

4-6-5

received Apr 2/19

Special Review Number---A Quarter Century of Progress
(Copyright, Canada, 1919, by Technical Press, Ltd., Vancouver B. C.)

Mining and Engineering Record

Established October 1895

Vol. XXIV., No. 1

VANCOUVER, B. C., January, 1919

Single Copies 50c.



...Headquarters...
 For TOYS, GLASS
 and CHINAWARE



Millar & Coe
 419 HASTINGS STREET WEST
 Vancouver, - - B. C.



When in Vancouver make it a point to visit

The Baby and Junior Shop

*A Store Devoted
Entirely in the Interests
of Infants--Children
and Misses*

Gordon Drysdale
LIMITED

575 Granville Street

*Women's and Children's Apparel--Dry Goods
and Housefurnishings*

FOR
QUALITY
USE
Canadian Explosives Ltd.
BRANDS



Manufacturers of

LOW FREEZING DYNAMITES
POLAR FORCITES
POLAR AMMONIA DYNAMITES, etc

Write for Prices and Catalogue, also Instructive Booklets.

Western Offices:

VANCOUVER, VICTORIA, NANAIMO, NELSON,
PRINCE RUPERT, B. C.
EDMONTON, ALTA.

The Pleasure of Travel

is fully realized in travelling on the **Canadian Pacific Railway**. By its lines can be reached all Canadian points, and its arrangements with American railroads enables its agents to issue tickets to all points in the United States.

It operates its own Sleeping and Dining Cars, and has its own Hotels and Steamships. Its magnificent scenery, and the excellence of its service have made it the favorite route across the American Continent.

Illustrated publications as to its route, Banff, Yoho Valley, Glacier, etc., sent on application to any agent.

L. D. CHETHAM **H. W. BRODIE**
City Passenger Agent General Passenger Agent
Victoria, B. C. Vancouver, B. C.

The *Barrett* Company
LIMITED

Vancouver Factory and Office:
Cor 10th Avenue & Arbutus Street

Branches in all Principal Cities

Flotation Oils, Creosote and all Coal Tar Products

Roofings	Building Papers
Roofing Felts	Insulating Papers
Roofing Pitch	Beaver Board
Roofing Paints	Congoleum Rugs
Roofing Cement	and Floor Covering
Stack Paint	etc. etc

We shall be glad to furnish samples and prices upon request

84,000 Horse Power of **ELECTRICAL ENERGY**

We have a large amount of power for
**MINING, SMELTING and
INDUSTRIAL Purposes**

We welcome enquiries regarding our rates and service. Our engineers are at your service for planning to meet your power needs.

Call, write or phone Sales Engineer, Seymour 5000.

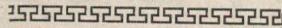
B.C. Electric

Carrall & Hastings

Vancouver

The Yorkshire & Canadian Trust LIMITED

Head Office: Huddersfield, England



GENERAL FINANCIAL AGENCY TRUSTEE, EXECUTOR & ADMINISTRATOR

This Trust is prepared to undertake Trusteeships for Debenture Issues of legitimate enterprises in British Columbia on Favorable terms. We are also in a position to give investors in this Province special service in all matters of a fiduciary nature.

A GENERAL INSURANCE BUSINESS TRANSACTED AS REPRESENTATIVE OF LEADING BRITISH AND AMERICAN COMPANIES

F. H. Wright

Assist. General Manager

YORKSHIRE BUILDING

H. W. Dyson,

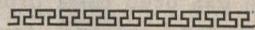
General Manager

VANCOUVER, B. C.

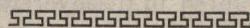
525 SEYMOUR STREET

SHAMROCK BRAND

HAM, BACON, LARD Etc.



'The Brand of Quality, always Reliable'



GOVERNMENT APPROVED

A HOME PRODUCT

Canada Food Board Licence No. 113

P. BURNS & COMPANY, LTD.

VANCOUVER

CALGARY

EDMONTON

BRITISH COLUMBIA

TO END OF DECEMBER, 1917

The Mineral Province of Western Canada

Has produced Minerals valued as follows: Placer Gold, \$75,116,103; Lode Gold, \$93,717,974; Silver, \$43,623,761; Lead, \$39,366,144; Copper, \$130,597,620; Other Metals (Zinc, Iron, etc.), \$10,379,018 Coal and Coke, \$174,313,658; Building Stone, Brick, Cement, etc., \$27,902,381; making its Mineral Production to the end of 1916 show an

Aggregate Value of \$595,571,107

The substantial progress of the Mining Industry of this Province is strikingly exhibited in the following figures, which show the value of production for successive five-year periods: For all years to 1895 inclusive, \$94,547,241; for five years, 1896-1900, \$57,607,967; for five years, 1901-1905, \$96,507,968; for five years 1906-1910, \$125,534,474; for five years, 1911-1915, \$142,072,603; for the year 1916, \$42,290,462; for the year 1917, \$37,010,392.

Production for 10 years ending December, 1917
\$296,044,825

Lode-mining has only been in progress for about twenty years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those of any other Province in the Dominion, or any Colony in the British Empire.

Mineral locations are granted to discoverers for nominal fees.

Absolute Titles are obtained by developing such properties, the security of which is guaranteed by Crown Grants.

Full information, together with mining Reports and Maps, may be obtained gratis by addressing—

THE HON. THE MINISTER OF MINES
VICTORIA, British Columbia

CRUSHER JAWS

Genuine "Manganese" Steel

"You can get them right here at home."

We have patterns for the following sizes
"Hadfield" Crusher Jaws"—

9½ in. x 16 in., 20 in. x 10 in., 24 in. x 13 in.

We can make you a pattern for any other
size or make.

Manufactured by Washington Iron Works
Seattle, Wash. Agents for B. C.—

Vancouver Machinery Depot LIMITED

1155 Sixth Avenue West, - Vancouver, B. C.

Also Agents for "Crawford's" Aerial Tram-
way

13tc

FOR
BUILDING }
And LIME } STONE

CEMENT & MARBLE

METAL & MINERAL

PROPERTIES

CONSULT

A. A. CROWSTON

NOTARY PUBLIC

VANCOUVER, CANADA

DIAMOND DRILL CONTRACTING COMPANY

SPOKANE, WASH.

Contractors for all kinds of Diamond Drill
work. We have complete outfits in British
Columbia, Alberta and Saskatchewan.

Write for Prices

ROSSLAND, B. C.

30tc

Thor SINGLE VALVE Chipping Hammer

Circular "W"
shows complete
line. Made in 5
sizes 1 in. to 5 in.
A B C D E



Foundry Chipping Hammers Our Offer:
30 Day Free Trial

What The Thor Line Consists Of

Piston Air Drills; Reversible, Flue Rolling,
Reaming, Tapping and Wood Boring Machines;
Close-Quarter Drills; Grinders; Pneumatic Riv-
eting; Chipping, Calking and Beading Hammers;
Stay-Bolt Hammers; Pneumatic Holders-On;
Hose and Hose Couplings; Rivet Sets and Electric
Drills.

FRANK DARLING & CO. 1142-1144 Homer St.
Vancouver, B. C.

ROBERT H. STEWART

Mining and Metallurgical Engineer

Vancouver Block

Vancouver, B. C.

British Goods at the Outposts of the Empire

We are agents in Vancouver, B. C., for many important lines that you are accustomed to buying at home.

SOLE AGENTS FOR ACQUASCUTUM and DEXTER COATS (Rain-proof and Winter).
SCOTT, TRESS and CHRISTY HATS and CAPS.
DENT'S and FOWNES' GLOVES
MONLEY'S HOSIERY

LLOYD ALTREE and SMITH and WELSH MARGETSON & CO. SHIRTS, COLLARS and NECKWEAR
SOLE AGENTS FOR ALL LINES OF JAEGER PURE WOOL WEAR

T. B. CUTHBERTSON & CO. LIMITED

2 Stores:

619 Hastings St. W. 648 Granville St. Vancouver, British Columbia

Sam Scott Limited

BOYS' CLOTHES SPECIALIST

693 GRANVILLE STREET
VANCOUVER, B. C.

G. R. GREGG & CO. LIMITED

Importers of
ORIENTAL MERCHANDISE

¶ Well established facilities for purchase of all lines of Oriental Goods.

¶ Long experience in the trade and best connections with manufacturers of Silk Piece Goods, Cotton Piece Goods, Porcelains, Mattings, Embroideries, etc.

Head Office: TORONTO, CANADA

Branch Offices:
WINNIPEG and VANCOUVER

Purchasing Office:
264 Settlement, Yokohama, Japan

The Telephone Would Serve You Well

¶If an industry is to develop, it must not be handicapped by the lack of any convenience. One of the greatest helps to the development of an industry is the telephone. At all times it is ready, and at all times it may be relied on. The mining industry calls for highly-paid men whose time is worth money. To them the telephone is everything, for not only does it save their time, but it enables promptness of action which is everything.

¶Recognizing the value of the telephone, remembering the various interests that use it, the object of the B. C. Telephone Company is to always have the utility it supplies available for any and every purpose. If that object is not attained, it is not because it is not earnestly tried for, and we will be pleased to know the circumstances if at any time the telephone fails in its service to you.

B. C. Telephone Company Ltd.

Geo. A. Campbell & Co.

Tower Building
500 Beatty Street cor. Pender Street
VANCOUVER, B. C.

WHOLESALE MEN'S CLOTHING,

Specializing in Guaranteed Indigoes
and Solid Worsteds

BROWN & MAHONEY Limited

**CONSULTING ENGINEERS,
BROKERS**

¶Mining Properties Bought, Sold and Exchanged. Write for our list of B. C. Mining Properties.

¶If you have a Mine to Sell consult us. We have buyers waiting.

¶We are also manufacturers and Importing Agents for

**MINING AND ENGINEERING
SUPPLIES**

STEEL RAILS, CABLES AND MACHINERY

Get Our Prices.

406-407 Vancouver Block, 736 Granville St.
VANCOUVER, B. C.

France Gave to Canada THE BRISCOE MOTOR

Today the prospective purchaser of an automobile has the opportunity of buying a car built purely upon French lines. Designed by France's leading Automobile Engineers. Built in a Canadian factory by Canadians. A high price car, within the reach of all. This made possible through the large quantity production of the BRISCOE factory. This car is now on display in Vancouver.

Make it your business to see the BRISCOE before you purchase. Call or telephone and make an appointment for a demonstration.

Your family would appreciate a BRISCOE for Christmas, place your order now, to secure delivery. 32 H.P. MOTOR—105 inch wheelbase; electric self starting and lighting system; demountable rims, 30 x 3½ inch tires, non-skid on rear; one-man top, sloping windshield; mahogany instrument board and full equipment.

THE CANADIAN BRISCOE MOTOR CO., LIMITED
BROCKVILLE, ONT.

\$1,325

International Motors, Ltd.

f.o.b. Vancouver
Fully equipped

Distributors for British Columbia

SALESROOM: 1129 HOWE ST.

Telephone Sey. 489

Only One Way

to reach the Mines and Homes of the

Porcupine Gold Camp

and that is through the columns of the "Porcupine Advance," the only full-size 8-page Mining and Local paper published in this Rich Camp. Write for advertising rates and particulars.

Of course, if you want the **REAL** news of the Porcupine Camp you **MUST** read "The Advance." Subscription rates: \$2.00 per year in advance to points in Canada; \$3.00 per year to U. S. addresses. Send for sample copy.

The Porcupine Advance

Geo. Lake, Proprietor

Timmins, Ont.

The Kamloops Telegram

The Brightest, Newsiest and Most Widely Read Newspaper published in the B. C. Interior.

Contains all the authentic Mining News of the Kamloops and North Thompson districts.

Subscription Rates: In Canada, \$1.50 per annum; in Great Britain and United States, \$2.00.

Advertising Rates on application.

Phone Green 417

P.O. Box 1604

A. E. Wright

Civil Engineer

B.C. AND DOM. LAND SURVEYOR

211 Third Street

PRINCE RUPERT, B. C.

Reports
Estimates
Plans

Speciality:
Mining
Claims

Vancouver Engineering Works Ltd.

Vancouver, B. C.

ENGINEERS - BOILERMAKERS

Steel, Iron and Brass Founders

BLACKSMITHS - PATTERNMAKERS

MANUFACTURERS OF

ORE CARS, MINE CARS, ORE BUCKETS, MINING MACHINERY ..
TANKS, BOILERS, RIVETED STEEL PIPE

USE "VEW" STEEL CASTINGS

AND AVOID COSTLY BREAKDOWNS

Office and Works:
519 to 659—6th Ave. W.
Near Cambie Street South

Private Exchange
Phone: Fairmont 240

Crown Broom Works Ltd.

Manufacturers of

Brooms, Whisks, Washboards, etc.

VANCOUVER, B. C.

RENWICK & CUNLIFFE LIMITED

Wholesale

CHINA, CROCKERY, GLASSWARE
AND CUTLERY

DOUBLE THICK WARE FOR CAMP USE
A SPECIALTY.

365 Water St.

Vancouver, B. C.

Forgings

Heavy or Light Forgings of Any Description

We Operate the Largest FORGE Shop in B. C.

Our Equipment is Complete and Thoroughly Modern

We can handle all classes of Blacksmith and Forgesmith Work. We carry a large Stock of Lloyd's Tested Blooms and Billets up to 12 by 12 inch square and 16 inch diameter

Get us by Wire, Telephone or Letter, let us know what you require in Forgings—in the Rough—Partially Machined — or Finished and see what we can do in the way of SPEED and QUALITY

Vancouver Forge Co. Ltd.

Breakdowns and Delays Cost Money—We All Know That
We are in Business to Give You SERVICE

Telephone Highland 701

Foot Victoria Drive, Vancouver, B. C.

THE CONSOLIDATED
MINING AND SMELTING CO.
— OF —
CANADA, LIMITED
Smelters and Refiners

PURCHASERS OF ALL GOLD, SILVER, COPPER
LEAD AND ZINC ORES

TADANAC BRAND PIG LEAD, BLUESTONE, SPELTER AND COPPER

OFFICES:

SMELTING AND REFINING DEPT.
TRAIL, B.C.

R. Gardom & Co.
LIMITED

INSURANCE REAL ESTATE
TIMBER MINES

¶Correspondence invited on above
subjects, and personal attention given
to any matter entrusted to our
agency.

GEORGE RORIE, C. A., Managing Director
R. GARDOM, Vice-President

Our Office address is:
HOTEL VANCOUVER BUILDING
737 Granville Street
Vancouver, Canada

CROSSMAN

Electrical Machinery Co. Ltd.

80 Dufferin Street East

Vancouver B. C.

MACHINE SHOP AND GENERAL REPAIRS

MOTORS AND GENERATORS REWOUND

Large Stock always on Hand for Immediate
Shipment

**SPARE PARTS FOR ALL STANDARD
MOTORS. COILS WOUND**

Phone Fair. 431

CANADA—Department of Mines

Hon. MARTIN BURRELL, Minister

R. G. McCONNELL, Deputy Minister

MINES BRANCH, Recent Publications

- Iron Ore Occurrences, Vols. I. and II., compiled by E. Lindeman, M.E., and L. L. Bolton, M.A., B.Sc., Introductory by A. H. A. Robinson, B.A.Sc.
 The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.
 Building and Ornamental Stones of Canada (British Columbia), Vol. V., by W. A. Parks, Ph.D.
 Annual Mineral Production Reports, by J. McLeish, B.A.
 Peat, Lignite and Coal: their Value as Fuels for the Production of Gas and Power in the By-product Recovery Producer. Report on, by B. F. Haanel, B.Sc.
 Analyses of Canadian Fuels, Parts I. to V., by E. Stansfield, M.Sc., and J. H. H. Nicolls, M.Sc.
 Electro-thermic Smelting of Iron Ores in Sweden, Report on, by Alfred Stansfield, D.Sc., A.R.S.M., F.R.S.C.
 Occurrence and Testing of Foundry Moulding Sands, Bulletin No. 21, by L. H. Cole, B.Sc.
 The Mineral Springs of Canada, Part II., by R. T. Elworthy, B.Sc.

The Mines Branch maintains the following laboratories, in which investigations are made with a view to assisting in the development of the general mining industries of Canada: Fuel Testing Laboratory, Ore-Dressing Laboratory, Chemical Laboratory, Ceramic Laboratory, Structural Materials Laboratory.

Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to The Director, Mines Branch, Department of Mines, Ottawa.

GEOLOGICAL SURVEY, Recent Publications

- Summary Report. The Annual Summary Report of the Geological Survey is now published in parts. Applicants should therefore state what particular geologist's report is required, or what subjects they are interested in.
- Memoir 84.—An Exploration of the Tazin and Taltson Rivers, Northwest Territory, by Charles Camsell.
- Memoir 87.—Geology of a portion of the Flathead Coal area, British Columbia, by J. D. MacKenzie.
- Memoir 88.—Geology of Graham Island, British Columbia, by J. D. MacKenzie.
- Memoir 93.—The Southern Plains of Alberta, by D. B. Dowling.
- Memoir 96.—Sooke and Duncan Map-areas, Vancouver Island, by C. H. Clapp.
- Memoir 97.—Seroggie, Barker, Thistle and Kirkman Creeks, Yukon Territory, by D. D. Cairnes.
- Map 154A.—Southwestern Yukon.
- Map 160A.—Nanaimo Sheet, Vancouver Island.
- Map 174A. Blairmore, Alberta. Topography.
- Map 1667.—Slocan Mining Area.
- Map 1702. Klotassin, Yukon Territory. Geology.
- Application for Reports should be addressed to the Director, Geological Survey, Ottawa.

PLACE YOUR PRINTING ORDERS

WITH THE

Technical Dress

LIMITED

GENERAL PRINTERS, PUBLISHERS

ENGRAVERS AND BOOKBINDERS

The Mines Building, 426, Homer St.,

Vancouver, B.C.

Telephone

Sey. 3825

A Telephone Call will bring our Representative to submit Samples and Prices.

MINING COMPANY,
 LUMBER COMPANY,
 RAILWAY,
 MANUFACTURERS',
 LAW, and
 COMMERCIAL PRINTING
 ACCOUNT BOOKS
 ANNOUNCEMENTS

APPEAL BOOKS
 BOOKLETS
 BUSINESS and
 PROFESSIONAL CARDS
 CATALOGUES
 COUNTER CHECKS
 DODGERS
 ENVELOPES, All Sizes

FACTUMS
 FOLDERS
 INVITATIONS
 LETTERHEADS
 LOOSE LEAF SYSTEMS
 MENUS
 MINE PAYROLLS and
 COST SHEETS

OFFICE FORMS
 POSTERS
 PROGRAMMES
 PROSPECTUSES
 SMELTER PAYROLLS and
 COST SHEETS
 TICKETS
 TIME SHEETS

MAIL ORDERS PROMPTLY ATTENDED TO

Established 1859

Incorporated 1891

E. G. PRIOR & Co.

LIMITED LIABILITY

WHOLESALE DEALERS IN

MINING and MILLING SUPPLIES

Iron, Steel

AND

Heavy and Shelf Hardware

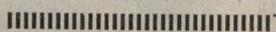
Head Office and Warehouses - - - - - Government St., Victoria, B. C.

Vancouver Office - - - - - Rogers Building, Vancouver, B.C.

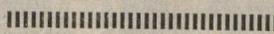
*Northern
Construction
Company, Ltd.*



*Shipbuilders, Railway
and General Contractors*



VANCOUVER





GEO. H. NICKERSON



J. A. M. FAULDS



WM. BUTCHART

Well-Known Firm Changes Name

D. E. BROWN Retires From Business

MR. J. A. M. FAULDS, who has for the past ten years been prominently connected with the well-known firm of D. E. Brown's Travel Bureau, Limited, has recently purchased the interest of Mr. D. E. Brown in that concern and it is proposed to change the name of the company from D. E. Brown's Travel Bureau, Ltd., to "Faulds' Financial and Travel Bureau Limited." The present offices of the company, located at 626 Hastings Street West (Strand Building) will remain the same. The company will continue in the same lines of business as formerly, and shall be pleased to have a continuance of public patronage.

MR. D. E. BROWN, former president of the old firm, having retired from active business, was formerly connected with the Canadian Pacific Railway Company for over thirty years, and came to Vancouver in 1886 as the first freight and passenger representative of the company, and after spending several years in that capacity in this city, was promoted to the position of chief executive of the company in the Orient and served in that position for fourteen years, with headquarters at Hongkong, China. In the year 1907, Mr. Brown retired from the service of the C. P. R. on account of ill-health, and later started business in the City of Vancouver, which he has continuously carried on until his retirement from D. E. Brown's Travel Bureau, Ltd. Mr. Brown has left for California and expects to return to the city about the end of March.

The new firm of FAULDS FINANCIAL & TRAVEL BUREAU LTD. will have the following personnel: J. A. M. Faulds, President and Managing Director; George H. Nickerson, Wm. Butchart, J. Coulthard, George V. Watchin, Directors, and James Napier, Secretary-Treasurer.

It is interesting to note the various lines of business carried on. Their individual departments are all in charge of capable and experienced men.

The Railway and Steamship Department is in charge of Mr. Geo. H. Nickerson, who has associated with him Mr. E. Wallace and Mr. W. G. Barker. Tickets can be secured to any part of the world and special facilities are given to passengers from the moment they leave Vancouver until they arrive at their destination. Prompt and careful attention is given to the securing of Passports.

The Foreign Exchange Department is in the hands of Mr. J. Coulthard, formerly connected for many years with the Bank of Montreal. In this department the intending traveler can secure the transfer of funds to any part of the world at the lowest rates obtainable. The company also have unequalled facilities for the issuance of Money Orders, Drafts, Travellers' Cheques and Letters of Credit, as they do direct accounts in London, Eng., New York, Seattle, Yokohama, Hong Kong and Vladivostok.

The Insurance Department is under the direct supervision of Mr. Wm. Butchart. The principal lines written being Fire, Marine, Accident and Health, Life, Automobile, Plate Glass, Burglary, etc. Their Fire business being written in the Citizens Insurance Co. of Missouri if subsidiary company to one of the largest insurance companies, viz. The Hartford Fire Insurance Co., and Accident, Sickness and Health in the Law Union & Rock Insur

ance Co. of London, Eng., a very old and well established firm, with assets of over \$48,000,000. Travellers are also fully protected in the Travellers Insurance Co. of Hartford, Conn. Life and Accident, or their baggage in the Travellers' Baggage Insurance Co. of London, Eng.

The Real Estate Department is in charge of Mr. Frank McQueen, who has associated with him Mr. A. H. Pearce as Assistant Manager; Mr. R. S. Clark, Conveyancer and Messrs. C. F. Skinner, Roy A. Lawrence, C. L. Thompson, and G. Smith, salesmen. In this Department clients can find anything that their heart may desire in the way of a city home or country residence at prices to suit their pocket. The department has special facilities and pays special attention to the collection of rent and conveyancing and Notary Public work. They will also build you a home to suit your particular requirements in choice locations. Anyone intending either selling, buying or building should consult Mr. McQueen or any of his staff at once.

A Russian Foreign Department is also maintained in charge of Mr. George V. Watchin, who both speaks and writes the language, and in view of the future prospective trade with this large country and the large movement of Russians from Canada this department offers exceptional facilities to anyone desiring assistance and information as to travel or trade conditions.

Owing to the retirement of Mr. D. E. Brown, who was formerly General Agent in British Columbia and the Yukon Territory for the Canadian Pacific Railway Co. Department of Natural Resources, the Company have appointed Mr. H. J. Loughran, formerly associated with the old firm, as Manager of their Farm Lands Department, as their new General Agent. He will continue as in the past to make his headquarters at the Company's office, 626 Hastings Street West. Associated with Mr. Loughran in the handling of this department is Mr. J. C. Matthews who has for several years occupied a position of trust as C. P. R. Land Inspector, throughout the prairie provinces, and being fully conversant with Farming and Ranching conditions throughout Western Canada, will be a valuable acquisition to the Vancouver office.



GEO. V. WATCHIN



JAMES NAPIER



E. WALLACE



J. COUTHARD



H. J. LOUGHRAN



FRANK McQUEEN



A. H. PEARCE



W. G. BARKER

QUALITY FIRST

MIXED CARLOADS

Our Modern Equipped Mill Enables Us to Meet Your Exact Requirements
in Properly Manufactured

LUMBER - LATH - SHINGLES

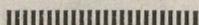
MOULDINGS, SASH and DOORS, BOXES and BOX SHOOKS

Good Stocks on Hand Insure Prompt Shipments

J. HANBURY & CO. Ltd.

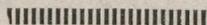
VANCOUVER, B. C.

London & British North America Co. LIMITED

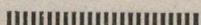


Representing—

North British & Mercantile Insurance Company
and Hartford Fire Insurance Company



LOANS—INSURANCE—ESTATE
MANAGEMENT
FINANCIAL AGENTS



London Building Vancouver, B.C.

Practical Prospector

SEEKS ENGAGEMENT FOR THE SEASON
PROSPECTS SYSTEMATICALLY
EXAMINED

ASSESSMENT WORK CONTRACTED
UNDENIABLE REFERENCES

C/o Vancouver Chamber of Mines

Dominion Building
Vancouver, B. C.

Phones—Office, High. 2000
Night Call—High. 577L

G. R. Gordon, Manager
L. T. Wood, Superintendent

MAINLAND ENGINEERING Co. LIMITED

ENGINEERS, MACHINISTS, BOILER-
MAKERS, FOUNDERS AND
PATTERNMAKERS

Manufacturers of
MARINE SAWMILL and MINING MACHINERY
IRON, BRASS ALUMINUM and BRONZE CASTINGS
Heavy and Light Forgings of Every Description

ALL REPAIR WORK PROMPTLY ATTENDED TO
422 Railway St. Vancouver, B. C.



COFFEE

**DISTINCTIVE---BECAUSE OF ITS
EXQUISITE FLAVOUR**

Blended and Roasted by

THE W. H. MALKIN CO. Ltd.

VANCOUVER, B. C.

Vancouver Machinery Depot LIMITED

Representing among other well-known firms the Marion Steam Shovel Co., manufacturers of the famous "Marion" Shovels and Dredges — Steam, Electric or Gasoline.

"MARION" SHOVELS & DREDGES are designed and constructed to give constant and efficient service under the most severe conditions at lowest possible cost of operation and maintenance. The advice of our "Marion" expert is at our service.

Write for Stock List of new and used Boilers, Engines, Hoists, Dericks, Locomotives, Steam Shovels, etc., in our Vancouver Works, for prompt delivery.

1155 Sixth Avenue W.

:

Vancouver, B. C.

INSURANCE

As General Agents in British Columbia for—
Phoenix Assurance Company, Ltd., of London
Liverpool and London and Globe Insurance Co.
British America Assurance Co.
Acadia Fire Insurance Co.
Globe Indemnity Company of Canada and
National Provincial Plate Glass and General Insurance Co.
We are in a position to take care of almost any class or amount
of Insurance

REAL ESTATE

Our Realty Department has an extensive list of City Properties, Factory Sites, Farms and Timber.

Rents Collected — Buildings and Estates Managed under personal supervision of experienced officers.

SECURITIES

We can offer the Investor, at very attractive prices, high grade Securities, including Government and Municipal Bonds.

Funds Invested in Mortgages

Ceperley Rounsefell & Company

Established in 1886

Ground Floor, Winch Building

Vancouver, British Columbia

BARR & ANDERSON LTD.

PLUMBING - HEATING

and

AUTOMATIC FIRE
PROTECTION

ENGINEERS *and* CONTRACTORS

1060 HOMER STREET

:::

VANCOUVER, B. C.

Gas Furnaces Will Bring Peace - Time Efficiency

Important as was efficiency during the period of the war it becomes of even greater concern today with the nation changing from a war to a peace basis.

Today the necessity of industrial development along constructive lines demands the practice of every possible manufacturing economy.

GAS, the Ideal Industrial Fuel

has very marked and superior advantages over every other fuel. Its use in heat-treating furnaces assures economies in time, labor, materials, money, etc., and a flexibility of production not otherwise possible.

Our engineers will be glad to talk to you. Telephone. Sey. 5000

VANCOUVER GAS COMPANY

CARRALL & HASTINGS

1138 GRANVILLE

Princeton Drug & Book Store

Largest and best equipped Pharmacy in the Similkameen.

Camp Medicine Chests a Specialty.
Complete Stock of Stationery.
All Late Magazines
Lending Library of Popular Fiction

BRIDGE STREET PRINCETON, B. C.

MINING STOCKS

ALL ACTIVE ISSUES BOUGHT AND SOLD
SEVERAL GOOD SILVER-LEAD PROPERTIES FOR
SALE OR BOND

Correspondence Solicited
INSURANCE.—All Lines... Strong Companies.

T. A. ROBLEY, Box 20

TRAIL B. C.

Green Brs., Burden Company

NELSON, B. C.

CIVIL AND MINING ENGINEERS
B. C., Alberta and Dominion
LAND SURVEYORS

Crown Grant Agents

Blue Printing

E. W. WIDDOWSON PROVINCIAL ANALYST

ASSAYER & METALLURGICAL CHEMIST

Ore Samplers & Shipping Agents

Representatives at Trail, Grand Forks, Greenwood. Smelters
Under Direct Supervision of our Nelson Office

Control and Umpire Assays a Specialty

Head Office and Laboratories:

517 VERNON ST.

NELSON, B. C.

Member C.I.M.B.

Member A.I.M.E.

John C. Rogers

MINING ENGINEER

Copper Cliff, Ont.

Examination and Exploration of Mines and
Prospects with view to Purchase. Geological
problems solved and reports made.

LECKIE BOOTS

ARE BOOTS OF QUALITY

If you are engaged in **Mining, Prospecting, Logging, Farming,** or require Shoes for City Wear, you will find **LECKIE BOOTS** are unexcelled .

Remember "The Quality goes in before the Name goes on." That's a Leckie.

J. LECKIE COMPANY, Ltd.

220 Cambie Street

Vancouver, B. C.

Distributors also of
RUBBER FOOTWEAR AND OILED CLOTHING

MARINE INSURANCE

CARGOES. HULLS. BARGES. SCOWS.
WAR RISK.

.....

C. Gardner Johnson & Co.

.....

Johnson Wharf

Tel. Sey. 357

Vancouver B. C.

FRED A. STARKEY
Mines

In a position to give full and Reliable Information of the Mining Industry of the Interior. All information as to properties cheerfully given.
P. O. BOX 552
NELSON, B. C.

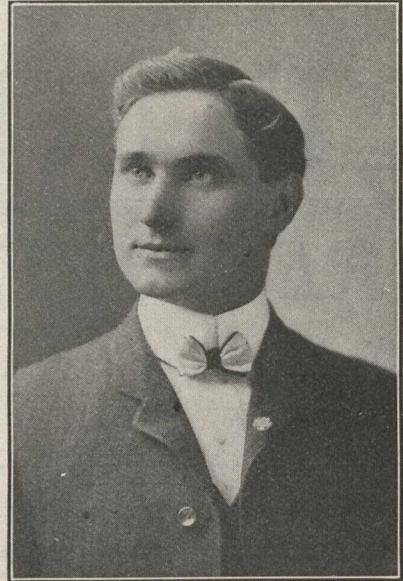


JEFF DAVIS & CO.

"The House of Quality."

**GENERAL
MERCHANT**

GRAND FORKS, B. C.



MATTHEWS GARAGE

**AGENTS FOR DODGE AND CHEVROLET
CARS**

Complete Equipment for all Repairing
Automobile Accessories

GRAND FORKS, B. C.

Telephone 175 Free Air to Inflate Your Tires

Phone No. 9

McLEOD & HODGSON, Limited
General Merchandise

Dry Goods, Silks, Woollens, Ready-to-Wear
Draperies

Groceries, Fruits, Provisions

GRAND FORKS, B. C.

J. H. SCHOFIELD, J.P., M.P.P. HARRY WRIGHT, J.P

J. H. SCHOFIELD & CO.
REAL ESTATE and INSURANCE BROKERS
CONVEYANCERS, ESTATES MANAGED

General Agents for the Monarch Life Assurance Co.
General Agents for The Continental Casualty Company, and a
Large Number of A1 Fire Insurance Cos.

P.O. Box 418 TRAIL, B. C.

DONALD MACDONALD
BARRISTER and SOLICITOR

Notary Public etc.

Tyson-Hazlewood Block TRAIL, B. C.

Dr. L. F. Tepoorten Dr. W. H. Pickering

All Work Guaranteed

Drs. TEPOORTEN & PICKERING
Dentists

P. O. Box 148—Telephone 92

Morrison Block GRAND FORKS, B. C.

RAILS *and*
ACCESSORIES
REINFORCING STEEL

BAR IRON

FIREBRICK--FIRECLAY

Special Shape Firebrick

*Manufactured at
CLAYBURN, B. C.*

VANCOUVER BRAND

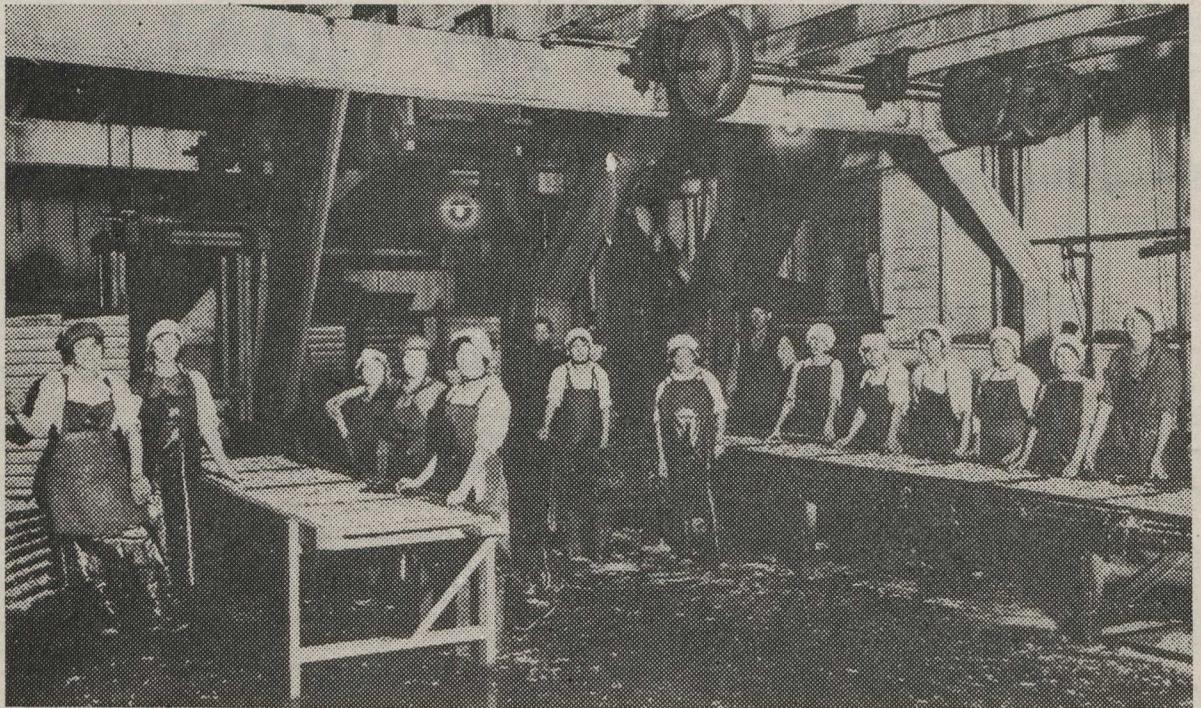
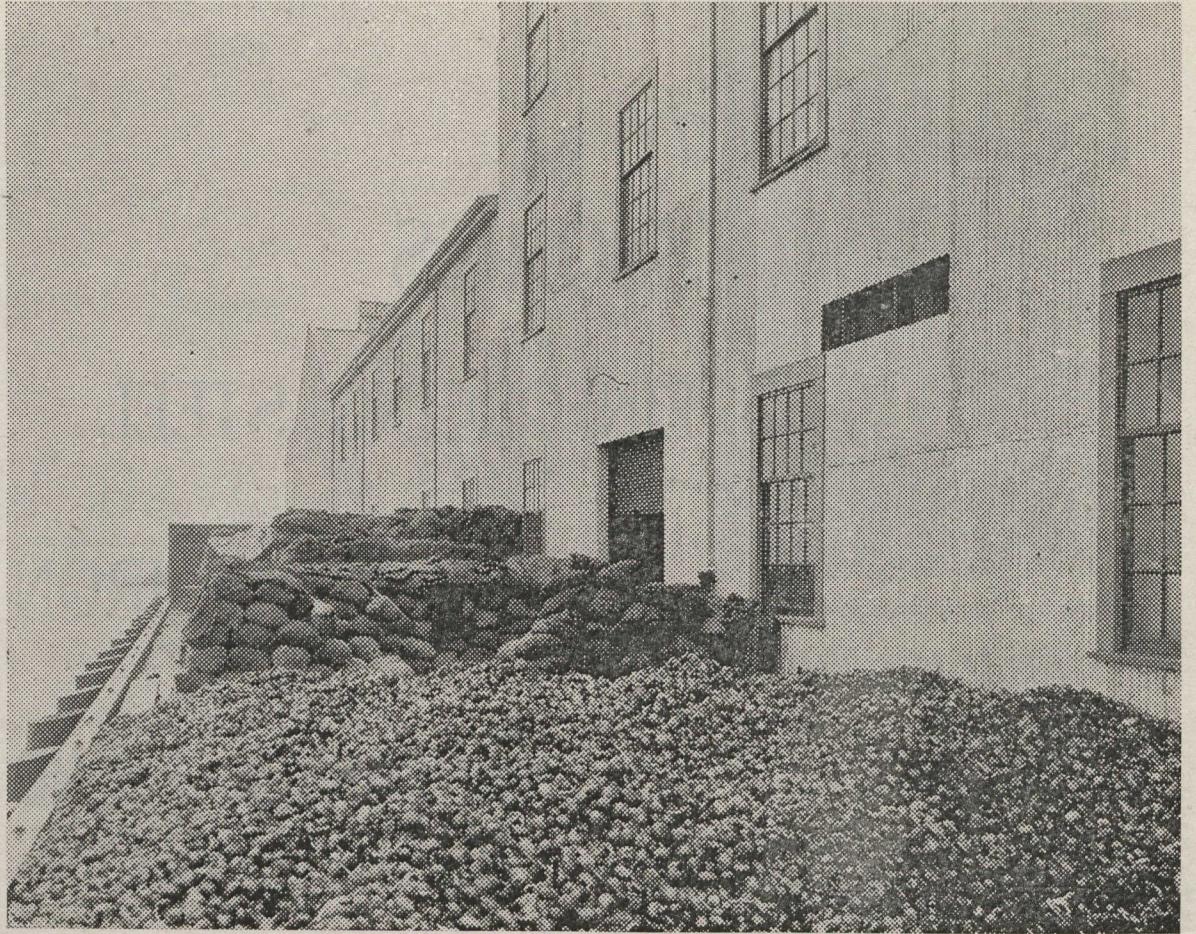
PORTLAND CEMENT

**BLACKSMITH COAL
HOUSE COAL**

**Largest Stock in
WESTERN CANADA**

Evans, Coleman & Evans

VANCOUVER and VICTORIA, B. C.



DOMINION PRODUCTS Limited

GENERAL EVAPORATORS

1522 Standard Bank Building

PLANT—NEW WESTMINSTER

CONTRACTORS TO THE ALLIED GOVERNMENTS

All contracts are contingent upon strikes, exigencies of transportation and accidents beyond control

Code Western Union 1900

P. O. DRAWER 1059

TELEPHONE 59

THE NELSON IRON WORKS LIMITED

Engineers and Founders

MANUFACTURERS OF

**MINING, SMELTING, SAW MILL
MACHINERY, CONTRACTORS'
EQUIPMENT, etc.**

**New and Second-hand Machines
and Supplies**

Agents for—

SULLIVAN MACHINERY CO.—Rock Drills, Compressors,
Diamond Drills

COLUMBIAN PULLEYS LTD.—Wood Split Pulleys

ONEIDA STEEL SPLIT PULLEYS

Manufacturing Agents—

WORD BROTHERS' DRILL SHARPENER

NELSON, B. C.

W. M. Cunliffe, Manager

Phone 106

Box 767

Best Prices Paid for Raw Furs

G. GLASER
Manufacturing Furrier

GUARANTEED HIGH CLASS FURS

Nice Selection Kept in Stock and Made to
Order From Selected Skins

Customer's Furs Made Up, Re-Modelled and Repaired
Skins Dressed and Mounted at Reasonable Prices
Discount During Summer Months

50 Years' Practical Experience in Principal European Cities

416 WARD STREET

NELSON, B.C.

Phones—Day, 292; Residence, 157; Night Undertaking 142

P. O. BOX 827

D. J. ROBERTSON

**Furniture Dealer, Funeral Director and
Embalmer**

FURNITURE, CARPETS, LINOLEUMS, OILCLOTH, etc.

Corner BAKER and KOOTENAY STREETS

NELSON, B. C.

F. R. S. BARLEE

Real Estate and Insurance

Notary Public

All Enquiries Cheerfully Answered

GRAND FORKS, B. C.

Princeton Coal & Land Co., Ltd.

Owners of the Townsite of Princeton, B. C.

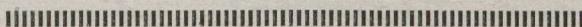
“The Hub of the Similkameen.”

Owners and Operators of

The Princeton Colliery

Producing the Well-known

Sootless Coal



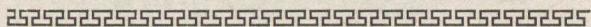
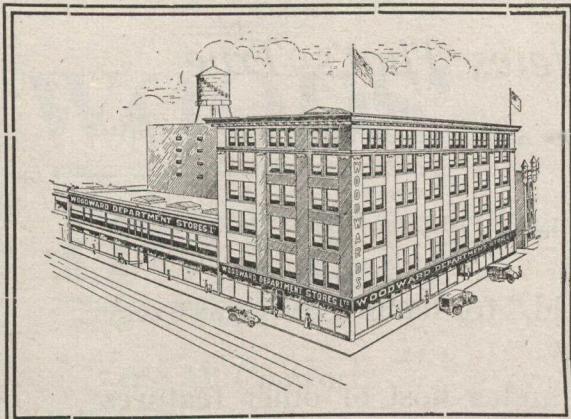
PRINCETON is beautifully situated at the Junction of the Tulameen and Similkameen Rivers.

PRINCETON is served by both the Great Northern and Kettle Valley Railways.

PRINCETON has a Waterworks System and is supplied with Electric Light.

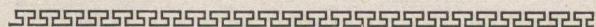
PRINCETON and its value as a business centre is much enhanced by the operations of the
Canada Copper Corporation, the third largest Copper Mine in the British Empire.

“Get it at WOODWARD’S”



**THE PEOPLE'S
Popular Store**

Write for a Copy of our General
Catalogue.



WE SELL EVERYTHING

Woodward Department Stores Limited

VANCOUVER, B. C.

CAMMELL LAIRD & CO., Ltd.

Phone
Seymour
5943

TRADE



MARKS

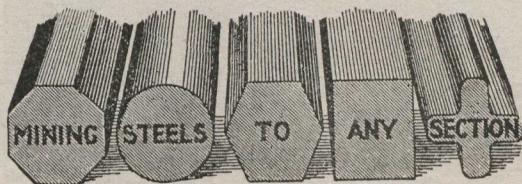
Head Office:

Sheffield
England



FROM ORE TO FINISHED PRODUCT

Basic Open Hearth and Crucible Steel Products
Rails, Forging-Billets, Blooms, Slabs,
and Bars.



MINING EQUIPMENT

Including Ball and Tube Mills, Roll Sheets,
Crusher Jaws, Shoes and Dies.

Also **SOLID** and **HOLLOW DRILL STEELS**.
Crucible and High Speed Tool Steels, Nickel
and Nickel Chrome Steels, High Grade Files
and High Speed Twist Drills.

Branch Office and Warehouse:

847-863 BEATTY STREET, VANCOUVER, B. C.

C X L --- EXPLOSIVES

FORCITE, fumes minimum, Force maximum.
Orders given "CXL" service
Results assured.
Can be used in wet or dry work.
Insist on "**Polar Forcite**" for hard rock work
Tamping bags save you money, order some now
Efficiency and "**Forcite**" go together.

POLAR AMMONIA DYNAMITE. Have you
used it? Ask any mine in B. C. about our
"CXL" Polar Ammonia Dynamite. It repre-
sents economy and efficiency.

ACCESSORIES.—Order Anything for Blast-
ing, we have it.

Write for information regarding our Ex-
plosives and Accessories.

Offices:

Vancouver, Victoria, Nanaimo, Prince
Rupert, Nelson, B. C., and
Edmonton, Alta.

CANADIAN EXPLOSIVES, LTD.

VANCOUVER, B. C.

**THE
WOODS'
HOTEL**

It's All Comfort.

