

Technical and Bibliographic Notes / Notes techniques et bibliographiques

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

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

Coloured covers/
Couverture de couleur

Coloured pages/
Pages de couleur

Covers damaged/
Couverture endommagée

Pages damaged/
Pages endommagées

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

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

Cover title missing/
Le titre de couverture manque

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

Coloured maps/
Cartes géographiques en couleur

Pages detached/
Pages détachées

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

Showthrough/
Transparence

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

Quality of print varies/
Qualité inégale de l'impression

Bound with other material/
Relié avec d'autres documents

Continuous pagination/
Pagination continue

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

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

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

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

Title page of issue/
Page de titre de la livraison

Caption of issue/
Titre de départ de la livraison

Masthead/
Générique (périodiques) de la livraison

Additional comments:/
Commentaires supplémentaires:

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

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

CANADIAN RAND DRILL CO. SHERBROOKE, QUE.

Mining, Tunneling & Rock-Working Machinery

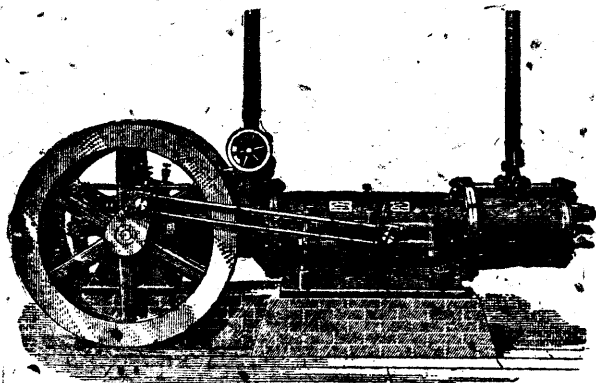
STRAIGHT LINE COMPRESSORS.

DUPLEX, COMPOUND & CONDENSING COMPRESSORS

With MEYER or CORLISS VALVE GEAR
 For ECONOMICAL PLANTS.

THE JENCKES MACHINE CO., Sole Agents,

16 VICTORIA SQUARE, MONTREAL. HALIFAX HOTEL, HALIFAX. 632 CORDOVA STREET, VANCOUVER.



ALL KINDS OF
RUBBER GOODS for MINING PURPOSES

MANUFACTURED BY

THE CUTTA PERCHA AND RUBBER MFG. CO. OF TORONTO, LTD.

OFFICE 61 & 63 FRONT ST WEST TORONTO. FACTORIES AT PARKDALE.

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

INGERSOLL ROCK DRILL CO.

ROCK DRILLS For TUNNELS . . .
 MINES & QUARRIES

STRAIGHT LINE, DUPLEX & COMPOUND

AIR COMPRESSORS,

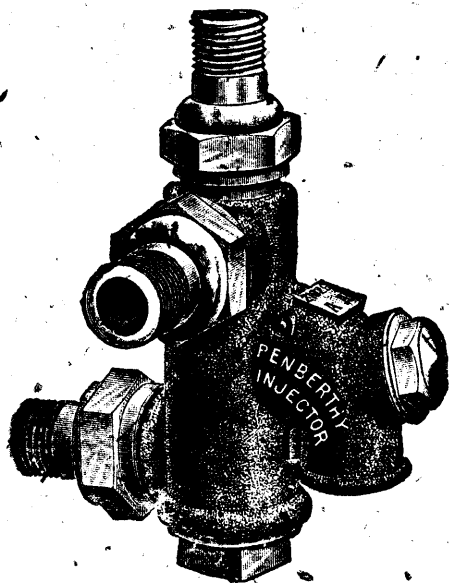
Stone Channelling Machines, Coal Mining Machines, and Complete Plants of
 Mining Tunnelling and Quarrying Machinery.

164 ST JAMES STREET, MONTREAL

80,000 IN USE

LIFE and PROPERTY are
ENDANGERED

BY THE USE OF
CHEAP
BOILER APPLIANCES.



... THE **PENBERTHY** STEAM SPECIALTIES

Are SAFE, because ...

