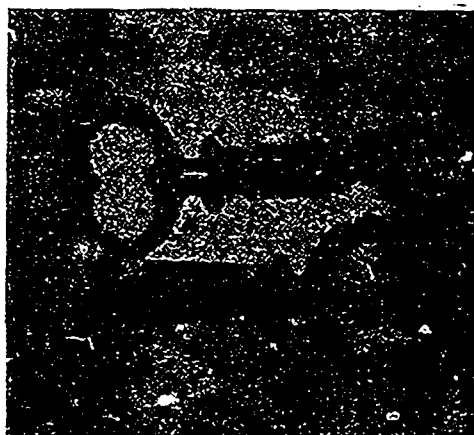
This "coal" has a fibrous, irregular structure and contains a small amount of mica; it proves to be of a similar nature to a non-coking bituminous coal, yielding considerable gas which burns with a bright, yellow flame.

Volatile matter (including volatile combustible matter and a small quantity of moisture)	40.185%
Fixed Carbon	52.59%
Ash	7.225%
<hr/>	
Total	100.00%

The ash itself was analysed and found to contain 2.56% of Uranium, based on the coal, which is equal to 35.43% of Uranium in the ash itself.

It is important to note that the color of the ash was olive green, due to the presence of oxide of Uranium.

In another test the coal was not burned but was merely finely pulverized and the powdered coal treated with boiling nitric acid to dissolve the Uranium compounds. It is interesting to note that the Uranium may be extracted by the direct treatment of the coal with nitric acid.



No. 8.

A specimen of this "coal" from the same place, tested in Montreal, was found to be radio active, as well as the ash it gave, this radio-activity being due to Radium.

I am not able to state what the relation is between the two specimens of "Cleveite" and "coal," but I think this fact important, and I propose to make a further investigation next summer.

The white mica vein where these specimens came from is situated near the lake "Pieds des Monts," about 18 miles back of Murray Bay, in the county of Charlevoix, on the north shore of the St. Lawrence.

NOTE—Since the above was read at the Meeting, I have had a letter from Mr. P. Curie, of Paris, in which he says that the small piece of "Cleveite" from Murray Bay, which I sent him, shows a radio-activity equal to six times that of the Uranium.

The Percussive Theory.

Information is wanted about the Percussive Theory as applied to Colliery Explosions. During the progress of the damage suits against the Crow's Nest Pass Coal Company for compensation in respect of the Fernie disaster Mr. E. J. Beard, Principal of the Scranton School of Mines, boldly adopted this as the solution of the problem affecting the instantaneous death of men in distant parts of the mine. He held that, long before the blast or concussive force of the explosion could reach these men, percussive waves passing (like waves of ether in air) through the strata caused paralysis of the heart by shock and instant death. After this the blast might come along and produce mutilation and other evidences of force but they were not the cause of death—the swifter messenger had already done its work. He quoted Chatellier and Dixon in support of these views. The subject is, to say the least, profoundly interesting both from a scientific and practical standpoint, and, if it should be demonstrated that another and hitherto unrecognized force has been effecting the dire results attributed to explosive blasts and poisonous gases, the whole rationale of explosions will have to be revised and practical preventives adjusted to the requirements. Clearly the first result would be the total abolition of blasting in gaseous or dusty mines since detonation of any kind is intimately allied with the propagation of percussion. At present the matter rests on a purely theoretical basis and is the result of an inductive theory of reasoning to account for some physiological conditions not sufficiently explained by any known hypothesis. The question is whether it has a scientific basis and can be demonstrated.

Some Recent Improvements in Gold Dredges.

Among the recent improvements which have been made in the appliances used on dredges employed in working gold gravels is the substitution of a polygonal revolving screen in the place of the usual circular screen. In the ordinary circular screen the gravel and associated small stones have a tendency to lie in the lowest part of the screen, in a line parallel to the axis, and as the screen revolves this mass of material rises with the motion of the screen for a foot, or perhaps 18 inches, and then slides back to the lowest element; it does not turn over and over so as to afford rapid and continual sizing. To remedy this defect and to assist in turning over the material, bars of angle iron or similar shapes have been rivetted upon the frame work of the screen so as to carry up portions of the gravels and dump them again from a position varying from 90 to 180° of the turn. The introduction of these longitudinal bars has been accompanied with doubtful results: if these bars are too high up from the screen, stones and small pebbles get jammed between the screen and the bar, and frequently make one or more complete circuits, or, a large stone may be carried up to a

certain height and then fall, bruising, bending or damaging the sparge pipe. The improved screen proposed is hexagonal, octagonal, or better yet, decagonal in section, which affords two or three distinct advantages. In the first place the polygonal section permits the screen plates used to be flat and to be put on in sections, thus making renewals easy and permitting the plates to be of any thickness: secondly, each flat plate, forming a side of the polygonal figure, carries up the gravel a greater distance than any circular shape would permit, and, when the material leaves that plate it falls or is dumped upon the plates below giving an impact to the wet gravel which breaks it up and is the equivalent of the jerking motion customary with a reciprocating screen: thirdly, there is much less tendency for the holes, or meshes, of the screen to become clogged as is frequently the case with circular screens. Another great advantage of the polygonal shape is that the plates can be thickened in the centre where the chief wear takes place, or, if perforated plates are used, they could be made of manganese steel (which is too hard to tool) and which would have the holes cast in it, and which, as experience has shown, is much less susceptible to attritional wear than any other metal known.

Another improvement noted is called the "Davis Patent Grapnel" which is intended to supersede the ordinary grab-hook used on the bucket chain. The construction of these grapnels is such that on reaching the polygonal bottom tumbler of the bucket chain they are made to project past and beyond the line of the bucket lips and tear into the gravels ahead, raking and working them up for the buckets which follow; as soon as these grapnels pass beyond the bottom tumbler they recede within the line of the bucket lips and remain there until their next passage round the bottom tumbler. The ordinary grab-hook used on the bucket chain does not project much, if any, beyond four inches beyond the line of the bucket lip, but it is the first thing to catch the drop shute when lowering the ladder; the grapnel hooks are stated to keep within the line of the lips when passing the drop-shute and in consequence the ladder may be lowered further with the grapnel than when equipped with the grab-hook.

The Matane (Que.) Copper Deposits.

In the annual report of the Quebec Department of Mines for the year 1902, Mr. J. Obalski, M.E., Inspector of Mines for the Province, made mention of an interesting occurrence of copper ore on the Gaspé peninsula. The comment made by Mr. Obalski, upon this occurrence is most interesting, and the subsequent exploitation which has been made by a corporation known as "The Matane Mining and Smelting Co." is again proof of the possibility of Quebec's possessing mineral resources which are at present little known and less appreciated by the inhabitants of that province.

The REVIEW has recently had an interesting interview with the engineer who has been in charge of the work which has been done on this deposit. It lies in the townships of both Tessier and St. Denis, in the county of Matane, and is found over a total area of about 1,000 acres, of which approximately one half lies in the 5th range of St. Denis, and the other half on the northern end of the 5th and 6th ranges of Tessier township. The cupriferous territory lies on foothills which extend along the northwestern slope of the Shickshock Mountains, and which have an average elevation of about 500 ft. above the St. Lawrence River.

The presence of grains of native copper in the boulders found along these foothills was noted some ten years ago in the reports of the Mines office, but no exploratory work was done until the summer of 1902. The Matane Mining and Smelting Co. (which has absorbed and united the previous local companies operating there) is prosecut-

ing work with a force of about 15 men, and has a small plant of an hoisting engine, pump and steam drills in operation. Two shafts have been sunk upon a belt of limestone, which, for the greater part, is of a whitish color, but in places is colored black or dark gray in consequence of the admixture of a considerable amount of carbonaceous material, which strongly resembles the material *anthraxolite*; these blackish portions of the limestone are notable as containing disseminated particles of metallic copper, and also as containing segregations of a secondary copper mineral, bornite.

The fundamental rocks of the Gaspé peninsula (according to the Canadian Geological Survey) are the schists of the Cambrian formation which are known as the Sillery and Levis groups. These schists are penetrated by dikes and intrusions of eruptive rocks of which diorite and diabase are the commoner forms. Lying along one of these bands or belts of diorite which forms, as it were, a wall for the belt of crystalline limestone just mentioned, occurs a wide stratum or belt of this limestone, with schist forming the other wall. The minerals which have been observed by the workers have been metallic copper in grains, green and blue carbonates of copper (malachite and azurite), cuprite, bornite and chalcocopyrite, the latter of course being the prevailing copper mineral, but in many places the admixture of bornite with chalcocopyrite is so plentiful as to substantially increase the percentage of copper obtained from the clean material. Metallic copper particles of considerable size have been found in boulders both of diorite and of limestone; on the surface of the land the largest piece of native copper known to have been found weighed between four and five pounds.