Steam Heated, Hot and Cold Water
Restaurant in Connection

Rates: \$1.00 per day

W. D. Wood, Manager

**The Kootenay's
Leading Druggists**

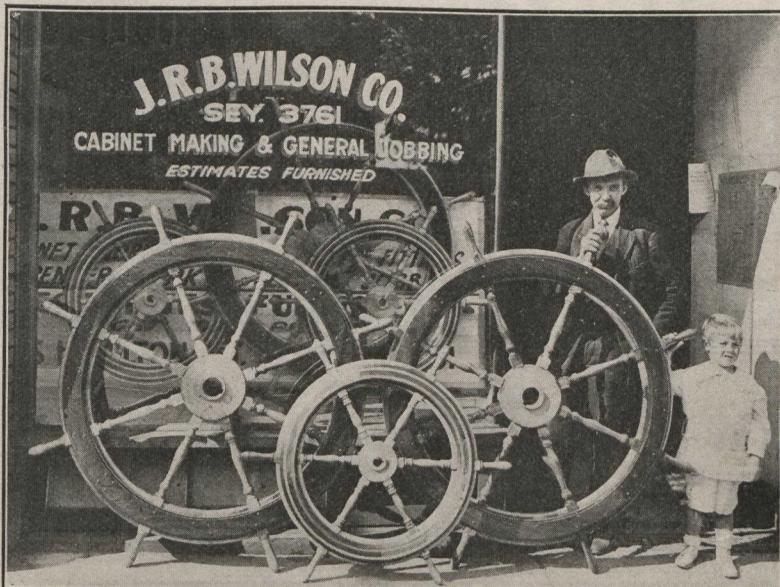
We carry a full line of
**DRUGS,
DRUG SUNDRIES,
KODAKS & SUPPLIES
STATIONERY**

We are Agents for Edison Phonographs and
Records

**CANADA BOOK & DRUG CO.
LIMITED**

F. J. Boles, Manager

J. R. B. WILSON
MANUFACTURER AND JOBBING



DESIGNS AND
ARCHITECTURAL WORK

We Specialize in Homes to Suit
All Classes
Alterations and Repairs of All
Kinds

Cabinet Work, Store, Office
and Ship Fittings

Stern Wheels Made to Order

Estimates Furnished.

Satisfaction Guaranteed

564 CAMBIE ST.

VANCOUVER, B. C.

The Clarke & Stuart Co., Ltd.

COMMERCIAL *and* MANUFACTURING

STATIONERS - PRINTERS - BOOKBINDERS

Makers of
LOOSE LEAF SYSTEMS AND BLANK BOOKS

British Columbia Agents for—
EDISON MINEOGRAPH and MONROE CALCULATING MACHINES

MINING ENGINEERS and SURVEYORS DRAWING INSTRUMENTS and
DRAWING MATERIALS

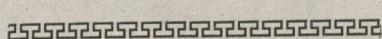
WATERPROOF TALLY BOOKS, TIME BOOKS, FIELD and LEVEL
BOOKS, specially adapted for Mining Work.

MINING FORMS of every description printed and Ruled to order, and supplied in Bound Books or Loose Leaf Form, and if desired for Underground or Outside Work can be furnished in **WATERPROOF** form. Enquiries and Mail Orders receive careful attention.

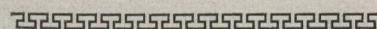
320 Seymour St. (opposite C. P. R. Depot)

Vancouver, B. C.

LEEK & COMPANY



LIMITED



ENGINEERS

AND

CONTRACTORS

POWER, HEATING AND VENTILATING PLANTS
DESIGNED AND INSTALLED
ENGINE AND BOILER CONNECTIONS, PIPE BENDING, etc.

Office and Works: 1090 Homer St.

Vancouver, B.C.

Damer Lumsden Co.

— Wholesale —

BOOTS and SHOES

— And —

RUBBER FOOTWEAR

MINING AND LOGGING BOOTS

..... OUR SPECIALTY

Our Fine Lines Comprise

MEN'S "BERESFORD" and WOMEN'S "VASSAR."

123 Pender Street

Phone Sey. 2407

Vancouver B. C.

Ball Mills, Crushers, Rolls

AND OTHER

Mining Machinery

Manufactured and carried in stock by

Union Iron Works

SPOKANE

- - -

WASHINGTON

Canadian Northwest Steel Co.

LIMITED

VANCOUVER

BRITISH COLUMBIA

CANADA

Cable Address: Norwesteel, Vancouver, B. C. Code A.B.C. 5th Edition.

Structural Steel

We fabricate Steel for every purpose. BRIDGES, BUILDINGS, TOWERS,
TANKS, MINE, and SMELTER STRUCTURES.

We carry in stock in Vancouver, B. C., approximately 5,000 tons of
Standard Structural Shapes and Plates available for immediate shipment.



BEAMS, CHANNELS, ANGLES, TEES PLATES AND COLUMNS.

All orders for plain material shipped cut to length within 48 hours of
receipt of order.

Fabricated Work Shipped With Corresponding despatch.

Canadian Northwest Steel Co., Ltd.

VANCOUVER

BRITISH COLUMBIA

CANADA

A Quarter Century of Mining in British Columbia

By E. A. HAGGEN, Editor Mining and Engineering Record

PREFACE.

The year 1918 marks the passing of the first Quarter Century in the history of lode mining in British Columbia. In 1893 was the first production of lode gold. In 1894 the first copper production was recorded; the construction of the first coke ovens to supply the smelting industry was launched; the Provincial Department of Mines became a special portfolio in the Cabinet at Victoria; and the policy of placing the Department in the hands of a Provincial Mineralogist of recognized technical standing was adopted. In these 25 years the mineral production of British Columbia has risen from \$3,588,413 per annum to the record in 1916 of \$42,290,462. In that period the mineral industry has contributed to the wealth production of the Province close on \$529,000,000, or about \$2,600 per head of the average population.

The purpose of this Special Quarter Centenary Edition of the MINING AND ENGINEERING RECORD is to review the development of the mineral industry during the First Quarter Century of its history, and by placing before home and foreign investors the facts as to the production achieved in a short period of time by a small mining population, statistics of capital invested, profits earned, dividends paid, ore reserves, developments of mining and metallurgy, to show that no better or more profitable field of investment exists than is offered in the development of the mineral resources of British Columbia. That the MINING AND ENGINEERING RECORD is in a specially favorable position to undertake this work is evident from the fact that this journal began publication almost contemporaneously with this period of mining development, and has maintained complete records of the events of these early years which now pass into history.

Copies of this special edition are being placed in the Dominion and Provincial Government Offices in Canada; also among investors in Great Britain, Australia, New Zealand, South Africa, the United States, France, Belgium, Holland, Norway, Sweden, Brazil, the Argentine Republic. That we have been able to undertake and carry out this work is due to the advertising support, and orders for copies of this Special Edition, received from the following, to whom our thanks, and the thanks and appreciation of the people of British Columbia, are due for the compila-

tion, publication and circulation of the facts and statistics presented herewith.

BRITANNIA BEACH, B. C.

Britannia Mining & Smelting Co., Ltd.

COPPER CLIFF, ONTARIO

John C. Rogers.

GRAND FORKS, B. C.

Jeff Davis & Co.

S. J. Matthews.

Dr. L. F. Teepoorten.

NELSON, B. C.

Canada Drug & Book Co., Ltd.

Ellory & Walley.

P. Glaser

A. H. Green

Hume Hotel

Nelson Iron Works

D. J. Robertson

F. W. Starkey

E. W. Widdowson

NEW WESTMINSTER, B. C.

Shull Lumber & Shingle Co., Ltd., Boundary Station

NORTH VANCOUVER, B. C.

North Shore Iron Works, Ltd.

PRINCETON, B. C.

Princeton Coal & Land Co., Ltd.

Princeton Drug & Book Store

REVELSTOKE, B. C.

Forest Mills of B. C., Ltd.

ROSSLAND, B. C.

A. S. Goodeve & Co.

SEATTLE, WASH.

Sam Hunter & Co.

SPOKANE, WASH.

C. M. Fassett & Co.

Hotel Davenport

Hotel Spokane

Standard Silver-Lead Mining Co.

Union Iron Works

TACOMA, WASH.

Tacoma Smelting Company

TRAIL, B. C.

Consolidated Mining & Smelting Co., Ltd.

D. M. Macdonald

T. A. Robley

- J. H. Scholefield, M.P.P.
Trail Hospital
- VANCOUVER, B. C.
- Barr and Anderson, Ltd., 1060 Homer St.
Bowena Copper Co. Ltd., Rogers Building
B. C. Electric Railway Co., Ltd., Carrall St.
B. C. Equipment Co., Ltd., Bank of Ottawa Bldg.
B. C. Exploration Syndicate, 413 Granville St.
B. C. Leather and Findings Co. Ltd., 119 Pender St.
- West
- B. C. Marine Ltd., Foot Victoria Drive
British Columbia Refining Co. Ltd., 1050 Hamilton St.
- B. C. Telephone Co., Ltd., Seymour St.
Brown and Mahoney Ltd., Vancouver Block
D. A. Brown's Travel Bureau, Hastings St. W.
P. Burns & Co. Ltd., Foot of Woodland Drive
Cammell, Laird & Co. Ltd., 847 Beatty St.
Geo. A. Campbell & Co., Tower Building
Canadian Explosives Ltd., Birks Building
Canadian Northwest Steel Co. Ltd., Foot Prince Edward St.
- Canadian Pipe Co. Ltd., 550 Pacific St.
Cassidy's Ltd., 929 Granville St.
Ceperley, Rounsefell and Co., Winch Building
Clark and Stuart Ltd., 320 Seymour St.
Cleland-Dibble Engraving Co. Ltd., Tower Building
Clubb and Stewart, Ltd., 315 Hastings St. W.
J. Coughlan & Sons, Front and Columbia Sts.
Crossman Electrical Machinery Co. Ltd., 80 Dufferin St. E.
- Crown Broom Works Ltd., 304 Front St. E.
T. B. Cuthbertson & Co. Ltd., 648 Granville St., and 619 Hastings St. W.
- Damer, Lumsden Co., 123 Pender St. W.
Dominion Products Ltd., 510 Hastings St. W.
Drum Lummon Copper Mines Ltd., 207 Hastings St. W.
- Gordon Drysdale Ltd., 575 Granville St.
G. S. Eldridge & Co., 567 Hornby St.
Empire Oil and Natural Gas Co., 419 Pender St. W.
Evans Coleman and Evans Ltd., Foot Columbia St.
R. Gardom & Co., Ltd., Hotel Vancouver Block.
C. Gardiner Johnson and Co., Foot Columbia St.
Gault Bros. Ltd., 361 Water St.
Gibson's Ltd., 101 Water St.
Granby Consolidated Mining Smelting and Power Co. Ltd., Birks Building
Gregg, G. R. & Co., Ltd., 322 Water St.
J. Hanbury & Co. Ltd., cor. Fourth Ave. and Granville St.
- Haskins, F. S.
B. Holt and Co. 800 Granville St.
Hudson's Bay Company, Cor. Granville, Georgia and Seymour Sts.
J. Leckie Co. Ltd., 220 Cambie St.
Leek & Co., 1098 Homer St.
- London and British North America Co., Ltd., 626 Pender St. W.
- London Grill
McClary Manufacturing Co., 305 Water St.
A. Macdonald and Co., 40 Powell St.
McLeod & McAlpine, Pender St. W.
Pride of the West Knitting Mills Ltd., Tower Bldg.
Mainland Engineering Co. Ltd., 422 Railway St.
The W. H. Malkin Co. Ltd., 57 Water St.
Millar & Coe, 419 Hastings St. W.
S. W. Miller & Co., Vancouver Block
Mission Confectionery Co. Ltd., 722 Granville St.
Northern Construction Co. Ltd., Vancouver Blk.
Pacific Coast Pipe Co. Ltd., 1551 Granville St.
Pacific Great Eastern Railway, 325 Howe St.
Pacific White Lead Co. Ltd., Industrial Island
Pan-Pacific Corporation Ltd., 626 Pender St. W.
Paterson Boiler Works, Foot Heatley Ave.
Pumps & Power Ltd., 224 Abbott St.
Purdy's Confectionery, 675 and 990 Granville St.
Red Jacket Development Co. Ltd., Standard Bank Building
- Renwick and Cunliffe, Ltd., 365 Water St.
Ritchie Contracting & Supply Co. Ltd., 1561 Granville St.
- River Gold Recovery Co. Ltd., Rogers Building
Sam M. Scott Ltd., 693 Granville St.
Simonds Canada Saw Co. Ltd., 554 Beatty St.
Smith, Davidson & Wright Ltd., Homer and Davie Streets
- Smith's Electric Co. Ltd., 561 Granville St.
R. H. Stewart, Vancouver Block
Sullivan Machinery Co., 1561 Granville St.
J. A. Tepoorten Ltd., 308 Water St.
Terminal Steam Navigation Co. Ltd., Foot Carrall Street
- Jas. Thomson & Sons Ltd., 353 Water St.
Tod & Manning Ltd., 574 Granville St.
Union Steamship Company of B. C. Ltd., Foot Carrall St.
- Union Steamship Co. of New Zealand (Canadian Australasian Royal Mail Line), 440 Seymour St.
Vancouver Board of Trade
Vancouver Business Institute, Ltd., 336 Hastings Street, W.
- Vancouver Engineering Works Ltd., 519 Sixth Ave. West
- Vancouver Knitting Co., 78 Dufferin St. E.
Vancouver Machinery Depot Ltd., 1155 Sixth Ave. West
- Western Oil and Supply Co. Ltd., 560 Beatty St.
Western Power Co. of Canada Ltd., Carter-Cotton Building
- Wilkinson Co. Ltd., 846 Beach Ave.
Wilson, J. R. B. & Co. Ltd., Hamilton St.
Wood, Vallance & Leggat Ltd., 573 Carrall St.
Woods Hotel, Cor. Carrall and Hastings Sts.

Wood's Ltd., 160 Cordova and 215 Hastings St., W.
Woodward Department Stores Ltd., Cor. Hastings
and Abbott Sts.

The World, 445 Hastings St. W.

Yorkshire & Canadian Trust Co. Ltd., 525 Seymour
Street

VICTORIA, B. C.

Canadian Collieries (Dunsmuir) Ltd.

E. G. Prior & Co., Ltd. Liability, Government St.

Hon. William Sloan, Minister of Mines

Turner Beeton & Co. Ltd.

* * *

BRITISH COLUMBIA

British Columbia is the most westerly Province of the Dominion of Canada, bordering the Pacific Coast in a northwesterly direction for 660 miles from the City of Victoria at the southern end of Vancouver Island to Portland Canal in the north. From Portland Canal the western boundary strikes inland following the elevation of the Coast Range in the same northwesterly course for a further distance of 570 miles to the 60th parallel, giving the Province a length of about 1,200 miles along the Coast Range of the Cordillera. In width the Province extends from the Coast to the summit of the Rocky Mountain Range, an average width of 500 miles, and in length from the 49th to the 60th parallel, a distance of 600 miles. The Province comprises an area of 390,344 square miles.

British Columbia is mountainous over its entire length and width, giving rise to the observation of an eastern Canadian statesman in the early days of Confederation that it was a "sea of mountains"; the inference being that the Province was in consequence of little value to the Dominion. Time, science and enterprise have shown that British Columbia is, in natural resources, one of the richest gems of the British Empire, and the Advisory Council on Industrial and Scientific Research have recognized this to the extent that they have urged the Dominion Government as an important part of its reconstruction policy, to devote special attention to the development of the resources of this Province as a means of sustaining the national credit under the heavy financial burdens imposed by the Great War.

The natural resources of the Province consist of its wealth in minerals, timber and fisheries. The valleys, though of limited area, are generally suitable for agriculture; while the neighbouring hills present possibilities for the breeding of live stock. Strong efforts are being made by the Dominion and Provincial Governments to develop the agricultural production to a point where it will at least afford a home food supply for the population.

TOPOGRAPHY.

The mountain system of British Columbia consists of a series of zones paralleling the North Pacific Coast, known respectively as:—(1) Vancouver Range, forming the backbone of Vancouver and Queen Charlotte Islands; (2) the Coast Range; (3) the Gold Range, with its northern extensions in the Cariboo and Babine ranges; (4) the Rocky Mountain Range.

The elevation of these ranges averages 6,000 to 7,000 ft., with occasional peaks attaining a height of from 8,000 to 11,000 ft. above sea level. The loftiest peaks are found in the Selkirk and Rocky Mountain Ranges, Mount Robson, in the Rocky Mountain Range, north of the Yellowhead Pass, attaining an elevation of 13,068 ft. above sea level.

The mountain systems are heavily glaciated, the surface of the ice-cap having risen in places 7,000 ft. above sea level.

Between each series of ranges is a deep intermontaine depression, the most important being that following the western limits of the Rocky Mountain Range. This trench from Montana to the Yukon affords a natural route for a future railway connecting the systems of Canada and the United States with those of Europe via Behring Strait and Russia. In this trench are the Kootenay, Columbia, Canoe, Parsnip, Findlay and Pelly Rivers. Between the Selkirk and Gold Ranges flows the Columbia River, after turning south at the Big Bend, its waters feeding the Upper and Lower Arrow Lakes.

Between the Coast Range and the Gold Range is the Interior Plateau with an average width of 200 miles, drained on the west by the Fraser River.

The Columbia River has a length of about 500 miles in British Columbia, and, except for a mile at Canal Flat, at its headwaters, separating the Columbia from the Kootenay River, the two rivers enclose the Selkirk Mountain Range as it were in an island about 300 miles in length.

Other important rivers are:—The Fraser River, taking its rise in the Rocky Mountains at Yellowhead Pass, intersecting the Coast Range, having its outlet to the sea close to the Boundary between Canada and the United States, and traversing a length of about 1,200 miles; the Skeena River, taking its rise in the mountains of Cassiar, and intersecting the Coast Range south of Prince Rupert, flowing a distance of about 600 miles; the Stikine River, also heading in the mountains of Cassiar, intersecting the Coast Range, and having its outlet in south-eastern Alaska, its length of flow being about 600 miles; Peace River, so named from the point of confluence of the Findlay, Omineca and Parsnip Rivers on the western flank of the Rocky Mountains, which it intersects, flowing east to the Athabasca, its length in British Columbia being about 300 miles.

On the Coast, fiords cut into the heart of the Coast Range for distances as much as 80 miles, affording the best of water transportation facilities, while in the interior are great lakes permitting service of large areas by water transportation. The principal lakes are: Okanagan, Arrow, Kootenay, Slocan, Quesnel lakes, in the south, and Eutsuk, Stuart, Babine, Tacla and Atlin lakes in the north.

With the exception of the Interior Plateau, known as "the dry belt" the valleys and mountains up to an elevation of 4,000 ft. are well timbered.

* * *

ECONOMIC GEOLOGY.

The Cordillera of North and South America form one of the world's most important sources of mineral wealth. In the United States and Mexico the Pacific Mountain system has produced metals to the value of about \$4,000,000 per lineal mile, and is likely to continue to maintain production for an indefinite period. So far as developed the portion of the Pacific Mountain system in British Columbia promises as great available resources of mineral wealth as the portion of the system developed to the south.

The Gold Range is an extension of the Cabinet, Coeur d'Alene and Bitter Root Mountains of the neighboring States; the Interior Plateau represents the Great Basin of Utah and Nevada¹; the Coast Ranges resemble the Sierra Nevada, and the auriferous slaty and schistose rocks on the western border of that range appear to be here represented by the auriferous schists of Leach River, the country west of Barkley Sound, and Graham Island of the Queen Charlotte Group.

Dawson remarked: "While local occurrences of gold placers are known in association with slates, probably of Triassic age, on both sides of the Coast Ranges, the main auriferous territory in the Province is found to align itself on the Gold Range, and the original deposits of gold, from which the placers have been supplied, are already known to exist in several series of rocks widely separated in age and ranging all the way from the Triassic to the Cambrian. While, therefore, there is no single well-developed gold-producing region, as in California, the area and mass of the rocks throughout which deposits of gold may be hopefully looked for is here greatly increased."²

The geological areas of British Columbia in order of age are the pre-Cambrian, Paleozoic, Mesozoic, Tertiary and Pleistocene. The Pre-Cambrian is represented by the mica schists, gneises and marbles of the Summit, Selkirk, Purcell and Shuswap series; the Paleozoic by the black, shaly or schistose argillites, limestones, grey and green schists and volcanics of the Nisconlith, Adams Lake, Ainsworth, Cache Creek, Slocan and Nicola series; the Mesozoic by shales, sandstone, conglomerates, granite, grano-diorites and

monzonites; the Tertiary by sandstones, shales, conglomerates, andesites, tuffs, basalts, and rhyolites; and the Pleistocene by the glacial drift. The principal ore deposits are mainly of Jurassic age, found in the metamorphosed Paleozoic rocks in the vicinity of dykes and batholithic intrusions, the most important area of which is the Coast Range. This Range is the greatest phenomenon of its kind in world geology. It covers a length in the Province of 1,200 miles, by an average width of 90 miles.

THE COAST RANGE.

This fact suggests that the Coast Range, as well as its western and eastern borders, should prove an attractive field for prospectors. Already its development has demonstrated within its area the two largest copper mines in the British Empire.

These are, respectively, the Britannia Mine, on Howe Sound, and the Hidden Creek Mine at Anyox. In this area is also the Surf Inlet Mine, the second largest gold mine in Canada.

The rocks of the Coast Range batholith are mainly grano-diorite and quartz-diorite, and until recently prospectors have avoided the area under the impression that the granitic rocks held out little hope of producing ores of economic importance. The minerals developed on the west side of the Coast Range are:—

Gold, associated with marcasite, and small amounts of silver, copper and molybdenite, at Texada Island, Phillips Arm and Surf Inlet; and accompanied by silver at Portland Canal.

Silver, accompanying gold at Surf Inlet; copper at Britannia Mine, on Howe Sound; Hidden Creek Mine at Anyox; and Texada Island mines; zinc, on Burrard Inlet; and lead at Fanny Bay.

Copper at Pitt Lake, Howe Sound, Jervis Inlet, Texada Island, Phillips Arm, Knight Inlet, Princess Royal Island, Swanson Bay, Kuhlze Inlet, Altenash Inlet, Gribble Island, Douglas Channel, Observatory Inlet, Portland Canal, Rainy Hollow.

Iron, as magnetite, at Nelson Island, Texada Island, Redonda Islands, Seymour Arm, Pitt Island; as limonite at Alta Lake and Copper River; as hematite on Klinaklini River.

Lead at Lund, Fanny Bay, Texada Island, Portland Canal.

Zinc on Burrard Inlet, Howe Sound, Texada Island, Fanny Bay, Observatory Inlet, Portland Canal.

Molybdenite on Burrard Inlet, Howe Sound, Jervis Inlet, Kuhlze Inlet, Princess Royal Island, Observatory Inlet, Portland Canal.

Graphite at Bute Inlet, Wark Island.

Pyrites at Eckstall River and Anyox.

THE VANCOUVER RANGE.

which forms the backbone of Vancouver and Queen Charlotte Islands, is composed mainly of crystalline rocks, flanked by Cretaceous rocks, whose economic importance is due to the fact that they contain the

¹Dawson, Canada Geological Survey 1887, p. 12R. ²Ibid.

principal coal measures, as those of Nanaimo, Cumberland, Suquash, on their eastern base. Gold, silver, copper, lead, zinc, molybdenite, mercury, manganese, and iron deposits are found in several localities.

INTERIOR PLATEAU.

The Interior Plateau covers what is known as the Dry Belt of British Columbia. It lies between the Cascade and Gold Ranges, has an average width of about 100 miles and an average elevation of about 4,000 ft. Much of the area consists of flows of basaltic rocks; while the Tertiary sedimentaries carry deposits of coal, lignite and clays. Its mineral products are:—Gold, both placer and lode, copper, silver, mercury. Several small deposits of lead and zinc have been reported. Other minerals are: Antimony, platinum in lodes and placers, microscopic diamonds, soda lakes and springs, epsom salts. It comprises the most promising auriferous area of the Province; but much difficulty is experienced in prospecting the country, as the Paleozoic rocks and ore deposits are for the most part concealed by flows. At Lillooet, underground development has revealed metalliferous veins of importance. Old river channels also exist, sections of which may be found to contain payable auriferous gravels, now concealed by basaltic and lava flows.

THE GOLD RANGE

is the most important mountain area of the Province from a metal mining point of view. In this range is Rossland, the richest lode gold camp yet discovered; also the Cariboo goldfields; while it has developed, in the Sullivan Mine, of East Kootenay, the largest silver-lead-zinc mine in the world. As the northern extension of the Coeur d'Alenes, of Idaho, the eastern portion of the range gives promise of important metalliferous developments. This range is a complex of several minor series, including the Purcell, Selkirk, Columbia ranges in the south, and the Cariboo and Babine Ranges in the north. The rocks are of ages varying from pre-Cambrian to Carboniferous, the majority of the ore deposits being associated with the latter.

High-grade silver-lead deposits occur; and there are ores of copper, zinc, tungsten, molybdenum, iron. This range contains the most extensive areas of crystalline schists found in the Province, and the numerous batholithic intrusions and dykes present features which should prove attractive to the prospector.

THE ROCKY MOUNTAIN RANGE

forms the eastern boundary of British Columbia, its summits delineating in the south the line between that province and Alberta. It varies in width from 60 miles in the south to 40 miles in the north. The rocks are mainly Carboniferous sedimentaries, with few occurrences of crystalline and intruded rocks, the most notable exception probably being the syenite area at the head of Ice River, south of Field, on the main line of the Canadian Pacific Railway. The economic

value of the range consists in its extensive deposits of coal occurring in isolated basins of Cretaceous rocks. Copper, silver, lead and zinc occur, the most important yet developed being the Monarch Mine at Field. There is a possibility that phosphate deposits may be developed in the contact between the quartzite and limestone as such deposits have assumed great commercial value in the southern extension of the range in Idaho and Montana, and similar deposits have been found near Banff. The northern part of the range is entirely in British Columbia, and these deposits will probably be found to extend towards Peace River. The value of commercial phosphate deposits cannot be over-estimated, as they are essential to the supply of fertilizers and the maintenance of agricultural production.

MINERALIZING INTRUSIVES, ASSOCIATED ROCKS AND GANGUES.

Of twenty-two producing camps in British Columbia it is interesting to note that the intrusive mineralizers in 17 of these are granites and grano-diorites; in two gabbro; in one, diorite; in two peridotite; one syenite. Of the associated rocks, limestone is the predominating rock in ten of those camps; granite in four; tuffs in two; diorite in two; schist in two; augite porphyrite in one; and quartzite in two. In nine of these camps the ore-bodies are in quartz gangue; in five, garnet, diopside, tremolite, epidote, calcite, pyroxene and amphibole; in two, serpentine and olivine; in one, argillite.

Examples of camps in which the mineralizers are granite and diorite are:—Hazelton, Surf Inlet, Anyox, Britannia, Lillooet, Franklin, Phoenix, Rossland, Sheep Creek, Slocan, Ymir, Ainsworth, Sullivan, Molly Gibson. Hedley and Sunloch owe their mineralization to gabbro; at Texada Island the mineralizer is diorite; at Tulameen and Deer Creek it is peridotite; at Field it is syenite. Mines in which the ore deposits are associated with limestone or altered lime rocks are:—Slocan, Sheep Creek, Ymir, Ainsworth, Field, Texada Island, Franklin, Phoenix, Deadwood, Hedley. Ore-bodies are in grano-diorite at Hazelton, Surf Inlet, and Molly Gibson. At Sunloch and Observatory Inlet the ore is associated with tuffs. At Texada Island it is with diorite. At Anyox and Britannia the associated rocks are schists; at Rossland, augite-porphyrity; at Trout Lake and South-east Kootenay, quartzite.

Examples of the gangue minerals are:—Quartz, at Slocan, Ymir, Anyox, Molly Gibson, Britannia, Hazelton, Sheep Creek, Rossland, Lillooet, Sullivan; garnet, calcite, tremolite, epidote, diopside at Texada Island, Boundary, Hedley, Franklin, Phoenix, Deadwood; serpentine and olivine at Tulameen and Deer Creek; argillite in Slocan.

COAL-BEARING ROCKS.

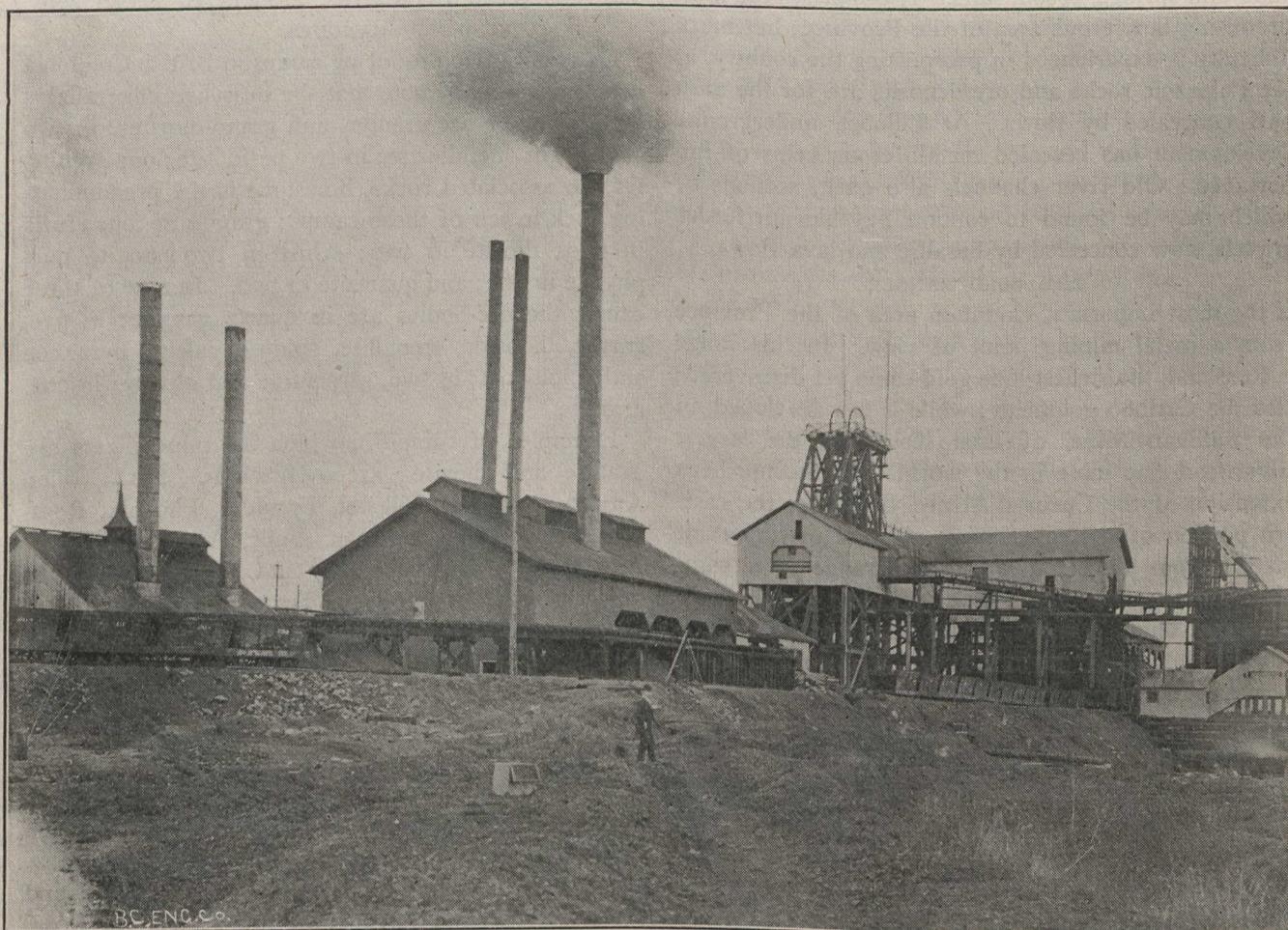
The Cretaceous and Tertiary formations include the

whole of the coal fields of British Columbia. The coals in the Cretaceous areas are the most important from their composition and extent, and include the Vancouver Island and Crows Nest, Bulkley, Telkwa,

Morice, Groundhog, Copper River, Peace River, Atlin, and Queen Charlotte Fields. The coals of the Tertiary formation are mainly lignites, though bituminous coals occur in this formation at Nicola and Tulameen.



History of Mining and Metallurgical Development in British Columbia



No. 1 Mine of Canadian Western Fuel Co., Nanaimo. Operated by the Hudson's Bay Company from 1852 to 1861.

The first recorded discovery of minerals in British Columbia was that of Douglas, the botanist, who, in 1825, when exploring Kootenay Lake, observed what is known as the Bluebell vein, carrying silver-lead ore, outcropping on the shore of the lake on the present Comfort mineral claim at Riondel.

DISCOVERIES OF COAL.

The next discovery was that of coal at Suquash, on

the north coast of Vancouver Island, at Queen Charlotte Sound. Suquash is so named from the Indian expression meaning 'the rock that burns.' The Hudson's Bay Company was the first mine operator in British Columbia, bringing out miners from Scotland to work the Suquash field, but this field was abandoned when, on May 8th, 1850, coal was discovered at Nanaimo, on Vancouver Island, laying the founda-

tion for the great coal mining industry which has since developed in that portion of the Province.

Between 1835 and 1853 the Suquash Mine produced 10,000 tons of coal, which was mainly used for steaming the boilers of the Hudson Bay Company's "Beaver," the only steamship trading in the

waters of the north Pacific in those days. Port McNeill, adjacent to the Suquash Mine, was named after the captain of the "Beaver."

In 1852 the Hudson's Bay Company opened the Nanaimo mine, which is worked to this day as the No. 1 Mine of the Canadian Western Fuel Company.



Yale, on the Fraser River. The home of 11,000 Miners in the First Gold Rush of 1858.

In 1853, 2,000 tons of coal were shipped from the new mine to San Francisco. Prices of coal in those days ranged from \$11 a ton at the mine to \$28 a ton in San Francisco. In 1861 the mine changed hands, being sold to the Vancouver Coal Mining and Land Co. From 1852 to 1859 it had produced 25,398 tons.

In 1859 coal was discovered at Cowgitz, Queen Charlotte Islands, by Downie, and in 1865 the mine was equipped for operation. Up to 1871 this mine produced 565 tons of coal, when it was closed down. In 1871 the Wellington field on Vancouver Island was opened by Robert Dunsmuir, who became the principal coal and railway operator of Vancouver Island.



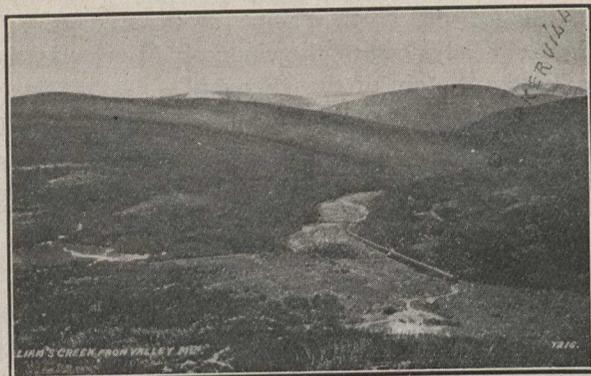
Quesnel Forks. Scene of the First Gold Discovery in Cariboo, in 1861.

In 1875 Robt. Dunsmuir and Sons also opened the Cumberland field.

In 1898 the Crows Nest Pass coalfield was opened, and in 1907 the Nicola field, followed in 1908 by the Corbin field. In 1909 the coal mine at Princeton was opened; and in 1912, the Coalmont coal mine at Tulameen.

DISCOVERY OF GOLD.

The first gold discovery was at Gold or Mitchell Harbour, Queen Charlotte Islands, in 1851, when Indians brought to officers of the Hudson's Bay Company at Fort Simpson, a sample of rich gold quartz which had been broken from the outcrop of the vein by an Indian woman. The sample weighed between 4 oz. and 5 oz., and was sent to the Company's headquarters at Victoria. The brigantine "Una" was despatched to the scene of the discovery, which proved to be a quartz vein about 7 in. wide, outcropping for a length of about 80 ft., and carrying such rich values that in places 25% of the vein was solid gold. The crew of the brigantine broke down some of the quartz to take back to Victoria, but the vessel was wrecked at Neah Bay in December of that year. In January, 1852, the Hudson's Bay Company purchased the U. S. brigantine "Orbit," ashore on the rocks at Esquimalt, renamed it the "Recovery," hoisted the British flag and despatched the boat to what was supposed to be the land of gold. Thirty miners



Williams Creek, Cariboo. Scene of one of the Richest Gold Discoveries in the History of the World's Placer Mining.

were engaged on a 50-50 co-operative basis; the mine was worked three months, a cargo of quartz brought out and shipped to England, and net proceeds obtained of about \$5,400, their share of which gave the miners \$30 per month per man for the time engaged in mining.

News of the discovery spread and the San Francisco argonauts of that day despatched several vessels loaded with miners and supplies to Gold Harbour, the British Admiralty sending the warship "Thetis" from Valparaiso to maintain order in the new camp. Captain Rooney, of the vessel "Susan Sturgess," took back with him to San Francisco quartz which the original miners considered too low grade to ship, and sold it for \$1,400. Elated by the result, Captain Rooney returned, but the Haida Indians of that time were hostile, seized his ship, and held the crew prisoners until released by the Hudson's Bay Company's steamer "Beaver."

The value of the gold mined at Gold Harbour at that time is not definitely known, but has been placed at from \$20,000 to \$70,000. This was the foundation of lode gold mining in British Columbia, and since that time the production of lode gold has been approximately \$96,000,000.

PLACER GOLD DISCOVERIES.

In 1852 the Hudson's Bay Company at Kamloops is reported to have purchased placer gold from the Thompson and Similkameen; and in 1855 an officer of the company discovered gold at Colville, Wash. The Hudson's Bay Company was thus the pioneer coal and gold miner of British Columbia, and laid the foundations of what is today the greatest and most important industry in the Province. Though the Hudson's Bay Company is not actively engaged in mining operations here, there are indications that the London board is returning to its first love, for the company is taking an active part in the organization of the new British company formed to handle the metal output of the British Empire in the interest of the Empire, and prevent it again getting under German control, as it was before the war.

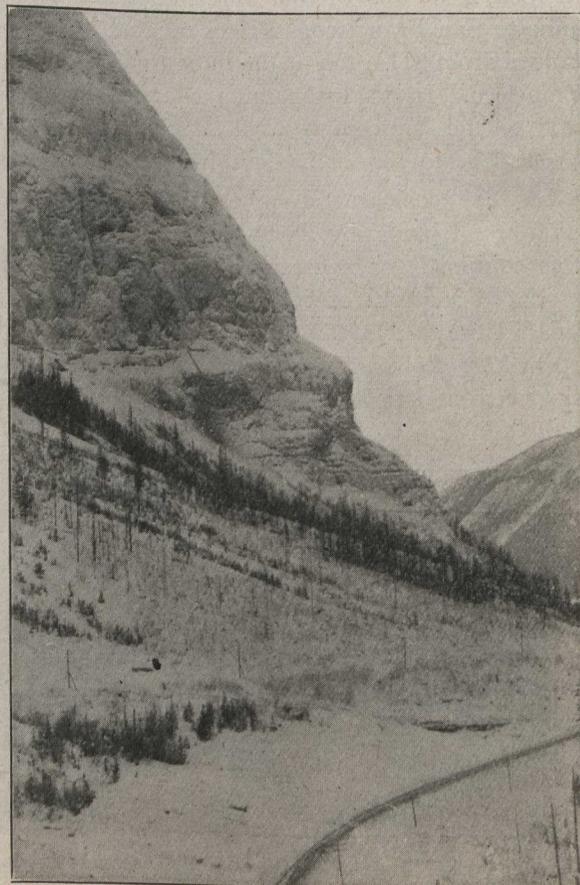
The Colville discovery having developed to an im-

portant production the miners cast about for new fields. Indians told them a similar metal existed in the Thompson River, and in 1857 the first party of placer miners to operate in British Columbia started operations on the Nicomen River, about nine miles from its confluence with the Thompson. The first placer gold production is reported by Sir James Douglas as 300 oz., purchased by the Hudson's Bay Company between October 6, and December 31, 1857.

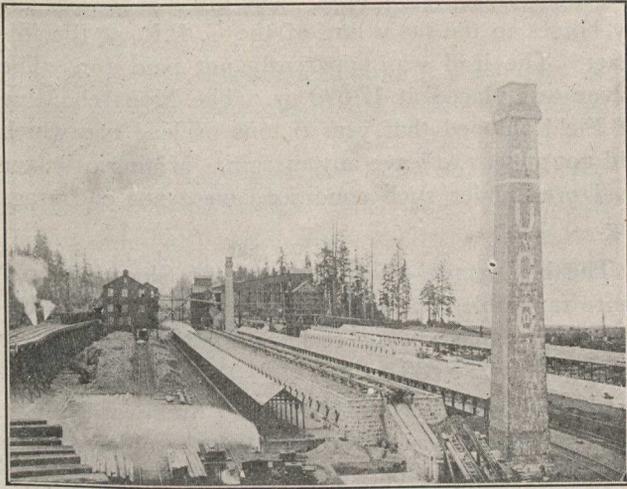
The year 1858 saw the first of the Fraser River "rush" when from March to June between 20,000 and 23,000 miners arrived from San Francisco and camped at Victoria awaiting transportation to the Fraser River. For want of means of reaching their destination, owing to lack of shipping, all but 3,000 returned to California. About 8,000 more came overland, so that by the end of 1858 there were about 11,000 miners at work on the bars of the Fraser River, of whom the greater number were camped at Yale.

The golden age of British Columbia began in June, 1858, with the shipment of gold to the value of \$6,000. The steady growth of production is shown by the following returns:—

June	\$ 6,000
July	45,000
August	164,000
October	283,000
	\$543,000



Monarch Mine, Field. A Shipper of Silver-Lead Ore in 1887



First Coke Ovens. Installed in 1896 at Union Bay by Robt. Dunsmuir & Sons to Supply Coke for Smelters at Pilot Bay, Nelson and Trail.

One of the most remarkable enterprises of the time was the establishment in 1859 at Victoria by the Bank of British North America of a branch equipped to assay and purchase gold. The assayer was sent out from the Bank of England metallurgical staff. The

Bank of British North America was thus the first metallurgical institution in western Canada, and the pioneer of the great metallurgical works which the mineral industry has since built up here.

By 1859 the miners had followed the Fraser River north to Quesnel, and by 1860 had found rich gold at Quesnel Forks, where 600 men were at work. Antler Creek was discovered. Cariboo was soon to be heard of as the greatest placer gold mining camp in British Columbia, and one of the greatest in the world. The wave of pioneer miners spread south as well as north, and the Similkameen was added to the list of discoveries.

In 1861 Williams and Lightning Creeks in Cariboo, and Peace River placers were discovered. Before the close of the year Cariboo had produced gold to the value of \$2,000,000 for 1,500 men. When this news got abroad miners flocked from Great Britain, Australia, New Zealand and the United States.

In 1863 Wild Horse Creek, in East Kootenay, was discovered. In 1864 Leach River, on the west coast of Vancouver Island, was the scene of a new rush. The discovery was made by Dr. Brown, who followed up the Sooke River and obtained prospects of from 3c



Hall Mines Smelter at Nelson. Opened in 1896.

to \$1 to the pan. Nuggets worth as much as \$70 were obtained, and \$30,000 was taken out in about five weeks. In 1865 the Big Bend of the Columbia was discovered, and in that and the next year 7,000 miners were camped there. In 1869 gold was discovered in Omineca, which saw its greatest rush in 1871. In 1872 a rush set in to Cassiar. Granite Creek, Tulameen, was struck in 1885, and following the Yukon gold excitement a rush set into Cassiar in 1889. Thus were laid the foundations of the placer mining industry, which has produced to date gold to the value of \$75,500,000.

LODE MINING AND SMELTING.

While the first lode mining was done on the small vein at Gold Harbour as far back as 1851, the first appearance of lode gold to excite attention in southern British Columbia was a discovery at Goldstream, near the city of Victoria, in 1863. The Parmeter Company shipped half a ton of the ore to San Francisco, and obtained a return of \$25 per ton. Ten companies were formed in Victoria to operate in the district, but the first specimens obtained were evidently from a solitary pocket.

In 1886 the iron ores of Texada Island were worked, and the ore shipped to Irondale, in the State of Washington, for manufacture of pig iron. In the two years between 1886 and 1888 the shipments aggregated 6,000 tons.

It was not till 1887 that any attempt was made to mine and market other ores. The Lanark Mine at Illecilliwaet, now operated by W. R. Dornberg, of Spokane, shipped to an American smelter 16 carloads, estimated at about 320 tons, of ore averaging 89 oz. per

ton in silver and 28% lead. The ore was packed out by horses to the main line of the C. P.R. at Illecilliwaet. The lead was apparently not paid for. The silver was placed at 17,690 oz. The Monarch Mine at Field shipped that year 6 tons of lead ore which did not appear to leave any margin. Mining of silver lead ores under such conditions were not encouraging.