WELL MADE and
THOROUGHLY TESTED

PENBERTHY

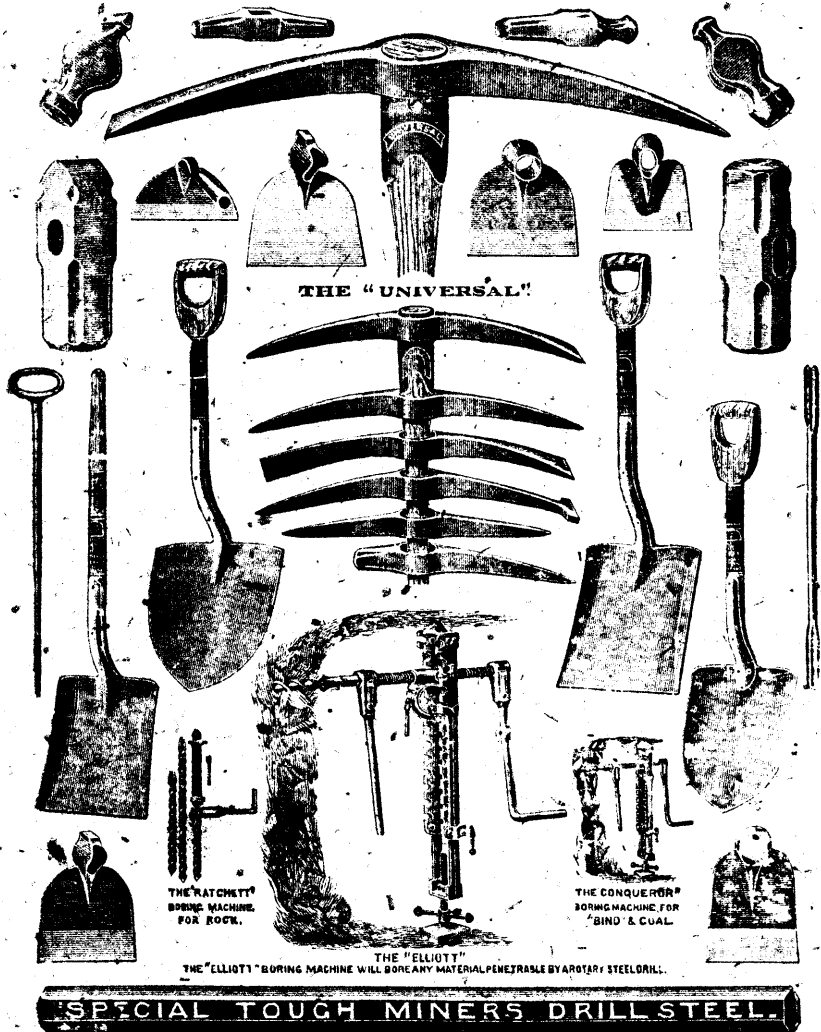
VALVE DRIP WATER GAGE
XL EJECTOR or JET PUMP
SAFETY CRANK PIN OILER
AUTOMATIC INJECTOR, Etc.

Send for Catalogue

PENBERTHY INJECTOR CO.

Branch Factory at Windsor, Ontario.

DETROIT, MICHIGAN.



THE CASSEL GOLD EXTRACTING CO., LTD.
OF GLASGOW.

THE MACARTHUR-FORREST PROCESS (CYANIDE)

MINE OWNERS and others, having Gold Ores and Tailings hitherto untreatable at a profit, should send samples, prepaid, for experimental purposes, to the Company's Agent, W. PELLEW-HARVEY, F.C.S., when Cost of Treatment, Amount Extracted, and other particulars will be sent.
We want to contract for the purchase of Tailings, in parcels of 10,000 tons and upwards, or will treat on commission.

Address: **EXPERIMENTAL WORKS,**
Pender Street, Vancouver, B.C.

W. PELLEW-HARVEY, F.C.S., Superintendent.

... THE WEBSTER ...

VACUUM FEED WATER HEATER & PURIFIER.

Aggregate Sales 400,000 HORSE POWER Guaranteed.

We guarantee this Heater to give better results than any heater in the market, and will furnish the same subject, to 30 days' trial,
IN STOCK—Heaters from 15 h. p. to 400 h. p. inclusive, in stock for prompt shipment.

SEND FOR ILLUSTRATED CATALOGUE.

WEBSTER OIL EXTRACTOR AND LIVE STEAM SEPARATOR

MANUFACTURED BY

DARLING BROTHERS

"RELIANCE WORKS," MONTREAL.

THE HARDY PATENT PICK CO. Limited
SHEFFIELD, ENGLAND

NOVA SCOTIA STEEL COMPANY, LIMITED.

MANUFACTURERS OF HAMMERED AND ROLLED STEEL FOR MINING PURPOSES.