Assays show that the minerals of copper contain high values in gold and silver; a list of assays made by Mr. Armand Muscovici, the engineer in charge, show values ranging from \$5.00 to \$1260 to the ton. These assays, however, were made from portions of a deep diamond drill hole which was put down on the southeast side of the shaft to a depth of about 640 ft. The log of this hole shows the strata to have been quartzite, quartz porphyry and diorite in descending order; on the north side the sequence was schist, diorite and quartz porphyry.

Reference is made to this matter chiefly for the purpose of showing the possibilities of this portion of Quebec province. The Gaspé peninsula both on the St. Lawrence side and on the Baie de Chaleur side has given considerable evidence of the possibility of this peninsula becoming a considerable producer of mineral at no remote period, specimens of both lead and copper ores having been found along the foothills of the Notre Dame Mountains. Dwellers in the province of Quebec know very little of the resources of their own province and the REVIEW may, perhaps, be permitted to say to the Provincial Department of Mines that, there is yet a very large field in which that Department can exercise its best efforts in order to make the provincial resources better known to the public.

Pig Iron Statistics.

The quantity of pig iron made in Canada in 1903, was 321,190 tons.

The bounty paid on pig iron made from Canadian ores (46,450 tons) in 1903, was \$125,415.00.

The bounty paid on pig iron made from foreign ores (274,740 tons) in 1903, was \$494,533.00.

The production of steel ingots and castings made in Canada in 1903, was 235,122 long tons.

The bounty paid on steel ingots in 1903 (232,640 tons) was \$628,131.00.

The bounty paid on puddled bars in 1903 (2,482 tons) was \$6,702.00.

The production of nickel in Ontario for the year 1903 amounted to 6,998 tons valued at \$2,499,068, this is the largest quantity yet produced by this Province.

BOOK NOTICES.

From the King's Printer comes a Government publication entitled—"Altitudes in Canada" accompanied with a relief map of North America, and four profile sheets extending from the St. Lawrence River to Vancouver. The work is of value as a reference book, and as such should have a place on the shelves of every engineer practicing in Canada.

The University Press, Knoxville, Tenn. has just issued the 4th edition of a vest-pocket book of engineering and other data, which not only is very neatly gotten up but is an unique method of advertising to the South the value of the technical training given to its students.

The success of the book is shown by the fact that the demand has already absorbed over 15,000 copies, and a fourth edition of 5000 has just been issued. In addition to the ordinary mathematical tables we note the introduction of several tables relating to electrical work, such as losses in wiring with voltages ranging from 200 to 2000, cost of arc lighting, &c. &c. The issue is a credit to Prof. Chas. E. Ferris, who has edited it.

Vol. X of "The Proceedings and Transactions of the Nova Scotia Institute of Science," has been received and is fully up to the standard of the previous volumes of this Institute. Among the papers which are of especial interest is one on "The Progress of Geological Investigation in Nova Scotia" in which Dr. R. W. Ellis of the Canadian Geological Survey gives a clear and succinct account of the workers in that Province, and of the work they have done. Another interesting paper is a sketch of Mr. Andrew Downs by Mr. H. Piets. Mr. Downs was a native of New Jersey who came to Halifax in 1825, and founded the first Zoological Gardens in America in the City of Halifax in 1847, thus antedating the Central Park collection by 16 years.

The fourth annual "Copper Handbook" of Mr. Horace J. Stevens which has reached our table is the largest and most complete of the volumes yet issued. Chapter XV, containing detailed descriptions of the copper mines of the world, has been entirely rewritten and revised. The number of mines noticed has been increased by 50%, and the descriptive matter of the producing mines has been greatly enlarged. The growth of *The Copper Handbook* has been marvellous; Mr. Stevens started in 1901 with a list of less than 300 Lake Superior properties only, the number of pages in the first volume being 328; each year has seen an increase in the number of properties described and a widening of the field noticed until the present fourth edition covers the production of the whole world and lists 3311 different properties.

Not less marvellous is the thoroughness with which the information has been edited. It is impossible to avoid all errors, and the REVIEW has observed a few minor ones—for instance, the plant which the Roseland Power Company has erected to treat the low grade ores of the Centre Star and War Eagle mines does not use the "Elmore process" nor any oil process, but a method of progressive water concentration: neither did the Montreal & Boston Copper Co. ever smelt for "about \$1.40 per ton."

The Copper Handbook is published by Mr. Stevens at Houghton, Michigan, and sold at the low price of \$5.00 per copy, it is well bound in green linen. One of Mr. Stevens original ideas is the sending of the book, on request, to any part of the world, without any advance payment. The circulation of this work, while not large, is yet very thorough, reaching almost every country in the Universal Postal Union; everyone interested in the copper industry, in any of its phases, will find this handbook indispensable to him.

MINING NOTES.

NOVA SCOTIA.

The output from the Dominion Coal Company's collieries for May 1904 was 301,240 tons.

The Cumberland Railway & Coal Company's output from January to May 1904 was 165,718 tons.

Extensive improvements have been made in the Newcastle Collieries Co.'s mine at Port Morien with the object of increasing the output of coal. Among other improvements are a Rand air compressor and two 500 h p. Babcock & Wilcox boilers.

Rumor has it that Mr. H. M. Whitney, of Boston, and B. F. Pearson, of Halifax, who were the promoters of the Dominion Coal and Dominion Iron & Steel Companies, have formed a company and secured control of coal lands at Inverness Mines, Port Hood and Chimney Corner, together with the railroads now being operated there in connection with these mines.

Hereafter the several collieries of the Dom. Coal Co will be known by their respective numbers viz:—Dom. No. 1, Dom. No. 2, Dom. No. 3, Dom. No. 4, (Caledonia), Dom. No. 5, (Reserve), Dom. No. 6, (New colliery, Big Glace Bay), Dom. No. 7, (Hub), Dom. No. 8, (International), Dom. No. 9, (Dom. No. 2 Harbor seam.) The No. 1 pier shall be known as Dom. 13 and the No. 2 as Dom. 14

The Mic-Mac Gold Mining Co. at Millipsigate, N. S., has put in a new air compressor and has also purchased a water power at Port Medway River. Electricity will be used to run the plant and light the mine. A ten stamp mill is now in operation and five more stamps will shortly be added. The shaft is now down 400 ft.

The Morgan Construction Co. which built the rail mill of the Dominion Iron & Steel Co., at Sydney, Cape Breton, now just about completed, will erect similar works in several places in Germany and France.

The manufacture of the material furnished by the Dominion Iron & Steel Co., is being undertaken in small part by local concerns. The Cape

Breton Iron & Steel Co., one such concern, is to erect buildings to be used for a foundry and for a machine shop and forge shop, at Sydney, Cape Breton.

ONTARIO.

A small stamp mill is to be erected on the Steele property in Sturgeon Lake District.

The International Asbestos Co. has sold its property at Actinolite, Ont., to the American Cement Co., who intend to push the manufacture of the product.

The National Gold Mining Co. are said to be carrying on successful operations in the Manitou district. Work is progressing on the 100 ft. level and it is reported that a rich vein which crosses the shaft diagonally at 50 ft. depth has been cut on this level.

A despatch from Rat Portage advises that the Dominion Reduction Works at Rat Portage will have its mill kept busy this summer in consequence of a contract made with the Gold Reef Mining Co. to mill the large dump of ore which the Gold Reef Co. now have ready.

A company is attempting the concentration of merchantable iron ore from the iron ore sands found along the north shore of Lake Superior. The plant is to be located near Nipigon, and magnetic separators are to be used.

Location A. L. 282, Atikokan district, is again attracting attention owing to the placing of a small stamp mill on the property. A shaft has been put down to a depth of 280 feet, and several levels driven off. The vein is reported as averaging 3 feet in width and \$7.00 in value.

Rumor has it in Rat Portage that Buffalo people have bought the old Champion mine and that work will begin at once. The Champion has a shaft some 200 ft. deep and several hundred feet of levels but no mill. The new owners are beginning cautiously as they propose a 5 stamp mill as a starter.