The high-grade silver-lead ores of Slocan offered more favorable conditions, and in 1888 shipments began, the values being reckoned entirely in silver, aggregating \$75,780.

In 1888 a smelter for silver lead ores was built at Vancouver, but was never operated, the object of the promoters being to obtain a land grant in the City of Vancouver which the Dominion Government had offered to provide for the construction of smelters. As there was no proviso for operation, the matter ended with construction, and the smelters built under the system were of no value to the industry.

In 1890 a smelter was built at Golden, and in 1894 another smelter was built at Revelstoke under the land grant system, but none of these smelters were ever operated.

Returns for lead were received for the first time in 1890, when the amount paid for was 113,000 lb., realizing \$5,805. In 1890 Nelson district became a shipper, producing from Toad Mountain 110 tons silver-copper ore valued at \$409 per ton.

In 1893 Rossland entered the producing lists and laid the foundation of the mineral industry of British Columbia with a production of 1,170 oz. gold, while



Knob Hill and Old Ironsides Mines at Phoenix. Opened by the Granby Company in 1898.

the Slocan and 2,1

In 1887 the treatment Division

In 1888 the first cost to supply

The special smelter their share Heinze

In 1889 from the

In 1890 with 2 per cent

In 1891 S. H.

Ironside was in

ing en its first

1901. blown

Falls a

In 1892 office

object miner

the Slocan production was trebled to 227,000 oz. silver and 2,135,023 lb. lead.

In 1894 the first smelter was built at Pilot Bay for treatment of silver lead ores of the Ainsworth Mining Division.

In 1896 Robt. Dunsmuir and Sons established the first coking plant in British Columbia at Union Bay to supply the Trail and Nelson smelters with coke.

The year 1896 saw the commencement of commercial smelting. In that year the Hall Mines, Ltd., built their smelter at Nelson, and in the same year A. Heinze built a smelter at Trail to treat Rosslund ores.

In 1896 the first shipments of zinc ore were made, from the Lucky Jim Mine.

In 1898 there were in the Province mills equipped with 223 stamps, producing \$1,244,180 of lode gold per annum.

In 1898 the Granby Company was organized by S. H. C. Miner, of Granby, P.Q., to take up the Old Ironsides and Knob Hill claims at Phoenix, and thus was inaugurated the largest copper mining and smelting enterprise in the Province. The company made its first copper production from its own smelter in 1901. In the same year the Greenwood Smelter was blown in, and in that year the smelters at Boundary Falls and Ladysmith were placed in commission.

In 1899 the Provincial Government opened an assay office in Vancouver to assay and purchase gold, the object being to meet the requirements of the Yukon miners who were returning from the north and were

taking their gold to the U. S. assay office at Seattle. W. Pellew Harvey, who conducted an assay office at that time, was appointed official Government assayer at Vancouver, but the scheme was not attended with success, the amount of gold melted at the Government Assay Office at Vancouver being limited to 7,822 oz. ; and at the Provincial Assay Office at Victoria to 3,124 oz.

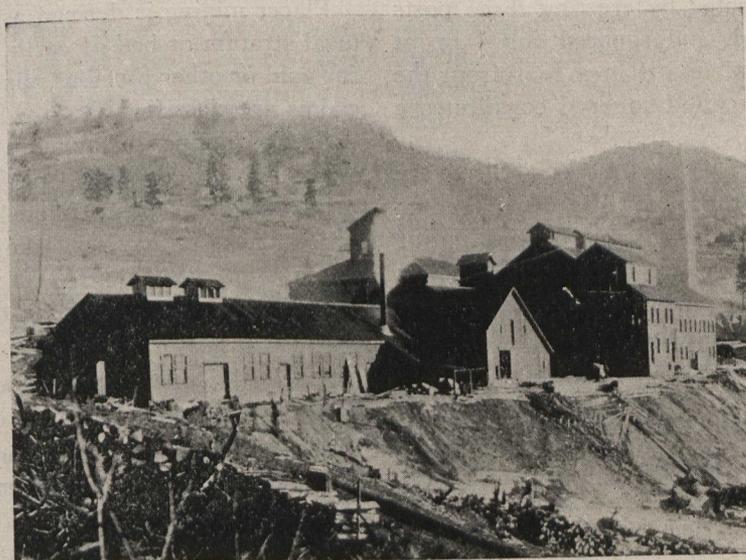
In 1910 the Granby Company acquired from M. K. Rodgers an option on the Hidden Creek Mine on Observatory Inlet, and within two years had proved up ore reserves which placed the mine in the rank of the second largest copper mine in the British Empire.

In 1914 the Granby Company's smelter at Anyox, now the largest producer of copper in the Province, was blown in.

Spelter was first commercially produced at the Trail Smelter in 1914, and in 1916 a copper refinery was added to the plant at Trail.

In 1916 the Britannia Mining and Smelting Company completed its new mill at Britannia Beach with a capacity of 2,500 tons a day.

In 1917 the Canada Copper Corporation took over the smelter and mines of the B. C. Copper Company, and developed the Copper Mountain Mine to the position of the third largest copper mine in the British Empire. In 1918 the Company began the construction of a mill at Allenby, B. C., to treat 2,000 tons of ore per day.



Granby Company's First Smelter at Grand Forks. Operated in 1901.

Mining Laws

The Mining Laws of British Columbia provide as follows:

FREE MINER'S CERTIFICATE.

Any person over 18 years of age may prospect for and locate minerals, hold and acquire mineral claims, by taking out a Free Miner's Certificate at a cost of \$5.00 per annum, terminating on May 31, in each year, the fee being proportionately to the unexpired portion of a year if taken out later than June in each year. Incorporated companies have similar privileges on payment of a fee of \$100 a year. Lands on which locations may be made are those held by the Crown, or on which the Crown has reserved the right to the minerals thereon. This latter provision applies to all lands alienated since 1888, except where Crown Grant has been obtained to the mineral rights. A free miner may locate only one claim on the same vein or lode, but may acquire others by purchase. In the event of a free miner allowing his certificate to lapse all his rights become forfeited, subject to revival under payment of a fee of \$15, provided no rights have accrued to others meantime. In the case of a partnership the rights of the defaulter accrue to the remaining partner or partners maintaining their free miner's certificate in good standing and otherwise complying with the law.

LODE MINERAL CLAIMS.

These may be located in rectangular form of an area not exceeding 1,500 feet square.

A mineral claim is located by erecting three posts not less than 4 feet high and squared for 4 in. at least on each face for not less than a foot from the top. A tree stump so cut and squared constitutes a legal post.

The three posts are placed as follows:—Discovery Post at the place where the mineral is discovered in place; No. 1 Post as near as possible on the line of the ledge or vein on which the Discovery Post has been placed to mark one boundary of the claim; No. 2 Post, as near as possible on the course of the ledge or vein, not more than 1,500 feet from No. 1 Post, to mark the other boundary of the claim.

Upon each of the three posts mark the date of location, name of claim and name of locator. In addition to these particulars write on No. 1 Post the words "Initial Post. Direction of Post No. 2 (give approximate compass bearing); . . . feet of this claim lie on the right and . . . feet on the left of the line from No. 1 to No. 2 Posts."

The location line between Nos. 1 and 2 Posts must be marked in a timber locality by blazing trees and cutting underbrush, and in bare country by monuments of earth or rock not less than 2 feet in diameter at the

base, and at least 2 feet high, so that the line can be distinctly seen.

Claims must be recorded at the office of the Mining Recorder for the Mining Division in which they are located within 15 days from date of location, one extra day being allowed for each ten miles of distance from the Recording Office after the first ten miles. If a claim is not recorded in time it is deemed abandoned and open for re-location; but if the original locator wishes to re-locate he may do so by permission of the Gold Commissioner on payment of a fee of \$10.00 and this condition applies to a claim abandoned for any reason.

Mineral claims are held practically on yearly lease, subject to annual assessment work being performed to the value of \$100 for each and every year until Crown Grant is obtained, such assessment to be filed within the year with the Mining Recorder, or the sum of \$100 paid for each claim, subject to the claim being otherwise regarded as abandoned. The actual cost of survey may be treated as assessment up to \$100 a claim. Any work done over the required assessment in any one year may be recorded against future assessments to the extent of \$100 a year for each claim. On performance of work, or payment of \$100 a claim to the extent of \$500 a Crown Grant may be obtained on payment of the fees and publication of the usual notices.

PLACER CLAIMS

Placer mining is defined as "the mining of any natural stratum or bed of earth, gravel or cement mined for gold or other precious minerals or stones." Placer claims are classified as:—

Creek Diggings—Any mine in the bed of any stream or ravine.

Bar Diggings—Any mine between high and low water marks on a river, lake or other large body of water.

Dry Diggings—Any mine over which water never extends.

Precious Stone Diggings—Any deposit of precious stones, whether in veins, beds or gravel deposits.

Size of claims—Bar Diggings:—250 feet square, provided that side lines be measured along the general course of the stream.

Bar Diggings—250 feet square on any bar covered at high water; or 250 feet long at high water mark, and extending from high water mark to extreme low watermark.

Dry Diggings—250 feet square.

Every placer claim shall be as nearly as possible rectangular in form, and marked by four legal posts

at the corners firmly fixed in the ground. On each post shall be written the name of the locator, number and date of free miner's certificate, date of location and name of claim. In timbered localities all boundary lines of a placer claim shall be blazed so that the posts can be distinctly seen, underbrush cut, and the locator shall also erect legal posts not more than 125 feet apart on all boundary lines. In localities where there is not timber or underbrush, monuments of earth or rock, not less than 2 ft. high and 2 ft. diameter at base, may be erected in lieu of the said last-mentioned legal posts, but not in the case of the four legal posts marking the corners of the claim.

A placer claim must be recorded in the office of the Mining Recorder for the Mining Division within which the same is situate, within 15 days after the location thereof, if located within ten miles of the office of the Mining Recorder, and one additional day for every ten miles or fraction thereof, the number of days being inclusive of that on which the location was made, but exclusive of the day of application for record. A claim not so recorded shall be deemed abandoned. To hold a placer claim for a year it must be recorded before the expiration of the record or re-record. A placer claim must be worked by the owner or some-one on his behalf, continuously as far as practicable during working hours. If work is discontinued for a period of 72 hours, except during the close season, lay-over, leave of absence, sickness, or for some other reason to the satisfaction of the Gold Commissioner, the claim is deemed abandoned. The Gold Commissioner may grant lay-overs on account of insufficient water or declare a closed season; grant licenses for tunnels and drains on the applicant giving security for damages; or grant right-of-way for construction of tunnels or drains on payment of a fee of \$25.

DISCOVERY CLAIMS

Discoverers of new placer fields are entitled to grants of 600 feet for one discovery; 1000 feet for two; and claims of ordinary size for each party over two, discoveries not to be allowed within five miles of each other.

CO-OWNERS AND PARTNERSHIPS

Mining partnerships of general and limited liability may be formed, and partners may recover from other partners in default their proportion of assess-

ment work subject to forfeit of interest to the co-owners maintaining their title.

HYDRAULIC AND DREDGING LEASES.

Claims for which it is intended to apply for lease for hydraulicing or dredging may be marked by a legal post at each corner of the ground applied for, and making application to the Gold Commissioner. On the post nearest the placer ground then being worked the locator must post a notice stating the name of the applicant; the location and quantity of the ground to be acquired, the term for which lease is applied for. The application must be made to the Gold Commissioner in writing and in duplicate, within 30 days, plan of the ground being shown on the application, and stating name of each applicant, with number of free miner's certificate, locality, quantity of ground applied for and rental offered, accompanied by a fee of \$20, which is returned if the application is not granted. Leases must not exceed 20 years, and areas are limited as follows:—Creek, $\frac{1}{2}$ mile; hydraulic diggings, 80 acres; dredging leases, 5 miles; precious stone diggings, 10 acres. Minimum rental for a creek lease is \$75 per annum; for hydraulic lease, \$50 per annum, with expenditure of at least \$1000 per annum in development; dredging lease, \$50 per mile per annum, expenditure of at least \$1000 per annum in development and royalty of 50c. per oz. on gold recovered.

COAL AND PETROLEUM

Applications for coal or petroleum lands are made by posting notices for 30 days on the land applied for and at the office of the Government Agent, advertising same in the Gazette and a local newspaper, and making application in duplicate to the Government Agent, accompanied by a plan of the ground applied for and fee of \$50. A license may be issued for not more than 640 acres for one year, the \$50 covering the first year's rental. Land applied for must be in a square block, with boundary lines running due north, east, west and south. Extension of the lease may be granted for a second and third year; and may be leased for five years at a rental of 10c. per acre per annum on proof being given of the discovery of coal; provision being made for royalty on each ton of coal or barrel of oil produced. If lessee is able to prove continuous development he may purchase the land within three months of the expiration of his lease at \$5 per acre.

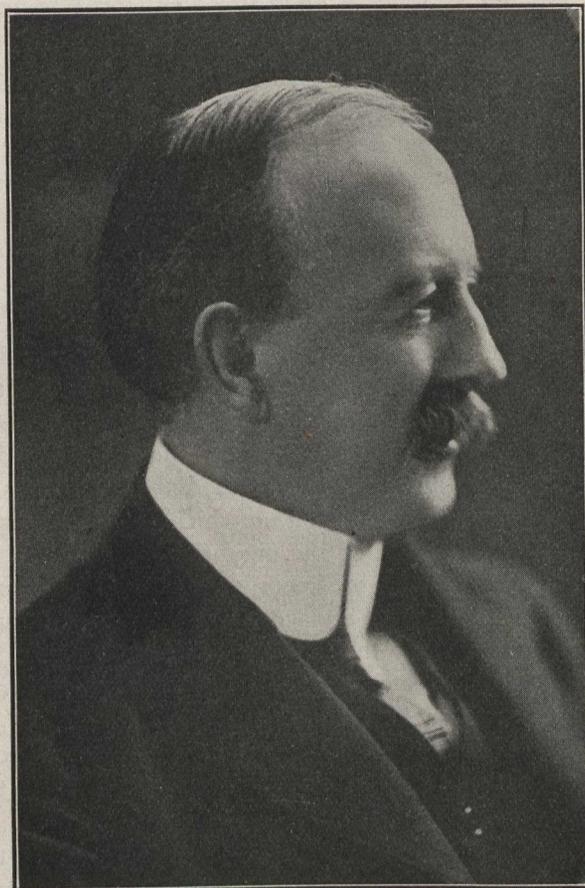


Canada Department of Mines

The Canada Department of Mines was organised in 1906, with Hon. William Templeman, M.P. for Victoria, as its first Minister. The new Department took over the Geological Survey, which had been established since 1842, and was conducted in two sections—the Geological Survey proper and the Mines Section. The Department of Mines controls the second largest source of wealth in Canada, the mines of this country ranking next to agriculture in wealth production.

The Geological Survey of Canada has taken a leading place in the world's scientific achievements, having been directed by men who were in the front rank in their particular line of activity. Hon. Martin Burrell, M.P. for Yale-Cariboo constituency of British Columbia, is the present Minister of Mines, and is doing much to extend the fields of usefulness of his Department.

R. G. McConnell, the senior member of the staff of the Geological Survey, is Deputy Minister of Mines. One of the most important changes in the administration under Mr. Burrill was the constitution in 1918 of the British Columbia and Yukon Branch of the Geological Survey, which has been placed in charge of Chas. Camsell, with headquarters at Vancouver. The effect of the change has been to place the work of the Department more closely in touch



Hon. Martin Burrell, of Grand Forks, Present Minister of Mines for Canada

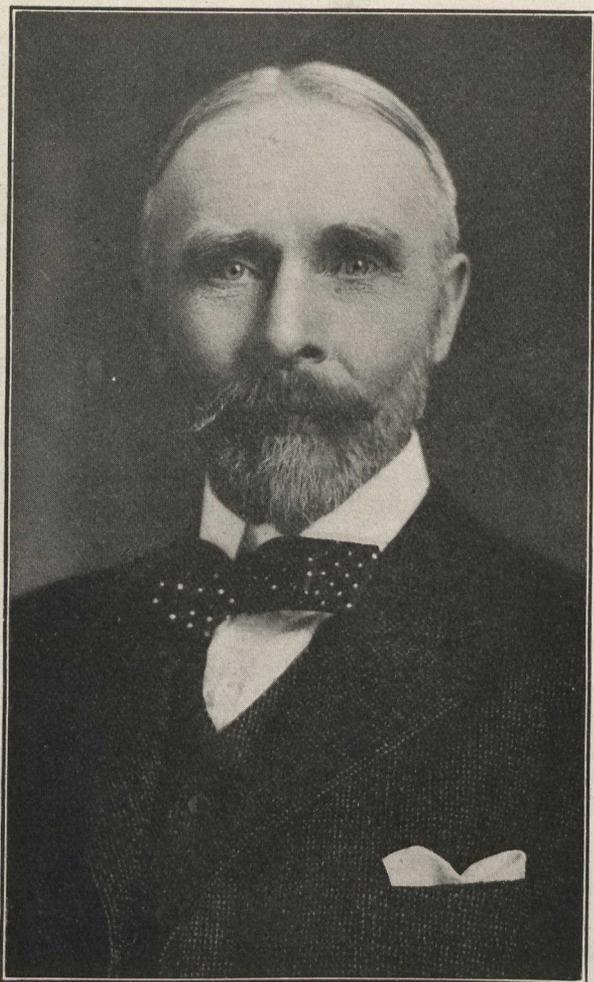


Hon. Wm. Templeman, of Victoria, First Minister of Mines for Canada

with the activities of the mineral industry, and immense public benefit is bound to result. Since taking charge of the new Branch Mr. Camsell has covered the Lillooet, Tulameen, Coast, Vancouver Island, Fraser Valley, Cariboo, Northern and other sections of the Province as fully as the staff at his disposal would permit. Arrangements are being made for a detailed geological survey of the Coast Range, which geologists now recognise as having immense possibilities in the way of mining development.

THE MINES BRANCH

The Mines Branch is in charge of Dr. Eugene Haanel. Ore testing laboratories have been established at Ottawa, and it is proposed to provide similar public facilities for the western portion of the Dominion by establishing a plant at Vancouver. Among the activities of the Mines Branch have been the electric smelting of magnetite ores; utilization of peat for fuel; regulation of explosives; investigation of the complex zinc ores of British Columbia; magneto-metric location and measurement of iron ore deposits; promotion of lead mining in British Columbia by the



R. G. McConnell, Deputy Minister of Mines for Canada, and Director Geological Survey.

bounty system; collection of data on the iron ore deposits of British Columbia; investigation of building stones, clays, petroleum, copper, cobalt, coal, peat, platinum resources of Tulameen and Boundary, etc. The Mines Branch also conducts the Dominion Assay Office at Vancouver, where gold is assayed and purchased; and where, during the past year, a branch was established for the assay and purchase of platinum for the Munitions Board. This office was established in 1901.

The following are some of the tributes paid to the work of the Canada Department of Mines:

EXTRACTS FROM "TRANSACTIONS OF THE FARADAY SOCIETY," VOL. X., PARTS II. AND V.

"THE COPPER SMELTING INDUSTRIES OF CANADA"

By Alfred W. G. Wilson, Ph. D., Chief of the Metal Mines Division, Department of Mines, Canada—Ottawa, 1913

This is one of the most interesting of the remarkable series of Reports and Maps being issued almost continuously by the Department of Mines of the Canadian Government under the general editorship



Charles Camsell, Director of Geological Survey for British Columbia and Yukon.

of its Director, Dr. Eugene Haanel. The present Report gives first a historical review of the development of the copper smelting industries of Canada, then a full description of one of the plants of each of the six great companies engaged in the industry, and finally a chapter on Statistics of Copper Production. Like all the Reports published by the Department, it is splendidly, even sumptuously got up, and it is profusely and beautifully illustrated with maps, diagrams, and photographs. Not only this Report, but the whole series, is one of which those responsible for its issue can be justly proud. Home Departments might well imitate enterprise of this kind."

"Chateau Laurier,

Ottawa, Ont., August 30, 1913

Dear Dr. Haanel.

Just a line to thank you for your kindness in showing me over your Department. What I have seen has filled me with admiration for the great work you and your staff are doing. The Government of Canada may well be proud of its Mines Department, and its distinguished head. What you have shown me has more than convinced me of the great national work you are doing, and I am sure a great harvest is in store for the Dominion in pursuing this enlightened and far seeing policy.

Please accept my congratulations, and believe me,

Yours sincerely,

(Signed) JOHN CADMAN

Professor of Mining Engineering, University of Birmingham, England.—Advisor to Home Government on Mining Matters."

"J. A. Leo Henderson, Ph.D., F.G.S., M.Inst. M.M.,
M. Inst. P.T., Mining and Petroleum Engineer.

3 London Wall Buildings,
London, E.C., November 26, 1915.

Dear Dr. Haanel,—I have received and thank you very much for the Bulletin on Electric Plating with Cobalt, by Dr. Kalmus. The result of these tests will be of the greatest importance to the Cobalt Industry, and of value to Canada, and this research maintains the high standard which you have set up for your Department, and which has established for itself the reputation of being the most progressive in the Empire.

Believe me, with kind regards,

Yours very truly,

(Signed) J. A. L. HENDERSON."

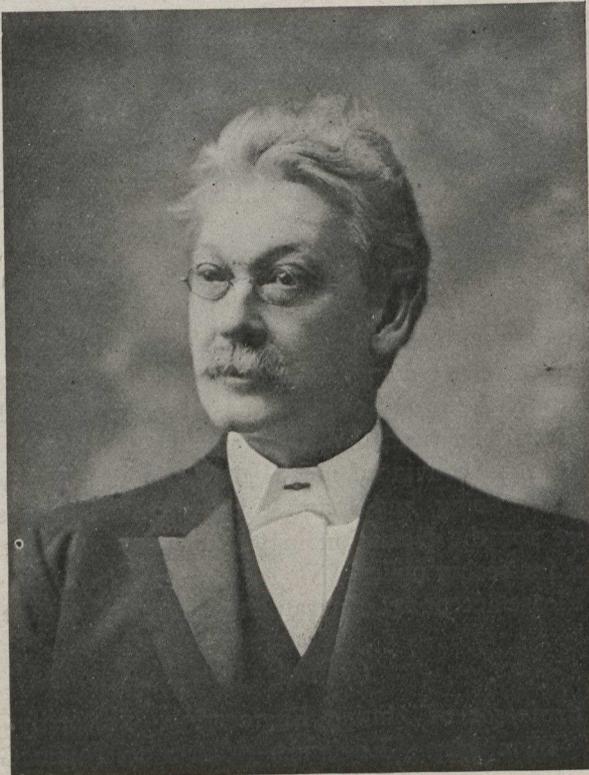
"Office of the High Commissioner for Canada.

19 Victoria Street,
London, S. W., England.

Dear Dr. Haanel,—Although you are no doubt already quite aware of the general consensus of opinion on this side in regard to the work performed by the Dominion Department of Mines, I think you will be interested to read the enclosed letter which has today reached me from Professor C. G. Cullis, of the Royal School of Mines, South Kensington, S. W.

Yours faithfully,

(Signed) W. L. GRIFFITH,
Secretary."



Dr. Eugene Haanel, Director of Canada Department of Mines

(Enclosure.)

"IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY,"
(Royal School of Mines)

South Kensington,
London, S. W.,
27th October, 1916.

The High Commissioner for Canada,
19 Victoria Street,
Westminster, S. W.

Dear Sir,—I beg to thank you for the beautiful "Mineral Map" of Canada which you have been so good as to have sent to the School of Mines in reply to my request. The map is only another exemplification of the admirable manner in which information with regard to the Dominion's Mines and resources is being obtained, and systematically recorded. Canadian practice in this matter is a pattern which might be copied by the whole Empire.

I am, sir, your obedient servant,

(Signed) C. GILBERT CULLIS."

"Petrograd, July 18, 1915.

Hon. E. P. Blondin,
Minister of Mines,
Ottawa.

Dear Sir,—When visiting Canada on behalf of the Russian Ministry of Trade and Industry in November and December of 1915, I had the opportunity, thanks to Dr. Haanel's kindness, to make myself acquainted with the wonderful organization of your Department of Mines, its laboratories, and the work done there. As a result, my impression was, that for Russia, there is much to learn and to follow in the work of your Department. This impression was confirmed after my return home. The war brought up before the Russian Government a new problem on the systematic and rational use of peat fuel. A special government committee on fuels had charge of this problem, and I, taking part in the work of this committee, was able fully to appreciate the practical value of the publications of the Department of Mines on Peat, so kindly given by Dr. Haanel. Now, as I should like to keep in touch with the work of the Department on other questions, and to continue to follow it in future, I beg your honor to let my name be put on the mailing list of the Department that I may receive all the issues of the Department. Besides the above request, I beg your honour to let me have the data on the cost of the building and equipment, as well as of the upkeep of the Government Fuel Testing Station at Ottawa, Ont.

Yours respectfully,

(Signed) M. YATSEVITCH,
Chief Engineer of the Committee of Fuels.

"Petrograd, May 8, 1916.

Dr. Eugene Haanel,
Director of Mines Branch,
Department of Mines,
Ottawa, Canada.

Dear Sir,—Being in charge of the foreign correspondence for the Bureau of Peat Exploitation, I have examined the publications which you have kindly mailed to our Director. I have been especially interested in the two reports by Mr. B. F. Haanel, "Peat, Lignite and Coal," and "Report on the Utilization of Peat." As these works treat the subject in a very clear manner, they possess a great interest for the peat industry in Russia, and their translation into the Russian language is, therefore, very desirable. I permit myself, therefore, to pray you to have the goodness to authorize me to make the translation, which will probably be edited by the Bureau of Peat Exploitation.

Yours respectfully,
(Signed) D. M. KASSATKINE.
Chief Chemist.

Bureau of Peat Exploitation, Department of Agriculture.

"Louis D. Huntoon,
Consulting Mining Engineer
115 Broadway, New York.

November 15, 1915.

Dear Doctor Haanel,—I have visited laboratories throughout the United States and I cannot resist the temptation to drop you a line and congratulate you

on the thoroughness of your equipment and the well arranged rooms. It was a great pleasure for me to design and build the Hammond Mining and Metallurgical Laboratory at Yale University, and I made it a point there to try and have individual laboratories for research work, but the space was so limited I was only able to work three such laboratories. Before visiting your laboratories I thought I had left something to my credit at Yale, but yours so far outshines what I did, that I will hesitate to mention the Hammond Laboratory in the future. I am enclosing a reprint describing the Hammond Laboratory, and when you rewrite the article on the laboratories which you have designed and erected, I would greatly appreciate receiving a copy of the same.

With very kindest regards, I remain,

Yours very truly,

(Signed) LOUIS D. HUNTOON

(Extract from "Nature," August 17, 1916. Page 505)

"The Canadian Department of Mines has just published a volume (Bulletin No. 11) upon the "Investigation of the Peat Bogs and Peat Industry of Canada in 1913-14," by Aleph Anrep, which will be found interesting to all concerned in the problem of the utilization of peat. It may be looked upon as a continuation of the volumes upon peat already issued by the same Department, and brings the information upon this subject well up to date. The first portion contains detailed descriptions of a number of peat bogs in Ontario, Quebec, Prince Edward Island and Nova Scotia, and is followed by a particularly well



Dominion Assay Office, Vancouver

illustrated account of the botany of these bogs. This is followed by a series of notes upon special appliances for the manufacture of peat fuel, and upon the peat production in certain foreign countries, and an appendix contains abstracts of Canadian patents for excavating and handling peat and for the manufacture of peat fuel. This bulletin is a further example of the sedulous care with which the Canadian Government endeavors to foster the development and utilization of the natural resources of the Dominion; it is greatly to be desired that the example thus set may be followed in our country, and that we may see before long some government department specially charged with the duty of seeing that British natural resources are turned to the best possible account."

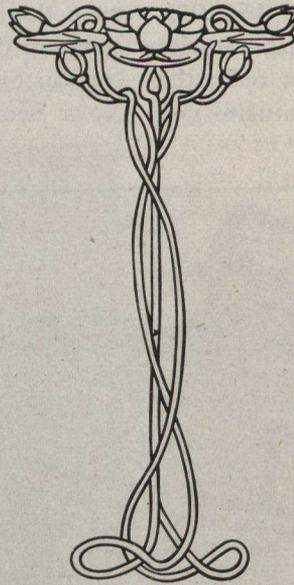
* * *

DOMINION ASSAY OFFICE.

Since its establishment the Dominion Assay Office at Vancouver has purchased the following amounts of gold, produced almost entirely in British Columbia, the Yukon and Alaska:—

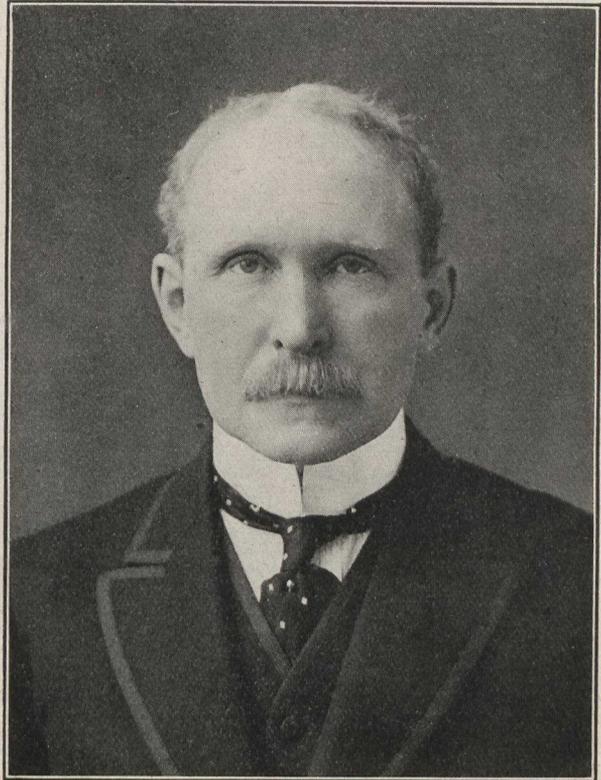
Year	GOLD RECEIPTS IN OUNCES.				Unclassified
	British Columbia	Yukon	Northwest Territories	Ontario	
1902	16,469	50,578	218	2,597	62
1903	22,112	12,231	340	1,159	452
1904	19,310	3,391	1,380	47	386
1905	21,966	5,894	28	986	116
1906	15,122	4,264	83	974	125
1907	14,111	5,767	126	9	22
1908	23,537	59,985	69	—	5,526
1909	35,970	5,003	42	—	6,561
1910	34,482	3,594	32	—	7,119
1911	31,523	2,021	—	—	5,525
1912	49,292	2,143	—	—	6,593
1913	94,411	15,236	—	—	272
1914	106,591	56,567	29	—	355
1915	93,109	86,284	105	—	252
1916	81,806	93,348	30	—	207
1917	109,065	78,809	—	—	9
1918	118,047	120,154	17	—	—
Total	886,923	605,269	2,499	5,772	33,582

Between September 11th, 1918, and December 31st, 1918, 79 deposits of Platinum were received, aggregating in weight before refining, 124.86 oz., and after refining 82.73 oz.

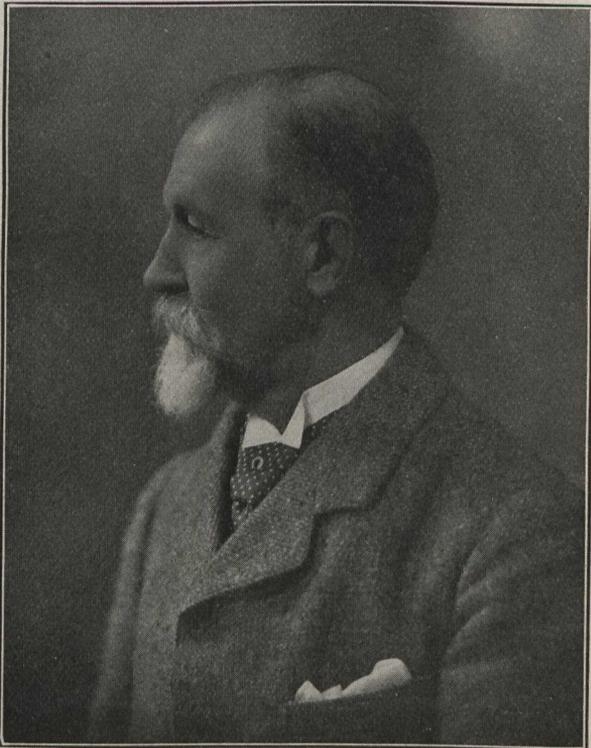


Provincial Bureau of Mines

In 1894 the mineral industry of British Columbia entered on a new phase. The placer fields were pretty well worked out, the output of placer gold being the lowest in 35 years. It was apparent that the future of the mineral industry depended on the development of the lode mines. To bring that about a progressive policy was required. There had been a portfolio of Mines since 1889, when the Premier, Hon. John Robson, held it, in addition to that of Provincial Secretary. On his death, and following the elections, Hon. Col. Baker, who represented East Kootenay in the Legislature, joined the Davie Cabinet, and on the Turner ministry succeeding in 1895, he was appointed Minister of Mines. He inaugurated and carried through the Legislature a policy to create a Bureau of Mines, and place it in charge of a Provincial Mineralogist, whose reports would command universal recognition. Dr. G. M. Dawson, of the Geological Survey of Canada, was asked to recommend a mining engineer for the appointment, and as a result, W. A. Carlyle became the first Provincial Mineralogist. The appointment gave the utmost satisfaction. Mr. Carlyle personally visited the active mining centres of that time, and issued in bulletin form reports which attracted widespread attention and interest. In the first year of his appointment Mr. Carlyle issued Bulletin No. 1, on Alberni



W. A. Carlyle, First Provincial Mineralogist for British Columbia.



Hon. Col. Baker, Organizer of Provincial Bureau of Mines, and Minister of Mines, 1895 to 1898.

Mining District; Bulletin No. 2, on Trail Creek District, and Bulletin No. 3 on Slocan, Nelson, and Ainsworth Districts; also a report on East Kootenay, which appeared in the Annual Report for 1896, the first of the annual reports since published regularly by the Provincial Bureau of Mines, and which form a valuable official record of the progress of the industry.

The staff of the Provincial Bureau of Mines then consisted of three, W. A. Carlyle, Provincial Mineralogist; H. Carmichael, Provincial Assayer; and Archibald Dick, Inspector of Mines. Mr. Carlyle resigned in 1898, and was succeeded as Provincial Mineralogist by W. Fleet Robertson, who was highly recommended for the office by Dr. Dawson. Mr. Fleet Robertson has now been Provincial Mineralogist for 20 years.

Hon. Col. Baker was defeated in the elections of 1898, and the following gentlemen have since filled the portfolio of Minister of Mines:

Hon. J. F. Hume, M.P.P. for Nelson, 1898 to 1900.

Hon. Smith Curtis, M.P.P. for Rossland, 1900.

Hon. Richard McBride, M.P.P. for Dewdney, 1900 to 1902.

Hon. Col. E. G. Prior, M.P.P. for Victoria, 1902 to 1903.

Hon. Sir Richard McBride, 1903 to 1914.



H. Carmichael, First Provincial Assayer for British Columbia

Hon. Lorne A. Campbell, M.P.P. for Rossland, 1914 to 1916.

Hon. Wm. Sloan, M.P.P. for Nanaimo, 1916 to date.

In 1913 H. Carmichael resigned as Provincial Assayer and was succeeded by D. E. Whitaker, who has since held the position. In that year the first step was taken to increase the staff by the appointment of J. D. Galloway as Assistant Provincial Mineralogist. In 1916 Hon. Lorne A. Campbell extended the usefulness of the Bureau by appointing several engineers to assist the Provincial Mineralogist in reporting on the field work.

In 1917 Hon. W. Sloan introduced legislation to amplify the work of the Provincial Bureau of Mines and the Province was subdivided into six Mineral Survey Districts as follows, with the Resident Engineers named appointed to each.

(1.) Northwestern Mineral Survey District, consisting of following Mining Divisions: Atlin, Stikine, Liard, Skeena, Portland Canal, Bella Coola, Queen Charlotte. Resident Engineer, Geo. A. Clothier. Office at Prince Rupert.

(2.) Northeastern Mineral Survey District, consisting of following Mining Divisions: Omineca, Peace River, Cariboo and Quesnel. Resident Engineer, J. D. Galloway. Office at Hazelton.

(3.) Central Mineral Survey District, consisting of the following mining divisions: Clinton, Lillooet, Kamloops, Ashcroft, Nicola, Vernon, Yale. Resident

Engineer, R. W. Thomson. Office at Kamloops.

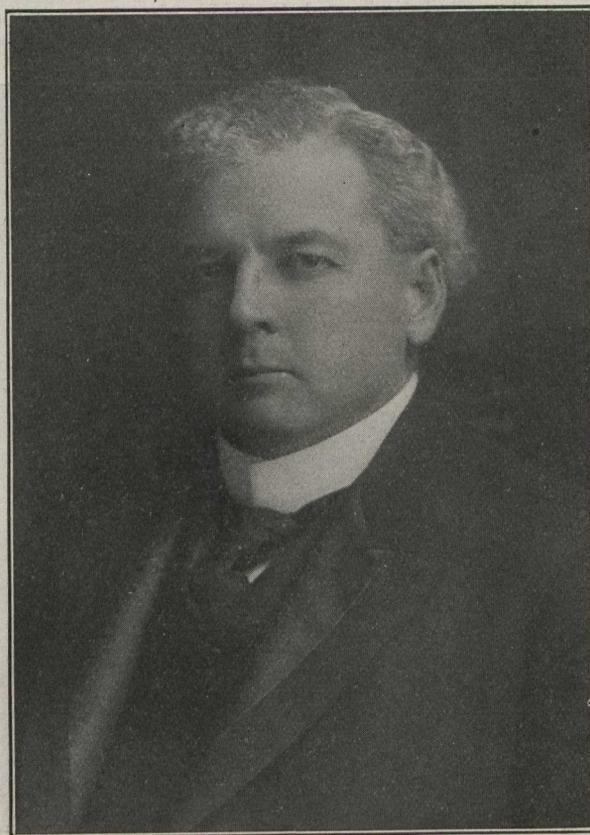
(4.) Southern Mineral Survey District, including the following Mining Divisions: Similkameen, Greenwood, Grand Forks, and Osoyoos. Resident Engineer, P. B. Freeland. Office at Grand Forks.

(5.) Eastern Mineral Survey District, comprising the following Mining Divisions: Golden, Windermere, Fort Steele, Ainsworth, Slocan, Slocan City, Trout Lake, Nelson, Arrow Lake, Revelstoke, Lardeau and Trail Creek. Resident Engineer, A. G. Langley. Office at Revelstoke.

(6.) Western Mineral Survey District, comprising the following Mining Divisions: Nanaimo, Alberni, Clayoquot, Quatsino, Victoria, Vancouver, and New Westminster. Resident Engineer, W. M. Brewer. Office, Nanaimo.

The duties of the resident engineers are to keep the Minister and the public informed in a reliable way of the value of new discoveries, the progress and development of prospecting and mining operations, the facilities necessary to promote exploration and production; and to advise prospectors and operators where required on the technical features of their operations. The policy has been attended with much success and is likely to be extended.

The Provincial Bureau of Mines has legislative authority to diamond drill and otherwise explore mineral claims to ascertain their prospective commercial value, purchase ores, establish or co-operate in the establish-



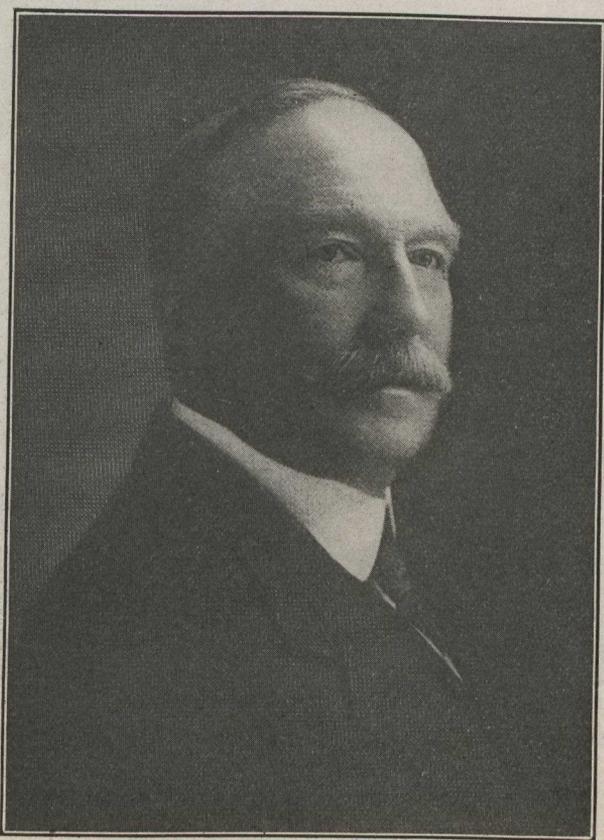
The Late Sir Richard McBride, Premier and Minister of Mines, 1900-1902, 1903-1916.

ment of mills, smelters and metallurgical works. The Bureau has financed the French Complex Zinc Ores Reduction Company, and has let a contract for diamond drilling a copper property at Highland Valley. It is proposed to explore iron ore deposits, with a view to estimating the tonnage available.

MINE INSPECTION.

Col. E. G. Prior was the first Mine Inspector for British Columbia. He was succeeded by A. Dick, who was the sole Inspector till 1899, when James McGregor was appointed inspector of metalliferous mines, leaving Mr. Dick to look after the coal mines. In 1901 Thos. Morgan was added to the inspection staff. In 1904 F. H. Shepherd, of Nanaimo, was appointed acting inspector and later was appointed Chief Inspector. In 1911 Thos. Graham succeeded F. H. Shepherd, as Chief Inspector, and in 1917 George Wilkinson was appointed Chief. The Mine Inspection staff now consists of the following officials: Geo. Wilkinson, Chief Inspector, Victoria; James McGregor, Nelson; Robt. Strachan and W. Lancaster, Fernie; John Newton, and Henry Devlin, Nanaimo; J. H. McMillan, Prince Rupert; H. H. Johnstone, Nelson.

The Safety First movement has resulted in the Provincial Bureau of Mines maintaining rescue stations at Nanaimo, Cumberland and Fernie. Instructors are in charge of the stations, as follows: Nanaimo, J. D.



Hon. Col. E. G. Prior, First Inspector of Mines and Minister of Mines, 1902-3.



Hon. Lorne A. Campbell, Minister of Mines, 1914-1916.

Stewart; Cumberland, John Thomson; Fernie, C. O'Brien. Dudley Michell is organizer and instructor in First Aid.

OTHER SERVICES

Examinations are conducted by the Bureau and certificates of competency issued in assaying and coal mining. Samples of minerals sent to the Bureau are identified without charge and the holder of a Miner's License is allowed two free assays a year at the Provincial Assay Office at Victoria.

The Bureau has been doing good work during the past two years in checking up the flotation of new mining companies, and where fraud or misrepresentation has been indicated steps have been taken to protect the public by warning the promoters.

The Bureau maintains at Victoria an exhibit of ores and minerals characteristic of British Columbia occurrences, and issues bulletins, the most important recently published being a report by Dr. Alfred Stansfield on the prospects of an iron and steel industry in British Columbia. Assistance is given prospectors and operators in obtaining access to their holdings by recommending grants from the public works fund for roads and trails where the properties concerned appear to warrant development or the shipment of ore.

Another important policy inaugurated by Hon. Mr. Sloan is the provision of a means of educating miners by a correspondence school conducted by the Provincial Bureau of Mines, supplemented by classes held in



Hon. William Sloan, Minister of Mines, 1916 to date.

the mining districts, at which oral instruction and examinations will be conducted.

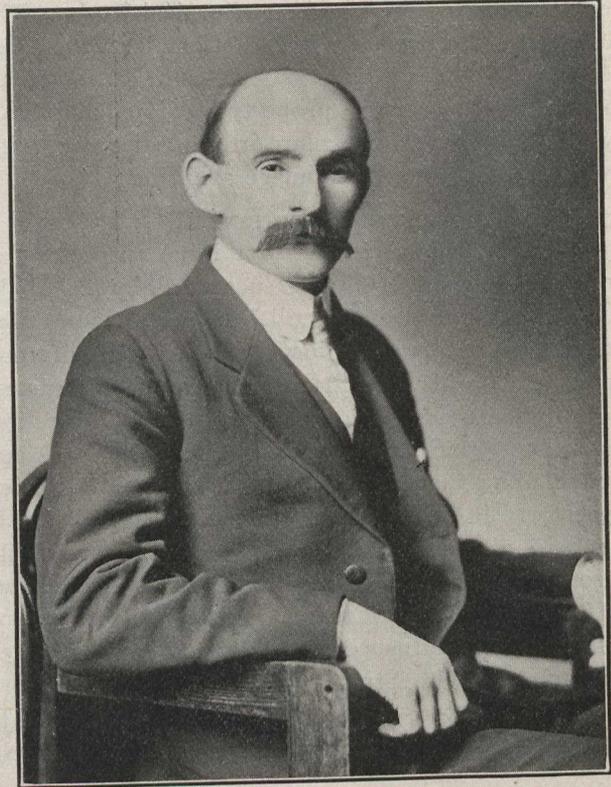
The first year courses will include: Arithmetic, mensuration, drawing and English in relation to mining, for young men over fourteen years of age.