Pit Rails, Tee Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel $\frac{3}{8}$ " to $3\frac{1}{4}$ " Diameter, Steel Tub Axles Cut to Length, Crow Bar Steel, Wedge Steel, Hammer Steel, Pick Steel, Draw Bar Steel, Forgings of all kinds, Bright Compressed Shafting $\frac{5}{8}$ " to 5" true to $\frac{2}{1000}$ part of One Inch.

A FULL STOCK OF MILD FLAT, RIVET-ROUND and ANGLE STEELS ALWAYS ON HAND
SPECIAL ATTENTION PAID TO MINERS REQUIREMENTS.
CORRESPONDENCE SOLICITED.

WORKS & OFFICE: NEW GLASGOW, N.S.

AUSTEN BROTHERS.

RAILWAY, COLLIERY AND GOLD MINERS' SUPPLIES.

No. 124 HOLLIS STREET, HALIFAX, N.S.

ALL GOODS AT MANUFACTURERS PRICES.

MACDONALD & CO., LIMITED.

—MANUFACTURERS AND DEALERS IN—

PUMPING MACHINERY, IRON PIPES, FITTINGS, &c., &c.,
FOR MINERS' USE.

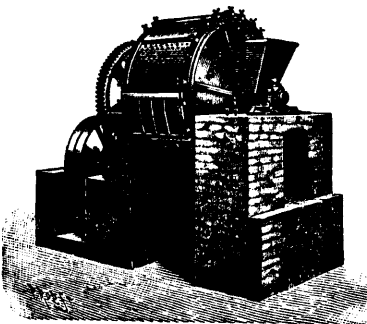
Call or Write us for Prices.

HALIFAX, N.S.

FRIED. KRUPP GRUSONWERK,

MAGDEBURG-BUCKAU (GERMANY.)

ENGINEERING WORKS, IRON AND STEEL FOUNDRY.



CONCENTRATION MACHINERY.
Gruson Rock and Ore Crushers of specially strong construction.

Roller Mills, Stamp Batteries.

CHROME STEEL SHOES and DIES.

Ball Mills, with a continuous feed and discharge improved system for reducing ores to any degree of fineness.

MORE THAN 700 AT WORK.

Amalgamating Apparatus, Hydraulic Classifiers, Jig Machines, Harz and Bilharz Patterns, Round Buddles, Improved Rotary Tables, Frue Vanners, Improved Percussion Tables, Salsburg Tables, Sweeping Tables, Amalgam Cleaners, Amalgam-Distilling and Gold Smelting Furnaces, etc.

COMPLETE CONCENTRATION PLANTS.
Plants for Silver Extraction by the Francke Amalgamation System.

Twelve Awards at the Columbian Exposition.

AGENTS:

CANADA: JAS. W. PYKE & CO.,
35 St. Francois Xavier Street,
MONTREAL.

For the United States: THOS. PROSSER & SON, 17 Gold St. New York.
For Mexico: Oficina Tecnica de las Fabricas, de Fried. Krupp, Essen y Fried. Krupp Grusonwerk, Magdeburg-Buckau, 20 Calle de San Augustin, Mexico.
For South Africa: Fried. Krupp Grusonwerk. South African Agency, P. O. Box 399, Johannesburg, S. A. R.

TRURO FOUNDRY & MACHINE CO

GOLD MINING MACHINERY

Engineers BoilerMakers' and Founders TRURO N.S.

WITH LATEST IMPROVEMENTS

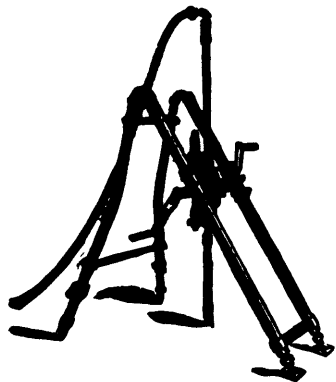
WINDING ENGINES

Special Mixture, Shoes & Dies

With the BEST RECORD IN THE WORLD

Wearing quality unsurpassed

ROTARY SAW MILLS.



"M" Drill—Hand Power.

Capacity—300 ft. depth.

Removes 1 1/4 inches solid core.

DIAMOND DRILLS FOR PROSPECTING MINERAL LANDS.

The Sullivan Diamond Drill is the simplest, most accurate, and most economical prospecting drill for any kind of formation, hard or soft, in deep or shallow holes.

The Diamond Drill brings to the surface a solid core of rock and mineral to any depth, showing with perfect accuracy the nature, quality and extent of the ore-bearing strata, and with great saving in time and expense over any other method.