Mr. T. W. Gibson of the Bureau of Mines has sent an exploring party into the region north and west of Abitibi Lake. The party which will investigate the mineral and agricultural possibilities of the region, consists of Mr. J. G. McMillan, M. A. (in charge) with Mr. A. Henderson as agricultural expert. The region thus to be explored lies on the line of the projected Grand Trunk Pacific Railway.

It is stated that great activity is going on in the Manitou District. The Laurentian Mining Company's property at Gold Rock, is reported to be producing ore of extraordinary richness. Arrangements have been made for the completion of camps, installation of machinery and the erection of a 20 stamp mill, which indicates that the camp will be an exceptionally busy one this summer.

Mr. Robert H. Flaherty who has been prospecting the ranges of Ontario for iron ores for several years on behalf of certain iron corporations in the United States, announces that he is uncovering a big deposit of Bessemer hematite within one mile of the C.P.R. main line. Mr. Flaherty is reported to say that the deposit is of better quality than any he had seen with the possible exception of some portions of the Atikokan range.

The E. v. Commissioner of Crown Lands and the Director of the Bureau of Mines gave audience recently to Messrs H. Appleton and P. Primeau on an application for a provincial bounty on copper. The argument shown declared that the gentlemen named were interested in copper properties lying in the Township of Salter, that they could not dispose of their product without exporting the ore at very heavy charges for transportation, and asked for assistance in the shape of the bounty if they should erect a smelter to produce a copper matte containing 80% to 90% of copper. The two gentlemen making this application were Canadian born but are now residents of Michigan. The Commissioner promised consideration.

The Ontario Mining & Smelting Company, at Bannockburn, Ont., have put the new concentrating plant at work on the old dumps left by the Hollandin Company. The shaft has been retimbered and sinking resumed. The milling plant consists of a building 35'x45', into which the ore is delivered on an upper floor. After passing through rock breaker the ore is delivered to screens, from which the various sizes pass to jigs and shaking tables. The mill needs the labor of two men per shift, and handles 30 tons in the two shifts; the 30 tons of crude ore produce about 4 tons of concentrates, or a reduction of 7½ into 1. The concentrates are low in grade, owing to dump material being treated, but the tailings are remarkably clean. The vein carries about 30% of clean galena, which is cobbled out and shipped as lump ore. The blast furnace is nearing completion. All the work of design and construction has been under the direction of the Superintendent, Mr. H. F. E. Gamm.

Some Western Ontario papers, and a few Michigan journals, in making comment upon the troubles which have been pursuing some of the Lake of the Woods properties in the Courts and elsewhere, allude to a Mr. M. A. Meyers of Buffalo, who acted as promoter and optioned a number of mineral properties in Western Ontario, some of which it is understood were successfully floated but others of which did not enjoy as good fortune. The Big Master mine in the Wabigoon District is one of the properties which has gotten into trouble by reason of a Mr. Barron exchanging a town property for some mining stocks. Last winter, at a meeting of shareholders, it was revealed that the Big Master mine had no money in hand and a large amount of floating indebtedness. By reason of these difficulties, litigation between Mr. Meyers and Mr. Barron is already in sight. The matter is worth mentioning only as indicating how possible remunerative properties have been slaughtered and sacrificed through the grotesque ideas of promoters and men ignorant of mining business. The Jubilee mine, well known to our Ontario readers, was capitalized at the ridiculous sum of \$3,000,000 and the stock sold at 10% of par putting a valuation on this prospect of \$300,000. In 1899 this same Jubilee mine was examined by a competent engineer for

eastern people, and its purchase on a valuation of \$75,000 was *condemned*. Yet, by the broker and promoter, the mine was offered as a good purchase at four times the value which the engineer refused to sanction.

BRITISH COLUMBIA.

The Slough Creek Mining Company at the statutory meeting held in London at the beginning of the month voted to issue 40,000 10% cumulative preferred shares, preferred as to 40% of the profits, and redeemable at 110.

The St. Eugene mine is now working full time and has 280 men on its pay roll. Contracts with the British Columbia smelters and with Belgian ore buyers assure steady work for about two years.

The Sunset mine, at Sandon, issued its cheques for the 11th dividend at the last of May. This mine is maintaining its reputation for high grade ore shipments, the average running 140 ounces of silver and 80% lead.

The lessees of the Chapleau mine, Slocan Lake District, have struck a body of ore which assays well, and a steady run of the mill is probable. This property prior to May 1904, had been idle for three years.

The Queen Bess mine, and the Wakefield have both forces of lessees at work; the former is working some good ore on the 5th level, the latter has not yet obtained as satisfactory conditions.

Prospectors on Cottonwood Creek, Toad Mountain, have found a ledge, varying from 18" to 40" in width, of white quartz, carrying iron pyrites and free gold. Some of the specimens are fine examples of free-milling quartz, the gold showing in large particles.

The B. C. Standard Mining Co. Ltd., owners of the "Hunter V" mine near Nelson are making regular shipments to Northport, Trail and Nelson, where the ore is used as a lime flux. It carries considerable values in gold and silver as well as a large percentage of free lime.

A discovery of a three foot seam of bituminous coal at the entrance of Wulfsohn Bay, Malaspina Strait, B.C. is announced, and licenses for nine square miles have been applied for. The coal seam has been examined by a Mr. W. Ashman who has endorsed its quality, and the large area of the field.

The Sullivan Group Mining Company of Marysville, East Kootenay, has experienced a change in its executive. Mr. Chas. Sweeney has secured an option on one million shares of the Company at 10c. per share, and will receive 450,000 shares as the bonus for underwriting the bond issue. The total capital is 3,000,000 shares.

The average monthly output of the Boundary mines during 1904, has been about 70,000 tons; if this is kept up for the year the annual output will aggregate 850,000 tons. The Granby mines contributed nearly 70% of the whole output, and the Mother Lode about 24%, leaving 6% for the Montreal & Boston aggregation and the smaller mines.

The Helen Mine at Greenwood J. C. struck the vein in its crosscut on the 7th of June. The ore seam was 14 inches in width and ran high in values, the native silver showing freely in the ore taken out. It is surmised that this vein is the southern continuation or counterpart of the Elkhorn, which lies north of the town.

A dividend of ten cents per share was declared last month by the Providence Mining Co. of Greenwood, B. C. This is the third dividend earned by this mine, two of ten cents each having been paid last year. The Company's operations, though not extensive, have been successful and profitable, owing to the excellent management which has characterized it since its inception.

Advices from Rosland state that the output of the mines in that district for the week ending May 30th. was.—Le Roi 1,225 tons, Centre Star 1,389 tons; War Eagle 1,130 tons; Le Roi No. 2, 350, and milled 280 tons; Spitzee 30 tons; I. X. L. milled 100 tons; Jumbo 2,000 tons. The total production for the year to date is 156,942 tons.

The Gold River Mining & Power Co., which has acquired about a mile and half of river diggings on Bull River, near Fort Steele, will commence active operations on an extensive scale this month. The bed of the Bull River is reported to be rich in placer gold and the outlook is most encouraging for a large amount of development work being done during the present season.

Mr. A. B. W. Hodges, Smelter Superintendent, at Grand Forks, B. C., has been appointed the General Superintendent of the Granby Consolidated Mining, Smelting & Power Company. Mr. W. Y. Williams, former Mining Superintendent, has been appointed Consulting Mining Engineer. These changes are the result of the growth of the Company's interests at places outside of and beyond Phoenix, B. C. which necessitate the services of a mining man almost continuously.

The Slough Creek Mining Company, an English corporation who own several miles of Slough Creek, Caribou District, report that their last effort to reach the rich gravels of the lower strata has been successful. A shaft was sunk off the known underground water course, and a level driven below the low stratum known to carry gold. From this level an upraise was made to the gravel bed, and a sufficient quantity obtained to prove its richness. Work will now be directed to obtaining this gravel in regular quantity so that dividends may be assured.

The Hall Mining & Smelting Company have been making improvements about the smelter consequent upon the activity given to the lead question by the resumption of mining operations. Both stacks have been running steadily on lead ores, and will continue to do so so long as shipments are received from the St. Eugene mine.

The Davys lease on the Silver King property expires in August 1904, and the Company are not prepared to say that it will be renewed.