Fourth year courses for the fireboss, shiftboss, of shotlighter's certificate (third class), for men of twenty-three years or over, are: Mining, arithmetic, gases and the theory of mining.

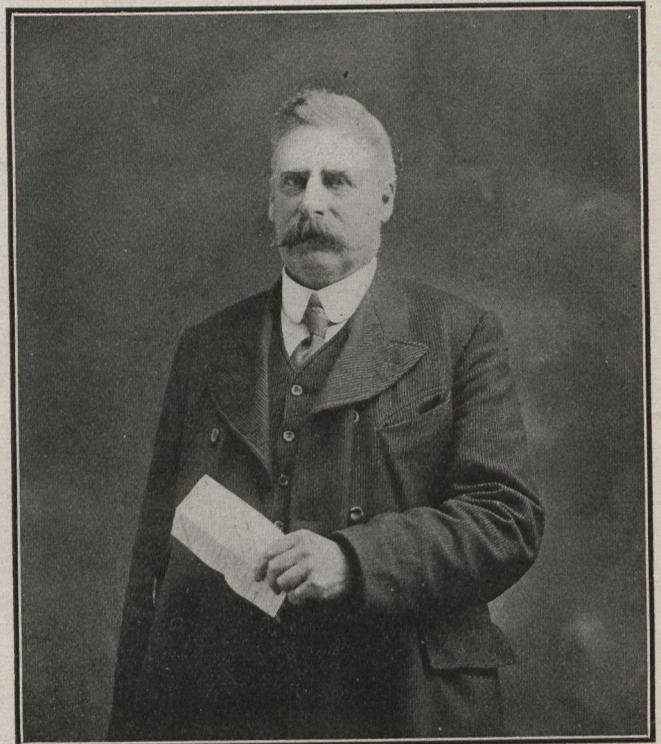
Fifth year—Course of work for the overman's certificate (second class): candidates to be at least twenty-three years of age. Shaft-sinking, colliery explosions, lighting, methods of working, transmission of power, technical electricity and its uses for safety, mathematical calculations.

Sixth year—Cover work for mine manager's certificate (first class): Candidates to have five years' practical experience, and be at least twenty-five years of age: Geology of coal, shaftsinking, methods of working coal, hoisting and haulage, mine drainage, ventilation, theory and practice, lighting, surveying, mechanics, boilers, steam engines, air-compressors, pumps, electricity, preparation of coke, and laws relating to coal mining in British Columbia.

Survey District



George Wilkinson, Chief Inspector of Mines, 1917 to date



W. M. Brewer, Resident Engineer for Western Mineral

Mineral Production of British Columbia For 25 Years 1893-1918

VALUE OF ANNUAL PRODUCTION FOR QUARTER CENTURY
1893 TO 1918.

1852 to 1892	\$84,351,682
1893	297,400
1894	4,225,717
1895	5,643,042
1896	7,507,956
1897	10,455,268
1898	10,906,891
1899	12,393,131
1900	16,344,751
1901	20,086,780
1902	17,486,550
1903	17,495,954
1904	18,977,359
1905	22,461,325
1906	24,980,546
1907	25,882,560
1908	23,851,277
1909	24,443,025
1910	26,377,066
1911	23,449,072
1912	32,440,800
1913	30,296,398
1914	26,388,825
1915	29,447,508
1916	42,290,462
1917	37,010,392
1918 (Estimate)	41,083,093

Total	\$636,654,200
Production for last 25 years	\$552,303,118

The following is a list of minerals produced in British Columbia from 1852 to 1892; and for the past quarter century from 1893 to 1918, with approximate value thereof as far as can be ascertained from Government records and other available data:—

Mineral	1852 to 1892	1893 to 1918 (inclusive)	Total
Antimony		\$ 8,198	\$ 8,198
Chromite		9,600	9,600
Copper,		146,279,566	146,279,566
Gold, placer	57,016,597	18,407,506	75,424,103
Gold, lode		96,968,969	96,968,969
Iron, ore and flux.....		129,851	129,851
Lead	78,591	42,232,180	42,310,771
Manganese		10,125	10,125
Molybdenum		35,723	35,723
Platinum	25,000	76,250	101,250
Quicksilver		10,000	10,000
Silver	285,087	45,939,794	46,224,881
Zinc		12,880,591	12,880,591
Totals	\$57,405,275	\$362,988,253	\$420,393,528

Provincial Bureau of Mines

NON-METALLIC MINERALS.

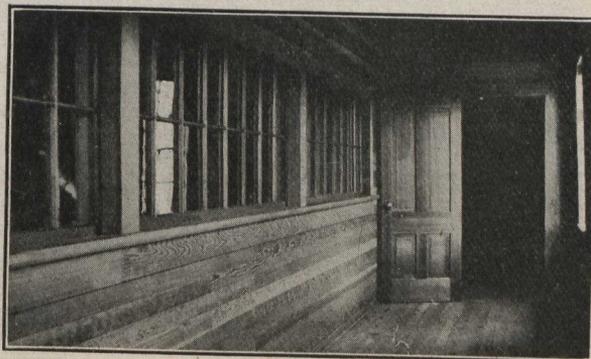
Arsenic		40,000	40,000
Brick—Face, Fire, and Silica		1,556,583	1,556,583
Brick—Red		3,463,599	3,463,599
Building Stone		9,474,386	9,474,386
Cement		7,117,534	7,117,534
Clay, Gypsum		166,147	166,147
Crushed Rock		1,470,775	1,470,775
Coal	22,496,654	141,928,939	164,425,593
Coke		22,682,997	22,682,997
Fluorspar		1,700	1,700
Lime		1,376,482	1,376,482
Magnesite		22,500	22,500
Mica		12,000	12,000
Mineral Waters		55,300	55,300
Pottery and Tile		1,246,319	1,246,319
Pyrites		95,480	95,480
Rip-rap		1,768,005	1,768,005
Salines		26,271	26,271
Sand and Gravel		2,006,030	2,006,030
Slate		25,000	25,000
Talc		1,050	1,050
Total	\$22,496,654	\$194,537,097	\$217,033,751
Grand Total	\$79,901,929	\$557,525,350	\$637,427,279

* * *

THE METAL PRODUCTION.

ANTIMONY.

There are numerous antimony deposits in British Columbia, but the only producers have been the Alps-Alturas Mine, on the north fork of Carpenter Creek, Slocan, and the Gun Creek Mine, in Lillooet Mining Division. The former is owned by a company organized in Vancouver by W. J. McMillan, the former owner. While antimony was bringing high prices in 1916 and 1917, a carload of ore was packed out on horses from the mine in the fall of each year to the railway at Three Forks, and shipped to Chicago. The ore is stibnite, carrying from 50% to 60% antimony. A carload of ore was shipped by the P.G.E. Railway from



Interior of Mines Rescue Station at Nanaimo, conducted by

Gun Creek property. In 1916 the Consolidated Mining and Smelting Company bonded an antimony property on Quoieek Cr ek, tributary to the Fraser River near Keefers, and located by W. S. Clark of that place, but the bond was dropped.

Other deposits of antimony are located on the Fraser River, north of Lytton; at Great Central Lake, Alberni; Bennett Lake, Atlin; Copper Creek, Kamloops; Tatlayoco Lake; Vermont Creek; and Donald, Golden Mining Division. Antimony is associated with the silver-lead-zinc ores of Slocan and Omineca. The Trail Smelter formerly produced the metal as a by-product from the Slocan antimonial silver ores.

CHROMITE.

Chromite occurs in the Boundary, Similkameen, Ashcroft and Lillooet mining divisions, but the only production was in 1918, when shipments were made to the extent of about 800 tons from the Mastadon Mine, Grand Forks. This ore carried 35% to 45% chromic oxide.

* * *

Copper

The first copper production recorded was in 1894, and was derived from shipments from the Rossland camp, made to an Helena smelter in 1893. The ore shipments aggregated 700 tons, averaging 4 oz. gold, 3 oz. silver and 5.5% copper. The amount of copper paid for in the shipment was 324,680 lb.

Statistics of annual production as follows show the wonderful growth of this industry:—

Year	Copper production lbs.	Value
1894	324,680	\$ 16,324
1895	952,840	47,642
1896	3,818,556	190,926
1897	5,325,180	266,258
1898	7,271,678	874,781
1899	7,722,591	1,351,453
1900	9,997,080	1,615,289
1901	27,603,746	4,446,963
1902	29,636,057	3,446,673
1903	34,359,921	4,547,535
1904	35,710,128	4,578,037
1905	37,692,251	5,876,222
1906	42,990,488	8,288,565
1907	40,832,720	8,166,544
1908	47,274,614	6,240,249
1909	45,597,245	5,918,522
1910	38,243,934	4,871,512
1911	36,927,656	4,571,644
1912	51,456,537	8,408,513
1913	46,460,305	7,094,489
1914	45,009,699	6,121,319
1915	56,918,405	9,835,500
1916	65,379,364	17,784,494
1917	59,007,565	16,038,256
1918 (estimate)	63,387,010	15,681,946
Total for 24 years (1894 to 1918)	839,900,250	\$148,279,566

PRODUCTION BY DISTRICTS.

The following figures show the copper production by districts:—

	Copper lbs.
Cariboo	5,593,018
Cassiar	117,733,094
East Kootenay	80,685
West Kootenay	120,561,346
Boundary-Yale	438,862,319
Southern Coast	156,097,816

The Cariboo production was entirely from the Omineca Mining Division, the Rocher de Boule Copper Co. being credited with almost the entire output.

The Cassiar production up to 1909 amounted to 1,608,774 lb., almost entirely from Queen Charlotte Islands, where the Ikeda was the principal shipper. The Red Cliff, Portland Canal, was a small shipper in 1912-13. In 1914 a change suddenly came over the scene, as the Granby Company had developed and equipped the Hidden Creek Mine, and blown in the smelter at Anyox, running the production up to 11,123,376 lb. in that year, and further increasing it to 30,925,928 lb. by 1918, placing the Skeena Mining Division of Cassiar in the rank of the largest copper producing division.

East Kootenay has been a small copper producer, the total amount being 80,685 lb., almost the whole of which came from the Windermere Mining Division. West Kootenay is credited with 120,561,246 lb. copper, of which 105,692,306 lb. was from Rossland, and 14,849,802 lb. from Nelson.

The Boundary has been the largest copper producing district, having to its credit 441,741,491 lb., nearly 50% of the total output. This production is the output of the Granby, B. C. Copper (now Canada Copper) and Dominion Copper Companies, and a number of smaller operators.

The southern coast has come prominently to the front as a copper producer, due almost entirely to the Britannia Mine.

DIVIDENDS.

The copper companies have been the second largest dividend payers of any class of mining, as will be seen from the following list of dividends paid by them during the past 25 years:—

	Dividends declared
Granby Consolidated M. S. & P. Co.	\$10,147,252
B. C. Copper Co., Ltd.	615,349
Tyee Copper Co.	291,325
Britannia Mine	239,682
Hall Mines	187,500
Marble Bay	105,000
Total dividends from copper mines	\$11,586,108

ORE RESERVES.

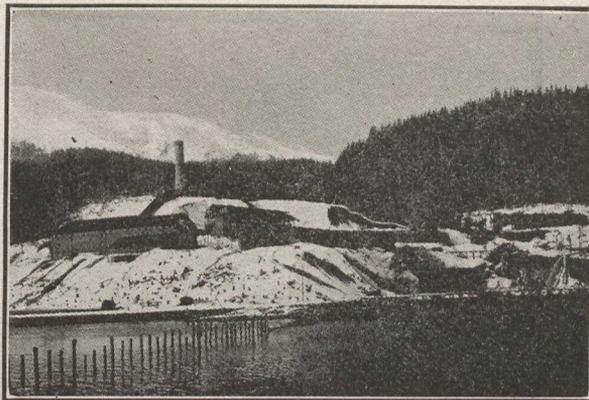
The following are the reserves of actual and probable ore proved up in the principal operating mines:—

Mine	Tons ore	Average	Copper lb.
Britannia	20,000,000	1.97%	788,000,000
Granby (Phoenix)	3,032,532	0.75%	45,987,980

Granby (Anyox)	20,498,676	1.5%	614,960,280
Total	55,531,208		1,856,948,260

The ore reserves of the leading copper mines have thus a copper content more than double the amount of copper produced during the past 24 years, so that the future of the copper mining industry is assured. While we have stated the reserves of operating mines alone, there are several properties under development which might be credited with important additional reserves. These include the Old Sport, at Quatsino, the Sunloch, on the west coast of Vancouver Island; the Highland Valley properties, one of which, the Snowstorm, is under a diamond drilling contract on behalf of the Provincial Bureau of Mines. A recent discovery in the Lillooet District is stated to have 30,000,000 tons of high grade copper ore developed by nature.

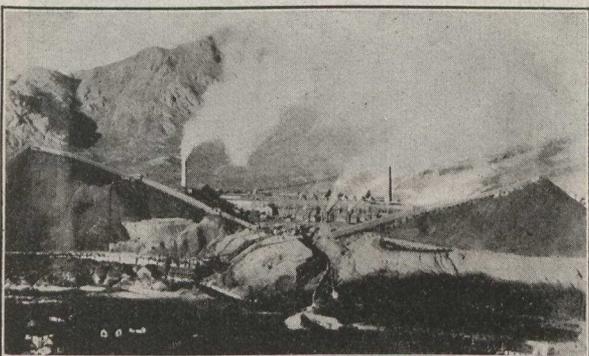
There are numerous promising copper prospects awaiting development, and one of the leading American copper companies has bonded a new property at



Copper Smelter of Granby Consolidated Mining, Smelting and Power Co., Ltd., at Anyox

SMELTERS.

The two largest copper smelters are operated by the Granby Consolidated Mining, Smelting and Power Company. That at Grand Forks, constructed to treat the self-fluxing ores of the Phoenix Mines, has a capacity of 4,000 tons a day, and is the largest copper smelter in the British Empire. The same company's smelter at Anyox, built to smelt the ores of the Hidden Creek and Bonanza Mines, and the ores from the company's mines on Prince of Wales Island and at Valdez, Alaska, has a capacity of 3,000 tons a day, and is the second largest smelter in the Empire.



Copper Smelter of Granby Consolidated Mining, Smelting and Power Co., Ltd., at Grand Forks

The Consolidated Mining and Smelting Company's copper furnaces at Trail Smelter have a capacity of 1,800 tons a day. These furnaces have been mainly running on the gold-copper ores from the company's own mines at Rossland; the Emma mine in Boundary, also owned by the company; custom shipments from mines in the neighboring state of Washington; and several small copper producers in British Columbia. A contract has now been entered into by which the concentrates from the Allenby Mill of the Canada Copper Company will be smelted at Trail, and the Consolidated Mining and Smelting Company has

the largest figures on record here for an undeveloped mine.

CONCENTRATING MILLS.

There are five mills operating and under construction for treatment of copper ores. The largest of these is at the Britannia Mine, with a capacity of 2,500 tons a day. The Canada Copper Corporation are constructing at Allenby, near Princeton, a mill of a capacity of 2,000 tons a day to treat the ores of their Copper Mountain property, where 12,000,000 tons of ore have been proved up. The Iron Mask, at Kamloops, has built a mill to handle 150 tons a day. At the Highland Valley Copper Company's Mine, in Highland Valley, there is a mill of a capacity of 50 tons a day, and a mill of a similar capacity has been constructed at the Tidewater property on Sidney Inlet, west coast of Vancouver Island. All these plants use flotation processes, the plant at Britannia having achieved a marked success with the Mineral Separation Company's process, effecting an extraction of 95%.



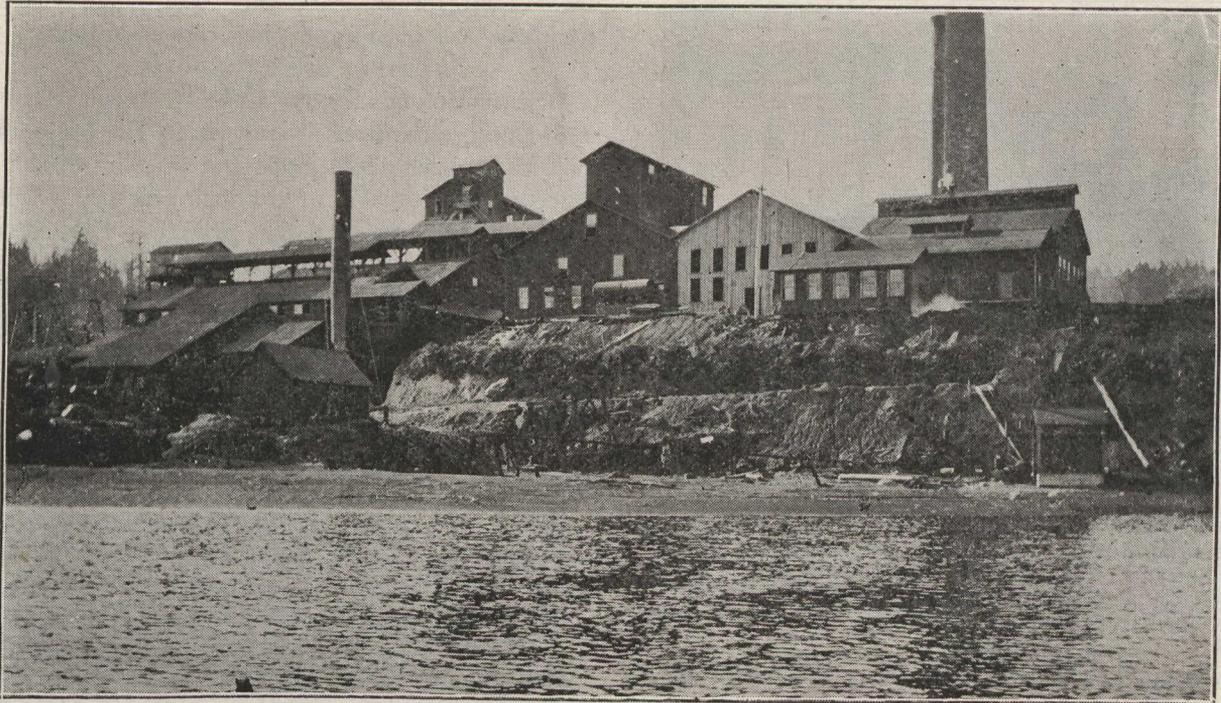
Smelter of Consolidated Mining & Smelting Co., Ltd., at Trail



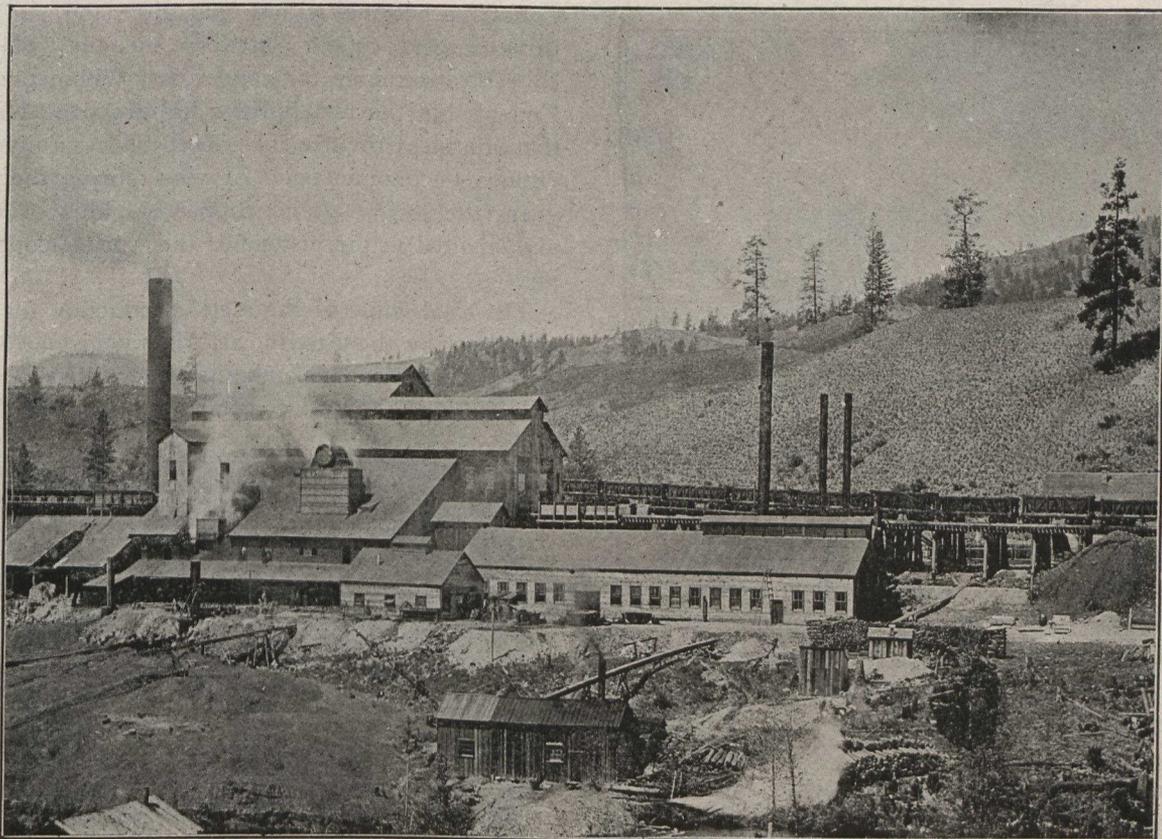
Copper Smelter of Canada Copper Corporation at Greenwood



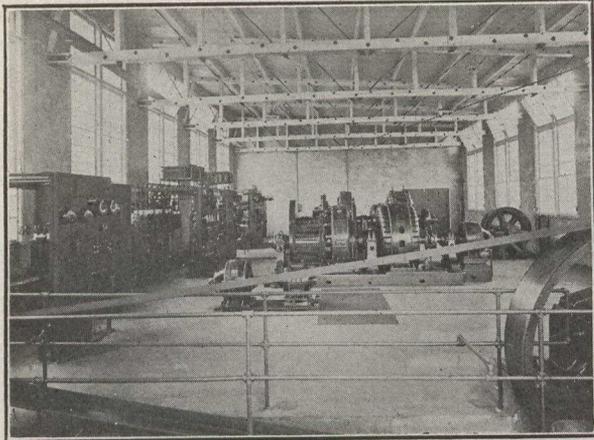
Copper Smelter at Ladysmith



Copper Smelter of Britannia Mining and Smelting Co., Ltd., at Crofton. Not operated for some years



Dominion Copper Company's Smelter at Boundary Falls

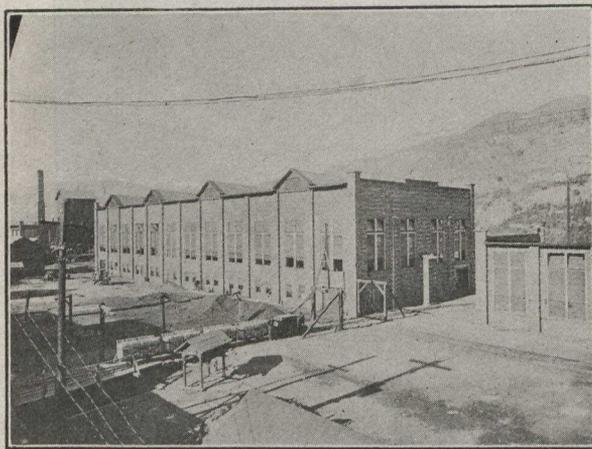


Electric Generation Station of Consolidated Mining and Smelting Co.'s Copper Refinery at Trail

taken an option on the Voight properties at Copper Mountain, adjoining those of the Canada Copper Corporation, with a view to obtaining further supplies of ore for its copper furnaces.

The Canada Copper Company has a copper smelter at Greenwood capable of treating 2,500 tons of ore a day, but since the company's mines at Greenwood are practically exhausted, and it is intended to smelt the concentrates from the Allenby Mill at Trail, that smelter is being dismantled.

The Ladysmith Copper Corporation has a copper smelter at Ladysmith on the east coast of Vancouver Island, with a capacity of 400 tons a day, but



Electrolytic Copper Refinery of Consolidated Mining & Smelting Co., Ltd., at Trail

this smelter is at present closed down for want of a sufficient ore supply to keep it running.

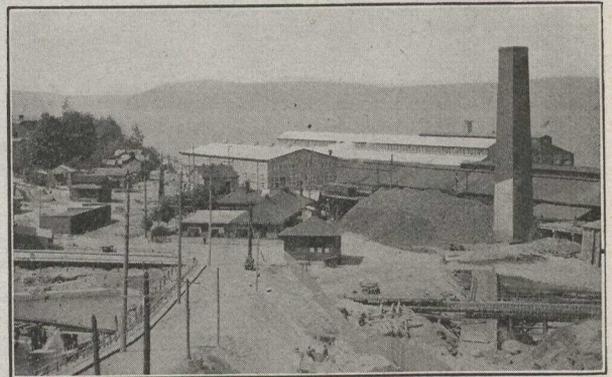
COPPER REFINING AND MANUFACTURE.

The Consolidated Mining and Smelting Company installed at the smelter at Trail a plant to refine copper by hydro-electric power. This plant had an initial capacity of 10 tons per day, which has since been increased to .15 tons, and will be doubled to a capacity of 30 tons a day. Arrangements have also been made to produce manufactured copper in the shape of

sheets, wire, rods, bars, &c. For some years the company has been producing copper sulphate.

FUTURE OF THE INDUSTRY.

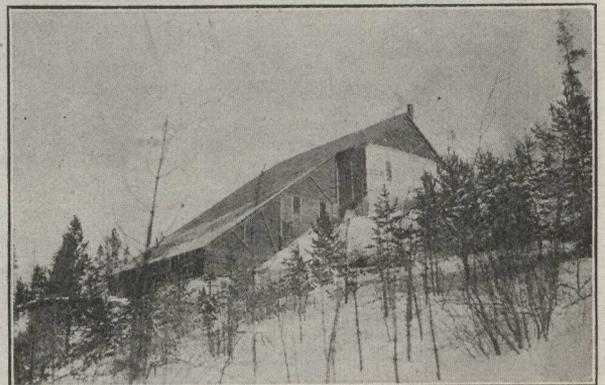
British Columbia now holds fifth place in the world's largest copper producers. By the beginning of 1920 the copper mines, mills and smelters of the Province will be capable of producing 80,000,000 lb. of copper per annum, and that production will increase as new mines are developed and equipped. The prospects are that within five years British Columbia will take third rank as the world's largest copper producing country. It is a proud record that within the past quarter century this Province should have devel-



Copper Smelter and Refinery of Tacoma Smelting Co., Tacoma

oped its copper mining industry to the extent indicated in the above figures. Not only has British Columbia become within that time the site of the three largest copper smelters and the two largest concentrating mills for copper ores within the British Empire, but the metallurgical progress has been such that in this Province have been successfully treated from an economic point of view during the past 13 years the lowest grade copper sulphide ores mined and smelted in the history of the world's copper mining.

The total value of the metal production for 1918 is estimated by the Provincial Mineralogist at \$27,283,161, of which copper amounts to \$15,681,946, or more than half of the entire metal production.



Copper Ore Concentrator of Highland Valley Mining and Development Co., at Highland Valley

Gold

Up to 1892 mining was confined to placer gold, with the exception of a small tonnage of silver-lead ore shipped from the Slocan. As late as 1895 placer gold and coal were the only minerals of which statistics regarding the production were furnished by the Annual Report of the Minister of Mines. Up till 1893 the placers were the sole producers of gold, and at the close of 1892 the gold production from that source was \$57,016,597. Since then placer mining has shown a general decline. There is doubtless a large area of auriferous gravels which can be worked at a profit, but large capital and economical management are necessary to success.

Cariboo was one of the richest goldfields ever discovered, and there are still deposits of auriferous gravels and old channels remaining unexplored. The Fraser River, Tulameen, Atlin, Omineca, the Liard and its tributaries are yet likely to yield much placer gold.

The Atlin district is, and has been for some years, the principal producer of placer gold, and the improvement in production in 1899 and the following year was due to the discoveries in that camp following the Yukon rush.

Nine-tenths of the placer gold production is derived from hydraulic plants. Dredging has been attempted on the Fraser and Thompson Rivers, and at Atlin and Cariboo, but without success. The causes of failure appear to have been due to the construction of plants unsuited to the work, and to attempts to dredge gravels which had not been tested before the dredges were built, and which were found to be non-productive. A dredge on the Fraser River at Yale made good profits for a time, until the bar on which it was working was exhausted. It is stated that a California company has taken up dredging leases on the Findlay River, and that the testing of the gravels has been attended with results of such an encouraging character that it is proposed to build a dredge there.



Clean-up of 56¼ oz. Gold from a Pan of Gravel at Point Claim, Van Winkle, Lightning Creek, Cariboo

The first lode gold production of which a record is available was in 1893, when Rosslund sent out its first ore shipments, realizing \$23,404. In the 25 years that have elapsed since then the lode gold production



Dipper Dredge at Quesnel, Cariboo

has reached \$96,968,869. The growth of this branch of mining is shown in the table herewith:—

Year	Placer Gold oz.	Lode Gold... oz.	Total Gold oz.
1858 to 1892.....	2,850,830	—	2,850,830
1893	17,806	1,170	18,976
1894	20,275	6,252	26,527
1895	24,084	39,624	63,708
1896	27,201	62,259	89,460
1897	25,671	106,141	131,812
1898	32,167	110,061	142,228
1899	67,245	138,315	205,560
1900	63,936	167,153	231,089
1901	48,505	210,384	258,889
1902	53,657	236,491	290,148
1903	53,021	232,831	285,852
1904	55,765	222,042	277,807
1905	48,465	238,660	287,125
1906	41,400	224,027	265,427
1907	41,400	196,179	237,579
1908	32,350	196,179	228,529
1909	23,850	255,582	279,432
1910	27,000	238,224	265,224
1911	21,300	267,701	256,402
1912	27,775	228,617	256,392
1913	25,500	257,496	282,996
1914	28,250	272,254	300,504
1915	38,500	247,170	285,670
1916	29,025	250,021	279,046
1917	24,800	221,932	246,732
1918 (estimated)	15,400	114,523	128,923

PLACER GOLD.

The following is the production of placer gold for the past 25 years (1893 to 1918) by districts:—

District	oz.
Cariboo	406,642
Cassiar	395,106
Yale	36,303
Lillooet	23,892
East Kootenay	12,515
West Kootenay	6,024
Coast	2,753
Boundary	2,408

Of the Cariboo district, 253,930 oz. came from Cariboo Mining Division; 138,281 oz. from Quesnel, and 14,431 oz. from Omineca.

Of the Cassiar production, 371,775 oz. was from Atlin, and 23,331 oz. from the Liard and Stikine.

The Yale production came almost entirely from the Fraser, Thompson and Tulameen rivers and tributaries. Fort Steele placers, Wild Horse and Perry Creek, produced 12,360 oz. of the East Kootenay output, the rest coming from Windermere.

In West Kootenay there were three producing sections, Nelson, Revelstoke and Trout Lake. Revelstoke and Trout Lake produced 4,424 oz., mainly derived from the Big Bend creeks; and Nelson produced 1,600 oz., which came from Hall and Forty-nine Creeks.

The Coast production came mostly from Leech, and Nahwitti rivers, Wreck Bay, Sombrio, on Vancouver Island, and a small production was made from the head of Jarvis Inlet, on the Mainland. Rock Creek and Kettle River were the principal contributors to the Boundary production.

LODE GOLD.

The lode gold was contributed by the following districts:—

District	Gold oz.
West Kootenay	2,929,090
Boundary	1,431,292
Coast	119,626
Cassiar	78,862
Lillooet	16,236
Cariboo	4,942
Yale	3,284
East Kootenay	57

The West Kootenay production was mainly derived from the mines of Rossland and Nelson, Rossland contributing 2,547,610 oz., and Nelson 362,060 oz. The dry ores of the Slocan carry gold, and from these Ainsworth is credited with 1,158 oz. gold, and Slocan with 2,413 oz. Revelstoke and Trout Lake produced 15,849 oz., mainly from the Silver Cup Mine at Ferguson, and the stamp mills at Camborne.

The Boundary production includes that of the Nickel Plate Mine at Hedley, the balance being almost entirely a by-product from the copper mines, to which the Granby Company's Phoenix mines were the largest contributors.

The Coast production is mainly from the Tye Copper Company's operations on Vancouver Island; the Britannia Mine on Howe Sound, and the Marble Bay Mine, on Texada Island.



Placer Miner Finding Big Nugget at Atlin

Of the Cassiar gold production, the Granby Company's Hidden Creek Mine, the Queen Charlotte Islands, Portland Canal, and the Engineer Mine at Atlin contributed almost the whole.

Lillooet has been a steady producer of lode gold since 1897, the early output being from arastras. Latterly the gold output has mainly been from the mills operated at the Lorne, Pioneer and Coronation mines.

The Cariboo output was from the Omineca Mining Division, with the exception of 19 oz. mined on Hixon Creek, where a mill was installed in 1902. The Omineca mines responsible for the balance were those of the Rocher de Boule Copper Co. and Silver Standard Mining Company.

The Yale production is mainly from the Iron Mask Mine at Kamloops. East Kootenay has been a surprisingly small producer, considering that Fort Steele was an important placer mining camp, and in the neighborhood are important deposits of auriferous quartz. The small production recorded was entirely from the Golden Mining Division.

The lode gold production is mainly a by-product of the copper ores, the annual average being about 75% from this source.

The falling off in production during the war was due to economic causes—increase of wages and cost of supplies on one hand, and depreciation in the purchasing power of gold on the other.

DIVIDENDS.

The following dividends have been paid by companies operating gold mines in British Columbia:—

Hedley Gold Mining Co.	\$2,448,000
Le Roi No. 2, Ltd.	1,590,000
Le Roi	1,475,000
War Eagle	1,245,250
Daly Reduction Co.	881,570
Cariboo Gold	500,000
Cariboo-McKinney	320,000
Centre Star	210,000
Ymir	200,000
Surf Inlet	137,890
Motherlode, Sheep Creek	161,500
Canadian Pac. Exp.	37,500
Poorman	25,000
Fern	15,000

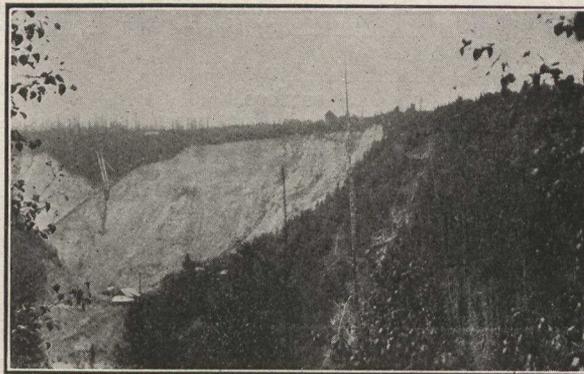
\$9,246,710



Lowhee Hydraulic Mine, Barkerville, Cariboo, operated by John Hopp

ORE RESERVES.

Although Rossland has been by far the largest contributor to the lode gold production, and still has a great future ahead of it in this respect, the mines have no large amount of reserves blocked out. Mining conditions in the camp are so well understood that as development proceeds sufficient ore is available to



Hydraulic Pit of Bullion Mine, Cariboo

maintain an important average production. The only two gold mines in which there are defined ore reserves are the Surf Inlet and Nickel Plate Mines, and these are as follows:—

	Tons	Ave. value	Tot. value
Surf Inlet Mine	385,520	\$11.22	\$4,265,534
Nickel Plate	400,000	\$10.00	4,000,000

MILLING AND SMELTING.

The ores of the Rossland camp are treated by smelting at the Trail plant of the Consolidated Mining and Smelting Co., Ltd.

Several small shippers in the Nelson and Boundary districts send their ores to the smelters. The gold bullion is generally sold to the Dominion Assay Office at Vancouver.

Milling plants which have been installed during the past 25 years are as follows:—

Mine	Mill	Capacity, tons
ALBERNI.		
Consolid., Alberni	8 stamps	20
Erl Syndicate	10 Tremain stamps	50
ATLIN.		
Engineer	3 stamps	5
BOUNDARY.		
Jewel	10 stamps	25
Oro	10 stamps	25
CARIBOO.		
Barkerville	1 stamp	1
Island Mountain	10 stamps	25
Hixon Creek	10 stamps	25
Horsefly	10 stamps	30
EAST KOOTENAY.		
Robt. E. Burns	3 stamps	5
Perry Creek	2 stamps	4
KAMLOOPS.		
O. S. Batchelor	5 stamps	10
LILLOOET.		
Coronation	10 stamps	25
Golden Cache	10 stamps	25
Ida May	Huntingdon Mill	10
Lorne	5 stamps	10
Pioneer	Bryan Mill	24
NANAIMO.		
Dorothy Morton	10 stamps	30
NELSON.		
Arlington	10 stamps	25
Athabasca	10 stamps	25
Chapleau	5 stamps	10

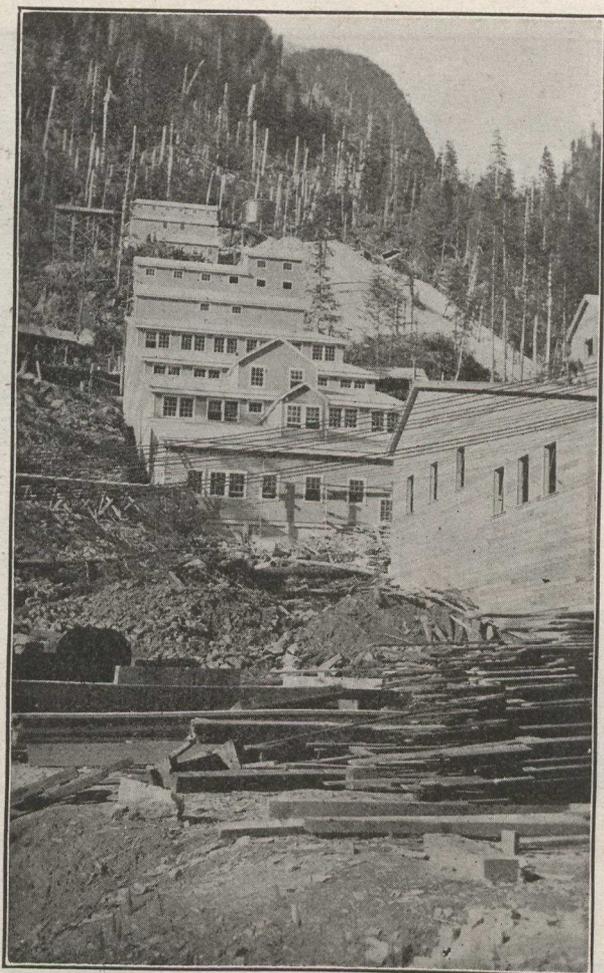
Fern	10 stamps	25
Granite Poorman	20 stamps	50
Kootenay Belle	15 stamps	30
May and Jennie	10 stamp	25
Motherlode Sheep Creek	10 stamps and cyanide	100
Nugget	4 stamps	8
Perrier	5 stamps	10
Porto Rico	10 stamps	25
Queen	20 stamps	50
Second Relief	10 stamps and cyanide	25
Wilcox	10 stamps	25
Ymir	80 stamps and Cyanide	240
NEW WESTMINSTER		
Fire Mountain	10 stamp	25
OSOYOOS.		
Cariboo McKinney	10 stamps	25
Fairview	40 stamps	200
Minnehaha	10 stamp	25
Nickel Plate	40 stamp mills	200
Oro Fino	3 stamp	6
Stratheyre	10 stamp	25
Tinhorn	10 stamps	25
Waterloo	10 stamps	25
QUEEN CHARLOTTE ISLANDS.		
Gold Harbour	2 stamps	4
LARDEAU.		
Calumet and B. C.	10 stamps	25
Eva	10 stamps	25
Oyster Criterion	10 stamps	25
Lucky Jack	2 stamps	4
ROSSLAND.		
O. K.	10 stamps	25
SKEENA.		
Surf Inlet	Rolls, concentration and flotation	300
TROUT LAKE.		
Silver Cup	10 stamps and chlorination	50
VERNON.		
Cherry Creek	5 stamps	15
Morning Star	5 stamps	10
YALE.		
Martel	6 stamps	12
Mt. Baker and Yale	10 stamps	25

Of the above mills, that of the Erl Syndicate, at Alberni, was shut down owing to the company's min-

eral claims being jumped through non-receipt of a letter from the company renewing its license. The Engineer mill at Atlin, the Batchelor mill at Kamloops, the Coronation, Ida May, Lorne and Pioneer Mills at Lillooet, the Athabasca, Granite Poorman, Queen, Motherlode, Perrier, Second Relief mills at Nelson, the Nickel Plate at Hedley, and the Surf Inlet constitute the operating plants. The Jewel in the Boundary suspended operations because, on the complex type of ore, the mill could not be operated successfully. The Barkerville mill was installed by the Provincial Bureau of Mines as a testing plant for the convenience of Cariboo prospectors, and to encourage the opening up of quartz properties. The Horsefly mill was installed by the Cariboo Gold Company to work the auriferous cemented gravels, but these proved too low grade to pay. The Robert E. Burns mill, in the Burns Basin, on the Middle Fork of the Spillimachene River, only made a short run. The Perry Creek mill was installed by the late H. C. Hammond, of Toronto, to test out auriferous quartz deposits west of the Sullivan Mine. The Dorothea Morton mill on Phillips Arm was shut down after successful operation, owing to the company which built it becoming financially involved in South Africa. The Arlington mill, south of Nelson, was burned down. The Chapleau, on Lemon Creek, has not been operated for some time. The Fern, Kootenay Belle, Nugget, Porto Rico, Wilcox and Ymir mills have not been operated for some years. The Ymir, one of the leading gold mines of the Province, was closed down owing to the reserves being exhausted. Cariboo McKinney was one of the early dividend payers, and was subsequently sold to a Toronto company. After short operation by that company the mine was shut down from exhaustion of reserves. The Fairview and Waterloo have been idle for some years. The little mill at Gold Harbor



Hydraulic Mining on Boulder Creek, Atlin.



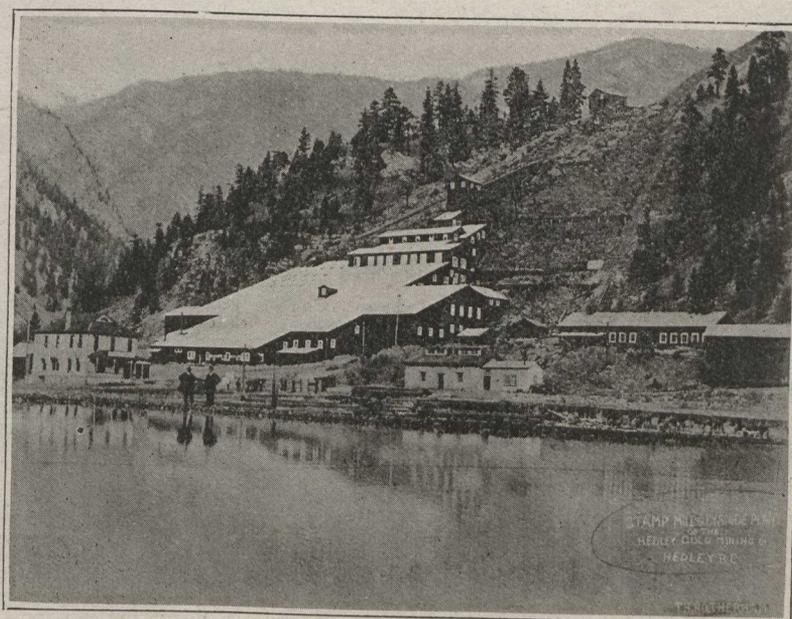
Mill at Surf Inlet Mine, Princess Royal Island

on Graham Island, is occasionally operated by J. McLellan. The Calumet and B. C., Eva, Oyster-Criterion, and Lucky Jack mills were erected to treat the auriferous quartz of Lexington Mountain, but owing to the low grade of the ore they were unprofitable and closed down in consequence. The O. K.