Complete stock of all sizes, driven by hand or horse power, steam, compressed air or electricity. For sale by

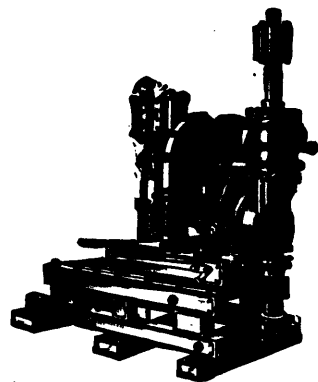
SULLIVAN MACHINERY COMPANY,

Successors to DIAMOND PROSPECTING CO., 54 & 60 N. Clinton St., CHICAGO, ILL., U.S.A.

MANUFACTURERS AND DEALERS IN

Sullivan Diamond Prospecting Drills, Channelling Machines, Rock Drills, Hoists and other Quarrying Machinery.

Hoisting and Hauling Engines, Cages, Tipples, and other Coal Mining Machinery. Contractors for Prospecting Mineral Lands with the Diamond Drill.



"N" Drill—

Capacity—2,000 ft. depth.

Removes 1 1/4 inches solid core.



SEND FOR CATALOGUE.

ELECTRIC BLASTING

VICTOR ELECTRIC PLATINUM FUSES.

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

"PULL-UP" BLASTING MACHINE.

The strongest and most powerful machine ever made for Electric Blasting. No. 3 fires 30 holes. No. 4 fires 50 holes. No. 5 fires 100 holes. They are especially adapted for submarine blasting, large railroad quarrying, and mining works.

VICTOR BLASTING MACHINE.

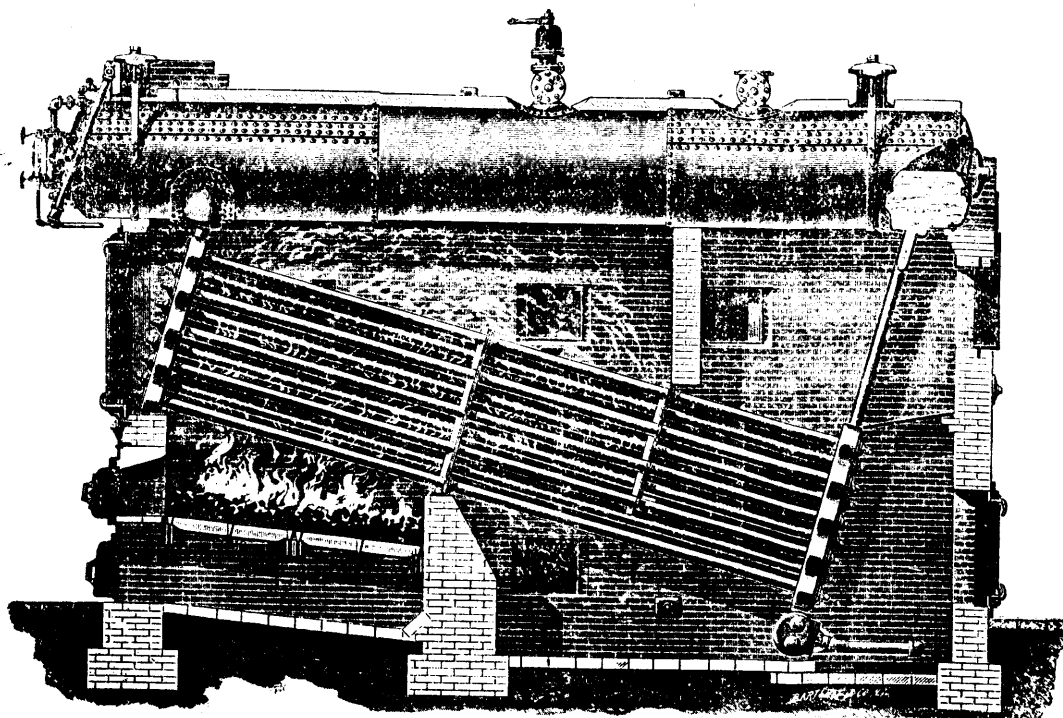
No. 1 fires 5 to 8 holes; weighs only 15 lbs. Adapted for prospecting, stump blasting, well sinking, etc. Standard Electric Fuse and Blast Tester, Wire Reels, new design. Leading and Connecting Wires.