The Emma Iron Mine at Eholt, B. C., operated by the Hall Mining & Smelting Co. is still shipping at the rate of 130 tons per day, which are distributed to the smelters of the Boundary Creek country, to the Canadian Smelting Works at Trail, and to the Hall Company at Nelson.

The new Montreal & Boston Consolidated corporation has formed an underwriting syndicate in the persons of Messrs. Brent Good (Carters Little Liver Pills) Leach (Farwell, Leach & Co., bond-brokers) and Loomis (National City Bank), all of New York City. The shares are now being offered at 30% of par—giving a flotation value of \$2,250,000 to the aggregation whose nominal capital is \$7,500,000. This percentage allows \$1,500,000 for the purchase of the Dominion, Morrison, Athelston-Jackpot, 3/4ths Emma, \$150,000 cash working capital, and syndicate's profit, and puts a valuation of \$450,000 on the M. & B. smelter combined with the Sunset mine. In boom times the syndicate would make a handsome profit, but with present conditions it looks like a waiting proposition.

The Elk River Power & Light Co., have started work at Elk River Falls, and will proceed to install a large power plant immediately, which will furnish power to all the industries in the Crows Nest Pass region. The establishment of this plant will prove to be an important factor in the development of mining in South East Kootenay, its chief aim being to supply electricity, for conversion into power and light, in connection with mining operations in the Kootenay valley. It is also the intention of this company to construct an electric railway from Elko to Michel, which will solve the the problem of cheap transportation for coal and coke, and in the event of the erection of a smelter,—which must necessarily come,—this cheap and efficient means of transportation of fuel will be one of the essentials for the successful operation of the smelter.

NORTH-WEST TERRITORIES.

Oil has been struck at Pincher Creek, Alberta. The flow amounts to three hundred barrels daily.

Advices from the Frank Mine state that over 100 men are now employed and large quantities of coal are being delivered daily to the C. P. R., who are taking the whole output for their own use. 350 tons per day were taken out of the main entry and loaded on the cars. The shaft is now down 360 feet and promises to maintain a large output.

YUKON.

A Dawson Despatch advises that the royalty paid on output to 1st of June, is the largest amount ever paid to the same date by the district. The production to June 1st is reputed as 55,753 ozs; for 1903, the output to 1st of June totaled only 11,000 ozs.

INDUSTRIAL NOTES.

The Ottumwa Box Car Loader Co., of Ottumwa, Ia., U.S.A., whose advertisement appears in this issue, is making some progress in getting its machinery introduced into Canada, and report that its representative will spend considerable time visiting the mines during July and August. The machines introduced by this Company are proving a great success, and if, as is claimed, they greatly reduce the loading expense, and at the same time will prepare the coal in better condition for the market, they will unquestionably be much sought for by both producers and dealers.

The Canadian Westinghouse Company, Limited, of Hamilton, Ontario, have recently closed a contract to furnish the Shawinigan Water & Power Company, Shawinigan Falls, P.Q., with a 6,600 K. W., two-phase, 2,200 volt, 3,600 alternations, Rotating Field Alternator, for direct connections with water wheel. Two 2,200 K. W. Oil Insulated Water Cooled Transformers, 2,200 volt primary, 50,000 volt secondary, are included in this contract.

The Canadian Westinghouse Company, Limited, of Hamilton, Canada, has sold to the Northern Electric & Manufacturing Co. Limited, of Montreal, Que. a 300 KW. Steam Turbine unit, consisting of a Westinghouse-Parsons Turbine and a Westinghouse Turbo-Alternator. They report numerous inquiries for these units and anticipate a brisk demand for them in Canadian territory.

Machinery Hall at the St. Louis Fair is not closed in the evening, as are the other buildings, and in consequence the big 5000 H. P. Allis-Chalmers-Bullock engine which drives the electric generator is a constant source of interest to the evening visitors. This engine and generator produce the current which illuminates some 120,000 decorative lamps scattered all over the buildings and grounds.

Mr. C. C. Tyler has resigned his position as Superintendent of the Works of the Westinghouse Electric & Manufacturing Co. at East Pittsburg, Pa., and has been appointed General Superintendent of all the works of the Allis-Chalmers-Bullock interests in the United States. Mr. Tyler will make his headquarters at Milwaukee. Before Mr. Tyler went to Pennsylvania he had made an excellent reputation, and at Pittsburg he enhanced this by the results he achieved in increasing the efficiency of the Westinghouse Electric Works. In the equipment of manufactories, in the design and construction of machine tools in the handling of machinery and material, in processes of manufacture, and in fact in all that pertains to the economy of machine shop administration, Mr. Tyler is recognized as an expert. His appointment is another evidence of the care and strength by which the Allis-Chalmers-Bullock Company is being wrought together.

The St. Louis Exposition, in the Mining Division, will contain a 5 stamp mill of the exact size, weight and dimensions of a unit of the Homestake mills, accompanied by an equipment of amalgamating and cyaniding devices such as are employed by that corporation. The mill is donated by the Colorado Iron Works of Denver, Colo. and the daily cost will be financed

by an appropriation from the State of South Dakota, helped by the Black Hills Mining Men's Association. The equipment will require at least 1500 tons of ore to keep it in operation for an extended period, and contributions of ore parcels have been promised by mine owners in different localities in the Black Hills. Mr R. P. Akin of Denver, and Mr. B. C. Cook of Deadwood will be in charge of the running of the plant, which is intended to make clean-ups twice a month. It has been suggested that the plant may be used to make test runs on outside ores, but authority to do this has not yet been granted by the exposition authorities.

Messrs Peacock Bros., the Canadian representatives of Hadfield's Steel Foundry Works, at Sheffield, England, and whose offices are in the Canada Life Building, Montreal, have sent us an interesting copy of the London Times containing an account of a recent inspection of the Hecla Works of the Company by a section of the Institution of Civil Engineers, accompanied by representatives of the British Ordinance Committee and military attaches of foreign nations. A number of projectiles which had been fired at armour plated targets were exhibited, many of which had passed through the armour plates, so that the efficiency of the cap of mild steel was well demonstrated. A 12" shell which had passed through a 7" nickel steel plate appeared none the worse, being only slightly scratched on its sides. The foundries, machine shops and other departments were visited and a number of tests made to exhibit the properties of some of the steels made by this Company. Some 15 or 16 years ago the founder of the Company, Mr. Robert Hadfield, held the opinion that cast steel could be used, not only for common shells, but also for armour piercing shells, which view was opposed to the opinions of metallurgists and artillery experts of that day. The British Government authorities however encouraged Mr. Hadfield to proceed with his experiments, with the ultimate result that tests made by the Hadfield Company's steel projectiles showed that the same were suitable for perforating wrought-iron and compound plates. The Hadfield Company, however, have given attention to means of defence as well as of attack, and have recently produced a plate for the protection of mounted guns which possesses some unusual qualities. It is made of cast steel of a special description, to which the name "Era" steel has been given. At a test a 4½" armour piercing shell, fired at a velocity of 2100 foot-seconds, was successfully resisted by one of these plates 6" in thickness. The same plate resisted a 6" common shell and 6" Lyddite shell, and was only partially pierced by a 6" armour shell having a velocity of 2039 foot seconds, and a striking energy of 2880 feet tons. A Krupp cemented 4½" plate under similar tests was completely broken up. The tests made on armour plate have disproved the long maintained contention that to produce trustworthy articles it is necessary to put mechanical work on the metal, that is to say, that the metal must either be forged or rolled. The fact that the Hadfield Company have been able to produce cast metals which have achieved such results as these is striking and full of significance. The means by which the Hadfield Company have achieved their results are, of course, secret and held as one of the assets of the business. The public is informed however, that the success of the Hadfield Company's steels is due to the result of chemical research into the action of minute differences in proportions of the different alloys of iron, and also to the subsequent special heat treatment to which the material is subjected. Among the other exhibits at the Hecla Works which were shown were castings for tramway and railway work for both rolling stock and permanent way. The rapid wearing action to which points and crossings are subjected have led to the same being manufactured of manganese steel by the Hadfield Foundry. This steel being both hard and tough has a very great resistance to wear and tear, and at the same time is not brittle, as would be the case with ordinary high carbon steel. The advantages of this metal for points and crossings, which are subjected to strain and shock to a very high degree, will be at once appreciated by engineers. The only difficulty with manganese steel which is presented is its hardness, which prevents its being machined, since no steel tool will cut it. Therefore it must be cast into whatever shapes or dimensions are required. The works of the Hadfield Company cover some 80 acres, and the steel foundry is one of the largest in the world, covering alone 6 acres. Over 4000 men are employed in this establishment.