Mine at Rosslund has not been operated for some years. The Silver Cup mill was established to treat the dumps of the Silver Cup Mine, which was in its day one of the richest silver mines in the Province, and carried good gold values. The values occurred mainly in tetrahedrite, and it was expected that with the aid of chlorination these values could be extracted. The process failed, the values being lost in the tailings. The Cherry Creek and Morning Star mills in the Okanagan have not been operated for 15 years. The Martel, and Mount Baker and Yale Co.'s mills, Siwash Creek, Yale, have lain idle for a long time.

FUTURE OF GOLD MINING.

Gold takes third place in the value of the metal production, being exceeded only by coal and copper. In view of the large placer gold output of earlier years, and the fact that such gold was derived from lode deposits, it is reasonable to expect that there is an important future ahead of the gold mining industry. Gold occurs over almost the entire mineral area of the Province, but is mainly associated with the complex ores of other metals. An important fact that should be noted by prospectors is that tellurides occur throughout the entire length of the Province, and in that form important deposits may be passed over undetected. Mineral deposits of this character occur in the Boundary; at the watershed of Kettle River, Cherry, and Fire Valley Creeks; in Lardeau, Revelstoke, Cariboo, Omineca, Atlin, New Westminster, Kamloops, Lillooet, Similkameen, and Vancouver Island. The Sheep Creek camp, in Nelson Mining Division, is a freemilling gold camp of importance; and in fact that division generally deserves attention as a producer of lode gold, the precious metal being found from the Slocan watershed, at the extreme north of the division, to Lost Creek in the south. In East Kootenay there are promising lode gold deposits at the eastern portal of St. Mary's Pass; on Toby Creek; and at the headwaters of the Spillimachene River in the Golden Mining Division; as well as on Bugaboo Creek. Promising gold quartz deposits have been found on Old Baldy, or Proserpine Mountain, Cariboo; and the aurifer-



Hedley Gold Company's Mill at Hedley



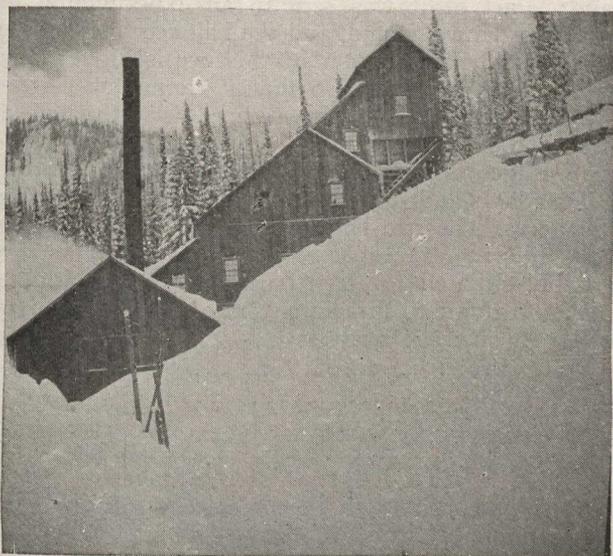
Le Roi Mine, Rosslund



Clean-up on Mosquito Creek, Cariboo.



Le Roi No. 2 Mine, Rosslund



Silver Cup Mine, Ferguson

ous cements in the section may prove of importance. In the Omineca division auriferous conglomerates, resembling the South African banket, have been reported by prospectors, and are stated to outcrop for many miles. The Engineer Mine at Atlin has produced phenomenally rich gold; and the Atlin district has great promise as an auriferous field.

Along the route of the Grand Trunk Pacific Railway, east of Prince Rupert, are several promising gold occurrences. The Coast has not generally been regarded as offering much encouragement for gold mining, and the Surf Inlet mine has proved it a mistaken idea to overlook the possibilities of the Coast granites. The Drum Lummon Mine, on Douglas Channel; the Western Copper Group on Khutze Inlet; the Gold Harbour and Southeaster on Queen Charlotte Islands; the Dorothea Morton Mine on Phil-

lips Arm; the Old Sport at Quatsino; the Della at Central Lake; the Marble Bay Mine on Texada Island, all carry important gold values, and demonstrate the possibilities of the Coast for gold mining.

So far the ore mined for gold has produced an average value of around \$10 per ton, but operators must make up their minds to be satisfied with lower grades of ore. With economic methods of mining and milling there is no reason why ores carrying say



Chapleau Mill, Nelson

\$5 a ton in favorable locations should not be workable at a profit. Copper ores carrying less values and requiring more complex methods of treatment have been successfully mined and smelted at a reasonable margin over cost, and gold mining can be placed on the same footing if investors will realize that British Columbia is a country of low grade ores, offering however, ample reward to skilful management and metallurgical treatment. There appears no reason why the present gold production should not be doubled within the next three or four years.



Athabasca Mill, Nelson



Porto Rico Mill, Nelson

Iron.

There are numerous deposits of iron ores in British Columbia. On the Coast, and tributary thereto, the ores are magnetite and limonite; and in the interior magnetite, limonite, and hematite deposits have been reported. Insufficient development has been done to demonstrate the probable extent of these deposits. The most important deposits on or tributary to the Coast are those at Nootka, Texada Island, and Copper River, each of which is estimated to have about 5,000,000 tons proved up or sufficiently exposed by outcrops and development to justify that estimate. From four of the deposits shipments have been made, the ore from three of them having been used in the manufacture of pig iron. The following production has been recorded:—

	Tons
1893	600
1897	2,000
1898	2,000
1899	2,000
1900	1,740
1901	5,746
1903	10,017
1908	11,500
1917	500
1918	2,200
Flux	13,346

The shipment made in 1893 was from West Redonda Island to the Oswego Iron and Steel Company's furnace in Oregon, and was used to make car wheels.

The shipments in 1897, 1898, 1899 and 1901 were from the Glen Iron Mine near Cherry Creek, on Kamloops Lake. The ore was shipped to the Hall Mines, Trail and Tacoma smelters as flux. It is magnetite and is said to carry about \$2 a ton in gold.

Of the 1901 shipments, 3,246 tons were from the Glen Iron Mine, and 2,500 tons from Texada Island, the official valuation of these shipments being given at the time as \$17,238.

The Glen Iron deposit at Kamloops is close to the C. P. R. track, with which it is connected by an aerial tramway. There are four veins varying in width from 10 ft. to 20 ft. The ore averages 66.83 iron.

Of the shipments in 1903, 3,727 tons were from the Glen Iron Mine for the use of the smelters, and 6,290 tons were from Texada Island. The latter ore was sent to the smelter at Irondale, where it was mixed with charges of a ninth to three-tenths bog iron and converted to pig of such high quality that it brought \$5 a ton more than the ruling price.

Part of the pig produced was converted to steel at the Union Iron Works at San Francisco and used in the construction of the American battleships Oregon, Charleston, Monterey, Olympia, and two warships for the Japanese Government. The reports made on it at the time showed that it produced a steel of exceptional strength.

The shipment of 1,500 tons made in 1908 was limonite from Quatsino, despatched to Irondale.

In 1917 a shipment of about 500 tons of magnetite was made from Redonda Islands for testing purposes.

The shipment in 1918 was from the limonite deposit at Summit on the P. G. E. Railway and Texada

Island. Part of it was sent to an experimental oil furnace on Howe Sound, and the balance to Irondale.

The phosphorus content of this ore is higher than was originally reported, so that it cannot be classed as a Bessemer ore. The reserve is estimated at about 650,000 tons.

The Puget Sound Iron Company, which controls the Texada Island deposits, has holdings aggregating 2,700 acres. The ore bodies average 20 to 25 ft. in width, and are traceable for four miles. They are favorably situated for transportation, being within a quarter of a mile to three quarters of a mile from the shore. An average analysis is:—

Fe	69.88
Mn	Trace
Si	2.75
S	0.6
P	Trace

The shipments sent to Irondale were subject to an American import duty of 40c per ton.

For some years there has been a movement on foot to have an iron and steel industry established on the Coast, and several engineers and economic geologists have reported on the ore deposits and their utilization. The reports have generally been favorable to the possibilities of the industry, but as there was a want of technical information available Hon. W. Sloan, Minister of Mines, retained Dr. Alfred Stansfield, of McGill University, a world's authority on iron and steel, to make an investigation and report. The report has now been published, and copies may be obtained by those interested from the Minister of Mines.

Dr. Stansfield summarises his conclusions in his letter to the Minister as follows:—"Under this changed condition the electric smelting of iron ores by existing methods is scarcely possible, and the only remaining opening, unless cheaper power can be obtained, is by developing a new process, which has lately come to my notice, and which appears to be more economical than the usual methods of electric smelting."

The Nootka deposit is owned by the Canadian Collieries (Dunsmuir) Ltd., and as this company has a large amount of hydro-electric power to spare from its Puntledge River plant, coking coal and coke ovens at Union Bay, fireclay, limestone, and the other raw materials necessary to an iron and steel industry, it is in the best position of any holders of iron deposits to inaugurate such an industry. This company can adopt either the blast furnace or electric smelting of the ore, and the management has the industry under investigation. Union Bay has been considered by experts who have investigated the matter the best site on the Coast for such an industry.

The best magnetite on the Coast for making pig is probably that at West Redonda Island, an analysis at McGill University giving the following results:—

Fe₂O₃, 69.34; FeO, 29.33; SiO₂, 0.89.

Other deposits of magnetite on the Coast occur at Sooke, Chemainus, Barkley Sound, Sarita River, Nimpkish River, Gordon River, on Vancouver Island; Rivers Inlet, Knight Inlet, King Island, Seymour Inlet, Powell Lake, Queen Charlotte Islands, Pitt Island, Kildalla River, on the Coast. The Sarita River deposit is 80 ft. wide, proved for 800 ft. in length. Outcrops on the same strike occur at Copper Island,

2½ miles away, and at Sechart, 8 miles to the north-west, so that the deposit has great possibilities. Analyses gave the following results:—

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Fe.	64.00	64.01	66.62	66.60	67.98	69.16
Si.	7.35	—	2.00	—	2.67	1.5
Al.	0.52	—	—	0.14	—	—
S.	0.00	0.00	0.02	0.00	Trace	Trace
P.	0.00	0.01	0.01	0.03	0.00	0.00
Lime	3.76	—	4.00	—	3.00	0.25
Mn.	Trace	—	—	—	0.25	0.16
Mg.	—	—	—	—	1.15	0.12

The Sooke deposit is 15 to 20ft. wide, traceable half a mile and averages 60% iron. A small deposit of hematite has also been reported in the vicinity.

Analysis of Kildalla ore gave 69.5% iron and 0.01% phosphorus.

Part of the deposits on Queen Charlotte Islands are associated with the coal measures and are clay ironstones of a weight of a pound to many tons. Magnetite occurs on Louise Island and Harriet Harbour.

The Copper River limonite deposit requires a railway 30 miles in length to enable ore to be shipped to the Grand Trunk Pacific Railway or to the Coast via the Skeena River.

An excellent grade of hematite occurs on the Kleena-Kleeni River, and has been taken up by P. Wallace, of Vancouver. Insufficient development has been done to demonstrate the probable quantity available. Samples were sent to the Bethlehem Steel Works and a favorable report received. A railway about 70 miles in length would be required to make this deposit available to Coast transportation provided the deposit proves sufficiently large to be of economic value.

A small deposit of rather impure hematite occurs near Merritt, and there is considerable hematite of an impure character to the east of the main line of the C. P. R. north of Spence's Bridge. These deposits give some hope of the discovery of deposits of a more favorable character in the vicinity.

Hematite deposits have been reported from Fort George, where red hematite is stated to occur over a width of 500 ft. If this report is confirmed it is important, as it would form the most accessible source of hematite for an iron and steel industry on the Coast, transportation being afforded by the Government railway, the Pacific Great Eastern, which will shortly be completed to that point. Hematite also occurs in the Similkameen. The most important deposits are on the watershed between Bull and Goat Rivers, tributary to the Crows Nest Pass Railway. These have been known as the Kitchener deposits, part of which were acquired about 20 years ago by interests associated with the Canadian Pacific Railway. Exploration work has proved hematite for a length of 10 miles in five veins varying from 6 ft. to 20 ft. in width. The deposits occur between gabbrodiorite and quartzite. The holdings were acquired from the locators on a cash payment of \$80,000 and \$30,000 was expended in development. The deposits have a dip of 55 to 65 degrees. The ore averages 55% to 65% iron, 5% to 10% silica. Sulphur and phosphorus are negligible. The ore is said to be of as good average quality as the Michigan and Newfoundland ores on which the great iron and steel industry of eastern Canada and Pennsylvania has been developed. During the past year persons in close

touch with the owners have made the statement that it is proposed to establish an electric plant at Trail to treat these ores, utilizing the hydro-electric plant of the West Kootenay Power and Light Company to supply the current required at a rate which it is claimed would enable pig iron to be produced at a cost at which the market of western Canada could be supplied. While the ore deposits at Kitchener have been developed to a depth of only 60 ft., there are exposures in the canyons which show them to have a depth of 600 to 800 ft., and iron ore has been found to within two miles of the track of the Crows Nest Pass Railway.

* * *

Lead.

British Columbia is the only important lead producing province in the Dominion of Canada. The lead is mainly derived from the argentiferous ores of Slocan, Ainsworth and East Kootenay. The first lead production on record was in 1887, when 204,800 lbs. were produced from high-grade silver ores exported. The following are the statistics of lead production:—

PRODUCTION FOR 25 YEARS, 1893 TO 1918.

Year	Lead, lb.	Value, \$
1893	2,135,023	78,996
1894	5,662,023	169,875
1895	16,475,464	532,255
1896	24,199,977	721,384
1897	38,841,135	1,390,517
1898	31,693,559	1,077,581
1899	21,862,436	878,870
1900	63,358,621	2,691,887
1901	51,582,906	2,002,746
1902	22,536,281	824,832
1903	18,089,283	689,744
1904	36,646,244	1,421,874
1905	56,580,703	2,399,022
1906	52,408,217	2,667,578
1907	47,728,703	2,291,458
1908	43,195,733	1,632,799
1909	44,396,346	1,709,259
1910	34,658,746	1,386,350
1911	26,872,397	1,069,521
1912	44,871,454	1,805,627
1913	55,364,677	2,175,832
1914	50,625,048	1,771,877
1915	46,503,590	1,939,200
1916	48,727,516	3,007,462
1917	37,307,465	2,951,020
1918 (estimated)	43,949,661	2,944,627
Total production for past 25 years		966,388,808
		\$42,232,180

As the lead production up till the end of 1892 was 1,747,820 lb., valued at \$78,591, the total lead production to end of 1918 is 968,136,628 lb. valued at \$42,310,771.

PRODUCTION BY DISTRICTS.

While a small production has been received from Boundary and Yale, almost the entire lead production came from three districts—East Kootenay, West Kootenay and the Omineca Mining Division of Cariboo District. The production of these since 1893 is as follows:—

District	Lead, lb.
East Kootenay	491,711,743
West Kootenay	476,809,133
Cariboo	1,819,040

The dividends, ore reserves, milling and smelting plants are dealt with under the head of "silver," since the whole of the lead is derived from silver-lead, or silver-lead-zinc ores. The only ore deposits producing lead ore carrying small silver values are those of the Bluebell Mine, at Riondel; Emerald Mine, at Sheep Creek, and Monarch Mine at Field.

FUTURE OF THE INDUSTRY.

The future for lead mining is undoubtedly good. No new sources of supply are reported, and the metal has a world-wide market for sanitary, industrial and pigment manufacture. In 1916 lead reached the highest price in 50 years. In the Sullivan Mine, in East Kootenay, owned and operated by the Consolidated Mining and Smelting Company, British Columbia can claim the largest silver-lead-zinc mine in the world. The Slocan and Ainsworth mining divisions are noted for their deposits of silver-lead ores. The Windermere Division of East Kootenay, and the Omineca Division of West Kootenay, are coming lead producing sections of importance, and indeed it is probable, from the development so far carried on, that Omineca will rival Slocan as a lead producer. The lead is derived almost entirely from galena, though important shipments of carbonates have been made from several properties, notably the Paradise Mine, in Windermere Mining Division, and the Bluebell Mine, in Ainsworth Mining Division.

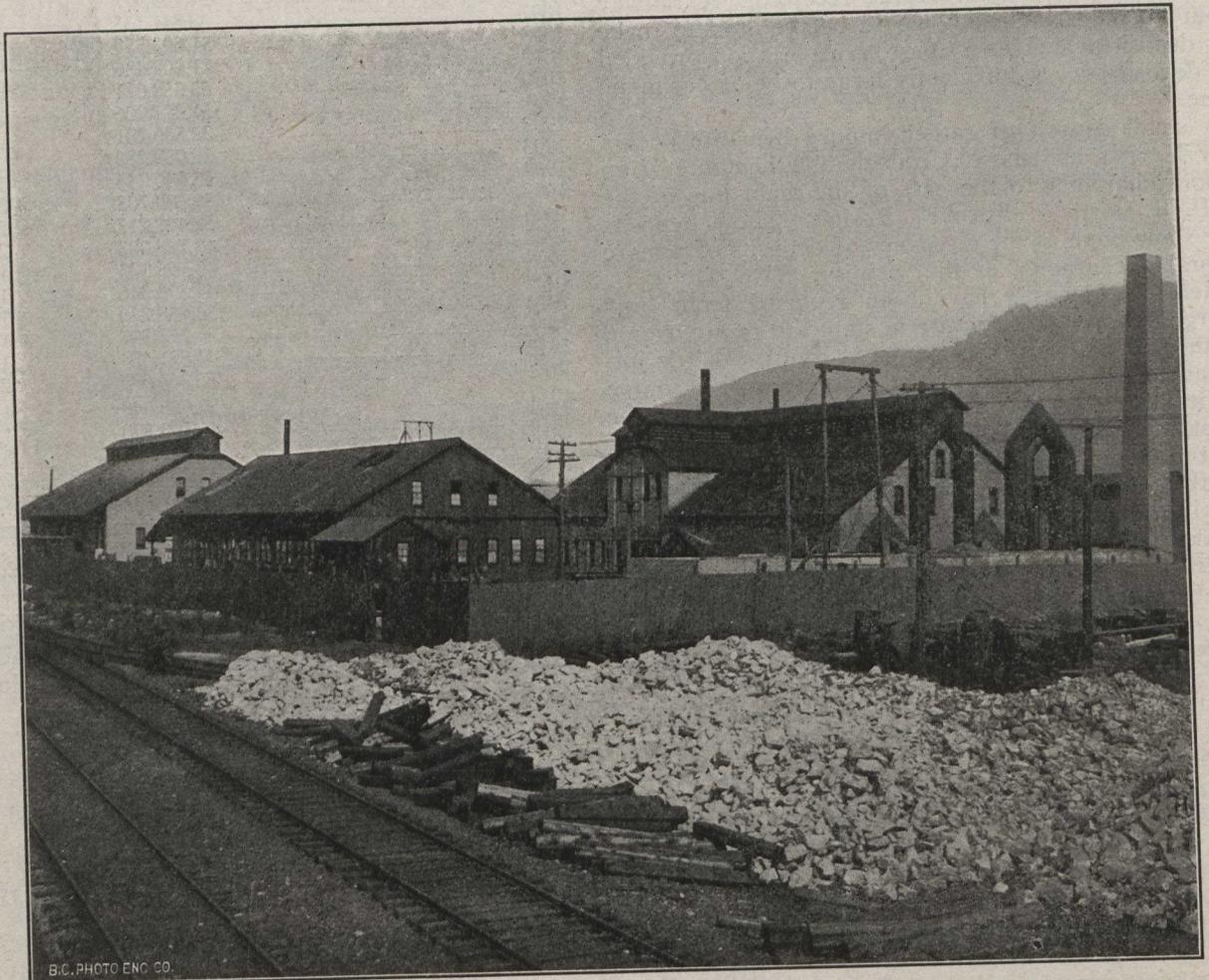
MANGANESE.

Manganese has been discovered in economic quantities at Kaslo, and at Cowichan Lake, on Vancouver Island. In the fall of 1917 Col. B. F. Millard, of Seattle, took a bond on the Kaslo property, and shipped during 1918 about 600 tons of the ore to steel works in the United States. The ore carries from 34.5% to 49.5% manganese.

The Cowichan Lake deposits were examined by several engineers and geologists during the spring and summer of 1918, and were favorably reported on, but require development to ascertain their probable extent, the mineral having been located at three points within 25 miles. These discoveries will prove an important adjunct to an iron and steel industry should such be established, making possible the production of ferro-alloys so much in demand in the manufacture of special steel products.

MOLYBDENUM.

Molybdenum is of common occurrence in British Columbia, having been found associated with copper, galena, gold, and other ores. Shipments have been made from the Molly Mine, Lost Creek, Nelson Mining Division; Tamarac Mine, at Highland Valley; Molly B., Portland Canal; Index Mine on Texas Creek, Lillooet Mining Division; Alice Arm; Similkameen; New Hazelton Gold Cobalt Company's property at Hazelton, Omineca Mining Division, and Kenallan Group, Grande Prairie, Kamloops Mining Division. The metal came into prominence during



Electrolytic Lead Refinery at Trail Smelter.

the war, \$2.50 per lb. being offered by American steel manufacturers. The war developed for this metal many uses, from which it will benefit on a revival of industry. It is an effective substitute for tungsten in tool steel. At the time of publishing this report the price is 85c per lb., or double the price ruling before the war. Many metallurgists express the opinion that molybdenum is likely to prove in increasing demand as its effect as an alloy is better understood, and as it is applied to uses now limited to more costly metals.

PLATINUM.

Platinum is frequently found associated with the gold of the placers, but is in a fine state of division, and difficult to separate from black sand. Consequently no special effort has been made to save it, and large quantities of the metal must have been lost in tailings from the sluice boxes in the various placer camps.

The most notable occurrence is at Tulameen, where it is found in the river and its tributaries draining Olivine Mountain. This mountain is composed of dunite, and carries platinum associated with chromite and microscopic diamonds. Investigation has so far failed to demonstrate that the metal occurs in situ in quantities of economic value. The occurrence in the placers is more promising, the metal being sometimes in large nuggets

In the summer of 1918 the Imperial Munitions Board, requiring platinum for war purposes, caused an investigation to be made of the Tulameen placer

deposits, which were drilled in several places under the supervision of C. G. Mackenzie of the Canada Department of Mines. The results were encouraging.

In addition to the Tulameen placers, platinum has been reported from Cariboo, Lillooet, Ashcroft, Omineca, Vancouver Island, Okanagan, Boundary, Fraser River, and other localities. The Provincial Bureau of Mines reported the production in 1895 of platinum to the value of \$3,800. In 1905 a quantity of the metal was reported sold at \$12 per oz.; and in 1907, 10 oz. from Lillooet placers brought \$25 an ounce. In 1908, 100 oz. platinum from Tulameen placers was reported sold at \$15 per oz. The following are the records of production so far as obtainable:—

Year	oz.	Year	oz.
1854 to 1894	2,195	1906	62
1895	475	1907	10
1897	20	1908	100
1899	55	1914	20
1901	457	1916	20
1902	51	1917	74
1903	15	1918	75
1905	35		

In 1918 the Quesnel Hydraulic Co., operating at Quesnel, was reported to be obtaining considerable amounts of platinum in hydraulicizing, but we have been unable to obtain confirmation of the report.

Gilbert Blair, of the firm of Mackay, Smith and Blair, Ltd., Vancouver, has a magnificent collection of platinum obtained from the Tulameen. This collec-



Lead Products Manufactured by Consolidated Mining and Smelting Co., Ltd., at Trail Smelter



Standard Silver Lead Company Concentrating Mill at Silverton
(From sketch by late Prof. Arthur Lakes)

tion was loaned by him to the Canada Department of Mines for exhibition at the Panama Pacific Exposition at San Francisco, where it attracted much attention.

* * *

QUICKSILVER.

There are several deposits of quicksilver in British Columbia. The mineral, in the form of cinnabar and native mercury, occurs at Sechart, Barkley Sound, and native mercury has been found in Leach River. Leach River mercury has been attributed to loss from sluice boxes operated by the placer miners, but cinnabar has been reported from that locality. Wm. Fernie, of Victoria, is interested in the Sechart deposits, and has done considerable development, producing some fine samples of ore.

The most promising deposit is that at Hardy Mountain, Kamloops, where cinnabar occurs in veins of quartz, calcite, dolomite, barite and feldspar. The mineral is associated with stibnite. These deposits were taken up by British investors, who put in a small retorting plant from which 7,000 lb. of mercury was produced about 1896. The deposits were examined in 1918 by Chas. Camsell, of the Geological Survey, with a view to ascertaining the prospects of obtaining here supplies of quicksilver for munition purposes, and his report was favorable.

Cinnabar also occurs on the Kickinghorse River, on the main line of the C. P. R., east of Golden; and has been reported from Homathco river, on the Mainland coast, in Nanaimo Mining Division. In 1910 an interesting occurrence of native mercury was noted at Field by C. E. Cartwright and G. S. Flindt, of Vancouver, and it has been demonstrated that the mineral occurs in the gravels of the Kickinghorse River, though the source of it has not been discovered.

Cinnabar has been found in the placers of the Fraser River, and Omineca Mining Division. Arquerite, a natural alloy of silver and mercury, has been found on Vital and Silver Creeks, Omineca.

SILVER.

Silver takes third rank in the value of the metal products of British Columbia, and apart from the early gold mining on Graham Island, it was the first metal to be produced from lode mining. A certain amount of silver was produced from the refining of the gold of the placers, but the first lode production recorded was in 1887, and amounted to 17,690 oz. In those days silver held rank with gold as a monetary metal in the United States, and the price was \$1.00 per ounce. The discovery of the rich silver-lead ores

of Ainsworth and Slocan attracted widespread attention on this account, a rich silver mine being regarded with as much favor among miners, investors and speculators as a gold mine.

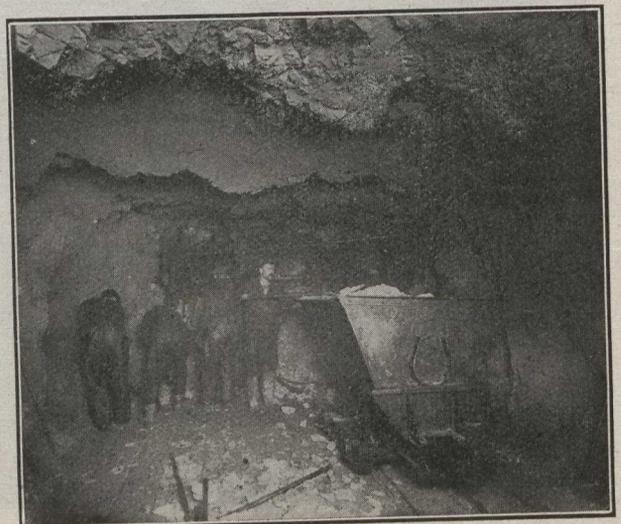
In 1888 the production of silver increased to \$79,780; falling back to 53,192 oz. in 1889. The production for 1890 was 70,427 oz.; in 1891 4,500 oz.; in 1892, 77,160 oz.

It was, however, in 1893, 25 years ago, that silver mining took on its first spurt, the production being trebled in that year. During the next four years Ainsworth and Slocan saw their boom days, the production advancing rapidly till, in 1897, the silver production reached the highest figure on record.

The following are the statistics of the silver production of British Columbia for the past quarter century:—

Year	Production, oz.	Value
1893	227,000	\$ 195,000
1894	746,379	470,219
1895	1,496,522	977,229
1896	3,135,343	2,100,680
1897	5,472,971	3,272,836
1898	4,292,401	2,375,841
1899	2,939,413	1,663,708
1900	3,958,175	2,309,200
1901	5,151,333	2,884,745
1902	3,917,917	1,941,328
1903	2,996,204	1,521,472
1904	3,222,481	1,919,516
1905	3,439,417	1,971,818
1907	2,745,448	1,703,825
1908	2,631,389	1,321,483
1909	2,532,742	1,239,270
1910	2,450,241	1,245,016
1911	1,892,364	958,293
1912	3,132,108	1,810,045
1913	3,465,856	1,968,606
1914	3,602,180	1,876,736
1915	3,366,506	1,588,991
1916	3,301,923	2,059,739
1917	2,929,216	2,265,749
1918 (estimate)	2,886,861	2,601,120

Total production for 25 years
—1893 to 1918 78,992,652 \$45,939,794



Face of Long Low Level Tunnel at Sullivan Mine, Kimberley

PRODUCTION BY DISTRICTS, 1893—1918.

District	Silver, oz.
West Kootenay	57,297,421
East Kootenay	11,168,366
Boundary	6,550,505
Coast	1,886,337
Cassiar	1,277,362
Cariboo	552,422

From these figures it will be seen that West Kootenay has produced nearly five-sevenths of the total silver production of the province in the past quarter century. Of the total silver production of West Kootenay, 39,388,754 oz. came from the mines of the Slocan; 6,734,063 oz. from the Ainsworth Mining Division; 4,019,624 oz. from Nelson Mining Division, and 2,311,712 oz. from Revelstoke, Trout Lake and Lardeau Mining Divisions. The shipments from these divisions were silver-lead ores, so that this class of ore has contributed two-thirds of the total silver production.

The balance was a by-product of copper and copper-gold ores. Of the silver from copper gold ores, the Boundary mines contributed 6,550,505 oz.; Rossland, 4,019,624 oz.; the Coast district, 1,886,337 oz.; Cassiar, 1,277,362 oz.

The important producers in Slocan were the Payne, Slocan Star, Standard; and in East Kootenay, the North Star, St. Eugene, Sullivan and Paradise.

Two-thirds of the Boundary production was from the Granby Company's Phoenix mines, and the balance from the B. C. Copper, Dominion Copper, and Consolidated Mining and Smelting Company's mines.

The Coast production was mainly from the Britannia Mine on Howe Sound, and the Marble Bay Mine, on Texada Island.

The Cassiar production was almost entirely from the Granby Company's Hidden Creek Mine. The Cariboo production was mainly from the Silver Standard Mine at Hazelton, and the Rocher de Boule Copper Mine in the Omineca Mining Division.

DIVIDENDS.

The following are the dividends declared to December 31, 1918, by mining companies operating silver mines in British Columbia, the list including those who are mining silver-lead-zinc ores. The Consolidated Mining and Smelting Co., Ltd., is included in the list for the reason that, while it is mining copper



Mill of Silversmith Mines, Ltd., Sandon

gold ores at Rossland, and copper in the Boundary, its principal source of dividend earnings is the Sullivan silver-lead-zinc mine in East Kootenay.

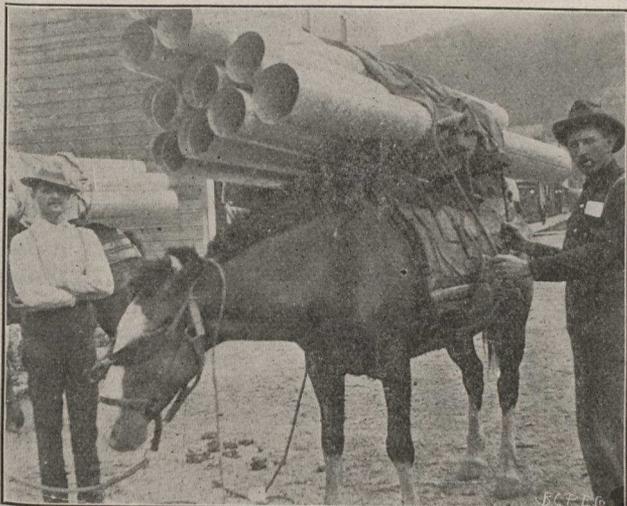
Company	Amount of dividends 1893 to 1918 inclu.
Consolidated Mining and Smelting Co., Ltd.	\$4,995,495
Standard Silver Lead	2,700,000
Payne	1,420,000
Slocan Star	575,000
Rambler-Cariboo	542,500
Idaho	400,000
North Star	373,000
Canadian Goldfields Syndicate	291,000
Reco	287,500
Retallack & Co.	230,000
Last Chance	213,109
St. Eugene	210,000
Whitewater	209,000
Hall Mines	187,500
Ruth	125,000
Sunset	66,000
Utica	64,000
Noble Five	50,000
Goodenough	45,188
Washington	38,000
Monitor	27,500
Queen Bess	25,000
Jackson Silver Lead	20,000
Providence	20,000
Surprise	20,000
Bosun	12,000
Antoine	10,000

Total dividends paid by operators of silver mines...\$13,156,822

ORE RESERVES.

The nature of the ore-bodies and methods of mining in Slocan and Ainsworth is such that the ore is practically mined as it is developed, and few mines show reserves. Where there is a vein in the Slocan and it is followed it generally develops ore.

The only silver-lead-zinc mine in British Columbia which has important reserves is the Sullivan, in East Kootenay, owned and operated by the Consolidated Mining and Smelting Company. On this property it is estimated the reserves aggregate 3,500,000 tons, constituting the largest mine of this class in the world. Ore has been demonstrated over a length of two miles, so that there is an immense tonnage of probable and possible ore over and above the actual reserves.



Packing Supplies to the Silver-Lead Mines of Slocan



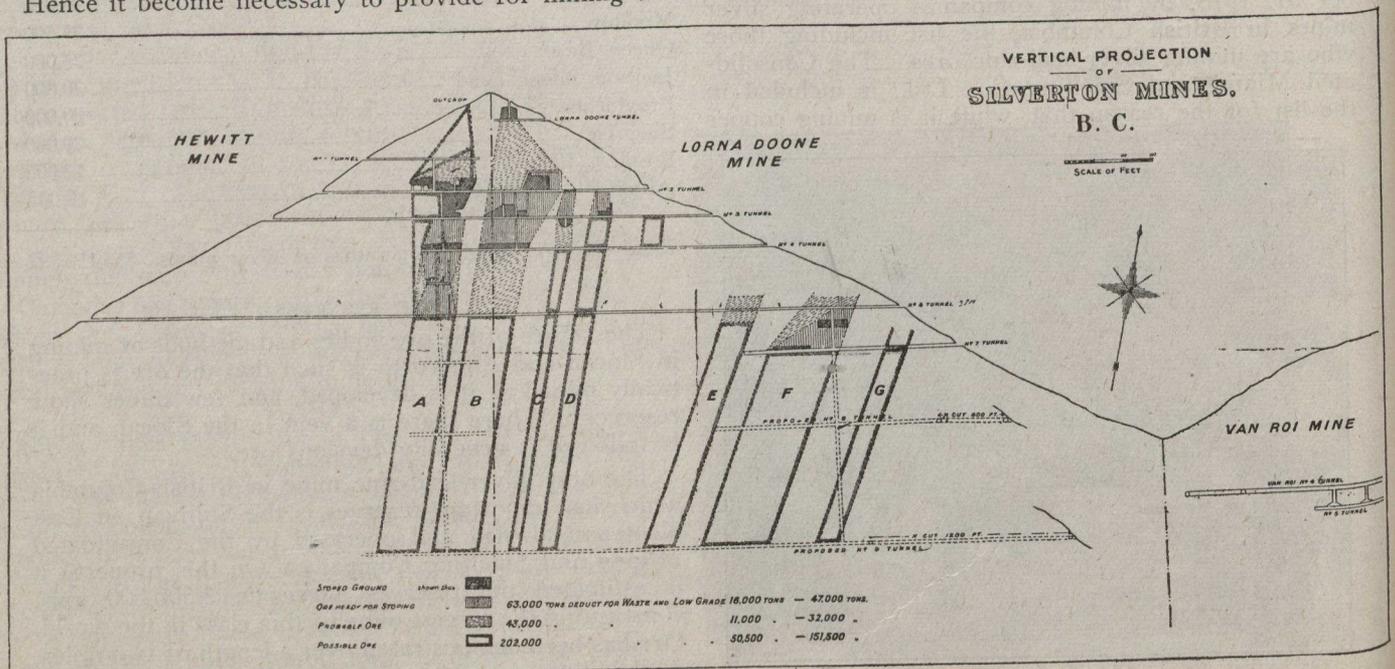
Bluff on Kaslo-Slocan Railway at Payne Mine

MILLING AND SMELTING.

In 1906 it was found that the ores of the Slocan were becoming lower grade with depth, and that dependence could not be placed on the crude ore available to maintain profitable mining operations. Hence it become necessary to provide for mining the

lower grade ores; and to obtain a product of sufficiently high value to allow for transportation and smelting charges concentration was necessary. The first concentrator was installed at the Lanark Mine in 1896, and other operators quickly followed. The following concentrating mills for treatment of argentiferous ores have been built during the past quarter century:—

Mine	Location	Daily Cap. Tons	Plant
Consolidated M. & S. Co.	Trail	1500	Jigs, tables flotation
Cork-Province	S. Fork Kaslo Creek	100	Jigs, tables vanners, flotation
Florence	Ainsworth	300	Jigs, tables flotation
Galena Farm	Silverton	100	Jigs, tables flotation
Hewitt	Silverton	140	Jigs, tables, flotation
Highland	Ainsworth	100	Jigs, tables
Kootenay Ore Treatment Works	Kaslo	140	Jigs, tables, magnetic separation flotation
Lanark	Laurie	100	Jigs, tables
Molly Gibson	Kokanee Ck.	100	Jigs, tables
Monarch	Field	40	Jigs, tables
Payne	Sandon	100	Jigs, tables
Queen Bess	Kamloops	50	Jigs, tables
Rambler-Cariboo	McGuigan	75	Jigs, tables
Roseberry-Surprise	Roseberry	100	Jigs, tables
Ruth	Sandon	100	Jigs, tables
Idaho-Alamo	Sandon	100	Jigs, tables
St. Eugene	Moyie	475	Jigs, Tables flotation
Silver Standard	Hazelton	50	Jigs, tables
Slocan Star	Sandon	100	Jigs tables, flotation
Standard	Silverton	120	Jigs tables, flotation
Van Roi	Silverton	125	Jigs, tables
Whitewater	Whitewater	100	Jigs, tables



Section on Hewitt and Lorna Doone Mines, Silverton

The Lanark mill, built at Laurie in 1895, was sold to the Payne Company, who installed it at their mine at Sandon, but it was destroyed in the fire which swept McGuigan Basin and neighborhood in 1910. The Whitewater mill was also burned down at the same time. The St. Eugene mill was destroyed in 1917, when it was under reconstruction to treat the ores of the Sullivan Mine. The Consolidated Mining and Smelting Company has now constructed at Trail a mill with a capacity of 1,500 tons a day to treat the Sullivan ores. At the present time there are in the Province mills capable of concentrating 3,340 tons of silver-lead-zinc ores per day, and making an effective separation of the lead and zinc concentrates.

The first smelter for treatment of silver-lead ores was established at Pilot Bay, Kootenay Lake, in 1895. It was operated till 1897, and in 1906 by the Canadian Metal Company on its acquiring the Bluebell Mine. The smelter had a capacity of 50 tons a day. On the original Canadian Metal Company going into liquidation the Pilot Bay Smelter was purchased by the Consolidated Mining and Smelting Company and dismantled.

The Hall Mines Smelter at Nelson, which had been established in 1896 as a copper smelter, was converted to a silver-lead smelter in 1898, and was at that time the only local purchaser of silver-lead ores. On the Canadian Pacific Railway acquiring the Heinze copper smelter at Trail in 1898, stacks were added for smelting silver-lead ores.

Under the management of W. H. Aldridge, the Trail Smelter made rapid progress, practically controlling the market for custom ores formerly shipped to American smelters; acquiring silver lead mines; establishing the first electrolytic lead refinery with a capacity of 80 tons a day; and manufacturing sheet lead, lead pipe, besides building up a large export trade with Asiatic markets in pig lead; and operating a silver refinery.

In 1903 the Sullivan Mining and Smelting Company, owners of the Sullivan Mine, with headquarters in Spokane, erected at Marysville a smelter to handle 100 tons a day, but owing to the quantity of zinc in the ore the smelter was never successfully operated and the company went into liquidation, the Consolidated Mining and Smelting Company acquiring the property by taking up the bond issue.

FUTURE OF SILVER.

Galena ores are the main source of silver production and are likely to continue so. At the same time some of the gold deposits, as those at Atlin, carry appreciable amounts of silver and the metal is also associated with gold in most of the copper mines. At Britannia the silver values average 0.3302 oz. per ton. The dry ores of the Slocan promise to become an important source of silver, and there are several argentiferous telluride deposits.

Slocan, Ainsworth and Nelson mining divisions of West Kootenay; Fort Steele and Windermere divisions of East Kootenay, have so far been the main sources of supply of the metal; but Omineca and Portland Canal mining divisions of Cassiar promise to become relatively as important producers as Kootenay.

The silver outlook depends largely on the attitude of the Allied nations toward the metal for monetary purposes. Because of the necessity of supplying India with large requisitions for silver, an arrangement

was made by the British and American governments to put a fixed price of \$1.00 an ounce on silver to stabilize its value, and hence the metal was, at the close of 1918, at the highest price since 1890. The policy of these governments had the effect of saving India from a threatening financial panic, and it is doubtful whether, from the point of view of international economics, they can fail to maintain a stable price for the metal. In fact, since the gold production is falling off, and is insufficient to bear the financial burden of the huge expenditures involved by the war, it is probable the leading nations will be obliged to adopt a bi-metallic standard of money, and legalize a fixed ratio between gold and silver, which would have the effect of making silver as much sought after, and of as great value in international economics, as gold.

* * *

Zinc

Zinc has shown the most phenomenal development of any branch of mining since the days of the Cariboo. In the early days of silver-lead mining the presence of zinc condemned many an otherwise promising property, as no means of separating the silver-lead and silver-zinc values had been attempted, and the smelters put a heavy penalty on the zinc contained in shipments. The Silver Cup Mine at Ferguson was an instance of this. The ore ran up to over 20% zinc, and not only was no return obtained from it, but in consequence of its presence the shippers were heavily penalized. The only mine which was a successful producer of zinc in the early days of the Slocan was the Lucky Jim, where the ore was for the most part free from silver and lead, and carried zinc values of from 35% to 53%. This mine started shipping in 1896 and from its shipments up to 1899 \$100,000 was distributed in dividends among the shareholders. The ore went to Antwerp and England. The Bosun at New Denver, shipped zinc ore in 1899.

As depth was gained on the ore-bodies of Slocan and Ainsworth the zinc content increased, and the ore became lower grade. The problem of separating and utilizing the zinc became so pressing that in 1906 the Dominion Government appointed a Commission, consisting of W. R. Ingalls, editor of the Engineering and Mining Journal, of New York; P. Argall, of Denver, Colo.; and A. C. Garde, manager of the Payne Mine in Slocan; to investigate and report on it.

One effect of the report was to stimulate methods of concentration, and the problem of separation of lead and zinc concentrates in the mills received particular attention. American spelter companies sent agents into the Province to purchase ores and concentrates which were in active demand, and by 1909 zinc became an annual product of the mines. In 1904 an effort was made at Nelson to apply the Snyder process, but without success. In 1910 A. Gordon French, of Victoria, claimed to have invented a chemical process of making a clean zinc separation, and a company known as the French Complex Ores Reduction Company was organized to apply the invention. The company installed a demonstration plant at Nelson, citizens of that town contributing their financial and moral support to the investigation.

The Consolidated Mining and Smelting Company had acquired the Sullivan Mine, where the problem of extracting the zinc was of prime importance in the

economic operation of the property. Under the direction of R. H. Stewart, then general manager of the Consolidated, the company's chemists set to work on the problem. Among other work of investigation they took an option on the French patents, and retained Mr. French to direct the research work. Satisfactory results were not obtained from the process, and it was dropped. Further research work developed an electro-chemical process which appeared to promise success, and about half a ton of spelter a day was produced by 1914.

Then the war came. German interests had control of the world metal markets. The Allies had to obtain supplies of the metals required for munitions at any cost. By June, 1915, zinc had gone up to 21c per lb. from the pre-war average of 5.1c, and as much as 40c per lb. was demanded for refined zinc. In view of the necessity to obtain home supplies at moderate cost the Imperial Munitions Board turned to the Consolidated Mining and Smelting Company with a proposal to advance \$1,000,000 to develop spelter production to 35 tons a day at a price of 15c per lb. Anxious to support the interests of the nation in the war to the utmost of its ability, the Consolidated accepted the proposal.

The effect on the zinc market was magical. German operators in the United States immediately reduced the price to 12.6c per lb., the deal saving not only the British Government but Allied nations as a whole many millions of dollars in the cost of munitions. The Consolidated Mining and Smelting Company had its plant up to the capacity of 25 tons a day early in 1916, and by the end of that year produced 15,000,000 lb. of spelter. In 1917 the plant was increased to take care of an output of 75 tons a day, and the production for that year was 20,715,090 lb. In 1918 the company's production was about 22,000,000 lb.

Concentrates shipped to American spelter works contained about as much more zinc as was produced at Trail, with the result that the zinc production jumped in three years from 7,866,467 lb. to 41,848,513 lb.

So far as the Consolidated Mining and Smelting Company is concerned, it has also a guarantee from the Government of 8c per lb. for two years after the war, so that the production of the spelter works at Trail Smelter will not be affected during that time by the price of zinc.