Manufactured only by

JAMES MACBETH & CO.,

128 MAIDEN LANE, NEW YORK CITY.

THE BABCOCK & WILCOX



WATER TUBE
**STEAM.
BOILERS**

OVER 1,500,000 Horse-Power of these Boilers are now running, and of all that have been built, less than Two per cent. have been thrown out of service from any and every cause.

Sales in 1892 alone amounted to 162,300 Horse-power.

Recent sales in Canada exceed 7,000 Horse-power.

HEAD OFFICE: 415 BOARD OF TRADE BUILDING MONTREAL.

WM. T. BONNER, - - GENERAL AGENT FOR CANADA.

SHOPS AT BELLEVILLE, ONTARIO.

CANADIAN GENERAL ELECTRIC COMPANY Ltd.

... PIONEER MANUFACTURERS IN CANADA OF ...

ELECTRIC MINING APPARATUS.

Motors

Rotary Drills

Prospecting Drills

Percussion Drills

Tramways

Rope Haulage



Fans

Pumps

Hoists

Crushers

Coal Cutters

Locomotives

ELECTRIC PERCUSSION and ROTARY DRILLS

In Operation at the Wentworth Gypsum Quarries, Windsor Nova Scotia.

Self-Starting Motors, absolutely without Spark

Self-Oiling! No Brushes! No Commutator!

Safety Electric Cables

When Water Power is available we can furnish apparatus to Generate and Transmit Electric Power with Economical Results, up to a Distance of Twenty Miles and upwards.

BRANCH OFFICES and WAREROOMS:

1802 Notre Dame St., Montreal

Main Street, Winnipeg

138 Hollis Street, Halifax

Granville Street, Vancouver.

Head Office: 65-71 Front Street West, Toronto, Ont.

FACTORIES: PETERBOROUGH ONTARIO.

MINING AND MILL MACHINERY.

Steam Engines, Rock Crushers, Boilers, Derricks, Steam Pumps,
Water Wheels, Brass and Iron Castings
of every description.

ALEX. FLECK, VULCAN IRON WORKS, OTTAWA.

CARRIER, LAINÉ & CO., FOUNDERS, MACHINISTS AND BOILER MAKERS, LEVIS, QUE.

Engines, Boilers, Steam Pumps, Hoisting Gear and all Machinery for Miners, Contractors and Quarrymen. Also Builders' Castings,
Stoves, Stove Fittings, Hollowware, Flour and Saw Mill Machinery, Marine Engines and Boilers, etc., etc.

WRITE FOR OUR PRICES.

HAMILTON POWDER CO.

Manufacturers of Sporting, Military and Blasting


GUNPOWDER, DUALIN, DYNAMITE and ECLIPSE

Dominion Agents for Safety Fuse, Electric Blasting Apparatus, Etc.

OFFICE: 103 ST. FRANCOIS XAVIER STREET, MONTREAL.

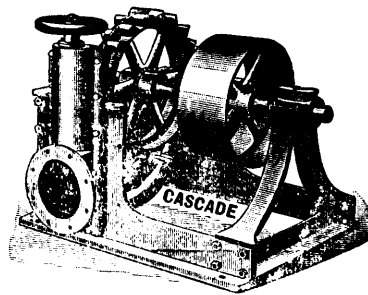
Branch Offices and Magazines at all Chief Distributing Points in Canada.

JEFFREY



Roller Chains, Steel Drag,
Steel Cable and Special Chains
FOR
**ELEVATING
AND CONVEYING
MACHINERY**
FOR HANDLING MATERIAL OF ALL KINDS
**POWER TRANSMISSION
MACHINERY.**
SHAFTING, PULLEYS,
FLANGERS, GEARWHEELS,
EUGETS, BOLTS,
DOORS.
**WIRE CABLE
CONVEYORS.**
For long and short
distance conveying.

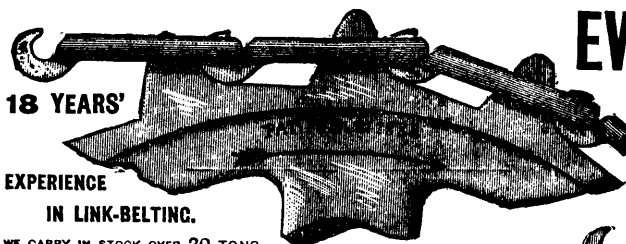
THE JEFFREY MFG. CO. 163 Washington St.
Columbus, Ohio. NEW YORK. Send for Catalogue.