ELECTRICAL NOTES.

ELECTRIC MOTORS FOR MINING WORK.—One of the questions that is agitating the engineering side of the mining world at the present time relates to the best form of electric motor for use in mines. The continuous current motor has done very good service, and thousands of that type are in use in mines all over the world, driving mining plant of all kinds; but recently, since the advent of the three-phase motor, the continuous current machine has fallen somewhat into disrepute. The continuous current motor has a commutator, while the three phase motor has none, also, the continuous current motor has the whole pressure of the service (usually 500 volts) in the revolving portion. While the rotor of the three phase motor has only approximately one-tenth of the pressure of the service, so that with a three phase machine there is less danger of shock, and a better chance for effective insulation. For small motors also, especially where the motor can be started without any load, the rotor (the moving part of the apparatus, the part corresponding to the armature in continuous current machines) need have no connection with the outer circuit, nor with any other part of the machine itself, while with larger apparatus the arrangements for starting against a load, are less liable to break down, or to sparking, or heating, than those used in connection with continuous current motors. Hence it is not surprising that three phase motors are making the running. When they were first introduced there were prophecies as to what would happen in mines if they were used, and the non-happening of the things prophesied has set the pendulum swinging rather violently in the other direction. The three phase apparatus is very useful, and very simple, and will probably be found to be more suitable for many situations in mines. Its adoption must be made with the eyes open, however. Three cables have to be used in place of two, and though this is not a serious matter, it is as well to remember it when drawing the balance sheet between the two. A more serious matter is

the fact that a large current has to be generated uselessly, owing to the fact that in alternate current work, the pressure and current are rarely in unison at any instant. The actual power given to a machine being known, the useful power is found by multiplying the current and pressure together, and then multiplying this product by a fraction which is rarely more than 0.8, while the full current has to be generated, just as if it was usefully employed. This leads to another drawback. In starting any motor, the current taken for the starting period is very large and the drop in pressure is great in proportion; with three phase apparatus this is very much accentuated, owing to the fact of the current pressure not acting together, and it is, therefore, found difficult to keep the pressure constant at both unless the generator is very much over its work. The generating capacity at the mine ought to be well in excess of its work, as one can never know when some extraordinary accident may happen, and if the capacity is to the requirement, the mine may have to stop through failure of power, while if it is well over its work the mine may be kept going till the matter can be attended to. There is another point, in the three phase motor the revolving part runs very close to the stationary part, and this leads to stoppages from very slight causes; this can be overcome by care, or by sacrificing a certain part of the efficiency of the apparatus.

THE TURBO-ELECTRIC SYSTEM IN MINING WORK.—The Newhouse Mines & Smelter Company, has adopted Westinghouse steam turbines and electrical apparatus for furnishing the power for mining operations in Utah, and for local lighting. Mining operators have but lately awakened to the advantages of the turbo-electric system for securing economy in mine operations, and the Newhouse plant will be of interest in this particular field. A notable precedent has already been established by the adoption of turbines of the same make by the DeBeers Mining Co., Limited, South Africa, where two 1,000 K. W. Westinghouse-Parsons turbines are already in operation and a third is under construction.

The Newhouse Mines & Smelter Company's new power station is at the terminus of the Oregon Short Line Railroad, twelve miles from Frisco, Utah. Power will be generated at 440 volts and transmitted at 2,300 volts, a distance of 9,000 feet from the power plant to the mines, where it will be stepped down to 400 volts for the motors in the concentrating mill situated at the mouth of the tunnel. Power will also be used to drive a motor generator set for the operation of mining locomotives in the main tunnel. The entire electric system is a 3-phase with a frequency of 7,200 alternations per minute.

The generating plant consists of two 400 K. W. Westinghouse-Parsons turbines with 3-phase generators of like capacity. The turbines will operate under 150 lbs. steam pressure, 27" to 27½" vacuum, and approximately 80 degrees Fahr. superheat at the turbines. An individual surface condenser will be provided for each turbine. The boiler plant will consist of three 280 H. P. Babcock & Wilcox boilers to carry steam at a pressure of 155 lbs. with superheater at the boilers of 100 degrees Fahr.

The plant is being erected and equipped under the charge of Robert F. Moser, M.E.

The Mining of Antimony.

Twenty years ago antimony was discovered in Nova Scotia. The location of the ore is at Rawdon in Hants County. A few years ago this property was acquired by Mr. A. McNeil of Halifax, and others, who, under the name of the Dominion Antimony Company, have spent a great deal of money in development work with very encouraging prospects. This shaft is about five hundred feet down, and one thousand feet of levels have been made. The ore carries considerable quantities of gold as well as antimony. A thirty-ton lot of ore recently shipped to London gave a return of \$50 per ton in gold, and this is a fair representation of the ore found on the property. The old owners of the property years ago took about 3,000 tons of ore from the mine, which was treated for antimony only. If that ore contained the same proportion of gold as the recent shipments these people threw away about \$150,000.

The most important question that has now to be solved is the treatment of the ore at the mine. Not very long ago it would have been said that the gold could not be extracted from such an ore as this, but at the present time there are two companies in England buying gold in antimony ore—and it will not be long before a plant for ore reduction will be established at the West Gore Antimony Mines, which will be the most interesting yet introduced into this province. The company now employs 40 men at the mines. The opening of the Midland Railway is of great assistance in the development of this district.—*Hants Journal, March 1904.*

Comparative Statement of Importation of Mining Machinery.

MONTH.	1902.			1903.		
	Free.	Dutiable.	Total.	Free.	Dutiable.	Total.
January....	\$ 92,984	\$ 2,549	\$ 95,533	\$ 77,298	\$ 7,676	\$ 84,974
February..	43,123	2,380	45,503	30,106	1,587	31,693
March.....	55,225	2,629	57,854	83,535	11,534	95,069
April.....	61,227	5,087	66,314	104,967	4,638	109,605
May.....	90,820	4,782	95,602	155,493	1,469	156,962
June.....	77,270	5,293	82,563	155,387	6,579	161,966
July.....	47,511	2,171	49,682	128,730	4,737	133,467
August....	90,798	1,139	91,937	105,838	3,119	108,957
September..	82,090	8,906	90,996	89,463	6,086	95,549
October....	57,011	4,040	61,051	110,570	1,641	112,211
November..	56,292	9,395	65,687	106,897	9,493	116,395
December..	45,359	1,677	47,036	60,489	11,710	72,199
	\$759,740	\$50,048	\$849,788	\$1,208,773	\$70,247	\$1,279,047

Yukon Gold.

The gold yield from the Yukon, from 1st July, 1903, to 29th February, 1904, was \$7,101,243.42, on which royalty to the amount of \$179,982.20 was collected. In 1903 the Government expended on roads and bridges in the Yukon, the sum of \$310,818.91.
The gold exported from Canada in 1903, was \$16,437,328.00.

Coal.

	Tons	Tons
Nova Scotia:		
Cape Breton.....	3,719,400	
Cumberland.....	593,475	
Pictou.....	697,743	
Other Countries.....	234,629	
British Columbia.....		5,245,247
North West Territory.....		1,659,741
New Brunswick.....		609,765
		15,000
		7,529,753

COAL TRADE.

Bituminous, mined in Canada.....		7,529,753
Bituminous and Anthracite imported (Great Britain 97,784.).....	161,822	
Australia and Japan.....	11,931	
United States, 3,642,296, 1,394,675.....	5,036,971	5,210,724
		12,740,487
Less exported to		
Great Britain.....	25,335	
United States.....	1,719,029	
Newfoundland.....	126,669	
Other countries.....	108,920	1,979,951
Total consumption of coal in Canada in 1903.....		10,760,526
Total consumption of coal in Canada in 1902.....		9,218,272
Increased consumption in 1903.....		1,542,254

What NOT To Do.

Mr. Lyman White, State Commissioner of Mines for Colorado has issued a code of "don't's" to be posted at the mouths of shafts and tunnels in that State.

Mr. White's action is doubtless prompted by a knowledge of the recklessness bred by the "contempt of familiarity," which marks the action of most miners. In the following code there are no new "don'ts" but the idea is to refresh the memories of the miners, and perhaps attract their eyes at the very moment of going under ground.

"Don't get on bucket without first seeing that safety chain is properly hooked.