Meantime the Provincial Government has financially supported the French Complex Ores Reduction Company in the development of its process, and the old zinc smelter at Nelson has been equipped for the purpose, but so far no commercial production of zinc has been made under the process.

The Provincial Bureau of Mines publishes no tabulated record of production prior to 1909. The following figures show the development of zinc production, the additions to the Government figures for the years 1899 to 1908 being from our own records:—

Year	Zinc lb.	Value
1890	1,600,000	\$ 92,000
1903	2,564,000	141,020
1904	2,781,000	111,240
1905	4,706,000	282,360
1906	560,000	33,600
1908	7,600,000	360,250
1909	8,500,000	400,000

1910	4,184,192	192,473
1911	2,634,544	129,092
1912	5,358,280	316,139
1913	6,758,768	324,421
1914	7,866,467	346,125
1915	12,982,440	1,460,524
1916	37,168,980	4,043,985
1917	41,848,513	3,166,259
1918 (estimate)	36,149,804	2,501,573

Total production for 25 years to 1918 183,263,078 \$13,901,061

PRODUCTION BY DISTRICTS.

District	Zinc, lb.
West Kootenay	89,041,668
East Kootenay	58,274,809
Omineca	880,063

Slocan Mining Division, in West Kootenay, leads all other mining divisions with a production of 78,396,320 lb.

East Kootenay was the next largest contributor, with 57,735,090 lb. zinc, almost entirely from the Sullivan Mine. Standard Silver Lead, Lucky Jim, Rambler-Cariboo, Van Roi, Slocan Star, Noble Five, Surprise, and Galena Farm were the principal producers of zinc in the Slocan, and the Cariboo production came from the Silver Standard Mine in Omineca Mining Division.

DIVIDENDS.

The dividend paying zinc producers are included in the list published under the statistics of silver mining, with the exception of

Lucky Jim, amount of dividends; \$100,000

FUTURE OF THE INDUSTRY.

At the time of publication the outlook for zinc is not encouraging. American production has been twice the ordinary trade demand, and mines and spelter works have shut down in proportion. The British Government has purchased the Australian output for a number of years, and will no doubt secure for the production from that country a preference in the British market. The future of the industry in this country lies in the development of manufactures utilizing the zinc produced, such as brass manufactures, pigments, and galvanizing. It is an advantage to the British Columbia producers that zinc is almost entirely a by-product from the milling of silver-lead-zinc ores, and consequently is produced at low cost. Most of the zinc produced here must, however, find an outside market, as in American and Belgian spelter works. The Consolidated Mining and Smelting Company, which operates the only spelter plant in the province, will doubtless be able to take some ores suited to its process, but as that company owns the Sullivan Mine, and its zinc resources are not equalled in any other part of the world, it is reasonable to expect that company's plant will be mainly occupied in the treatment of its own ores.

TONNAGE MINED.

The following figures show the development of tonnage mined during the quarter century under review:

Year	Tons mined	Year	Tons mined
1893	750	1900	554,796
1894	3,500	1901	920,416
1895	30,490	1902	998,999
1896	86,450	1903	1,286,176
1897	169,362	1904	1,461,609
1898	215,944	1905	1,706,679
1899	287,343	1906	1,963,872

1907	1,804,111	1914	2,175,971
1908	2,083,606	1915	2,690,100
1909	2,057,713	1916	3,188,865
1910	2,216,428	1917	2,761,579
1911	1,770,775	1918 (estimate)	2,859,454
1912	2,688,532		
1913	2,663,809	Total	38,647,329

TONNAGE AND VALUE BY DISTRICTS—1893 to 1918

District	Tonnage	Total value	Ave. val. per ton
West Kootenay	8773,564	\$141,637,402	\$16.21
Boundary Yale	19,925,685	106,269,241	5.34
Coast	3,850,192	37,774,943	9.65
Cassiar	3,839,000	36,953,346	9.62
East Kootenay	1,699,116	31,596,979	18.00
Cariboo (Omineca)	47,739	1,987,681	41.63
Lillooet	32,268	818,134	25.35

In West Kootenay, Trail Creek (Rossland) Mining Division produced 5,480,883 tons; Slocan Mining Division 1,351,607 tons; Nelson, 1,179,004 tons; Ainsworth, 677,584 tons; Revelstoke, Trout Lake and Lardeau, 83,426 tons.

Boundary was the largest producer of tonnage, amounting to 19,858,370 tons, to which the Granby was by far the largest contributor. Other large shippers were the B. C. Copper, Dominion Copper, and Nickel Plate at Hedley. Ashcroft, Kamloops and Yale contributed 63,927 tons, most of which came from the Iron Mask at Kamloops. The Similkameen tonnage was small, aggregating 3,388 tons.

In East Kootenay the production was mainly from Fort Steele Mining Division, where the North Star, St. Eugene and Sullivan were the leading producers, these mines turning out an aggregate of 1,699,116 tons.

Northeast Kootenay produced 46,741 tons, most of which came from the Paradise Mine in Windermere Mining Division, and the Monarch Mine in Golden Mining Division

The Coast production came mostly from the Britannia Mine, the Tye and Marble Bay mines being the other principal shippers.

Of the Cassiar production the Skeena Mining Division accounts for 3,837,448 tons, nearly all of which was produced at the Granby Company's Hidden Creek Mine. The Surf Inlet Mine is now an important producer. Atlin produced 1,552 tons of high grade gold ore. The uniformity of values of Coast ores is shown in the returns from southern coast, both of which show an average value of between \$9 and \$10 per ton, mainly derived from copper ores.

The Omineca Mining Division of Cariboo produced the highest grade ore mined in the Province, averaging \$41.63 per ton. These ores came mainly from the Rocher de Boule and the Silver Standard mines at Hazelton.

The high value of the Lillooet ores, which were entirely mined for their gold, and for the most part treated by arrastras, gives much promise for the future of gold mining in that division.

Non-Metals

ARSENIC.

Arsenic is a common mineral in British Columbia, and is invariably associated with the gold ores. There was no commercial production till 1917, when the Tacoma Smelter for the first time paid \$20,000 for the arsenic in the concentrates shipped from the Nickel Plate Mine at Hedley. No doubt the demand for poisonous gasses for the war gave the mineral a commercial

value for the first time in the history of mining in this Province. A similar amount was paid for the arsenic in the 1918 shipments from the Nickel Plate Mine.

BRICK.

No records are available of brick till 1905, though kilns had been operating on the Coast for some years before that time. The following is the production of brick so far as figures are available:—

	Brick, Face, Fire, Silica	Brick Red
1904	\$ 50,000	
1905	50,000	\$ 180,000
1906	50,000	360,000
1907	56,500	365,000
1908	95,000	370,000
1909	55,000	380,000
1910	85,000	400,000
1911	147,980	405,100
1912	175,406	354,000
1913	154,000	368,500
1914	114,704	163,299
1915	71,827	45,706
1916	131,067	36,194
1917	170,099	20,750
1918	150,000	15,000
Total	\$1,556,583	\$3,463,599

Firebrick was made at Comox in 1904 by the Wellington Coal Company, and at Victoria by the B. C. Pottery Company, the fireclay used being derived from the workings of the coal mines on Vancouver Island. In 1908 an impetus was given to the manufacture of firebrick by the opening up of the deposits of fireclay at Clayburn. These deposits are amongst the best in Canada. The output of firebrick by that company had reached \$35,000 by 1910. In 1911 the company's production was placed at 1,400,000, valued at \$43,000, and in 1912 at 2,800,000, valued at \$56,000. In 1913 the output was 3,000,000 firebrick, valued at \$77,000. Notwithstanding the depression immediately following the outbreak of war in 1914, the Clayburn Company in that year produced 1,600,000 firebrick, of a value of \$43,000. Since then the Clayburn Company has had exceptionally heavy demands for firebrick, supplying the requirements for the Trail Smelter; the iron and steel plants of Seattle; the by-product coking plant of the Granby Company at Anyox. The output of the Clayburn Company in 1916 was valued at \$164,000. The Clayburn Company manufactures a product that cannot be beaten, and it has developed into one of the most important branches of the clay industry in the Province.

The manufacture of red brick had developed largely by 1905, when the production was estimated at \$7,500,000 at Victoria, and a similar amount at Vancouver; 2,500,000 at Grand Forks; and 10,000,000 in other districts. In 1906 the Anvil Island brick yard was installed and produced 30,000 red brick a day. In 1909 the manufacture of red brick had reached 40,000,000, of which the Victoria Brick Co., Humber Yard, and Baker Bros.' yard at Victoria produced 3,500,000 each. In 1912 the production of red brick reached 50,000,000, valued at \$400,000, the brick being sold at prices ranging from \$8 to \$11 per thousand.

In 1913 the output was estimated at a similar amount, with a value of \$368,500. In 1914 the building boom at the Coast cities had collapsed, and

the production of red brick went down to 17,000,000 valued at \$163,300. In 1916 the production was estimated at 3,600,000, of a value of \$33,194.

In 1907 the silica brick industry was started at Victoria, and 1,100,000 brick of this type placed on the market at \$15 per thousand. In 1909 the number of silica brick manufactured was 3,000,000, but the price fell to \$12 per thousand.

The Clayburn Company produce splendid face brick, and some of the finest buildings, as the C. P. R. station, the Hotel Vancouver, the Dawson Building, Vancouver, and other important business blocks in the Coast cities have used Clayburn face brick in their construction. In 1910 the company's production of face brick was placed at \$165,000, and in 1912 at 2,700,000 brick, valued at \$98,000. In 1912 the production was 4,000,000 brick, valued at \$100,000. In 1913 it fell to 2,000,000 brick, valued at \$60,000, and in 1914, to 1,100,000, valued at \$30,000.

The Port Haney Brick Co., Ltd., has produced a large amount of red brick at its yard at Haney.

* * *

BUILDING STONE.

British Columbia supplies the finest building stone that can be produced. Evidence of this is seen in the Parliament Buildings at Victoria, the Courthouses at Nanaimo, Vancouver, Vernon and Revelstoke; and other public buildings and business blocks.

The most important building stone is that quarried at Haddington Island. It was formerly classed as a grey sandstone, but is a trachyte. The quarry is operated by W. S. McDonald and Co., of Vancouver. The principal buildings in the construction of which this stone was used were the Parliament Buildings at Victoria, and the Courthouse at Vancouver. In 1917 the Sechelt Granite Quarries, Ltd., quarried stone to the value of \$156,000 for use by the Dominion Government in the construction of the piers in Victoria Harbour.

The Vancouver Granite Co. has exported granite from its Nelson Island quarry to the Coast States, Australia and Honolulu.

Several quarries have been opened for the supply of granite, sandstone, marble. The principal granite quarries are those on the North Arm of Burrard Inlet, Howe Sound, Hardy, Jervis, Fox and Nelson Islands, Smith Island, Prince Rupert, North Bend, Little Shuswap Lake, Nelson and Okanagan Lake. On the southern coast are pink granites equal to the Bovenno granite of Italy, from which an important export trade may be developed. The post office at Rossland is of monzonite.

Sandstone quarries have been opened on Mayne, Gabriola, Saturna, Hornby, Denman, Salt Spring, Pender and Newcastle Islands, that from Salt Spring Island being used in construction of the dry dock at Esquimalt. From Newcastle Island were mined and dressed the huge pillars of the U. S. Mint at San Francisco, these pillars being 27 ft. 6 in. long and 3 ft. 10 in. in diameter.

The Post Office at Victoria, and the Roman Catholic Church on Dunsmuir Street, Vancouver, are built of sandstone from the Gabriola Island Quarry, owned by the Vancouver Granite Co. Sandstone from the Jack Point Quarry was used in the construction of the Post Office at Nanaimo, Dominion

Assay Office, and Bank of B. N. A. at Vancouver, and Bank of Montreal at Victoria.

Marble is mined at Marblehead, near Lardo, on Kootenay Lake, and one of the bank buildings at Nelson was built from marble mined on Sheep Creek. Excellent deposits of marble, rivalling that of Italy, exist at Nootka Sound on Vancouver Island, and a variety of choice marble has been developed on the southern portion of Texada Island.

In 1908 the Canada Granite and Marble Co., operating at Marblehead, produced marble to the value of \$50,000; and in 1914 the production was 200 tons.

The marble used in the construction of the Great West Life Building at Winnipeg was quarried at Marblehead, as also that used in construction of the Courthouse at Nelson. Marble from the Malaspina Company's quarry was used in construction of the Post Office at 15th Avenue, Vancouver.

The following figures show the production of building stone, from 1898 to 1918, the figures up till 1903 including all clay and rock products as well:—

To 1898	-----	\$1,350,000	1910	-----	315,000
1899	-----	206,400	1911	-----	1,419,000
1900	-----	251,470	1912	-----	675,000
1901	-----	417,238	1913	-----	275,700
1902	-----	480,051	1914	-----	148,889
1903	-----	531,870	1915	-----	267,450
1904	-----	550,000	1916	-----	167,783
1905	-----	342,000	1917	-----	113,275
1906	-----	237,500	1918	(estimate)....	75,000
1907	-----	447,060			
1908	-----	513,700	Total	-----	\$9,474,386
1909	-----	600,000			

* * *

CEMENT.

The first cement produced was by the Vancouver Portland Cement Co., Ltd., at Tod Inlet, Vancouver Island, in 1905, and was valued for that year at \$150,000. In 1907 the company's plant was increased to a production of 300,000 bls., the output for the year being 143,266 bls., valued at \$215,000.

The following shows the rapid increase in production by the company:— 1908, 170,861 bls., valued at \$256,300; 1909, 238,000 bls., valued at \$360,000; 1910, 260,000 bls., valued at \$395,000; 1911, 420,000 bls., valued at \$650,000; 1912, 520,000 bls., valued at \$800,000.

In 1913 two new cement plants came into production, that of the Associated Cement Company, on Saanich Inlet, and the Princeton Cement Co., who built a plant at Princeton. Over \$1,000,000 of cement was produced that year—Vancouver Portland, \$750,000; Associated, \$250,000; Princeton, 10,500. The end of the building boom at the Coast cities was shown in 1916 when production went down to \$436,459. The following figures show the annual production since the beginning of the industry:—

1905	-----	\$ 150,000	1913	-----	1,290,500
1906	-----	250,000	1914	-----	861,756
1907	-----	215,000	1915	-----	464,690
1908	-----	256,300	1916	-----	436,459
1909	-----	360,000	1917	-----	487,829
1910	-----	395,000	1918	-----	500,000
1911	-----	650,000			
1912	-----	800,000	Total	-----	\$7,117,534

* * *

CLAY, GYPSUM.

There has not been much production of these minerals, the former being limited to fireclay, and the

latter to small experimental shipments. In 1906 3,500 tons of fireclay were mined at Comox; in 1907 488 tons; in 1908, 5,000 tons. The Clayburn Company having entered the field for supply of fireclay and firebrick in 1908, has since had practically a monopoly of the business. That company has now also acquired the property of the Kilgard Company, in which Norton Griffiths was interested.

There are excellent deposits of gypsum in British Columbia, the best being at Grande Prairie. These have been acquired by the Manitoba Gypsum Company, of Winnipeg, who would have established the industry ere now, but they have been waiting the construction of the Kamloops-Okanagan branch of the C. N. R. system to give them transportation. Another deposit of gypsum occurs at Spatsum, and deposits have been reported from Similkameen and Clinton. Gypsum is associated with the ore deposits of the Britannia Mine. The following are the statistics of clay production:—

1906	\$17,500	1912	8,500
1907	24,440	1913	8,088
1908	25,000	1914	11,363
1909	21,000		
1910	21,000		
1911	29,256		
		Total	\$116,1447

* * *

Coal

It has been well said that the nations which have ample reserves of coal and iron are destined to become the world's manufacturers. While British Columbia cannot claim large reserves of iron ore it can claim to have enormous resources in coal, the reserves being placed by the Geological Survey at the following figures:—

Class	Actual Reserves Tons	Probable Res. Tons	Total Tons
Anthracite and Bituminous	23,653,242,000	40,807,700,000	64,460,942,000
Low Carbon Bituminous	118,000,000	2,300,000,000	2,418,000,000
Sub-bituminous	60,000,000	5,136,000,000	5,196,000,000
Total	23,831,242,000	48,243,700,000	72,074,942,000

Coal mining was the pioneer of the mineral industry of British Columbia, and the Hudson's Bay Company were the pioneers in that as in the fur trade. Eighty-three years have passed since the Hudson's Bay Company began the mining of coal at Suquash, on Vancouver Island, bringing from Scotland the first miners to lay the foundation of what is today the greatest branch of the mineral industry, with a production of \$187,000,000 to its credit. This is nearly 30% of the total mineral production, and exceeds the value of the gold production which takes second rank in total value of production.

The following are the statistics of coal production:

Year	Tons	Value
1852 to 1892	7,371,710	\$ 22,496,654
1893	978,294	2,934,882
1894	1,012,953	3,038,859
1895	939,654	2,818,962
1896	896,222	2,688,666
1897	882,854	2,648,562
1898	1,135,865	3,407,595
1899	1,306,324	3,918,972
1900	1,439,595	4,318,785
1901	1,460,331	4,380,993
1902	1,397,394	4,192,182
1903	1,168,194	3,504,582
1904	1,253,628	3,760,884

1905	1,384,312	4,512,936
1906	1,517,303	4,551,909
1907	1,800,067	6,300,235
1908	1,677,849	5,872,472
1909	2,006,476	7,022,666
1910	2,800,046	9,800,161
1911	2,193,062	7,675,717
1912	2,628,804	9,200,814
1913	2,137,483	7,481,190
1914	1,810,967	6,338,385
1915	1,611,129	5,638,952
1916	2,084,093	7,294,325
1917	2,149,975	7,524,913
1918 (estimated)	2,292,069	11,460,340
Total	49,336,652	\$164,425,593

Total production for 25 years, 1893 to 1918 was 41,964,942 tons, of a value of \$141,932,939.

PRODUCTION BY DISTRICTS.

	Tons coal
Vancouver Island	30,500,099
Crows Nest Pass	9,667,356
Nicola	1,124,684
Princeton	243,039
Telkwa	500

Robert Dunsmuir was the moving spirit in the development of the coal mining industry on Vancouver Island from the time that he discovered coal at Wellington till his death. He opened the Cumberland field, organized a large export trade to San Francisco, and made a success of his enterprises. In addition to the Dunsmuir mines the only coal mines operated on Vancouver Island up till 1907 were those at Nanaimo, first worked by the Hudson's Bay Company, succeeded by the Vancouver Coal Company, and later being sold to San Francisco interests, who organized the Western Fuel Company.

As the result of the passing of legislation confirming the right to coal underlying their holdings to settlers taking up land before the E. and N. Grant was issued, the Gilfillan Mine was operated by McGowan and Co. in 1907, and the same year saw the opening of the Fiddick Mine by the Pacific Coast Coal Mines, Ltd., organized by John Arbuthnot. Alvo von Alvensleben organized the Vancouver-Nanaimo Coal Co., Ltd., at the same time, to take up a coal area at East Wellington, which was also added to the list of producers. In 1916 J. Grant interested Vancouver men in the Nanoose field, and that was added to the producers. In 1917 the Granby Company acquired an area of coal lands at Cassidy, and during 1918 spent a large sum in development and equipment, the mine becoming a producer. The object of the Granby Company in acquiring this property is to furnish a supply of coke for its smelter at Anyox, where the first by-product coking plant to be established in British Columbia has been under construction for the past year.

The companies now producing coal on Vancouver Island are the Canadian Collieries (Dunsmuir) Ltd., with mines in the Cumberland and Wellington fields; the Canadian Western Fuel Company, with three mines at Nanaimo; the Pacific Coast Coal Mines, Ltd., with mines at South Wellington and Suquash; the British Columbia Coal Mining Co., Ltd., succeeding to the Vancouver-Nanaimo Coal Co.'s mine at East Wellington; the Nanoose Collieries, Ltd., with

mines at Nanoose; and the Granby Consolidated Mining and Smelting Company, Ltd., at Cassidy.

The importance of the Vancouver Island fields is evident from the fact that the coal produced in that portion of the Province is three times as much as all the rest of the Province put together.

The Crows Nest coal fields are among the most important in the world. Dawson was credited with the statement that a royalty of a cent a ton would bring to the Government Treasury \$100,000,000. The field was first developed by the Crows Nest Pass Coal Co., Ltd., in 1898, on the opening of the Crows Nest Pass Railway. That company opened mines at Coal Creek, Carbonado, and Michel, mainly with a view to supplying the demand of the smelters for coke and the railways with steam coal. In 1908 the C. P. R. opened the Hosmer Mine, and the Corbin Coal and Coke Co. developed the largest coal outcrop in Canada.

In 1907 the Nicola field was opened by the Middleboro Collieries. In the following year the Diamond Vale mine became a producer, and in 1910 the Inland Coal and Coke Co. added the Coal Hill property to the list of producers. In 1913 the Pacific Coast Coal Mine was opened. This field produces a coal suitable for coking and has a seam which is the richest in nitrogen of all deposits in Canada, promising an important by-product development for the future.

In 1909 the Princeton field was opened by the Princeton Coal and Land Co. with headquarters in London. This company also owns the townsite of Princeton. The assayer at the Daly Reduction Works at Nelson, who had much experience with this coal, informed us that it has exceptionally high heating value, due to its hydro-carbon content. In 1912 the United Empire Coal Mine at Princeton made a small production, and a new mine is being opened up to the west.

At Tulameen the Coalmont property is developing well in the hands of a Vancouver syndicate and making a production of about 35 tons a day.

In 1918 the Telkwa field became a producer in the hands of a Prince Rupert Company, who are working the Ashman Mine.

FUTURE OF THE COAL INDUSTRY.

That coal mining has a great future ahead of it there can be no question, so vast are the coal resources of the Province. The development of chemical industries will provide a market for by-products. Gas will be used for heating the cities, giving clean economical fuel; the values now wasted will be recovered; pulverised coal will be used to provide fuel and heat for industrial plants and smelters. Means will be provided for utilizing the lignites as well as the bituminous coals. There are valuable anthracite deposits at Groundhog Mountain.

The following figures by Dowling of the Geological Survey show the vast coal resources of the Province:

	Actual Res. Tons	Prob. Res. Tons	Total Tons
Vancouver Island..	1,178,000,000	6,369,000,000	7,547,000,000
Crows Nest Pass..	22,595,200,000	34,291,000,000	56,886,000,000
Queen Charlotte Islands....	60,000,000	1,000,000,000	1,060,000,000
Groundhog Mountain ..		1,200,000,000	1,200,000,000
Peace River		6,850,000,000	6,850,000,000
Northern B. C. (Skeena, Telkwa and Cariboo) ...		486,700,000	486,700,000
Nicola-Tulameen- ..			
Kamloops	22,595,200,000	34,873,000,000	57,468,200,000

COKE.

Coke is produced only on Vancouver Island and Crows Nest Pass. The Vancouver Island ovens are operated by the Canadian Collieries (Dunsmuir) Ltd., at Union Bay, mainly to supply the Granby Company's Anyox smelter. This plant was built in 1895, and with the exception of four years has been operated continuously, producing 304,174 tons coke.

The Crows Nest Pass Coal Company built its first coke ovens at Fernie in 1908, and followed by additional ovens at Michel and Carbonado. The Coal Creek and Michel coking plants are operated continuously when there is no labor trouble at the coal mines, but the Carbonado plant has been closed down for some years. The Hosmer Mines installed coking ovens but shut down the mines in 1914. The ovens have, however, been under lease to the Crows Nest Pass Coal Co., Ltd., which has produced 3,661,712 tons of coke. The following shows the output of coke to date:—

Year	Tons	Value
1895-7	19,396	\$ 96,980
1898	35,000	175,000
1899	34,251	171,255
1900	85,149	425,745
1901	127,081	635,405
1902	128,015	640,075
1903	165,543	827,715
1904	238,428	1,192,140
1905	271,785	1,358,925
1906	199,297	996,135
1907	222,913	1,337,478
1908	247,399	1,484,394
1909	258,703	1,552,218
1910	218,029	1,308,174
1911	66,005	396,030
1912	264,333	1,585,998
1913	286,045	7,716,270
1914	234,577	1,407,462
1915	245,871	14,745,226
1916	267,725	1,606,350
1917	159,905	959,430
1918 (estimated)	190,656	1,334,592
Total	3,996,026	\$22,682,997

The Copper River coal has shown under test to be one of the best metallurgical coking coals in the Province.

DIVIDENDS.

Crows Nest Pass Coal Co., Ltd. \$5,521,877

This company is the only company that has declared a dividend, but the other large operators were private syndicates, whose profits were not made public. The Wellington and Union Colliery Companies operated by the Dunsmuirs, and the Western Fuel Company were practically closed corporations. It is known that the Dunsmuir Companies paid large profits, one shareholder receiving \$300,000 a year for ten years from the operations of the coal mines.

* * *

CRUSHED ROCK.

The development of ferro-concrete construction, and road and street paving, have created a large demand for this material, several local government bodies having put in their own crushing and screening plants in addition to those of individuals and com-

panies. 1910, the production was 130,000 yards, valued at \$175,000; in 1911, \$250,000; 1912, \$275,000. The following was the production:—

	Values.		Values.
1910	175,000	1916	44,542
1911	235,214	1917	138,830
1912	315,000	1918	60,000
1913	256,000		
1914	173,241	Total	\$1,470,775
1915	72,948		

* * *

FLUORSPAR.

Fluorspar was mined for the first time in 1918, the Consolidated Mining and Smelting Company having shipped 100 tons from the Rock Candy Group in the Boundary. The company has purchased the property, is equipping it with an aerial tramway, and has arranged for construction of a spur from the Kettle Valley Railway to the lower terminal of the tramway. A large amount of this mineral is used at Trail in the manufacture of hydrofluoric acid for the lead refinery. Hitherto the company has had to import the mineral, but can now not only supply its own demand from local sources but develop an export trade, for which there is an opening.

* * *

LIMESTONE.

Up till 1912 the demand for limestone was for building and agricultural purposes, and as a flux for the smelters, but the establishment of the pulp industry has since created an additional demand. The Hall Mines Smelter was supplied with lime from the west side of Arrow Lake, near Arrowhead. The self-fluxing ores of the Boundary rendered supplies of lime as flux for the smelters unnecessary. Trail Smelter mines its supplies on the Columbia and Western.

The Consolidated Mining and Smelting Co.'s Smelter at Trail is one of the largest consumers of lime, its requirements in 1914 being placed at 52,000 tons, in 1913 at 95,000; in 1916 at 103,282 tons, valued at \$51,641

The Granby Company operated a lime quarry at Swamp Point, on Portland Canal, to supply the Anyox smelter. The Granby Company's lime production was valued in 1916 at \$24,000, and increases in ratio to the requirements of the plant at Anyox.

The Tye Copper Co., supplied their smelter at Ladysmith from deposits near Victoria.

The largest lime works in the Province are those of the Pacific Lime Co. on Texada Island, the output being in the form of calcined and hydrated lime, which finds a market between Alaska and San Francisco.

The Tacoma Steel Company has operated a lime quarry at Marble Bay for many years, the production in 1910 being valued at \$30,000. From this quarry the Powell River Co. obtains its supplies, amounting to about 300 tons a month. The Whalen Company has opened a quarry at Laredo Channel to supply limestone for its Swanson Bay plant.

A plant to produce lime for agricultural purposes is operated at Popcum, near Chilliwack.

The value of the limestone production is as follows:

1905	\$ 43,000	1913	162,500
1906	45,000	1914	142,311
1907	50,000	1915	125,642
1908	60,000	1916	106,000

1909	65,000	1917	102,223
1910	70,000	1918	100,000
1911	128,556		
1912	176,250	Total	\$1,376,482

As an industrial mineral the outlook for the production of lime is good. The manufacture of nitrates by hydro-electric power has now become an established industry at Vancouver, and will be extended. This development will consume an immense amount of pure limestone such as can be supplied from the Texada Island deposits. It is probable the government in this country will have to follow the lead of the United States in establishing public utility plants to supply fertilizers manufactured from the atmosphere by hydro-electric power, limestone being the rock best adapted to fixation.

* * *

MAGNESITE.

Until two years ago the only known deposits of magnesite of economic value in the Province were those of hydro-magnesite, at Atlin, from which several shipments have been made to British manufacturers, and a British firm has acquired one of these deposits. Messrs. Armstrong and Morrison took out about 1,000 tons in 1914. E. Carew Gibson, of Vancouver, has located a deposit of hydro-magnesite at Clinton, mentioned in Dawson's report of 1888, and is arranging to develop it. E. C. Cartwright, of Vancouver, has discovered promising bodies of magnesite at Clinton, and has done considerable development.

* * *

MICA.

There are promising deposits of mica north of Clinton, on Shuswap Lake, and at Tete Jaune Cache. The Tete Jaune Cache deposits were worked between 1898 and 1901 by a Nova Scotia Company, who made considerable shipments, packing the mineral out on horses to Kamloops. The product brought an attractive price as the mica is a clear bright muscovite from which large sheets can be obtained. Now that transportation is available in that locality by two railways there would seem to be an opening for the industry.

* * *

MINERAL WATERS.

The resources of British Columbia have not received the attention they deserve. The only mineral waters that have been aerated and bottled are those at Halcyon Hot Springs, shipments having been made to neighboring provinces. A lithia water of therapeutic value occurs at Albert Canyon. There are several mineral springs in East Kootenay which are radioactive. The most important is the Sinclair Hot Springs, which has been acquired by the Harmsworths, of London, with a view to establishing a large sanitarium. Mineral waters which should be investigated by the Geological Survey or Department of Mines occur at Nanaimo, Saltspring Island, Lillooet River, Fairmont Springs, Elk River, Upper Columbia River, Canoe River, Skeena, Stikine and Taku Rivers, Queen Charlotte Islands, Vermillion River, Clinton, Omineca, and Okanagan. The best known springs are those at Harrison, Halcyon, St. Leon and Ainsworth. It is possible that some of these waters may possess attributes which would make them valuable table waters, capable of being exported to the world's markets.

POTTERY AND TILE.

The B. C. Pottery Company, of Victoria, has been one of the largest producers of pottery and tile in the Province, having conducted its manufacturing business for nearly 25 years. It is, therefore, a matter of regret that last year the plant at Victoria should have been dismantled, and the works pass out of existence. The following figures of production show the importance of the industry:—1905, \$90,000; 1906, \$80,000; 1908, \$100,000; 1909, \$100,000; 1910, \$125,000; 1911, \$150,000; 1912, \$130,000; 1913, \$75,000. The company made sewer pipe, flower pots, drain tile, and vitrified products.

The Clayburn Company is now the most important manufacturer of these products.

The following is the value of the production:—

1905	\$ 35,000	1913	154,400
1906	40,000	1914	152,914
1907	42,000	1915	82,744
1908	50,000	1916	90,277
1909	50,000	1917	81,728
1910	60,000	1918	40,000
1911	162,256		
1912	205,000	Total	\$1,246,319

* * *

PYRITES.

As coal and iron are to manufacturing industries, so is sulphuric acid to chemical industries. Up till two years ago the manufacturers of sulphuric acid were satisfied to import their sulphur, but war conditions taught the necessity of depending on home resources. There are two purely chemical industries in the province and one metallurgical industry which manufacture large quantities of sulphuric acid. The former companies are the B. C. Chemical Works at Victoria, operated in conjunction with the industry of the Canadian Explosives Ltd., and the Nichols Chemical Works at Vancouver. The Trail Smelter uses sulphuric acid in its refining operations. During the last two years the Nichols Chemical Co. has obtained supplies of pyrites from the Hidden Creek Mine of the Granby Company. The mineral is high in sulphur and low in copper, but the residue is returned to the Granby Company for its copper value.

The Trail Smelter obtains its supplies of pyrites from its Sullivan Mine, using about 5,000 tons a year.

There are many pyrite deposits in the Province, but few of them have been investigated. The principal known deposits are those of the Ecstall Mine, on Ecstall River, the Hidden Creek Mine at Anyox, and the Sullivan Mine in East Kootenay.

* * *

RIP-RAP.

This is used mainly in river protection, railway, and harbour works, the production in 1914 reaching \$500,000 for Victoria harbour works.

The following is the production:—

1911	\$ 19,000	1916	228,731
1912	200,000	1917	28,170
1913	274,000	1918	20,000
1914	679,435		
1915	309,669	Total	\$1,768,005

* * *

SAND AND GRAVEL.

The building boom in the Coast cities developed a large demand for sand and gravel for cement and concrete work; and several plants were installed in and around Victoria and Vancouver to supply the demand. In 1911 the production reached \$360,000; 1912, \$382,310; 1913, \$200,000.

* * *

SLATE.

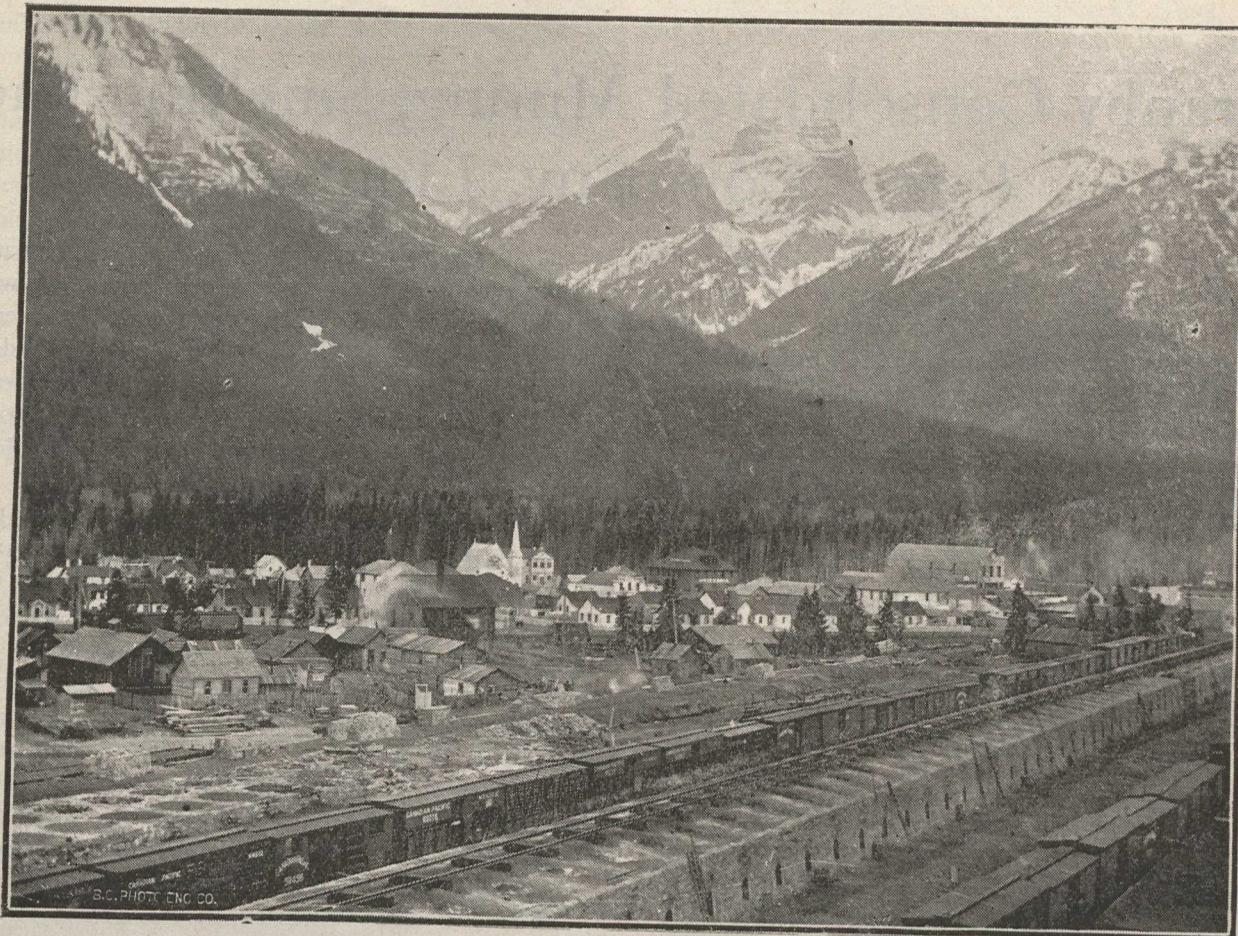
In 1900 a quarry was opened at Jervis Inlet to supply slate for roofing the Parliament Buildings at Victoria, but the plant has been idle for about 12 years. The only other slate deposit that has been worked is in the Kickinghorse Pass, Golden Mining Division.

* * *

TALC.

Shipments of talc were made from deposits on the P.G.E. Railway, Lillooet Mining Division, in 1916 and 1917. The shipments were to the order of roofing manufacturers at Victoria. Other talc deposits occur on the main line of the C. P. R. in the Fraser Canyon, at Leach River, on Vancouver Island, and in the Big Bend of the Columbia north of Revelstoke.





Coke Ovens of Crows Nest Pass Coal Co., Fernie, B.C.



No. 5 Shaft, Looking North, Cumberland, B. C.

Granby Consolidated Mining, Smelting and Power Company, Limited

The Granby Consolidated Mining, Smelting and Power Company has been the most potent factor in the development of the copper mining and smelting industries of British Columbia. Originally organized in 1899 by J. P. Graves, of Spokane, with S. H. C. Miner, of Granby, P.Q., at the head, the Granby Consolidated Mining and Smelting Company, Ltd., as it was first known, took up the Knob Hill and Old Ironsides mines at Phoenix, and constructed at Grand Forks a smelter with a capacity of 500 tons a day.

The original officers were: President, S. H. C. Miner; vice-president, J. P. Graves; secretary, C. E. Gault; treasurer, George W. Wooster. As a tribute to the splendid manner in which he has handled the finances of the Granby Company for 20 years Mr. Wooster is still treasurer of the company through its great development, and is the only one of the first



F. M. Sylvester, Managing Director of Granby Consolidated Mining, Smelting and Power Co.

official staff remaining in the service of the company. Of the operating staff the members remaining with the company are O. B. Smith, jr., general superintendent of Mines; W. A. Williams, General Superintendent of Smelters; and C. M. Campbell, Superintendent of Phoenix Mines. In those days Wm. Yolen Williams, of Spokane, was mining superintendent, and A. W. B. Hodges, smelter superintendent.

The Granby Company made its first copper production in 1901, when the amount of ore smelted for the year was 169,087 tons, yielding 8,871 oz. gold, 34,900 oz. silver, and 5,435,955 lb. copper. The Phoenix property had proved under development to be one requiring large capital, increased plant and mining facilities for its most economic development, and, when its great possibilities had become demonstrated by the first year's mining and smelting operations, New York interests acquired control, and reorganized the company as the Granby Consolidated Mining, Smelting and Power Company, with a capitalization of \$15,000,000 in shares of \$10 each, changed in 1906 to shares of \$100 each.

Development of the Phoenix mines proved ore reserves aggregating 16,400,422 tons, of which 3,574,996 tons yet remain to be extracted. This ore averaged about 16 lb. copper to the ton, with 40c in gold, and 15c in silver.

The capacity of the smelter was developed to eight furnaces of an average capacity of 500 tons a day, or 4,000 tons in all, constituting the largest copper smelter in the British Empire. Up till the end of 1913 the company's production was entirely from the Phoenix mines, and aggregated 215,947,132 lbs copper, while the precious metal values in addition amounted to 512,494 oz gold, and 3,482,032 oz. silver.

Granby has now had a long, honorable and important career as a mining operator in British Columbia, and is the largest producer of copper in the British Empire, owning the two largest copper smelters and the second largest copper mine in the Empire.

Jay P. Graves was general manager until 1914. In 1910 F. M. Sylvester was appointed assistant general manager; in 1914, he succeeded Mr. Graves as general manager; and in June, 1916, he was appointed managing director, relieving Dr. Nichols, the President, of his executive duties.

The history of the Granby Consolidated Mining, Smelting and Power Co., Ltd., is that of steady development, increase of resources and production; and

the company has, like others, had its ups and downs. Following the adverse report of Dr. Sussman on the company's reserves in 1909, the company's shares dropped on the stock exchange to around \$20, representing a value of \$3,000,000 for the entire holdings. One of the first tasks with which Mr. Sylvester was faced on his being appointed Assistant General Manager was that, to preserve the interest of the shareholders, in view of the approaching exhaustion of the reserves at Phoenix, a new mine must be secured. At that time M. K. Rodgers was developing the Hidden Creek Mine, on Observatory Inlet, and the property being on the market it was acquired in 1910 under a development bond, Mr. Rodgers retaining an interest. Development was attended with such success that it was determined to build a smelter at Anyox, and now the ore reserves of the Hidden Creek Mine constitute the second largest copper mine in the British Empire, while the smelter with a capacity of 3,000 tons ranks next to the Granby Company's Grand Forks Smelter as the largest copper smelter in the British Empire.

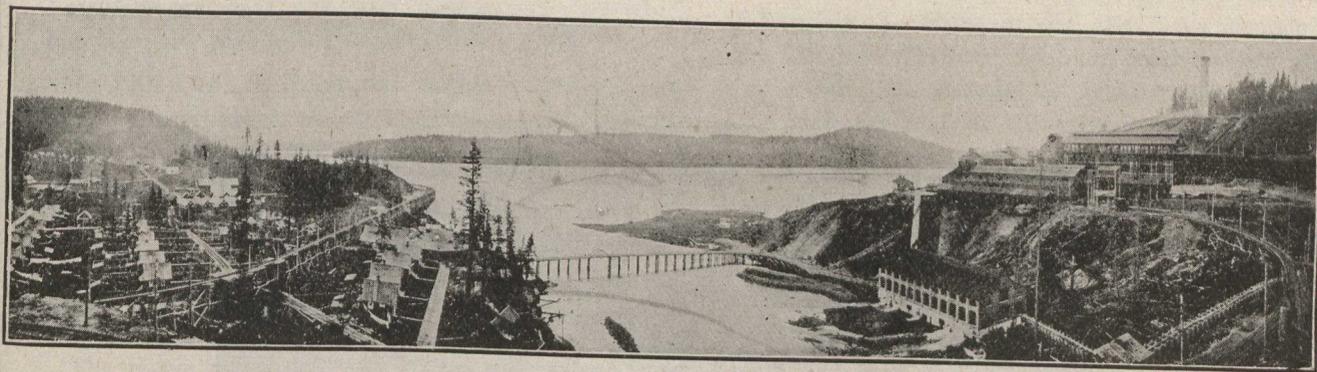
The successful development of the Hidden Creek

oz. silver and 99,443,843 lb. copper, of a total value of \$17,382,431. The Granby Company has therefore produced during its 18 years of operation 16,275,029 tons of ore, carrying 675,551 oz. gold, 5,446,417 oz. silver, and 379,105,210 lb. copper, of a total value of about \$60,238,349.

These figures mean that Granby has produced 43% of the total tonnage of ore mined in British Columbia; 15% of the total lode gold; and nearly 50% of the total copper production.

During its 19 years of operation the company has distributed among the workers of British Columbia for labor about \$30,000,000; among the merchants and manufacturers, \$11,000,000; and to the railways and steamship services about \$10,000,000.

In addition to the Phoenix and Hidden Creek Mines the Granby Company also operates the Midas Mine at Valdez; and the Mamie at Hadley, Alaska; and the Velvet Mine at Rossland. It also owns the Bonanza at Hidden Creek, and has working options on properties on Vancouver Island, Seymour River, north of Shuswap Lake, the Pyrites Mine at Ecstall,



Smelter and Townsite of Granby Consolidated Mining, Smelting and Power Co., at Anyox

Mine put the Granby Company on its feet, and payment of dividends was resumed, with an increase in the rate to 10% per annum, which rate has been maintained during the past two years, while the shares rose nearly to par. The total amount paid and declared in dividends to the end of 1918 was \$10,147,252, equivalent to about 67% on the company's issued capital. The Granby Company heads the list of dividend paying mining companies operating in British Columbia.

Since 1914 the company's Hidden Creek Mine has been a producer, beginning with 73,377 tons ore in 1914, and increasing till, in 1918 the amount mined and smelted was 881,206 tons. The Phoenix Mines produced to the end of the 1918 financial year 13,362,980 tons ore, carrying 654,733 oz. gold, 4,435,803 oz. silver, and 279,662,367 lb. copper, of a total value of \$42,855,918. The Hidden Creek Mines produced 2,911,049 tons ore, carrying 20,818 oz. gold, 1,010,624

on the Skeena River. The company has, in addition to its mining operations, carried on much exploration and development of prospects under option.

Its latest enterprise is the acquisition of the coal mine at Cassidy, on Vancouver Island, and its development and equipment to produce 500 tons of coal a day. The object of securing this coal field is to furnish coke for the smelter at Anyox, where a by-product coking plant—the first in British Columbia—has been installed to produce 250 to 300 tons of coke a day.