WATER WHEEL

ADAPTED TO ALL HEADS FROM
3 FEET TO 2000 FEET.

Our experience of 23 years building Water Wheels enables us to suit every requirement of Water Power Plants. We guarantee satisfaction. Send for Pamphlet, state Head, and write full particulars.
JAMES LEFFEL & CO., Springfield, Ohio, U. S. A.



18 YEARS'

EXPERIENCE

IN LINK-BELTING.

WE CARRY IN STOCK OVER 20 TONS.

POWER TRANSMISSION MACHINERY.

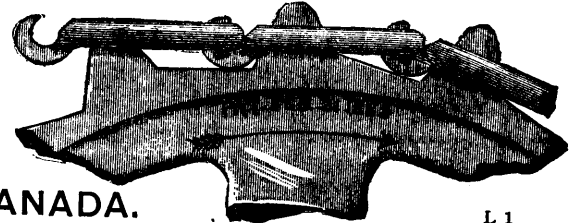
BELTING, CABLE, ROPE OR LINK-BELTING,
CABLE CONVEYORS FOR LONG-DISTANCE CONVEYING,
STEEL SCREENS, McCULLY ROCK CRUSHERS, STEEL
PULLEYS, GRIP PULLEYS, SHAFTING UP TO 26 FEET LONG.

Send for New Link-Belt Catalogue—just out of press.

WATEROUS, BRANTFORD, CANADA.

EWART LINK-BELTING

STANDARD STEEL CHAINS AND SEVERAL
SPECIAL CHAINS FOR
ELEVATING AND CONVEYING MACHINERY
FOR HANDLING MATERIAL OF ALL KINDS



L 1

The
**IRON and STEEL
INDUSTRIES of
CANADA.**



THE next edition of THE CANADIAN MINING MANUAL, now in preparation, will contain an elaborate up-to-date Review of the Iron and Steel Industries of the Dominion—complete statistics from the earliest times of the production and consumption of iron and steel, together with an immense amount of data hitherto unpublished, and of the greatest service and value to all in any way interested in these industries.

HAVE YOU ORDERED IT?



MINING LAWS OF ONTARIO.

ANY person may explore Crown Lands for minerals. Mining lands may be taken up as surveyed locations or staked claims.

Locations range from 40 to 320 acres. Claims range from 10 to 20 acres on vein or lode. Locations may be acquired in fee or under leasehold. Price of locations north of French River, \$2 to \$3 per acre, and south of it, \$2 to \$1.50, according to distance from railway.

Rent of locations first year 60c. to \$1 per acre, and subsequent years 15c. to 25c. per acre.

Rent of claims, \$1 per acre each year. Claims must be worked continuously.

Royalty on ores specified in the Act, 2 per cent. of value at pit's mouth less cost of labor and explosives.

Royalty not charged until seven years from date of patent or lease, nor (as provided in s. 4 (3) of the Mines Act, 1892), until fifteen years in the case of an original discovery of ore or mineral.

Original discoverer of ore or mineral on claim entitled to stake out a second claim.

Crown Lands sold under provisions of mining laws in force prior to 4th May, 1891, exempt from royalty.

Copies of the Mines Act, 1892, Amendment Act, 1894, may be had on application to

ARCHIBALD BLUE,

Director Bureau of Mines

TORONTO, May 25th, 1894.



CONDITIONS

OF

Obtaining Government Drill to Explore Mines or Mineral Lands.

Owners or lessees of mines or mineral lands in Ontario may procure the use of a Government Diamond Drill, subject to the provisions of the Rules and Regulations relating thereto, upon giving a bond for payment to the Treasurer of the Province, of costs and charges for (1) freight to location, (2) working expenses of drill, including labor, fuel and water, (3) loss or breakage of bits, core lifters and core shells, (4) wear or loss of diamonds, (5) other repairs of breakages and wear and tear of machinery at a rate per month to be estimated, and (6) an additional charge of \$50 per month after the mine or land has been shown, through use of the drill, to be a valuable mineral property.

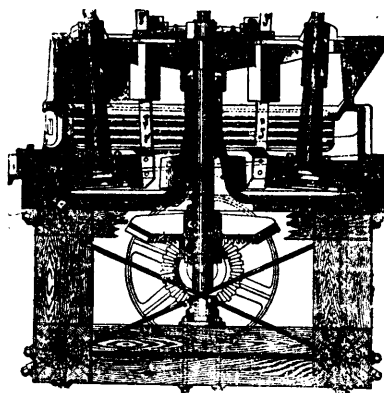
Of the aggregate of costs and charges above enumerated, excepting the sixth item, forty per cent. will be borne by the Bureau of Mines in 1894, thirty-five per cent. in 1895, thirty per cent. in 1896, and twenty-five per cent. in each year thereafter until the end of 1900. All accounts payable monthly.