Don't get on cage or bucket without first signaling the engineer. Give three bells, then get on cage or bucket, and ring one bell to hoist or two bells to lower.

Don't ride on loaded cage or bucket.

Don't ride on cage or bucket containing tools, timbers or explosives.

Don't load steel or timbers without first landing car or bucket.

Don't attempt to get on or off cage or bucket while in motion.

Don't leave guard rail thrown back.

Don't get in a hurry in signalling engineer, space your bells.

Don't work in ground you consider dangerous; call your foreman's attention to the condition of the ground.

Don't be careless, thereby endangering the lives of your fellow workmen.

Don't drill in an old hole or "gun."

Don't fail to thoroughly examine ground for missed shots before starting to drill, whether any misses are reported or not.

Don't attempt to pick out a missed shot.

Don't store explosives in excess of one day's supply under ground, but in magazine provided for that purpose.

Don't use steel or a metal rod of any description for tamping."

It is not wisdom to think too well of one's self, but Canadians may certainly be pardoned if they have such a mental attitude when they read the numerous paragraphs, appearing from time to time in the American Press, which are commendatory of the order which prevails in the Yukon Territory as contrasted with the moral and political disorder obtaining at Nome, in Alaska. Nome has no representation in the Councils of the great Republic, no public buildings, no wagon roads constructed at the State's expense, and no police system worthy of the name: in the last four years the administration of Justice at Nome has required the successive efforts of three judges, while at Dawson, one judge has held his position for seven years. The difference in conditions is not so much due to the different political systems under which the Government of the two sections are administered, as to the efficiency of the officials who are in charge of the administration of law and justice.

A sample of gold from near Dawson, Yukon Territory, analyzed by the provincial assay office, yielded 390 milligrams of osmiridium to the ounce of gold.

European investigation of the effect of rock drilling upon the health of machine drill men has resulted in the development of valuable statistics dealing with death rates among such workmen. In the Transvaal a commission reported that four of 1,210 men examined, 15.4 per cent. were clearly affected, and 7.2 per cent. were suspected cases, rock drillers contributing 91.98 per cent. of the infection. Exposure to mine dust is held mainly responsible for this condition of affairs, the investigation showing that dust and not mine gas was the direct cause of the mortality, microscopic examination of the rock particles showing them to be serrated and sharp. It is also reported that the rock drill miner's task is hazardous out of all proportion to other mining employment, at the same time pointing out that the added risk of occupation may be almost entirely eliminated by the use of water and that "in quantities so slight as to probably cause little danger of fostering ankylostomiasis" In the United States little attention has been paid to this question of mortality and its causes, it not being generally the practice for miners to return to their levels almost immediately after shots are fired.

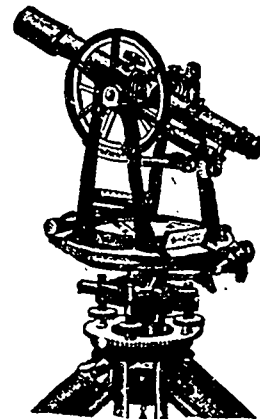
The Mines and Metallurgy Building in the Philippine section of the St. Louis exhibition is nearing completion, and will have an elaborate display of minerals, geological specimens and fossils found in the Island, together with models of primitive and modern mining and reduction plants used by the natives. The exhibit is in charge of Mr. Roy Hopping.

FOR SALE—A BARGAIN!

TWO TREMAIN STEAM STAMP BATTERIES of two stamps each, equal to about ten gravity stamps. They are in good working order and very efficient. No engine required; admirably adapted for testing prospect or new property. Apply "The Miner" Office, Rat Portage, Ontario.

FOR SALE

ONE NEW MORGAN-GARDNER ELECTRIC LOCOMOTIVE; weight 12 tons; built for 44" gauge track; motors wound for 220 volts. Locomotive has never run a single day. Immediate delivery can be made. Price \$1400.00. Address Box "1", Columbus, Ohio.



C. L. BERGER & SONS

37 William Street

BOSTON, Mass.

Successors to BUFF & BERGER.

SPECIALTIES:

Standard Instruments and Appliances for

Mining, Subway, Sewer, Tunnel, and all kinds of Underground Work

SEND FOR CATALOGUE



PROVINCIAL ASSAY OFFICE

BELLEVILLE, ONT.

Conducted by the Bureau of Mines as an aid to the mineral development of the Province.

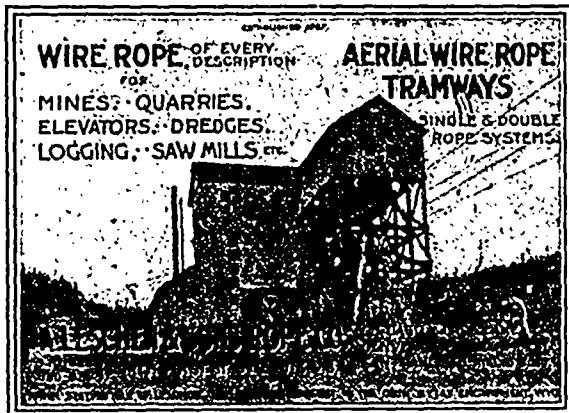
Assays, analyses and other commercial tests for the public at reduced rates.

Circulars of rates and sample bags furnished on application.

Address

A. G. BURROWS, Provincial Assayer,

BELLEVILLE.



Canada Atlantic Ry.

THE SHORT FAVORITE ROUTE
BETWEEN

Ottawa and Montreal.

Sunday Train Both Directions

PULLMAN BUFFET PARLOR CARS

Close Connections at Montreal with Trains for

Quebec, Halifax, Portland

And all Points EAST and SOUTH.

FAST THROUGH SERVICE BETWEEN

Ottawa, New York and Boston

And all NEW ENGLAND POINTS

Through Buffet Sleeping Cars between Ottawa and New York

Baggage checked to all points and passed by customs in transit.
For tickets, time tables and information, apply to nearest ticket
agent of this company or connecting lines.

W. P. HINTON,
Gen'l Passenger Agent.



CANADIAN MINING INSTITUTE

Incorporated by Act of Parliament 1898

AIMS AND OBJECTS.

(A) To promote the Arts and Sciences connected with the economical production of valuable minerals and metals, by means of meetings for the reading and discussion of technical papers, and the subsequent distribution of such information as may be gained through the medium of publications.

(B) The establishment of a central reference library and a headquarters for the purpose of this organisation.

(C) To take concerted action upon such matters as affect the mining and metallurgical industries of the Dominion of Canada.

(D) To encourage and promote these industries by all lawful and honourable means.

MEMBERSHIP.

MEMBERS shall be persons engaged in the direction and operation of mines and metallurgical works mining engineers, geologists, metallurgists, or chemists, and such other persons as the Council may see fit to elect.

STUDENT MEMBERS shall include persons who are qualifying themselves for the profession of mining or metallurgical engineering, students in pure and applied science in any technical school in the Dominion, and such other persons, up to the age of 25 years, who shall be engaged as apprentices or assistants in mining, metallurgical or geological work, or who may desire to participate in the benefits of the meetings, library and publications of the Institute. Student Members shall be eligible for election as Members after the age of 25 years.

SUBSCRIPTION.

Members yearly subscription.....	\$10 00
Student Members do	2 00

PUBLICATIONS.

Vol. I, 1898, 66 pp., out of print.
Vol. II, 1899, 285 pp., bound red cloth.
Vol. III, 1900, 270 pp., " "
Vol. IV, 1901, 333 pp., " "
Vol. V, 1902, 700 pp., " "
Vol. VI, 1903, 600 pp., now in press.

Membership in the Canadian Mining Institute is open to everyone interested in promoting the profession and industry of mining without qualification or restrictions.

Forms of application for membership and copies of the Journal of the Institute, etc., may be obtained upon application to

THE SECRETARY,

Canada Permanent Building, TORONTO, Ont.