The gas will be utilized for roasting sulphide ores and furnishing fuel for steaming the boilers of the auxiliary power plant, thus utilizing an important source of heat wasted in beehive coking plants. The equipment of the coal mine and the by-product coking plant have involved an expenditure of \$3,000,000, but will result in large economies in smelting, by the

MINING AND ENGINEERING RECORD

reduced cost of coke, the control of a reliable coke supply, and the utilization of the waste products of the coking plant.

The company has also been supplying from its Hidden Creek Mine pyrites to the extent of between 7,000 and 8,000 tons a year to the Nichols Chemical Works at Vancouver, for the manufacture of sulphuric acid.

Two 20ft. converters have been added to the Anyox plant. The company has organized an effective Safety First system among its employees, with the result that accidents have been largely reduced. The Company also owns the tugboats and shipping employed in transporting coke, machinery, and supplies from Coast ports north to Anyox, and handling return cargoes of pyrites and blister copper for shipment to the Nichols Refinery in New Jersey.

The business of the company is managed from the head office in the Birks Building, Vancouver.

The company's ore reserves aggregate 23,531,208 tons, carrying an average of 1.5% copper, capable of producing about 700,000,000 lb. copper, besides gold and silver values of around 30c. per ton.

The Granby Company has a great future ahead of it. During the war production was pushed to the limit, and the copper supplied to the order of the British Government for munitions manufacture. The company and its employes lent their hearty support to all patriotic organizations and subscriptions; and no organization could have rendered more loyal and patriotic service from the time war was declared till the signing of the armistice.



TRAIL HOSPITAL

Drs. Thom, Coghlan and Nay. Matron: Miss L. Ransom
Staff: Miss K. McMillan, Mrs. R. Wark, Miss J. McLean

The Britannia Mine.

No mine has done more to attract the attention of capital to British Columbia as a field for mining investment than the Britannia, which, within the past five years, has been developed to the position of the largest copper mine in the British Empire. The Britannia was one of the first copper discoveries in the Province, ore being found in 1888, but owing to the want of available capital in those days, and the fact that lode mining was an unknown quantity, the discovery was not even located. Nor was it till 1898, just 20 years ago, that the first location post was put on the ground.

Some development was done by Vancouver and Victoria men with such results that a Butte mining engineer, who examined it in 1900 wired his principal that it was "the biggest mine he had ever seen." That year a company was organized in Vancouver, and the development work done resulted in the discovery of the Fairview ore zone, the later development of which has been the making of the Britannia Mine.

In 1902 Geo. H. Robinson, of Butte, obtained control of the property, and it was through his efforts to obtain capital for the development of the mine in New York that the late G. B. Schley became interested. The first aerial tramway and mill were installed; the mine started shipping 200 tons of ore a day; and the crude ore and concentrates were smelted at Crofton, on Vancouver Island.

The Howe Sound Company was organized in New York as a holding company to finance the Britannia, and in 1905 the Britannia Smelting Company was organized to purchase the Crofton Smelter for treating the company's ores. The smelting experience was a dismal failure the extraction amounting to only 55% of the copper content of the ore, and the smelter was shut down.

The Britannia Mining and Smelting Company was organized in 1908 to take over the mine and smelter, Mr. Schley practically taking control of the direction of the company's affairs, and advancing money through the Howe Sound Company to carry on further development. He had an innate faith in the property, proceeded to extend it by purchasing the Goldsmith Group, and prosecuted the development of the Fairview zone, shipments being entirely suspended between 1907 and 1910.

In the fall of 1911, J. W. D. Moodie, the present manager, who had long been associated with Mr. Schley's mining interests in the south, was appointed general manager. As soon as Mr. Moodie took hold he saw the immense possibilities ahead of the property and organized a policy of development and

equipment in keeping therewith. The prosperity and success of the Britannia Mine date from the day that he took hold of it.

The old mill was improved till it had a capacity of 1,000 tons a day, and was making an extraction of 95%. Plans were prepared for the new mill, with an ultimate capacity of 4,000 tons a day, the first units of which have been installed with a present capacity of 2,500 tons a day. Development at the mine was prosecuted with such success that between 7,000,000 and 8,000,000 tons of actual ore were proved up, with probable reserves of another 12,000,000 tons, of an average value of 1.98% copper. The 2,200 level was driven as the main working level; a raise, which was the highest raise in metal mining up to that time, was driven 1,200 ft. to connect by shaft with the upper workings, while an ore chute was also driven between the 1,000 and 2,200 levels to feed the crusher and supply the trains of ore cars. An electric railway was built between the main level and the top of the incline. A substantial gravity incline railway connected the end of the electric railway with the mill.

Hydro-electric plants were installed to supply power to the extent of 5,000 h.p. for operating the machinery of the mine and mill. The holdings of the company were extended to 22,118 acres of mineral lands, and 4,366 acres of timber. Britannia Mountain was pierced by three tunnels connecting with the Empress Group, in South Valley, one of the properties added to the original holdings. Docks and ore bunkers were built of capacity required to meet the magnitude of the company's operations. A large department store was built, stocked with every requirement of the employes, and sold at prices which favorably compare with those of the coast cities. Comfortable buildings were erected for the accommodation of the employes at both Britannia Beach and the Mine, perfect sanitation being attended to. The annual production of copper has been increased in the seven years since Mr. Moodie took charge from 1,074,333 lb. to 18,150,000 lb., and the company put on a dividend paying basis for the first time last year, having distributed in dividends during the past year \$396,830 in quarterly declarations, being at the rate of 20% per annum on the issued capital. The profits for 1917 were \$816,625.10, which was absorbed in improvements.

The production of the Britannia Mine to date is:— Gold, 5,582 oz.; silver, 599,530 oz.; copper, 60,959,961 lb. The copper production was placed at the disposal of the British Government immediately war was declared.

Standard Silver-Lead Mine

One of the most successfully operated and profitable mining enterprises in British Columbia has been that of the Standard Silver-Lead Mining Company, owning and operating the Standard Mine at Silverton, on Slocan Lake. The Standard Group comprises the Shuniah, Standard and Surprise Mineral Claims, which were located 1898. In 1902 George H. Aylard, now of Victoria, and the late J. A. Finch, of Spokane, took a bond on the group, and entered on its systematic development. Mr. Aylard took charge of the work and within a year had a considerable tonnage of ore proved up. By the end of 1906 there were 400 tons of ore ready for shipment. In 1907 the expenditure on development work amounted to \$50,000, paid for entirely out of ore shipments, amounting to 700 tons. The year's development amounted to 1,000 ft. of tunneling, 500 ft. of stoping and 200 ft. of raising. The Emily Edith was added to the group and 20 men were employed throughout the year. By the end of 1910 ore to the value of \$240,000 had been shipped to the smelters.

The ore shoot of No. 5 level attained a width of as much as 20 ft. of solid ore, and another 20 ft. of concentrating ore, 40 ft. wide in all. The Standard was now recognized as one of the leading mines of the Slocan. P. Clark, of Spokane, acquired a third interest for \$250,000, and organized a company with a capital of \$2,000,000 in \$1 shares. The former owners, Messrs. Finch and Aylard, retained their interest. The new company proved a remarkable success. On its organization a mill was built at Silverton with a capacity of 150 tons a day; an aerial tramway 9,000 ft. in length was constructed between the mine and mill; hydro-electric power and compressor plant installed; wharf, warehouses, office and camp buildings erected, making the property one of the best equipped in the Province.

The continuation of development work by the new company was attended with such success that W. Fleet Robertson, Provincial Mineralogist, reporting on his trip through the Slocan in 1911, said of it: "The showing of ore on No. 5 level is one of the largest exposures of high-grade galena ever seen in British Columbia, and is practically intact up to No. 4 level, constituting a block of 'ore in sight' above No. 5 level, which, on a rough calculation, figures out to a net value in the neighborhood of \$1,000,000. The ore shoot is at the strongest on the No. 5, and so, un-

doubtedly, continues for some distance below; whether the ore found in the No. 6, some 200 ft. lower, is the same ore-body has not yet been proved, but it probably is, in which case over \$2,000,000 more of ore will be available."

By 1915 development had been undertaken on No. 7 level, 280 ft. below No. 6, and on No. 8 level, 400 ft. below No. 7., giving a total depth of 1,360 ft. Of his examination of the mine in 1915 the Provincial Mineralogist said it was the largest shoot of high grade galena ore ever encountered in B. C., being 400 ft. long, 20 ft. wide of clean ore, and a similar thickness of concentrating ore. In 1917 a new ore shoot was developed 400 ft. east of the main shoot, but did not prove extensive.

Under the management of the new company the mine shipped to the end of 1917 about 11,400 tons of crude ore, 77,610 tons concentrating ore, and produced 5,429,643 oz. silver, 59,374,945 lb. lead, and 43,394,857 lb. zinc. It also distributed dividends annually between 1912 and 1917 to the amount of \$2,700,000, equal to 135% on the capital.

In 1917 it became apparent that the ore reserves were exhausted, further development failing to prove up any important tonnage. The mine has since been leased to W. L. McPhee, and the mill has been leased to the operators of the Echo Mine. The company is on the lookout for another silver-lead mine in British Columbia.

The directors and officers of the Standard Silver-Lead Mining Co. are: President, W. J. C. Wakefield; Vice-president, J. F. Clark; Secretary-treasurer, Chas. Hussey, all of Spokane; General Manager, George Aylard, Victoria. No mine in British Columbia has made a better record. The value of the company's operations to the Province may be judged from the following summary of the receipts and expenditure from January 1, 1911, to September 1, 1918:—

Disbursements:—Supplies, \$789,552.64; labor, \$1,167,076.38; taxes, \$117,836.38; insurance, \$12,524.45; casualty insurance, \$18,183.64; workmen's compensation, \$9,321.89; general expense, \$63,608.57; legal expense, \$1,391.36; purchase of additional mining claims, \$71,000; total operating expense, \$2,700,495.61; distributed as dividends, \$2,700,000.00; balance in hand, \$236,232.55.

Receipts—By sales of ore from January 1, 1911, to September 30th, 1919, \$5,636,728.16.

Red Jacket Development Company, Ltd.

On the range of mountains between Jervis and Sechelt Inlets is a peak whose ironstained slopes are visible on a sunny day for many miles, forming a striking feature of the landscape. Its appearance reminds one of Red Mountain, which gave birth to the mining camp of Rossland. In the summer of 1916 the mountain was prospected by E Prendergast, of Vancouver, formerly superintendent of the Marble Bay Mine. In the canyon he found an outcrop of copper ore, and located a group of mineral claims which he named the Red Jacket Group. He then organized a company to undertake its development, and at the present time has a deal on with British capital to furnish the funds for diamond drilling.

During the past two seasons the property has been further prospected, with the result that a body of high grade ore has been discovered.

The property is well located for transportation, being within three miles of tidewater, to which access may be obtained by an aerial or gravity tramway. A trail has been opened from the beach to the locations. The deposit is of contact-metamorphic type, between diorite and limestone, and is on the westerly extension of the mineral zone which extends from the Marble Bay Mine, on Texada Island, across the mainland, on which the Calder Mountain, Norman, Treasure Mountain, Britannia, and Indian River copper locations have been made.

The mineral zone has a strike of N. 75 deg. W. and there are bands of mineralization paralleling one another of 10 ft., 21 ft., 4 ft., and 7 ft. respectively.

The property is 75 miles from Vancouver. W. M. Brewer, Resident Engineer for the Western Mineral Survey District, examined the property in 1917, and said of it:—

"The Red Jacket group is situated at an elevation of about 3,500 ft. above sea level, at the head of an un-named creek which flows into Jervis Inlet from the southeast, near Egmont Point, and the claims are reached by following a switchback trail up the mountain from the beach for a distance of about four miles. The most prominent outcropping of a mineral zone occurs on the Red Jacket No. 4 claim, near the boundary between that claim and the Red Jacket No. 2, where there is a ledge or zone of schistose rock that appears to be several hundred feet in width, crosscut by the canyon at the head of the un-named creek.

"Geology—The prevailing rock formation in the vicinity of the groups of mineral claims is a metamorphic rock that is sheared, fractured and fissured to such a degree as to be almost a schist. The metamorphosed rock contacts with the granite of the Coast Range, which forms the southerly boundary of the mineralized zone that occurs in the schistose,

metamorphosed rock. There are also some intrusive dykes of igneous rocks which have intruded into the schistose rocks, and will probably be found to have influenced the mineralization. The walls of the canyon, of which the schistose rocks form the bed, are exceedingly precipitous, and reach an elevation of about 100 ft. higher than the bed. Apparently the walls, which are heavily stained a reddish color from iron oxides, are made up of the same schistose rock as appears in the bed of the canyon, which appears to crosscut that formation in which there occur zones where the fissuring is very pronounced. It is in these zones that mineralization occurs.

"Mineralization — The Mineralization is most pronounced along the planes of the schistosity in the rocks, but there are also particles of iron chalcopyrite, iron pyrite, pyrrhotite, and specks of molybdenite occurring disseminated through the rock itself. Thorough prospecting should be done in order to determine the extent of the mineralization as well as the grade of the ore. It appears as though a very extensive body of mineralized schistose rock occurs on this property that would possibly develop into an important concentrating proposition.

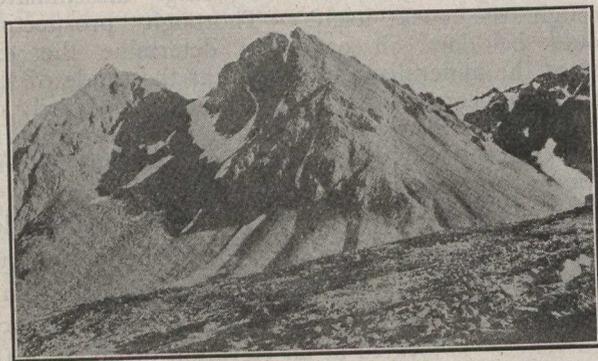
"Development work—There has been but little development attempted, except prospecting at various places on the surface where the iron-stained rock outcrops indicated the occurrence of ore. One of such occurrences is located at an elevation of about 3,200 ft. above sea level, another about 400 ft. higher elevation, and still others further up the canyon. It is practically impossible to sample the mineralized zone, unless a great deal of time is occupied and several holes drilled and blasted; consequently the writer only took one grab sample across six feet of outcropping at an elevation of about 3,600 ft. above sea level, which assayed: Gold, trace; silver, 0.6 oz; copper, 0.5%. The above-mentioned sample must not be considered as an average, or as representing the value that may be found generally on the property, provided thorough prospecting is carried out. It was merely taken to determine whether the ironstained outcroppings carried any value."

The Editor of the MINING AND ENGINEERING RECORD took an average sample of the outcrops he examined, and the assay by G. S. Eldridge and Co., of Vancouver, gave the following results: Gold, trace; copper, 1.1%.

The outcrops are exposed to glaciation for from eight to nine months of the year, so that the copper values have undoubtedly suffered considerable leaching. Should further development work prove up bodies of ore of economic value, there is every probability that the mineralization, judging from the surface indications, will prove extensive.

Gun Creek Copper Mountain

Within the past two years much interest has developed in the Gun Creek Copper Mountain property, in the Lillooet Mining Division. The property is located on the east side of a valley on the north fork of Gun Creek, 18 miles from the Bridge River waggon road. Access is obtained from Mission, at the 106 Mile Post of the P. and G. E. Railway, following the Bridge River road to Gun Creek, a distance of about 30 miles, and thence by Gun Creek to Green Lake. The property was examined in 1917 by R. W. Thomson, Resident Engineer for the Central Mineral Survey District, and on his recommendation the Government has reconstructed the trail on a uniform wagon road grade for a length of eight miles to the head of the canyon. Thence the trail leads through open grass country.



Copper Mountain, Lillooet Mining Division.

Copper Mountain is a peak of the MacKinnon Range, and rises to an elevation of 8,000 ft., or 2,700 ft. above Green Lake. The location is in the zone of contact between the Coast batholith on the west and the sedimentary rocks of the Interior Plateau on the east, and is thus along the line of contact to which geologists since the time of Dawson have urged prospectors to give their attention as forming one of the most promising areas for mineral deposits in British Columbia.

Copper Mountain is of altered grano-diorite seam-

ed by dykes with a general strike of north and south, and dipping from 60 deg. W. to vertical. The mineralized zone is exposed in the bluffs of the mountain to a depth of 200 ft. The mineralization extends to the northeast of the mountain. The mineralized zone has a width of 800 ft. by a length of 2,500 ft., and the mineralization occurs not only in quartz veins and stringers, filling seams and fissures, but in the granite itself. A sample of clean chalcopyrite from a quartz stringer gave values of: Gold, 0.48 oz; silver, 67.20 oz. per ton; copper, 31%. Assays of samplings gave results of from 0.01 to 0.05 oz. gold; 1.2 to 6 oz. silver per ton; 1.38 to 18.28% copper. In the neighborhood several locations have been made on small veins averaging 0.45 oz. gold, 170 oz. silver, and 40% copper, and as these locations are 1,000 ft. lower than the base of Copper Mountain, they afford encouraging evidence of mineralization extending to great depth. Cinnabar, copper glance and bornite occur as well as chalcopyrite.

Development consists of several open cuts and trenches, and it is proposed to further explore the deposits by diamond drilling. The property affords great facilities for economic development, a tunnel a mile in length giving a depth of 2,500 ft. below the apex of the mountain. Falls of 500 ft. two miles above Green Lake afford convenient water power. The property is distant from the P. G. E. 44 miles, over which an electrically operated railway may be constructed as a branch line. As mineralization is exposed on the sides of Copper Mountain for a depth of 200 ft., it would appear that nature has here developed a deposit of from 20,000,000 to 30,000,000 tons, doubling this amount for every 200 ft. of depth.

Chas. Camsell, Director of the Geological Survey for British Columbia and the Yukon, examined the deposit last summer, and his report and map will shortly be published by the Department. The entire Copper Mountain Group of 20 claims is owned by Col. J. M. MacKinnon, of Vancouver.



Pacific Great Eastern Railway.

The Pacific Great Eastern Railway is the most important railway yet projected as a colonization line for the opening up of the Province of British Columbia to settlement, development of agricultural, industrial, mining and lumbering pursuits.

Within the past year considerable attention has been given to exploration of the Clinton Mining Division, and a large number of claims have been located, the minerals that have attracted most attention being the earthy class or salts.

Deposits of white, pulverized magnesite and hydromagnesite occur in many places close to the route of the railway, and one of these, near the 108 Mile House, on Cariboo Road, was reported on by the Geological Survey as long ago as 1889, but was not of value until the construction of the P. G. E. Railway made it accessible. The largest deposit of this class, however, is in the vicinity of Meadow Lake, about 15 miles west of the 70-Mile House, which is on the railway.

Magnesite in the rock form is being developed by a Vancouver syndicate on the mountain on the south side of the railway at Clinton, and indications are favorable for a very large deposit of good quality.

Stewart and Calvert are engaged shipping epsom salts from Round Lake, $1\frac{1}{4}$ mile south-west of Clinton, on the road to Ashcroft. The salt forms as the water of the lake evaporates and is reported to be very pure. About 12 men are employed removing and sacking the salts from the lake. Other similar deposits are known to occur, and as the salts removed are to a great extent replaced the industry should prove practically permanent.

A number of locations have been made on deposits of carbonate of soda in the vicinity of the P. G. E. Railway, near the 70-Mile House. A deposit has been worked during the winter season about 20 miles west of the 70-Mile House, the salt crystallizing separately from the water in freezing. An evaporating plant has recently been installed, and operations commenced by a Vancouver syndicate near the railway, two miles from the 70-Mile House.

Sulphate of soda occurs in some of the deposits, and will no doubt be one of the products of the district.

These salts will probably form a large industry. There is little doubt that the occurrences are very numerous, and extend westward into the Chilcotin country. The deposits are generally very pure. In the past the market for these salts, which are generally used in the manufacture of caustic soda, has been supplied by Germany.

Gypsum has been added to the known deposits. One deposit has been located 10 miles west of Clinton, within 3,000 ft. of the railway, and another deposit on the claims at Clinton, being developed for magnesite. Both these deposits are extensive judging from the surface exposures, and will be further explored by the syndi-

cate. The fact that the western deposit is only 157 miles from tidewater via the P. G. E. Railway places it in a very favorable position to supply the Coast cities.

A promising deposit of chromite occurs on Scottie Creek, some 20 miles southeast of Clinton, and it is probable development will proceed shortly.

Claims have been located on a manganese deposit about 10 miles northwest of Clinton.

A large deposit of infusorial earth occurs on Loon Lake, some 15 miles from the P. G. E. Railway, near Clinton. It is probable, however, that other deposits will be found to occur close to the railway route when extended northwards, and on that account could be more economically worked.

Talc occurs on claims on Bonaparte River, 15 miles south of Clinton, and probably at many other places in the magnesia rocks of the district.

Alum occurs on the same claims in above locality.

A number of claims have been located on a copper deposit on Timothy Mountain, some 35 miles northeast of Lac la Hache. A large deposit of copper occurs on Copper Mountain, at the head of Gun Creek, and has been bonded by one of the largest copper operators on the continent. Should development prove satisfactory a branch railway will be built to connect with the P. G. E. Railway to enable the mine to be worked. The Consolidated Mining and Smelting Company, operating the Trail Smelter, have bonded the Fitzsimmons Group at Summit, and will develop it with a view to shipping ore. Promising copper deposits have been located north of the railway at several places.

A district that is likely in the future to become an important producer from lode mining lies to the northeast of the route of the P. G. E. Railway, and consists of the old placer mining districts of Cariboo and Horsefly. The cost of transportation prohibits mining anything but gold at present.

Four gold properties have been working on Bridge River, the Pioneer, Coronation, Ida May, and Lorne. The lode gold mined there has averaged \$23.35 per ton, the highest average returns of any gold camp. Silver and lead also occur on McGillivray Creek.

A coal field of some ten square miles in area occurs on the railway route south of Quesnel, and when the railway is constructed will no doubt be developed for production. Float coal is also said to occur on the Blackwater River, to the west of the Fraser, pointing to a possible coal field in that direction.

On the route of the railway at Summit is the only extensive deposit of red oxide of iron ore suitable as a mixture with the Coast magnetites for an iron and steel industry. The deposit contains from 750,000 to 1,000,000 tons or more of limonite. Hematite is also reported near the route of the railway at Fort George.

River Gold Recovery Co. Ltd.

At a meeting of Directors of the River Gold Recovery Co., Ltd., held at the office of the Company at Rogers Building, Vancouver, on February 17th, a proposal was discussed by the Directors and representatives of eastern capital to re-organise the Company, the eastern men taking a half interest in it and providing the capital for building the Roberts Rotary Alluvial Washer here in different sizes and utilizing the machines in the working of placer deposits. Edward Bagley, representing Wm. Forrest Roberts, of Sydney, Australia, who introduced the machine to British Columbia, has taken out a patent in the United States and Canada, the diagram herewith showing the features of the patent.

The eastern men were represented at the meeting by Geo. Westcott, of Winnipeg, through whose instrumentality a test was recently made of the machine in the auriferous sands of the Saskatchewan River at Edmonton.

The test at Edmonton was made in the presence of Prof. John A. Allen, of the chair of geology at the University of Alberta, at Edmonton. Mr. Allen made the following report on the test:—

PROF. ALLEN'S REPORT.

"I had the pleasure of being present for a short time at a demonstration given in Edmonton on January 17th, under the direction of Mr. Edward Bagley, Engineer, on the operation of the Roberts Rotary Alluvial Washer, when a bulk parcel of the gravels from the Saskatchewan river was put through the machine. This demonstration was not intended to represent a practical test of all the machine would do. Owing to the time of the year and the severe climatic conditions such a test was not possible which would show the actual percentage of gold that the machine would recover from the sands of the North Saskatchewan river.

"The machine is an auxiliary to a dredge, so that the preliminary screening of the gravel is an operation which can be readily adjusted to suit the conditions under which the washer is operated. The cylindrical screen, revolving in a tank of water, with the ingenious pockets for discharging the oversize from the screen in the front casting, is unique. The fine sand with the gold which passes through the screen is precipitated into the tank. The action of the blades slightly angled on parallel bars projecting radially, just sufficient to clear the bottom of the tank, and working parallel to the axis of rotation of the screen, has the effect of gradually moving the fine sand down over ten feet of corrugations in the tank bottom.

These corrugations are filled with mercury and afford a trap or catchment from which it appears to me to be impossible for the gold to escape.

"The arrangement of the outside tables is designed to capture any fine gold that may be in suspension in the water. The fine sand and water falls through apertures in boxes twelve feet wide and six inches deep. Four of these boxes are set in series immediately over one another, and are floored with amalga-

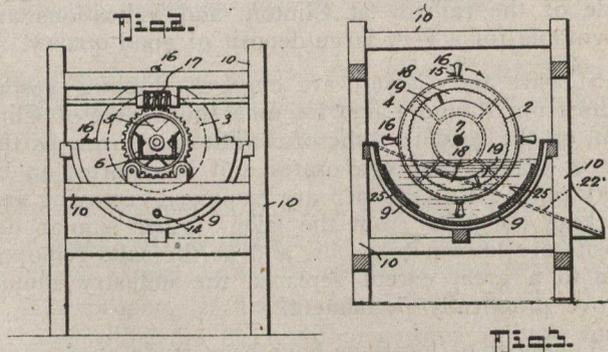
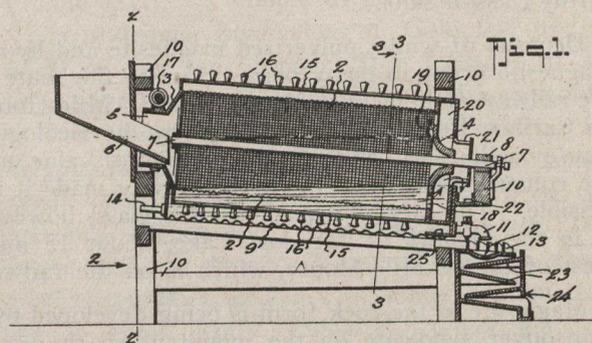


Diagram of Roberts' Rotary Alluvial Washer

mated copper plates. The whole machine is very strongly built and weighs approximately three tons.

"I believe that the design of the revolving drum and the tank is such that any concentration of the sands in the bottom of the tank is impossible. This feature has been a drawback in many of the gold recovery machines that have been tried out.

"After having seen this machine in operation and after examination of the principle on which this washer is constructed, I feel confident that the Roberts Rotary Alluvial Washer will do all that it is claimed to do, and that it ought to solve the problem of fine gold recovery, and, therefore, ought to supply a

MINING & ENGINEERING RECORD

long felt want in Canada. Its introduction at this time is most opportune as many of these machines, in sizes capable of being worked by hand, are required by prospectors, and might be the means of good advancement financially for many of our returned soldiers.

"A sample of the sand, which I collected from the tailings during a one-hour period in the operation, disclosed no gold under the microscope."

REPORT OF E. BAGLEY.

"E. Bagley reported on the test as follows:

"I beg to submit the following as my report on the sixteen yards of gravel taken from the river at Ross Flats.

"The clean-up shows a return of 3.92 dwts. smelted gold, equal to a return of $25\frac{3}{4}$ cents per cubic yard. The amount of gold absorbed by the 48' of 6" amalgamated copper plates, as well as the amalgamated bottom of the gold tank for ten feet, cannot be correctly estimated, as any practical mining man knows.

"I may state that the Saskatchewan river gold is very difficult to amalgamate, being coated to a large extent by a greasy substance probably derived from the coal measures, which are intersected by the stream.

"These difficulties are well-known, and the golden sands in the river are regarded as the most difficult of treatment in all Canada.

"The gold moreover is the finest I have ever treated, most of it impalpable dust. After the clean-up the mercury was squeezed through the best canvas cloth without showing any amalgam, the gold being so fine as to combine with the mercury. By chemically treating the mercury the coated gold as well as the free gold is easily captured.

"This machine is the largest type built for a dredge, where the cleanup would be monthly, at day and night work.

"No concentrator was put down at this test to secure the mineral sands known to exist in large quantities in this river. These sands would contain gold imprisoned in the mineral as well as platinum which has been discovered in these sands.

"To get a high return was not the object of this demonstration. A public exhibition of the mechanical operation of the machine, and to prove how powerless the gold is to escape was the great desideratum.

"This machine is no experiment. It has proved the test of time, and stands today with a record, unsurpassed by any other for strength, durability and big capacity. Thousands of them capable of treating thir-

ty yards per eight hours, of the small prospector's type, similar to those built by Mr. Roberts in Sydney, and capable of being worked by hand are needed by prospectors as well as provide remunerative openings for the mining men among returned soldiers.

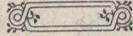
"These machines of large type should be installed on bucket dredges in rivers where fine gold occurs. Also on large steel-framed portable plants for dry bench work where the gravels can be dug by steam shovel, fed into a hopper and elevated by belt conveyor to a large preliminary screen, which would thoroughly wash and eliminate 60 per cent of the coarser material, which would reach the refuse dump by a stacking conveyor. The gravel from one-half inch size down, passing through two of these fine gold mills.

"Canada is probably the richest country in the world for placer drift and its large low grade gravels are practically untouched. In another 100 years it will be a great gold producing country, as the persistent demand for the precious metal will speed up production. Where payable gold values are proved to exist the modern machinery is available. In placer mining there is no shaft-sinking, driving or expensive exploratory work to be done, as soon as the machinery is ready gold can be won. If the area is low grade a plant of big capacity is required, up to 200 yards per hour. Operating costs are as low as three cents per yard, in some cases in California, which includes all wages, office, material and depreciation charges, and dividends are paid on five and six cent gravels in both California and Australia."

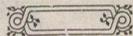
About 80 persons were present at the test of the machine, including bankers, professors, engineers and metallurgists. Edwards & Co., who erected the dredge at Fort Saskatchewan, 20 miles from Edmonton, and which dredge failed to save the gold values although well equipped with the latest gold saving devices, have expressed themselves of opinion that judging from the test just made, the Roberts Rotary Washer will solve the problem of saving the fine gold of the Saskatchewan River gravels. As the result of the test application has been made for dredging rights over length of 200 miles of the river.

It is intended to thoroughly test these gravels, and if payable values are proved to exist, it is proposed to install modern bucket dredges equipped with the Roberts Alluvial Washer. A British Company, which is stated to be in a position to finance gold dredging companies in Canada requiring from \$500,000 to \$5,000,000, is looking into the matter.

Vancouver's Electrical Development.



B. C. Electric Railway Company has 84,000 horse power in its two hydro-electric plants near Vancouver



The power facilities of a district from a manufacturing or mining point of view are often thought to be synonymous with the undeveloped water power in the vicinity. Unfortunately, there is a great deal of difference between water power undeveloped and harnessed.

Vancouver, on the other hand, is fortunate in having water power already developed on an ample scale in the plants of the B. C. Electric Railway Company, where there is available for use 84,000 horse power of electrical energy, safeguarded by a steam stand-by plant in Vancouver.

The whole lower mainland of British Columbia is covered by a network of wires owned by this large company. A territory 80 miles long and 20 miles wide is served not only by its power lines, but by the 300 miles of electric railway. Sent under high tension to both Vancouver and New Westminster, the electric current is distributed through a score of sub-stations

and thousands of miles of wires as far as Steveston, Ladner and the American border on the south and Chilliwack on the east.

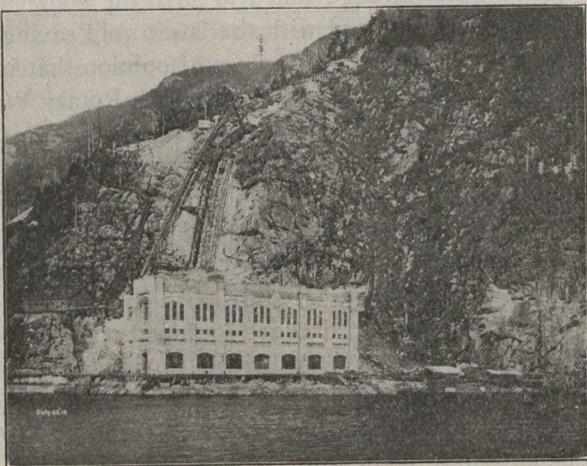
The B. C. Electric Railway Company has invested \$50,000,000 in the province in power and transportation facilities, part of this investment being in similar enterprises in and around Victoria. It may be said to have developed Vancouver, for during the years of rapid expansion, millions of dollars of capital was put in extensions, all of which developed the district.

Vancouver's industrial future warrants the most optimistic estimate of future power requirements. Already there are large ship-building industries located on False Creek and Burard Inlet. Power will be an ever-increasing factor in Vancouver's development.

The rates for power are acknowledged to be extremely low, and Vancouver is on its way to be an electric city in reality. As proof of the widespread use of current from the B. C. Electric system, every lumber mill along the southern Fraser Valley uses electric power.

One of the features of the B.C. Electric system is the interlinked plan of sub-stations whereby there need be no cessation of service even if one high tension line should be put out of commission. Owing to these highly developed facilities and the steam stand-by plant kept always in readiness in case of a breakdown at the hydro-electric plants, interruptions so costly and annoying to industries are almost a negligible factor.

The B. C. Electric operates 156 miles of interurban electric railway around Vancouver in addition to its street car lines. These lines tap innumerable industrial sites, and, indeed, haul an immense amount of freight to and from the steam transcontinental lines.



Vancouver Power Company's No. 2 Power House, Buntzen Lae, Vancouver, B. C.

Why Not a Rainbow's End in B. C.

That "Opportunity knocks once at every man's door," has been a trite saying ever since I could remember.

However, my purpose in starting this story as I did was not to deal with opportunity in general so much as it was to deal with one opportunity in particular, and that particular one happens to be oil. When you read Albert W. Atwood's remarkable story "Rainbow's End," and his subsequent articles on the Texas Oil boom, which recently appeared in the "Saturday Evening Post," did you, as I did, try to visualize the story of what had gone before? Did you stop to think for the moment that, where fortunes gushed forth at the rate of thousands of dollars per day, there, but a few short months ago some hardy pioneers, who had seen opportunity's invitation, worked quietly and effectively to bring forth that which meant the establishment of another oil field and the foundation of a permanent industry. Perhaps the reading of those stories did not just appeal to you in that way, but to me it opened up wonderful possibilities and set me thinking of rumors I had heard regarding oil prospects in British Columbia. So curiosity being an inherited trait, that will not down, and having caught a glimpse of The Rainbow's Shadow, I must, perforce, follow it to the end and discover if I could whether the mythical pot of gold existed in fact or was just a passing fancy of some dreamer's brain.

And now let me say in all seriousness that the rainbow is there and the end in sight. Soon, and how soon I would not dare hazard a guess, the news will break, and word will flash forth to the four corners of the earth and British Columbia will suddenly awake to find itself saddled with a full fledged oil boom as wild, fantastical and frenzied as California, Oklahoma, Kansas or Texas have ever seen.

In an article on "Petroleum in the Fraser Valley," published in 1918, E. A. Haggen, editor of

the "Mining and Engineering Record," says: "Petroleum is found in all geological ages from the Silurian to the Tertiary. The rocks of the Fraser Delta are Cretaceous and Tertiary. The Cretaceous measures of the Fraser Delta are closely related to those of Graham Island and Alaska, and as in both cases they are petroliferous, it is probable similar conditions may be found to obtain in the Fraser Delta. It is notable that in his work on the world's petroleum fields Sir Boverton Redwood includes the Fraser Valley as worthy of exploration, and Cunningham Craig, who was the discoverer of the Trinidad Oilfields, and did much exploration work for the British Government on the Oilfields tributary to the Persian Gulf, expressed an opinion favorable to the development of an oil field here on the occasion of his visit to Vancouver in 1914."

All this was interesting but not fully satisfying, and human like having had a taste I longed for more information on the subject. Perhaps the Gods of Fate took me in hand that day, or my ministering angel was hovering near. Anyway the impulse led me to Pender Street, and at 419 I found the man I wanted in the person of R. H. Wright. R. H. Wright to those who have not had the pleasure of meeting him had best be introduced as President and General Manager of the Empire Oil and Natural Gas Company, Limited (Non-personal Liability). Here I found a plain hard-headed business man seated in a plain office with no frills nor feathers, and because I am of the plain people myself, with a natural suspicion of fancy fixings, I felt at home and listened with interest to his simple story of Empire Oil which for your benefit I shall try to repeat just as it was told to me.

Empire Oil and Natural Gas Company, Limited was organized to follow out well defined information as to the location of oil in the Fraser Valley. The Company is capitalized at \$250,000.00. and the officers



New 40 h.p. Standard Rig recently installed on property of Empire Oil and Natural Gas Co., Ltd.

MINING & ENGINEERING RECORD



R. H. Wright, President and General Manager Empire Oil and Natural Gas Co., Ltd.

are R. H. Wright, President and General Manager; John M. Lacey, secretary; A. F. McDuffee, vice-president, whom with H. A. Morrish, C. T. Moore, and F. F. Jones, comprise the Board of Directors.

The holdings of the company which total some 950 acres, are situated near Aldergrove in the Langley Municipality, which is considered the best location in the Fraser Valley for oil. Drilling is now in progress on the Agur Farm about 35 miles from Vancouver, at the junction of the Yale and Otter Roads.

"Empire Oil" started quietly and unassumingly, without cash or blare of trumpets," said Mr. Wright, in speaking of his experiences. "In fact very little has been known of us by the general public until quite recently. But in spite of having to fight our way against opposition and obstacles of various kinds we have quietly forged ahead until our operations have attracted the notice of thinking men, and we now find little difficulty in securing capital as needed for our requirements. Starting in a small way we were by dint of hard work enabled to put a number four Keystone Drill on our property, and with this excellent progress was made, but we soon realized our equipment was inadequate to properly carry on our test work. Accordingly, arrangements were completed and we now have installed and in operation a forty horse power standard rig, the largest and most up-to-date plant in British Columbia. With this rig we will be able to go down 5,000 ft if necessary. We started with a sixteen inch hole, and with a day and night gang on the job, will be down 1,000 feet by the first of May, where the first oil sands are expected to be found."

"When I look back over the road we have travelled," continued Mr. Wright, "I am forced to conclude that our company stands today in a most unique position. Though the road was long and often the going was decidedly rough, financial assistance came when needed, and we have been able to sell sufficient stock as we

went along to meet all obligations. Today we are free from debt, our plant practically all paid for and money for operating expenses in hand. Moreover our shareholders have the absolute assurance that every cent invested goes into the well and not into the pocket of some promoter, they have no fancy salaries to pay or expensive offices to maintain, they are guaranteed a square deal and a run for their money under an honest capable management. Coupled with this we have the location that looks most promising, and the prospects of bringing in the first commercial well." Mr. Wright's earnestness and sincerity so impressed me that I felt fully convinced yet, Scotch-like, I took his advice and investigated further. This led me to get in touch with Roy J. Widney, under whose able direction drilling operations are making satisfactory progress. Roy Widney is not a man who talks much at any time and much less when you want to find out something about himself. By dint of close questioning, however, I was able to gather some information that helped me to form a fairly accurate opinion of the man on whom may rest the honor of tapping the first commercial oil well in British Columbia. Although young in years, as ages of men are considered, Roy Widney has behind him some twenty years' experience in the California Oil fields, 13 of which were spent in the employ of one firm. Previous to coming to British Columbia he took a prominent part in the development of the Alberta Oil fields, having been in that Province three years, and to him goes the credit of bringing in Southern Alberta Number One, one of the few oil wells in that territory that turned out to be a commercial success. His reputation as an expert driller, is known the country over, and no man is better versed on oil fields and oil formations than he. That he has decided after careful investigation to throw his fortunes in with B. C., is saying much, and that he will bring in a commercial well in the near future is his firm conviction and belief.



Roy J. Widney, Expert Driller. Superintendent in charge of operations for Empire Oil and Natural Gas Co., Ltd.

Drum Lummon Mine

The Drum Lummon Mine on Douglas Channel has passed the early development stage, and is on the point of becoming one of the producers of the province. From a prospect in 1915, with only average surface showings, in the face of difficulties that at times seemed almost insurmountable, due to financial conditions brought about by the war, the owners of this property kept the work of development going steadily on until they have opened up what gives promise of being one of the richest mines in B. C. in copper, silver and gold.

The first systematic work undertaken was the driving of a tunnel to crosscut an ore vein running at right angles to the slope of the mountain side. This tunnel was driven 440 feet. At 300 feet the ore body was encountered and proved to be of a character much more promising than indicated by the surface showings. Bornite was struck in a shear zone having a width of about 70 feet, and showing mineralization over a width of 50 ft. Drifts were then run east and west, the west drift being almost continuously in ore. Within a few feet of the point at which the west drift leaves the tunnel a shoot of covellite was struck and samples from it created somewhat of a sensation in mining circles. These were probably the finest samples of copper ore ever exhibited on the Coast. The shoot was 5 ft. long by a foot in width. An average assay gave the following values:— Gold, 0.10 oz.; silver, 66 oz.; copper 65.8%.

Continuing the drift bornite was encountered within a few feet and mineralization of this character has continued for the full length of the drift, a distance of 200 feet.

The company started operations with a small compressor driven by gasoline engine. As the tunnel is about a mile from tide water it was necessary to build a road to get in supplies, and the Government was appealed to for financial aid in the work. Hon. W. Sloan, Minister of Mines, sent J. D. Galloway, then Assistant Provincial Mineralogist, to report on the property, and the report being favorable, the assistance asked for was forthcoming, and the road connecting the mine with tidewater was built. Last winter it was decided to increase the plant, and a 25 h.p. engine, and a 10 x 10 compressor capable of running 3 to 4 drills, were put in. Drills of the Jack-hammer type were used, and a force of 12 men put on development.

During the past summer two Gibson mills, each of the nominal capacity of 18-24 tons per 24 hours, and a Gibson table were installed.

A small jaw-crusher at the head takes the mine run of ore, crushing to about 1 in. size and discharging into a storage bin, which in turn feeds the Gibson mills. This plant has demonstrated that it will make a concentrate of 63.5% copper 1.12 oz. gold, 30 oz. silver, running on a feed of 5.9% copper ore. Steps are now being taken to instal a process for saving the loss in the slimes and the middlings, and when this is in operation it will be a very complete little plant and in every way suitable for handling the output from the present workings.

Needless to say, the high grade bornite and chalcocite is not put through the mill, but is hand picked and shipped direct to the smelter. The percentage of this high grade ore is increasing in the workings with

depth, and it is quite within the range of possibilities that a large body may be encountered with further development.

The writer visited this property in the summer of 1917, and is of the opinion that the rich bodies of bornite encountered are in situ, and are not the product of secondary enrichment. It follows therefore that the higher values will be found at greater depths.

In 1917 the Drum Lummon property was favorably reported on by George A. Clothier, Government Resident Mining Engineer for the North-western Mining District (No. 1) and again in 1918.

The ore consists of bornite, covellite, chalcopyrite, chalcocite, and tetrahedrite. The west drift, which follows No. 2 vein, shows mineral for almost the entire length of 200 ft., and the width at the face is 7 ft. 10in. The average values are around 0.02 oz. gold, 3.2 oz. silver, and 5.26% copper, excluding the hand-picked high grade bornite. In the S. W. drift, 3½ ft. of ore is assumed to be the extension of No. 1 vein. The following assays show the values:—

No. 1.—Chalcocite and bornite: Gold, 0.12 oz.; silver, 58.4 oz.; copper 67%.

No. 2.—Bornite and schist: Gold, 0.20 oz.; silver, 7 oz.; copper, 10.2%.

No. 3.—Chalcocite and bornite: Gold, 0.10 oz.; silver, 66 oz.; copper, 65%.

No. 4.—General samples: Gold, 0.3 oz.; silver 6.4 oz.; copper, 8.5%.

No. 5.—Concentrates: Gold, 1.12 oz.; silver, 30.4 oz.; copper, 63.51%.

The Property is owned by the DRUM LUMMON MINES, Limited, with offices in the Dominion Building, Vancouver. About \$70,000.00 has been spent in equipment and development work to date, and the results have amply repaid the outlay, which, to quote from the report of the Resident Government Mining Engineer for the year 1917, was judiciously spent, up to the time of his visit.

J. D. Anderson, B.C.L.S., surveyed the claims in the summer of 1918 for Crown Granting, and at that time estimated the amount of ore in sight from the drift to the surface as 10,000 tons.

It is the intention of the company to drive another tunnel at a lower level, giving additional depth on the ore of 332 ft. and bringing the point of delivery much nearer the waterfront than at present, with more room for the permanent plant, the construction of which will be commenced this year. It is intended that the first unit of this will be ready by autumn, so that work may be continued at the mine throughout the winter. Hitherto this has not been possible owing to the temporary nature of the equipment.

The property is well located for transportation, the tunnel being less than a mile from navigable tidewater. This will be cut down to about half a mile when the new tunnel is finished.