For Rules and Regulations *in extenso* governing the use by companies and mine owners of Diamond Drills, or other information referring to their employment, application may be made to ARCHIBALD BLUE, Director of the Bureau of Mines, Toronto.

A. S. HARDY,

Commissioner of Crown Lands.

Toronto, October 17, 1894.



FRASER & CHALMERS

Chicago, Ill., U.S.A., and 43 Threadneedle St., E.C., London, Eng.

Its Merits
Recognized

THE RIEDLER PUMP

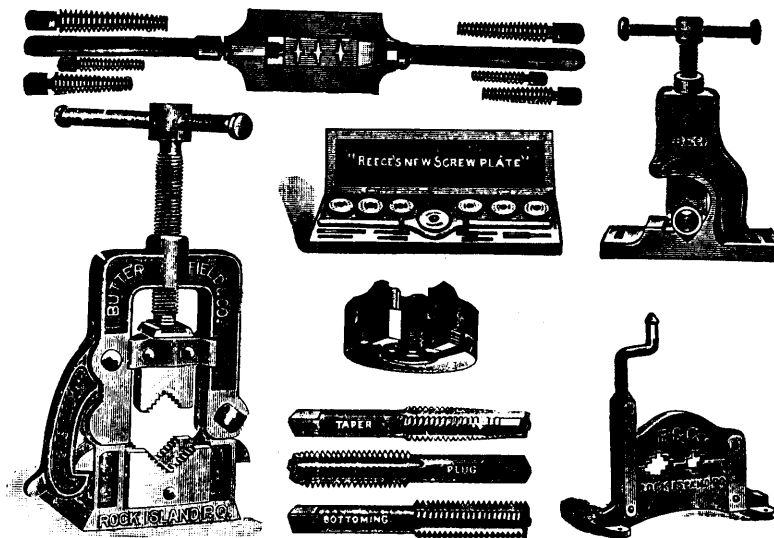
By the
Anaconda Co.

To whose representatives we have just sold a Riedler Pump, capacity 500 gallons per minute, against a head of 1000 feet. Also Riedler Pumps to N. S. Stratton, Independence Mine, Colorado; Montana Mining Co., and many others.

FRASER & CHALMERS, Chicago, Illinois.

BUTTERFIELD & CO.

ROCK ISLAND, P.Q.



ALL KINDS TAPS AND DIES AND KINDRED TOOLS.

CANADIAN GEMS, PRECIOUS STONES

AND COLLECTIONS OF ORES and MINERALS

COMPLETE CABINETS FROM \$1.00 UP TO \$10.00

Canadian Mining Review

Write for our Catalogue.

OTTAWA, ONT.

If you want

BAGS

FOR PACKING

ASBESTOS, PHOSPHATES, ORES, &c.,

Send to us for Samples and Prices.

Every Quality and size in stock.

Specially strong sewing for heavy materials.

Lowest prices compatible with good work.

We now supply most of the Mining Companies, and those who have not bought from us would find it to their advantage to do so.

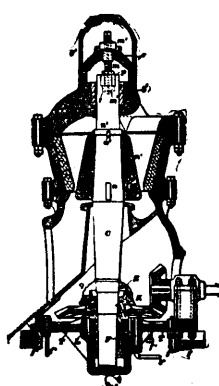
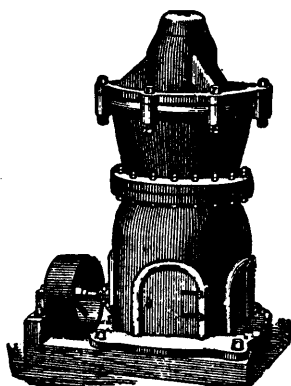
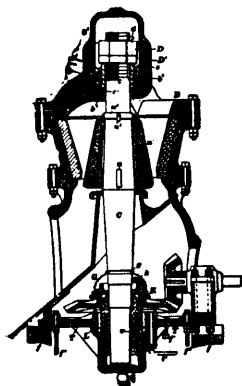
THE CANADA JUTE COMPANY (Ltd.)

17, 19 & 21 ST. MARTIN STREET,

MONTREAL.