HADFIELD'S STEEL FOUNDRY CO. LIMITED SHEFFIELD

HECLON ROCK & ORE BREAKER

HADFIELD AND JACK'S PATENT

THE ONLY PERFECT GYRATORY STONE-CRUSHER

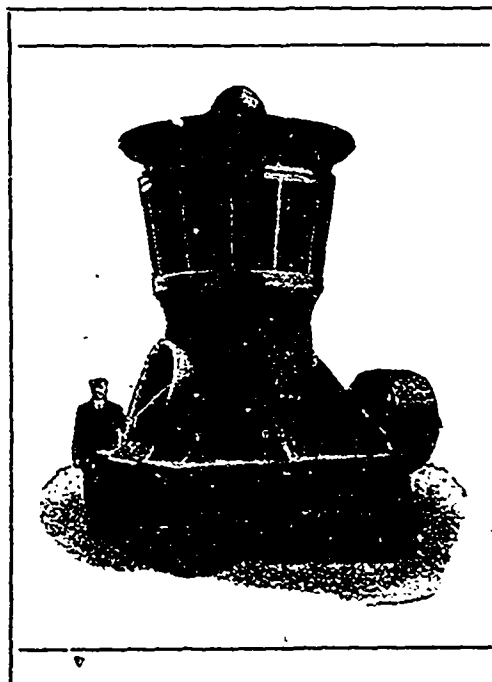
THE PARTS THAT ARE SUBJECT TO EXCESSIVE WEAR ARE MADE OF

HADFIELD'S PATENT "ERA" MANGANESE STEEL

WE MANUFACTURE JAW BREAKERS, CRUSHING ROLLS,
ELEVATORS, BIN GATES, AND GOLD MINING REQUISITES.

Sole Representatives in Canada

PEACOCK BROTHERS, Canada Life Building, Montreal.



CROW'S NEST PASS COAL CO., Ltd.

DIRECTORS:

GEORGE A. COX, President.
 ROBERT JAFFRAY, H. M. PELLATT, AND
 G. G. S. LINDSEY, Vice-Presidents.
 E. R. WOOD, Treasurer.
 G. G. S. LINDSEY, Secretary
 THOS. WALMSLEY, JAMES MASON, FREDERICK NICHOLS,
 DAVID MORRICE, J. D. CHIPMAN, J. A. GEMMILL, WM. FERNIE,
 AND C. C. DALTON.

Head Offices—TORONTO, ONT.

British Columbia Offices—Ferne, B.C.

BITUMINOUS COALS AND COKE

Mines and Ovens at Coal Creek, Michel and Morrissey, B.C.
 Present Capacity of Mines 1,000,000 tons of coal per annum.
 Coke Ovens 350,000 tons per annum.

We would call attention to the superior quality of our Michel Blacksmith Coal, suitable for large forgings. Can be shipped at reasonable prices to all parts of British Columbia, the Northwest Territories and Manitoba.

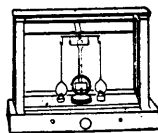
This Company also owns the Fernie and Morrissey Mines townsites, which offer investments in town lots that cannot fail to prove productive.

Having a large amount of development under way, there is always work for coal miners at good wages, and it may be said that there are few places in the world where labor of all kinds can earn more net money under agreeable conditions.

G. G. S. LINDSEY,
 Third Vice-President,
 Toronto.

THOS. R. STOCKETT, Jr.,
 General Superintendent,
 Fernie, B.C.

Assayers Supplies CHEMICAL APPARATUS



Prospectors' Outfits Fine Chemicals
 Miners' Outfits Heavy Chemicals

Correspondence invited.
 Prompt deliveries.



The Chemists & Surgeons Supply Co. Ltd.

CHAS. L. WALTERS (12 years with Lyman Sons) Manager

818 Dorchester St.

MONTREAL.

SPRINGHILL COAL.

The Cumberland Railway & Coal Company

Are prepared to deliver this well known
 Steam Coal at all points on the lines of
 G. T. R., C. P. R. and I. C. Railways.

Head Office: 107 ST. JAMES STREET, MONTREAL

Address: P. O. BOX 396.

200 Ottumwa Box Car Loaders



These figures represent sales of these labor saving and coal saving machines

Other operators regard an Ottumwa Box Car Loader as a necessary part of their mine equipment.

Can you afford to be without one.

Order one now in time for fall business.

Send for Catalogue.

Ottumwa Box Car Loader Co.

Chicago Office—1025 Old Colony Bldg.

General Offices and Factory—OTTUMWA, Iowa, U.S.A.

Ontario's Mining Lands.

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite; copper in sulphide and native form; gold, mostly in free milling quartz; silver, native and sulphides; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

HONORABLE E. J. DAVIS,

Commissioner of Crown Lands,

or

THOS. W. GIBSON,

Director Bureau of Mines,

Toronto, Ontario.



PROVINCE OF NOVA SCOTIA.
Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin
—AND—
PRECIOUS STONES.

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

GOLD AND SILVER.

Under the provisions of Chap. 1. Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at \$2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required

to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at \$19 an ounce, and on smelted Gold valued at \$18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquire promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

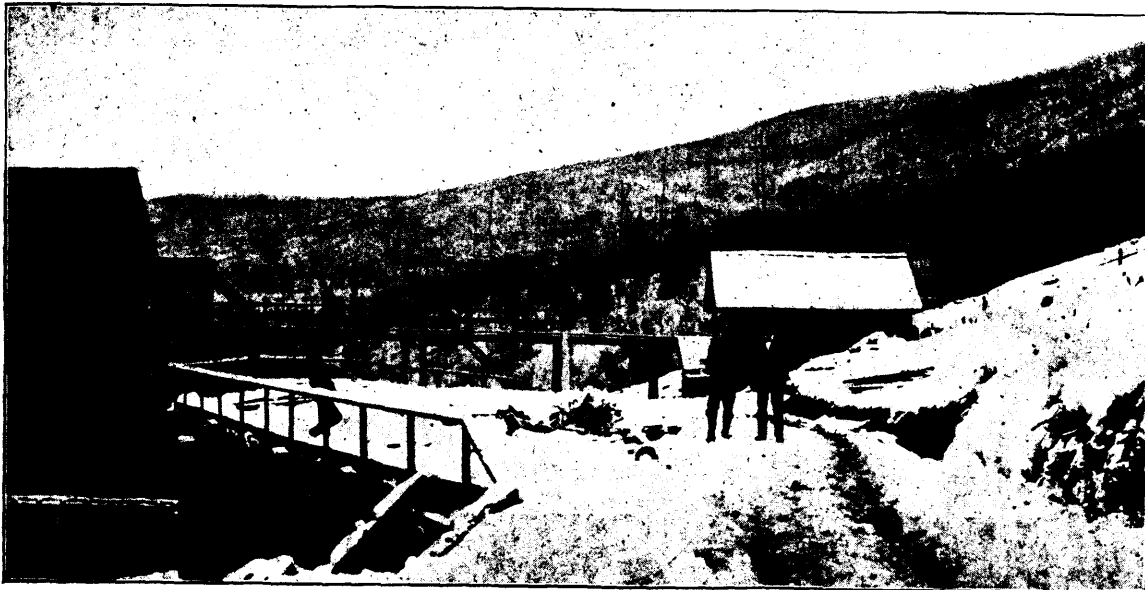
The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

THE HON. A. DRYSDALE,
Commissioner Public Works and Mines,
HALIFAX, NOVA SCOTIA.

One Man Can handle 1600 TONS per day with a Riblet Patent Automatic Aerial Tramway

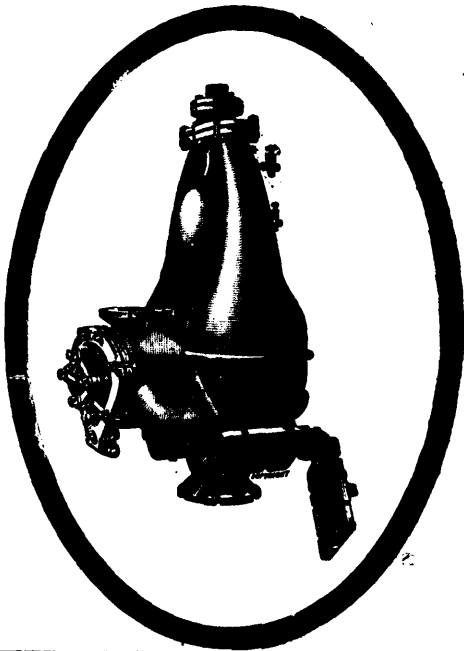


YOU CAN FIGURE
THE COST PER TON

More Riblet Tramways are now being
installed than of all the other
systems combined

WRITE FOR DESCRIPTION
AND PRICES

B. C. RIBLET, ENGR.
Spokane, Wash., U.S.A.
Nelson, B.C., Canada



A Thing to Remember!