Drum Lummon has taken the first prize for the best samples of copper-silver ore at the Vancouver Exhibition for the past three years, and what the Chief Mineralogist and Curator of the Dominion Department of Mines describes as "a particularly handsome specimen of bornite from the Drum Lummon Mine" is now on the way to the Lyons Fair, France, where it will form part of the mineral exhibit from the Dominion.

The Hudson's Bay

"Northern Special" Overalls For Men

BLUE
LABEL

At \$2.50 Pair



—If a wearer of overalls, we know you will be interested in "our Northern Special" Blue Label, for

- It's the roomest overall on the market
- It's two inches higher in the waistband than any other overall made.
- It is the only overall having a continuous fly and sidepiece.
- And it will easily cover any stock garment of comparative waist measure.
- It has been made to our own specification and combines every good point that an overall should possess. Every man that puts a pair on, acclaims it the best fitting overall he ever bought.



The material used is "before the war" quality blue, black, or stifel stripe denim almost unripable and immensely serviceable. We guarantee it to outwear any similar garment of same cost.

It's a money-saver, and a wonderful satisfaction giver:

Made by Union Labor for Union Men.

Per Pair \$2.50

ALWAYS DEMAND THE
BLUE LABEL



The Hudson's Bay Company

INCORPORATED 1870



Vancouver, B. C.

Forest Mills of British Columbia, Ltd.

HEAD OFFICE - - REVELSTOKE, B. C.

MANUFACTURERS OF

White Pine, Western Pine, Cedar, Larch and Fir

LUMBER

LATH, MOULDINGS, SHINGLES

Our Specialty: All Grades Western Soft Pine Lumber

FOUR MODERN MILLS

SPECIAL ATTENTION TO MAIL ORDERS

Bates "Steel Mule"

The consistent performance of the Bates Steel Mule Model D. Tractor, at the various Tractor Demonstrations throughout Washington and Oregon during the past season, and the excellent satisfaction that it is giving actual users, clearly justifies the manufacturer in using the slogan of

"THE MOST EFFICIENT TRACTOR IN AMERICA."

Loggers, Contractors, Road Builders, Farmers, Miners, County and City Officials will find the Bates Steel Mule a Wonderful Money Saver, and the handiest piece of equipment of its kind on the market.

Write for Catalogue.

Sam Hunter Company, Distributors

1025—11th AVE. WEST, VANCOUVER, B. C.

330 East Yamhill Street
Portland, Ore.

97 Columbia Street
Seattle, Wash

Always Wear



Overalls, Shirts and Pants

"Union Made by Union Maids for Union Men and Women"

None Better Made.

Every Garment Guaranteed. Once Worn
Always Worn. Your Dealer has them
or can get them for you.

Manufactured by
JAS. THOMSON & SONS
Limited
VANCOUVER, B. C.

Book Department

OF THE

MINING AND ENGINEERING RECORD

supplies the following Technical Books to order:

COPPER

Copper Handbook, 1913, Weed.....	\$5.00
Copper Mines of the World, Weed.....	5.50

GOLD

Dredging for Gold, Weatherbe	4.00
Getting Gold, Johnson	1.00
Gold Dredging in California, Aubury.....	1.25
Gold, Geological Occurrence and Distribution, Mc-	
Laren	6.00
Gold-seeking in South Africa, Kassner.....	1.50
Hydraulic Mining, Dowle	5.00
Hydraulic Mining, Longridge	6.50

ECONOMIC GEOLOGY

Economic Geology, Ries	4.25
Geology Applied to Mining, Spur.....	.75
Geology for Engineers, Sorsbie	3.00
Geology of Western Ore Deposits, Lakes.....	2.50
Graphical Solutions of Fault Problems, Tolman.....	1.00
Handbook for Field Geologists.....	2.00
Mining Geology, Park	2.00
Nature of Ore Deposits, Bock.....	7.50
Practical Geology, Cole	2.50
Secrets of the Rocks, Frazier	1.50
Stratigraphical Geology, Etheridge	9.50
Types of Ore Deposits, Bain.....	2.00

The Mines Building, 426, Homer St.,
Vancouver, B. C.



QUIGLEY Sweater Coats, Bathing Suits and Novelties

"QUIGLEY"

Garments are made from the finest of pure Scotch Worsted Yarn, in one of the most up-to-date plants in America. The fact that we are always booked up six months in advance and have connections in Australia, New Zealand, China, India and South Africa, proves two things conclusively. "Quigley" knitted wear must be right, and British Columbia can and will build up her Exporting Industries.

The Vancouver Knitting

COMPANY, Limited

78 DUFFERIN STREET EAST

VANCOUVER, B. C.

H. H. Robinson, Vice Pres. Chas. Mailhot, Sec. Treas.
N. C. Fassett, President

C. M. Fassett & Co.

Assayers, Chemists & Metallurgists

LABORATORY SUPPLIES
For Assayers Chemists, Physicians,
Mines, Smelters and Schools

Manufacturers' Agents for Leading Makes of
BALANCES, CRUSHERS, GASOLINE FURNACES, etc.
FINE GLASS AND PORCELAIN WARE
(Incorporated)

PURE REAGENTS, FINE CHEMICALS,
CYANIDE POTASH, ZINC SHAVINGS,
ANHYDROUS AMMONIA,
INDUSTRIAL CHEMICALS

207-209-211-213 Wall Street
Spokane, Wash.

SPOKANE HOTEL



MINING HEADQUARTERS

200 ROOMS

MODERN EQUIPMENT
CENTRALLY SITUATED

The Original
SILVER GRILL

a Modern Up-to-date Restaurant



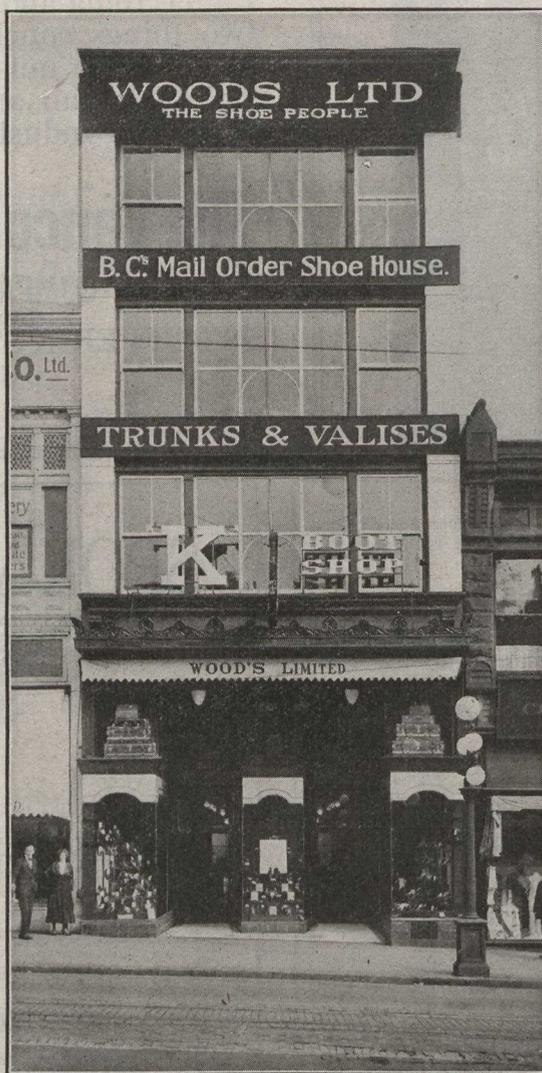
THE LARGEST RETAIL SHOE---- ESTABLISHMENT IN WESTERN CANADA

WE OPERATE OUR OWN MAKING AND REPAIR DEPARTMENT.
MAKERS OF SURGICAL BOOTS FOR THE DOMINION GOVERNMENT

Agents for The
Famous English
"K" BOOTS.

"SMARDON"
fine turn sole
BOOTS and
SLIPPERS

"STEELITE"
Brand Solid
Leather BOOTS
for School Wear



"INVICTUS"
BOOTS... Made
by G. A. Slater,
Canada's Best
Good Shoe.

"DOROTHY
DODD," Amer-
ican High Grade
Footwear for
Women.

LECKIE'S
Vancouver made
BOOTS for Men
and Boys.

Distributors for the Famous GOODRICH HIPRESS RUBBER BOOTS.
Now worn in almost all the principal Mining Camps in British Columbia.
and the Yukon.

MINERS' LOGGERS' and CRUISERS' SPECIAL LEATHER BOOTS MADE TO
ORDER.

We mail Shoes free to any part of British Columbia.
Write for our Catalog.

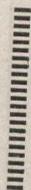
WO—VA—LEG

WHOLESALE HARDWARE

(MILL, MINE and MARINE SUPPLIES)



SPARE AND REPAIR PARTS.
TOOL AND DRILL STEEL
"WOVALEG" BABBITT
PIPE AND FITTINGS
MINERS' PICKS



BLACKSMITH COAL
PENBERTHY VALVES
PACKING WASTE, etc.
GAS ENGINE ACCESSORIES
BLACKSMITH TOOLS

JUSTRITE CARBON MINERS' LAMPS.
"JONES" and "BULLDOG" SHOVELS

WOOD, VALLANCE & LEGGAT

LIMITED

VANCOUVER, B. C.

Private Exchange Sey. 7200.

573 CARRALL STREET



B. Holt & Co.

Manufacturers of

STRICTLY RELIABLE FURS

Are exhibiting a large collection of
COATS, COATEES, CAPES,
SCARFS, MUFFS,
All Fashionable Furs

DEALERS IN RAW FURS

GRANVILLE & ROBSON STS.
VANCOUVER, B. C.
Tel. Sey. 3557

Phone: Highland 935

Res. Phone Sey. 752

Patterson Boiler ... Works ...

NEW and SECOND HAND BOILERS

BOILERS, STACKS, TANKS,
GENERAL REPAIRS,
RIVETED PIPES
ORE CARS

Heatley Avenue

Vancouver, B.C.

Provincial Assayers

Analytical Chemists

Flotation Amalgamation and Cyaniding Tests.
"Accuracy Guaranteed."

The largest and most complete testing laboratory
West of Ontario.

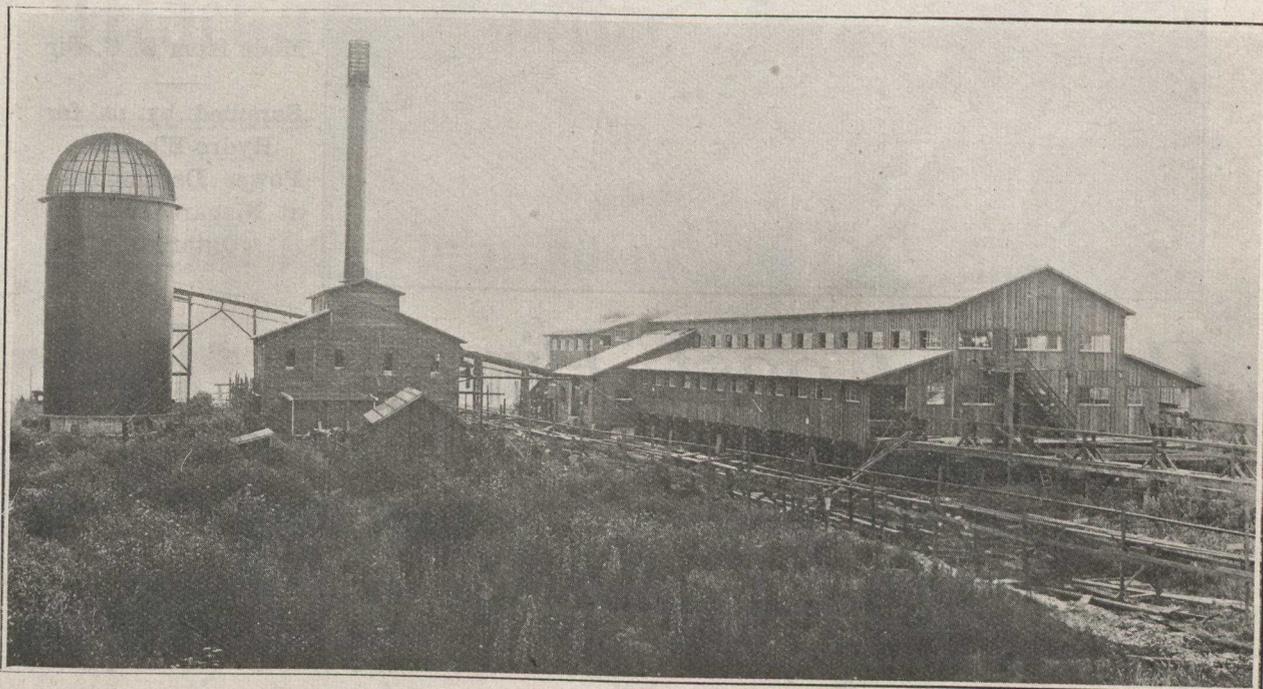
G. S. ELDRIDGE & CO.
(Established 1890)

567 Hornby St.

Vancouver, B. C.

Shull Lumber & Shingle Company

Limited

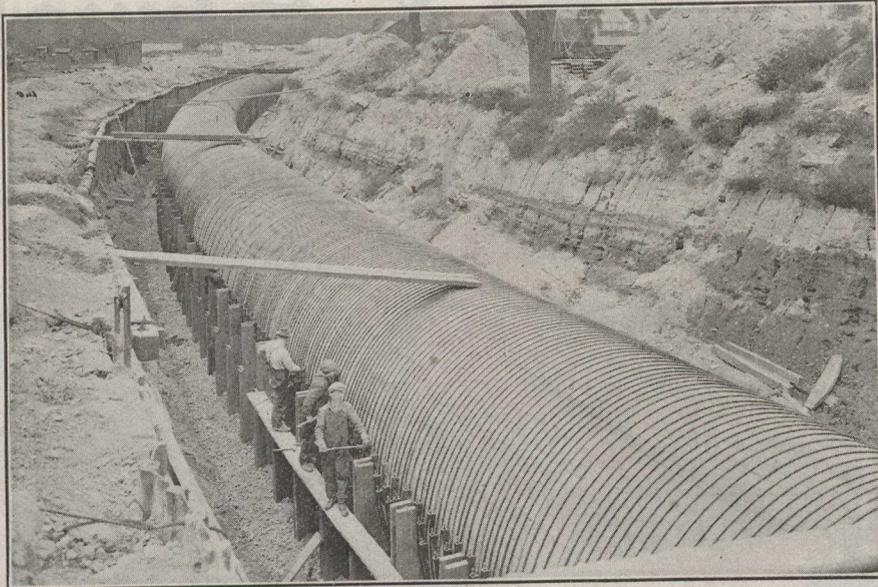


.....

Boundary Station
Vancouver, = B. C.

.....

Telephone Fraser 59



**THE LARGEST
WOOD STAVE
PIPE IN
CANADA**

13 ft. 6 in. Inside dia.

6,500 ft. in Length

Made from B. C. Fir

Supplied by us for
Hydro-Electric
Power Development
at Niagara Falls,
Ontario.

Pacific Coast Pipe Co. Ltd.

1551 GRANVILLE ST.

VANCOUVER, B. C.



Continuous Wood Stave Pipe 2 ft. to 14 ft. dia. for Hydro Electric Power Development. Our Specialty Complete Construction.

Wire Wound Wood Stave Pipe 2 in. to 24 in. dia. for General Water Supply, Hydraulic Mining, Fire Protection, Tunnel Ventilation, etc.

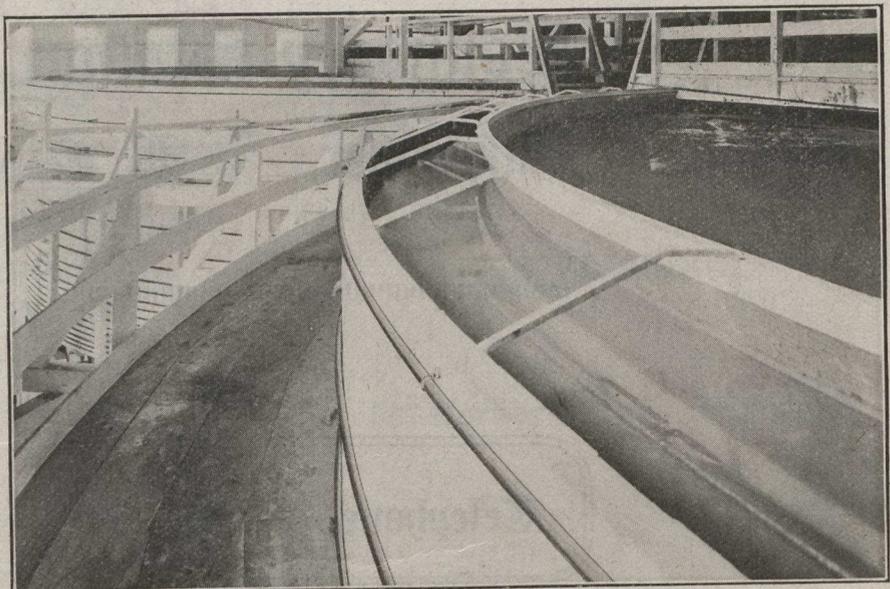
Wood Mining Tanks, of all descriptions up to 60 ft. dia.

This illustration shows series of Wood Stave Thickener Tanks 50 ft. dia. supplied by us to a Copper Mine in B. C.

Made from B. C. Fir.

Write us for information and prices

Large stock of Dry Material Always on Hand





Mackay, Smith, Blair & Co.

Limited

— Wholesale —

Men's Furnishings and Dry Goods

Manufacturers of
Shirts, Tweed Pants, Overalls, Tents
Hand Knit Sweater Goods

Corner Cambie and Water Streets

VANCOUVER, B. C.

Letter Orders Receive Prompt Attention



REGISTERED TRADE MARK

B. C. LEATHER & FINDINGS

Company, Limited
Vancouver, B. C.

Wholesale

LEATHER & SHOE FINDINGS, SHOE STORE
SUPPLIES, SHOE MACHINERY
LACE LEATHER and CUT BELT LACING

British Columbia Agents for

L. McBrine Co., Ltd., Kitchener, Ont.,

TRUNKS, BAGS, SUITCASES, GLOVES

Clubb & Stewart

Limited

Have been doing business in Vancouver for
29 years



Agents for

"20th CENTURY BRAND" SUITS
AND OVERCOATS

Men's Furnishings of Dependable
Quality

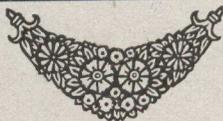
BOYS' DEPARTMENT

is the best known in the West. Every-
thing the boy wears but the boots.



309 to 315 Hastings St. West

STOCKS & BONDS



We Buy and Sell Canadian and U.S. Government Bonds; Mining, Oil and Industrial Stocks.

Money Loaned on Same
FREE MARKET LETTER
ON REQUEST.

C. M. OLIVER & CO.

Limited

Members Vancouver Stock Exchange

Suite 419 Rogers Building

Vancouver B. C.

Established 1907

Use

Clayburn Firebrick

and

Clayburn Fireclay

if you want

Clayburn Quality

throughout your work

Clayburn Company Limited

CLAYBURN, B. C.



Large Stocks of all kinds of

Mine Pumping Outfits on Hire to Pump Out Old Shafts.

Unbiased Engineering Advice Free

216-224 ABBOTT STREET

VANCOUVER, B. C.

Business Established 1896

A. S. GOODEVE & COMPANY, Ltd.

INSURANCE, FINANCIAL AND STOCK
BROKERS, REAL ESTATE & MANU-
FACTURER'S AGENTS, NOTARY
PUBLIC

Telephone 77

P. O. Drawer 909

Office: Columbia Avenue

ROSSLAND

PLACER MINING EQUIPMENT

Hendy hydraulic Gravel Elevator, 40 ft. of 16in flanged upraise pipe, 8-10-12in. manganese throats, 3-4-5in. nozzles, complete with flanged suction pipe, ball joints, Y's, flanged elbows, flanged pipe, gate valves and all necessary fittings. Cap. 1000 cu. yd. per day.
Hendy 10-in Water Lifter with 5- and 6-in. throats, 2- and 3-in. nozzles, complete with 40 ft. of flanged upraise pipe, 10 in diam., 8-in. suction pipe, ball joints expansion joints, flanged pipe and elbows.
Hydraulic Pipeline, 3500 ft., all sizes from 18 to 7 in., 16 gauge slip joints 15 to 18 ft. long. Five Giants with deflectors and nozzles, Y's, elbows, gate valves and reducers.
All the above equipment in good serviceable condition and for sale at a big sacrifice. Plant located near Idaho City, Idaho.

S. K. ATKINSON, Idaho City, Idaho.



The
**London
Grill**
and **Rotisserie**

752-4 Robson Street, Vancouver

Phone Seymour 3550

H. Aubeneau and F. Pascual, Props.

We maintain that the **LONDON GRILL** is absolutely the genuine place in the City of Vancouver to get a good meal at a reasonable price. Our French Chef has had more than fifteen years' experience in the very best Hotels and Restaurants in Paris and London, and can put up most correctly any dish a patron may call for. And for to back up our argument it is written on the back of every patron's check "Do not pay this check if you are not satisfied with your meal."

Canada Food Board Licence No.10-584

== USE ==

ELECTRICAL POWER

FOR FARM and DAIRY PURPOSES

SPECIAL RATES FOR ELECTRICAL
AND COOKING

Apply: Contract Department

**WESTERN POWER COMPANY OF CANADA
LIMITED**

CARTER-COTTON BUILDING

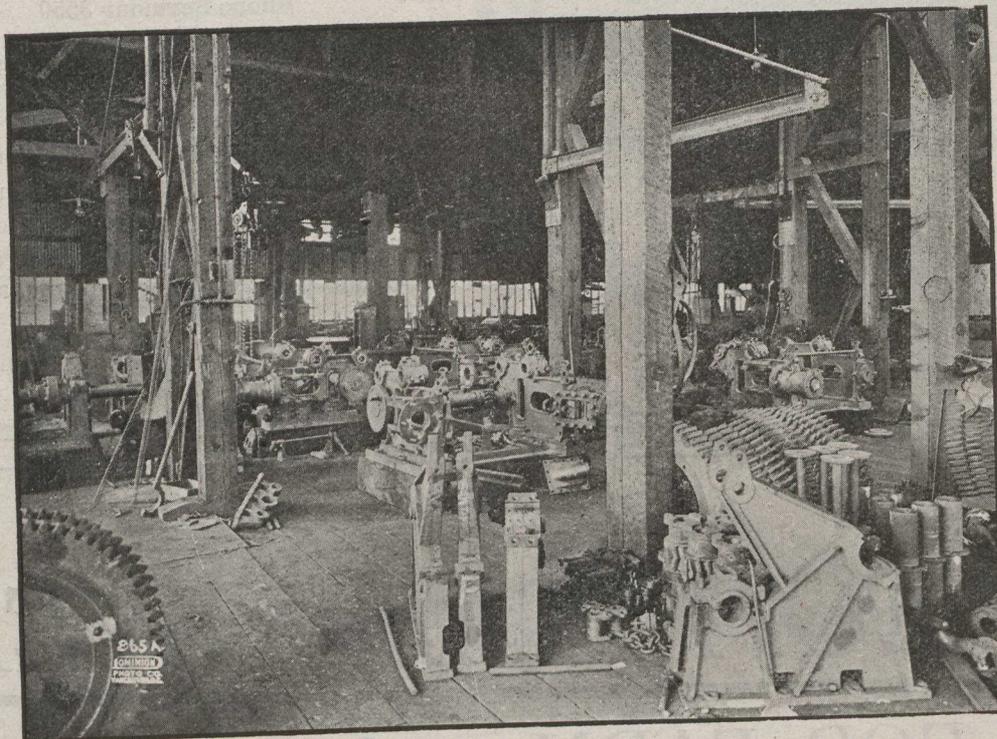
VANCOUVER, B. C.

----- THE -----

North Shore Iron Works

Limited

----- NORTH VANCOUVER -----



Situated on the North side of Burrard Inlet, these works enjoy exceptional shipping facilities, the wharf extending to deep water, while operations are conducted along 200 feet of water frontage.

Constructors of Windlasses, Winches, Boilers, Propellers, Castings, etc.

During 1917 and 1918 have completed 76 Winches and 35 Windlasses for I. M. B. Wooden Shipbuilding Dept., 10 Steering Gears for Patterson Macdonald Shipbuilding Co., Seattle; 33 Winches for J. Coughlan & Sons; and much general work for Wallace Shipyards, Ltd., Lyall Shipbuilding Co., Ltd., and the Imperial Munitions Board.

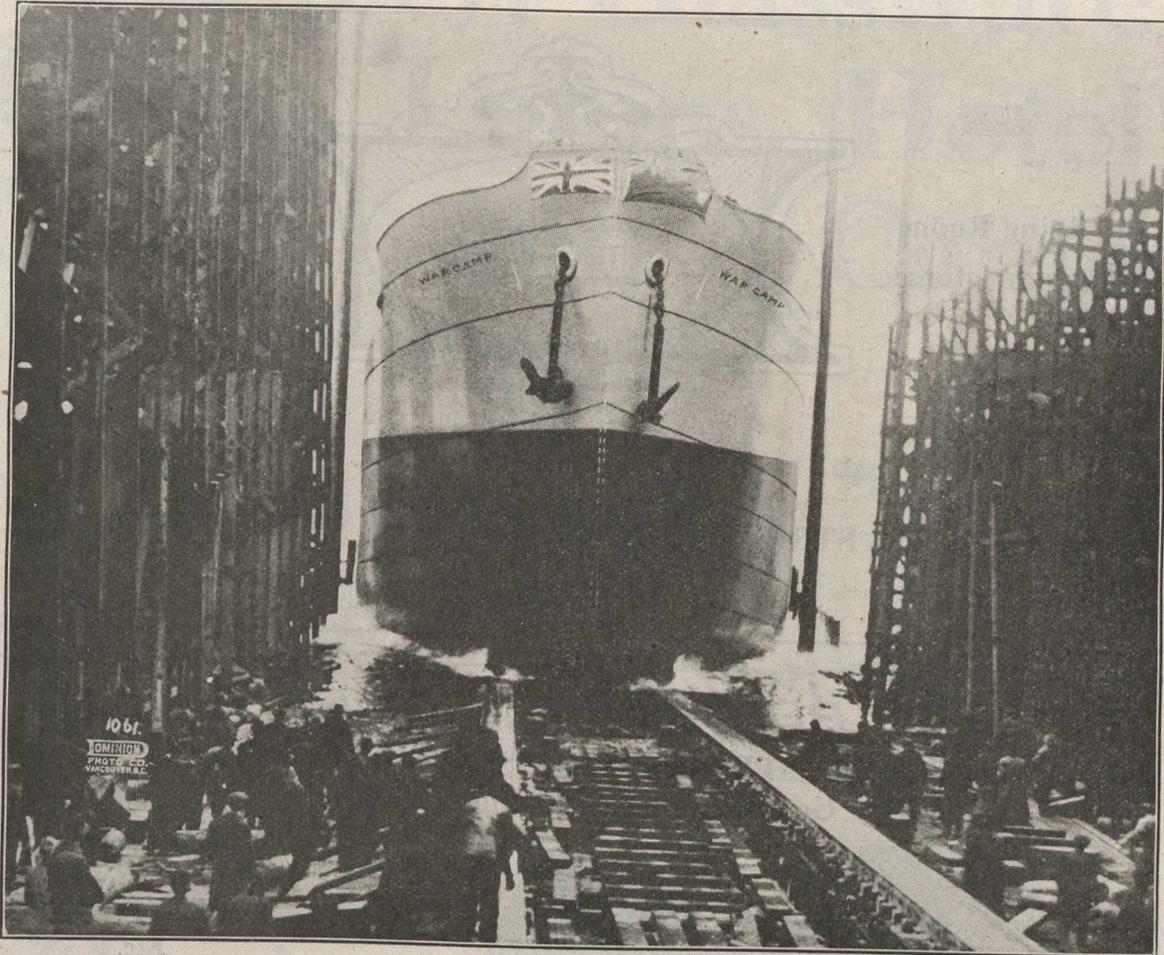
All Standard Patterns of Albion Iron Works in Stock

Steamship "War Camp" at Launching, Built and Launched by

J. Coughlan & Sons

SHIPBUILDERS & ENGINEERS
STRUCTURAL STEEL DEALERS

VANCOUVER, B. C.



Classified Advertisements

Professional Cards

EDWARD A. HAGGEN

Mining Engineer

Member Am. Inst. Mining Engineers; Member Canadian Mining Institute; Editor The Mining, Engineering and Electrical Record.

Mines Building, 426 Homer St.
Vancouver, B. C.

ROBERT H. STEWART

Mining and Metallurgical
Engineer

Vancouver Block, Vancouver, B.C.

Mining Machinery

OF EVERY DESCRIPTION

Second Hand and New

Bought and Sold

B. C. EQUIPMENT CO.,

602 Hastings Street W.,

Vancouver, B. C.

ANDREW G. LARSON

Mining Engineer

926 Old National Bank Building

SPOKANE, WASH.

Cable Address: "Larmac"

Bedford McNeill Code

20tc

CARTWRIGHT, MATHESON & CO

Civil Engineers & B.C. Land Surveyors

Mining Claims Surveyed

Plans, surveys and superintendence of construction for Railways, Tramways, Cableways, Wharves, and all structures for Ore Transportation—Water Supply, etc.

445 Granville Street

Phone 7070

Vancouver, B. C.

PROVINCIAL ASSAYERS

G. S. ELDRIDGE & CO.

with which is incorporated

THE

VANCOUVER ASSAY OFFICE

(Established 1890)

We guarantee accuracy of our results. Write for price list.

Cave Building

567 Hornby St.

Vancouver

J. A. Elder
Manager

Phone Seymour 2621

Thos. H. Laslett,
President

Mission Confectionery Co.

Limited

Dining Room
in Connection



Wedding Cakes
Our Specialty

722 GRANVILLE STREET

VANCOUVER, B. C.

Canada Food Control Licenses Nos. 5-1414, 11-943, 10-14134

TURNER, BEETON & COMPANY, LTD.

WHOLESALE MERCHANTS AND IMPORTERS

Dry Goods, Gents Furnishings, Tobaccos



Manufacturers of
"BIG HORN" BRAND
SHIRTS, OVERALLS,
Etc.

ALL KINDS OF FOREIGN
GOODS INDENTED

Established 1863

Incorporated 1902

Factory:

BASTION SQUARE
VICTORIA, B. C.

European Agents:

H. C. BEETON & CO.

57 Moorgate Street

London, England

Agents:

HARTFORD FIRE INSURANCE CO.

Assets \$25,449 839.41

A. B. C. A. I. SCOTT'S, MORRING & NEAL'S and
ATLANTIC DIRECTORY CODES USED

Telegraphic Addresses: Beeton, London; Turbeet, Victoria

VICTORIA, B. C.

WHOLESALE
Crockery, Glassware
China, Lamps, Hotel
Mine - and - Camp
Supplies

Cassidy's

- - - LIMITED - - -

929 Granville St.

VANCOUVER, B. C.

- - USE - -

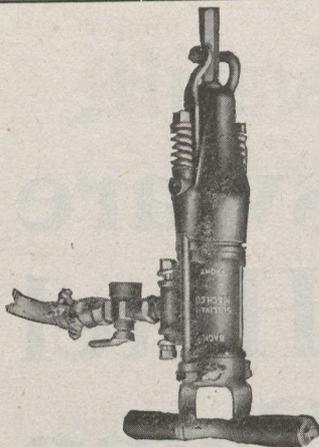
Brandram-Henderson
Paints

.....
FACTORY ON INDUSTRIAL ISLAND
.....

Brandram-Henderson of B. C. Limited

470 Granville St.

Vancouver, B. C.



Sullivan Mining Machinery

NOW IS A GOOD TIME to place your orders for mining equipment: Our facilities for prompt shipment of Sullivan Drills of all types, Sullivan Air Compressors and Sullivan Drill Sharpeners have never been better. In many cases delivery can be made at once from a branch in your vicinity.

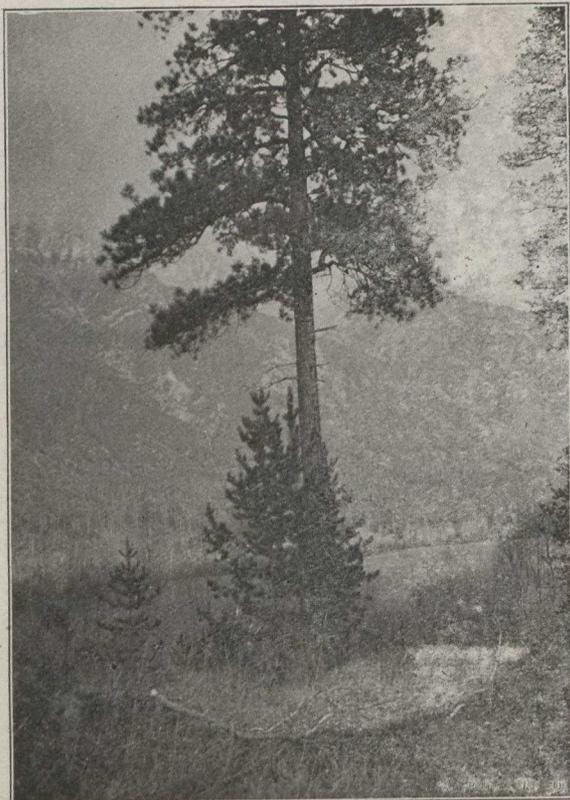
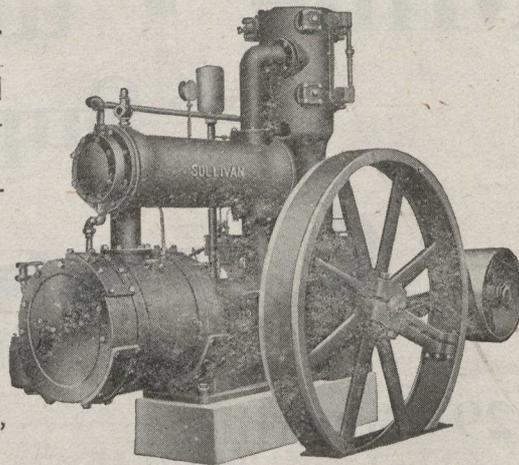
Sullivan Mining Machinery embodies the most modern ideas and the most successful practice. It stands for increased output, lower cost for power, labor and upkeep, satisfied workmen, and year-end to year-end operation at your mine.

Sullivan Engineering Service, based on our experience of nearly fifty years, is at your command.

Ask for Catalogue.

Sullivan Machinery Co.

HUTTON BUILDING, SPOKANE
VANCOUVER, NELSON, WALLACE, SEATTLE,
JUNEAU



Steeple Mountain, from Kootenay Valley

Attention Miners!



If you are interested in a good watch, a piece of jewelry for your wife, or a properly fitted pair of glasses, Tod & Manning will give you just the advice and information you are looking for.

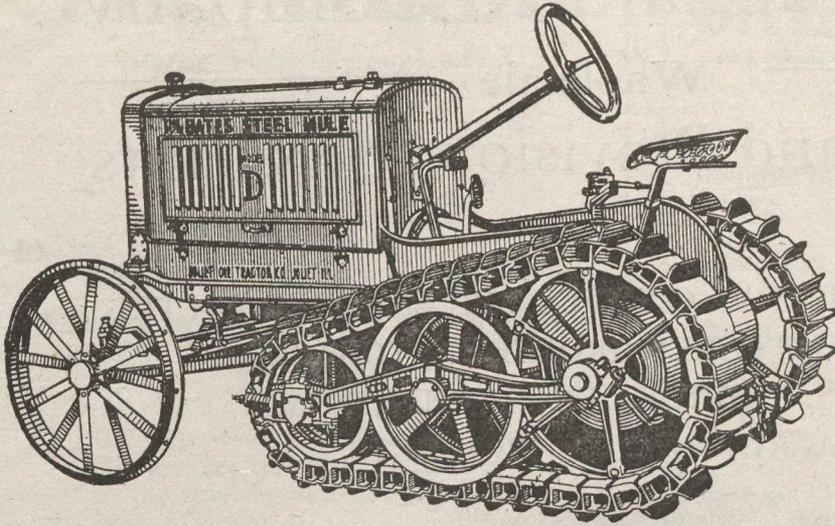


Tod & Manning Ltd.

JEWELLERS

574 GRANVILLE ST. VANCOUVER, B.C.

BATES "STEEL MULE"



The consistent performance of the Bates Steel Mule Model D. Tractor, at the various Tractor Demonstrations throughout Washington and Oregon during the past season, and the excellent satisfaction that it is giving actual users, clearly justifies the manufacturer in using the slogan of

"THE MOST EFFICIENT TRACTOR IN AMERICA."

Loggers, Contractors, Road Builders, Farmers, Miners, County and City Officials will find the Bates Steel Mule a Wonderful Money Saver, and the handiest piece of equipment of its kind on the market.

Write for Catalogue.

Sam Hunter Company, Distributors

1025—11th AVE. WEST, VANCOUVER, B. C.

330 East Yamhill Street
Portland, Ore.

97 Columbia Street
Seattle Wash.

BRITISH COLUMBIA REFINING CO.

Limited

REFINERS AND COMPOUNDERS OF
**LUBRICATING OILS and
GREASES**

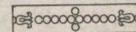


We positively guarantee to solve lubricating troubles. We lubricate the wheels of commerce as well as steam, gas, gasoline automobile and all high class and hard places.

Let us prove where others have failed. Drop us a line and let us quote you.

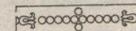
Laboratory and Refinery, Port Moody
Head Office, Vancouver

THE POPULAR DAY TRIP



S.S. Ballena

Leaves Union Wharf Daily at 9.15 a.m. calling at Bowen Island, Britannia Mines, Squamish, Way Points, returning at 7 p.m.



For further particulars phone
**Terminal Steamship
Navigation Co., Ltd.**
VANCOUVER, B. C.

A. Macdonald & Company

Wholesale

Grocers and Provision Merchants

IMPORTERS OF TEAS, COFFEES, SPICES, DRIED FRUITS,
STAPLE and FANCY GROCERIES, TOBACCOS,
CIGARS, BUTTER, EGGS, CHEESE and
PACKING HOUSE PRODUCTS.



Office and Warehouse:

40 POWELL STREET

VANCOUVER, B. C.

Wilkinson Company Limited

STEEL RAILS, Splice Bars, Bolts,
Nuts, Spikes, Screw Spikes,
Crossings, Frogs, Switches.

BEAMS, Channels, Angles, Tees,
Zees, Steel Mine Timbers, and
other Structural Shapes.

Steel Sheets, Merchant Bars, Tool
Steel.

Cold Drawn and Cold Rolled Steel
Bars for Screw Making and
Manufacturing.

Wire Rope Tramways and Cable
Hoist Conveyors.

Pipe for Water, Gas, and Steam
Steel Boiler Tubes.

Casing, Tubing and Drive Pipe
for Oil and Artesian Wells.

Derricks and Drilling Rigs for Oil
Wells.

Wire Rods, Drawn Steel Wire,
Barbed Wire, Galvanized and
Fence Wire, Electrical Wire and
Cables.

Solid Forged and Rolled Steel
Wheels, Forged Steel Axles,
Forgings.

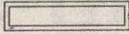
846 Beach Ave.

Vancouver

The Hume

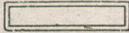
(George Benwell, Proprietor)

NELSON, B. C.

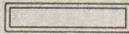


European Plan

Rooms, \$1.00 and Upwards
Cafe, a la Carte and Table d'hote



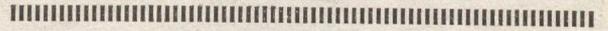
Cafe Service is unexcelled, and charges are the Most Reasonable in the Interior of British Columbia. We are Headquarters for Mining Men, Tourists and Commercial Travellers. Cordial Service is our Motto, and we solicit your patronage. Stay at the Hume and you will enjoy your visit to Nelson.



NELSON, B. C.

DAVENPORT HOTEL

SPOKANE, U. S. A.



"One of America's Exceptional Hotels."



Headquarters for Mining Men of the Northwest



No Undesirable Rooms
Very Low Prices
No Formality



Coffee Shop for Quick Service
Dollar Dinner Daily

THE MINERS OF KOOTENAY

Will find here the Best Value
in Style, Design, Models
and Fabric at

Emory and Walley

The Clothiers

Nelson, B. C.

Perfect Joy for a Boy Nothing Can
Equal a

"Perfect"

MAKE YOUR BOY HAPPY!

Give him a "PERFECT" BICYCLE
Something that will afford pleasure

Prices: \$55, \$57.50, \$60, \$62.50

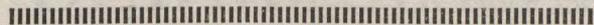
Easy Payments arranged



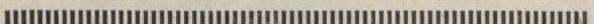
Haskins & Elliott

516 Howe Street

Vancouver, B. C.



Subscribe to the
**Mining & Engineering
Record**



Smith Electrical Co., Ltd.



Carry full stock of
Tungsten Lamps, Domestic and
Electric.

Industrial Lighting & Heating Supplies
Motors, Generators, Transformers,
Switchboards

Electrical Installations



561 GRANVILLE STREET
VANCOUVER, B. C.

MINERS AND MINING MEN

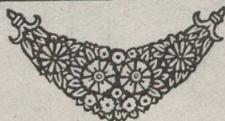
Buy Bull-dog Brand

Heavy Blue Denim Miners' Pants, or
Heavy Khaki Drill Pants, strong,
serviceable, satisfactory. For
sale at all stores.



Manufactured and guaranteed by
Gault Brothers, Limited,
361 Water Street Vancouver, B. C.

Western Oil and Supply Co.



PENNSYLVANIA LUBRICATING
OILS AND GREASES MINING
SUPPLIES

Right Prices. Best Goods. Prompt Delivery
Send us your Orders

560 BEATTY STREET

VANCOUVER, B. C.

Wholesale Druggists

Importers and Manufacturers' Agents

DRUGS, CHEMICALS

PATENT MEDICINES

SUNDRIES

J. A. TEPOORTEN

LIMITED

308 Water St.

- - - VANCOUVER, B. C.

SIMONDS SAW STEEL PRODUCTS

In the Small Mine Saw Mill

Here, as well as in the large Mill, the Economical Superiority of Simonds Saws is Easily Demonstrated

THEY HOLD THEIR CUTTING EDGE

THEY SAW TRUE

THEY MAKE HIGH GRADING LUMBER

Write Us About the Saws You Want

Simonds Canada Saw Co. Ltd.

"THE SAW MAKERS"

554 Beatty Street
Vancouver, B. C.

St. John, N. B.
Montreal Que.

1" Wire Wound Wood Pipe-24"

16" Continuous Stave-144"

WOOD TANKS

All Styles—All Sizes

All Products Manufactured from B. C.
Fir.

Write for Catalogue and Prices

CANADIAN PIPE CO.
Limited

550 Pacific Street Vancouver, B. C.

Purdy's Ice Cream

is all Pure Cream

Mr. Purdy uses the thickest, richest cream he can buy, and puts in only fresh fruit for flavor and cane sugar to make it sweeter.

He freezes it in an old-fashioned round freezer, because that is the only way to get real old-fashioned ice cream.

Try some if you haven't already.

PURDY'S

MAKER OF PURDY'S CHOCOLATES

675 Granville Street

A Business Education

is made necessary on account of the fact that the Mining and Smelting businesses which you run are more important than any other lines of business in the world today.

No man can really do himself justice without keeping an accurate set of accounts. Since the government has asked for an income tax, under such circumstances every man will find it necessary to keep an accurate set of accounts.

THE **SPROTT-SHAW** BUSINESS SCHOOL

336 Hastings Street West

Vancouver B. C.

Has Special Courses in Bookkeeping—These may be taken by Correspondence.

R. J. Sprott, B. A., Manager

Send for Prospectus Free

PAN-PACIFIC CORPORATION

OF
CANADA
VANCOUVER,
B. C.

IMPORTERS

Jute Bags
Cotton Duck
Cordage
Ixtle Fibres
Textiles
Cocoa-nuts
Oils and Copra
Hides
Rubber (Raw)
Tanning Materials
Coffee and Cocoa

SHIPPING AGENTS

Foreign
and
Coastwise

EXPORTERS

Canned Goods
Steel Products
Machinery
Iron Products
Galvanized Wire Rope
Manilla Rope
Hardware
Lumber (Cut & Rough)
Box-shooks
Hard-woods
Dye-woods

JAPAN, RUSSIA, CHINA, SOUTH AMERICA, MEXICO

Shipping Charters arranged upon application

We Solicit Orders and Invite Correspondence.

Specifications of requirements with introductory letters will receive our immediate quotations.

Cables:

"Panificorp"
Western Union
A. B. C. 5th Edition
Bentley's

WE ARE OPEN TO REPRESENT
REPUTABLE BRITISH HOUSES



SALES AGENTS

**SMITH, DAVIDSON & WRIGHT, LIMITED
VANCOUVER & VICTORIA, B.C.**