The water can often be got out
and the job finished by means of

Trade **The Pulsometer** Mark
Steam Pump

whilst you would be collecting the
necessary tackle for ordinary pumps.

The Pulsometer Engineering Co. Ld., Reading, England.

CANADIAN REPRESENTATIVES **PEACOCK BROTHERS** CANADA LIFE BUILDING Montreal



HEINE SAFETY BOILER

MANUFACTURED BY

The Canadian Heine Safety Boiler Co.
TORONTO, ONT.

THE HEINE SAFETY BOILER—Made in units
of 100 to 500 h.p., and can be set in batteries of
any number. Suitable for Mines, Pulp Mills, Water
and Electric Installations, and large plants generally.
The best and most economical boiler made.

CONTRACTORS TO H. M. GOVERNMENT

Allan, Whyte & Co.

CLYDE PATENT WIRE ROPE WORKS

Rutherglen, Glasgow, Scotland

MANUFACTURERS OF

WIRE ROPES for Collieries, Mines,
Aerial Tramways

Transmission of Power, Logging and general Hauling and Hoisting Purposes.
Wire specially selected for own exclusive use.
We have made many records with our Winding, Haulage and Crane Ropes.

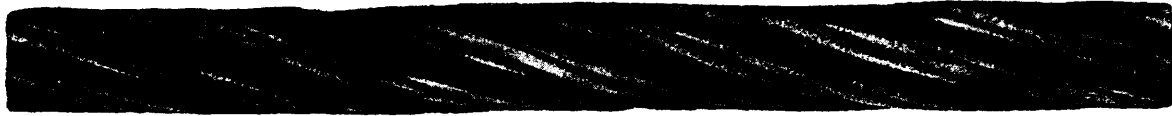


Illustration of $\frac{3}{4}$ " diam. Special Improved Patent Steel Wire Rope, 1760 yards long, supplied to Dalzell Colliery, Motherwell, Scot., which ran two years and 8 months, shewing condition when taken off. Previous rope from another maker lasted 1 year and 9 months

TELEGRAMS—"Ropery Rutherglen. A B C, A I and Lieber's Codes used.

AGENTS IN CANADA :

Wm. Stairs, Son & Morrow Ltd., Halifax, N.S.
W. H. Thorne & Co. Ltd., Saint John, N.B.

Drummond, McCall & Co., Montreal.
John Burns, Vancouver, B. C.

Drummond, McCall & Co.

IRON, STEEL and GENERAL METAL MERCHANTS

GENERAL SALES AGENTS

Algoma Steel Co. Ltd., Sault Ste. Marie, Ont.

AND IMPORTERS OF

Beams, Channels, Angles and other Structural Material.

Steel Plates—Tank, Boiler and Firebox Quality.

Cold Rolled Steel Shafting.

Mild Steel Bars—all diameters.

Wire Rope. Snow Steam Pumps. Tool Steel.

....COMPLETE STOCK KEPT IN MONTREAL....

General Offices: CANADA LIFE BUILDING - MONTREAL.

Montreal Pipe Foundry Co.
Limited

MANUFACTURERS OF

CAST IRON
WATER AND GAS

PIPE

and other Water Works Supplies.

"LUDLOW" VALVES & HYDRANTS

GENERAL OFFICES :

Canada Life Building - MONTREAL

PIG IRON..

"C.I.F." Charcoal Pig Iron, also

"Midland" Foundry Coke Pig Iron

MANUFACTURED BY

CANADA IRON FURNACE COMPANY, LIMITED

Plants at { RADNOR FORGES, QUE., and
MIDLAND, ONT.

GENERAL OFFICES

CANADA LIFE BUILDING, MONTREAL.

Geo. E. Drummond, Managing Director and Treasurer.

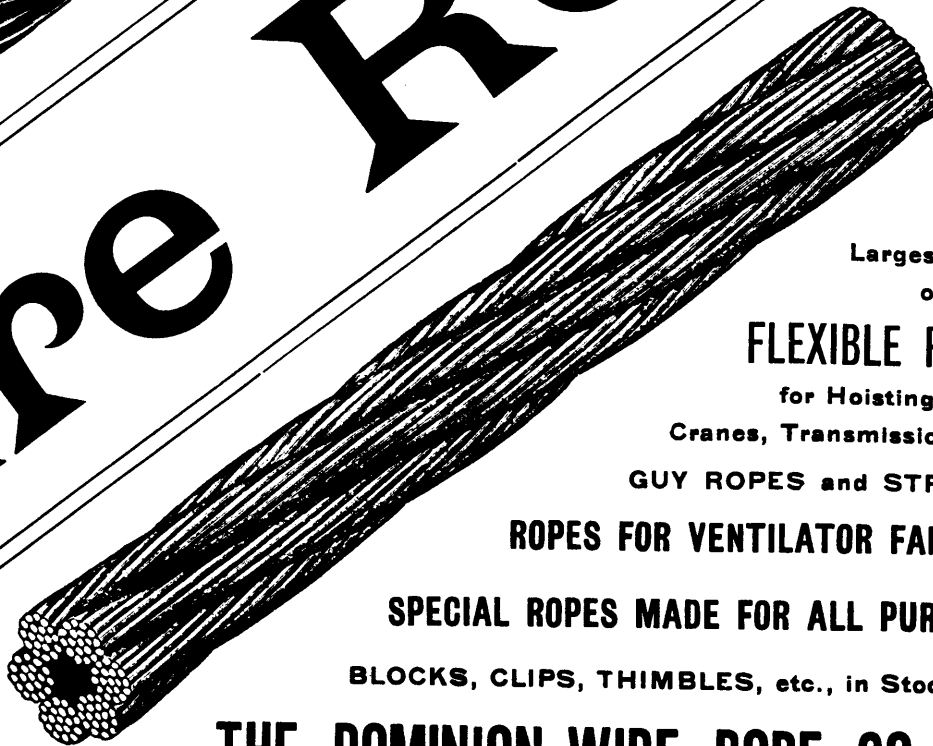
**WE MAKE A SPECIALTY OF
HIGH GRADE ROPES**

FOR

**Shafts, Slopes and
HAULAGE**



Wire Rope



Largest Stock
of

FLEXIBLE ROPES

for Hoisting,

Cranes, Transmission, Etc.

GUY ROPES and STRANDS

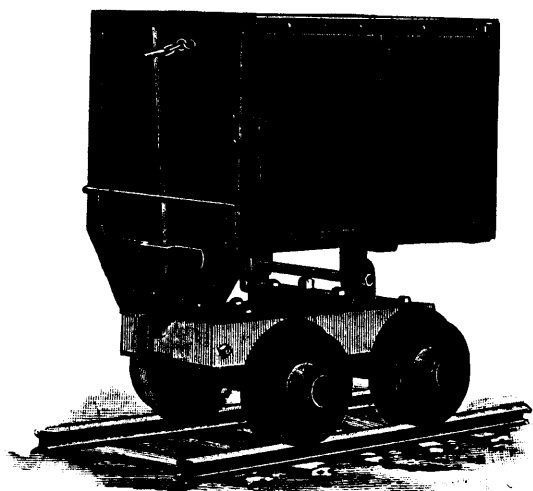
ROPES FOR VENTILATOR FANS

SPECIAL ROPES MADE FOR ALL PURPOSES

BLOCKS, CLIPS, THIMBLES, etc., in Stock.

THE DOMINION WIRE ROPE CO. Ltd.
MONTREAL

MINING SUPPLIES



ORE CARS
ALL SIZES AND KINDS

ORE BUCKETS AND TUBS

RAILS LIGHT AND HEAVY SECTIONS
NEW AND SECOND HAND

STEAM SHOVELS

LOCOMOTIVES

CARS

WHEEL AND DRAG SCRAPERS

MINING BARROWS

DRILL STEEL

FULL STOCK OF SUPPLIES

JACKS

CAR MOVERS

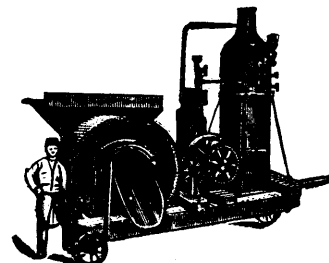
PICKS

SHOVELS

HAMMERS

**RANSOME
CONCRETE
MIXERS**

IN STYLES TO SUIT EVERYBODY.



SEND
FOR
CATALOGUE

F. H. HOPKINS & Co.

New Imperial Bank Building, 286 St. James Street

MONTREAL