The McCully

Rock and Ore Crusher....



Central Shaft with Crusher-Head supported from top instead of at lower end.

GUARANTEED to do more work with one-half less power than any other Crusher now known.

Received two awards at the World's Columbian Exposition at Chicago, Medal and Diplomas. The only awards given for this type of Crusher.

Also received an award and medal at the "Mid-Winter Fair," San Francisco, Cal.

Send for Catalogue or further information to

Patented in
Canada and United States.

Waterous,

BRANTFORD, CANADA

Canadian Manufacturers of the McCully Rock Crusher

BALBACH

**SMELTING & REFINING
COMPANY,**

EDWARD BALBACH, JR. - PRES'T.

J. LANGELOTH, - - VICE-PRES'T.

Newark, New Jersey.

Smelters and Refiners of
Gold, Silver, Lead, and
Copper Ores.

Bullion and Argentiferous Copper
Matte Received on Consign-
ment or Purchase.

Smelting and Refining Works:
Electrolytic Copper Works:

NEWARK, N. J.

Buena Fe Sampling Works:
Agency, SABINAS COAHULLA,

STAMPS!

PRITCHARD & ANDREWS,

173 & 175 SPARKS STREET.

GENERAL ENGRAVERS,

Rubber Stamp Manufacturers,
SCALE MAKERS AND BRASS WORKERS.

Brands, Steel Stamps, Time Checks
and Tags.

Stencils and Ink, Scales and
Weights.

RUBBER STAMPS FOR OFFICE WORK.

CANADA ATLANTIC RAILWAY.

THE SHORT FAVORITE ROUTE

BETWEEN

Ottawa and Montreal

6 TRAINS DAILY 6

EXCEPT SUNDAY

PULLMAN BUFFET PARLOR CARS.

Close Connections at MONTREAL with Trains for

QUEBEC, - HALIFAX, - PORTLAND
And all Points EAST and SOUTH.

FAST THROUGH SERVICE BETWEEN

OTTAWA, NEW YORK and BOSTON
And all NEW ENGLAND POINTS.

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

E. J. CHAMBERLIN,
General Manager

C. J. SMITH,
Gen. Passenger Agt

John E. Hardman, S.B.

**MINING ENGINEER,
MONTREAL, QUE.**

Can be consulted on all matters pertaining to the profession
The development and management of Gold Properties a specialty.

TO USERS OF THE DIAMOND DRILL.

Diamond Drill Bits set Promptly by an Efficient Man All Work Guaranteed.

Bort and Carbon Diamonds for sale. Same terms as New York. Prospecting with American Diamond Drill at per foot or by the day.

**McRae & Co.,
OTTAWA.**

J. T. DONALD,

Assayer and Mining Geologist,

156 St. James Street, Montreal.

Analyses and Assays of Ores, Fuels, Furnace Products, Waters, etc. Mines and Mining Properties Examined and Valued.

**SPECIALISTS IN MICA,
MINERS' AGENTS,
RICHARD BAKER SON & CO.**

19 St. Dunstan's Hill, LONDON, ENG.

R. C. CAMPBELL-JOHNSTON

(of Swansea, India, and the United States.)

**METALLURGIST, ASSAYER,
AND MINING ENGINEER.**

Properties reported on. All assays undertaken. Furnaces and concentrating plants planned and erected. Treatment for ores given. Ores bought and sold. Box 40, Vancouver, B.C.

J. H. CHEWITT, B.Sc.

Graduate in Applied Science Toronto University, Assoc. Mem.
Can. Soc. C. E.

MINING ENGINEER.

Reports on Mineral Lands, Treatment of Ores, Metallurgical Processes.

83 YORK STREET, ROSSIN BLOCK, TORONTO.

WALPOLE ROLAND,

Civil and Mining Engineer.

Reports, Surveys, Estimates, & Development

REFERENCES:

Engineering and Mining Journal, New York.
The Canadian Mining Review, Ottawa, and
The Mining Journal, London, England.

CONSULTING ENGINEER.

OFFICE: LA SEINE RIVER, ONT.

Cable Address: "ROLAND," A1 Code.

**F. CIRKEL,
MINING ENGINEER.**

(Graduate, Academy of Mines, Axchen, Germany.)

Reports on Mica Deposits, Asbestos, Phosphate

**78 QUEEN STREET,
OTTAWA.**

C. V. M. TEMPLE

(Formerly President Megantic Mining Co., P.Q.)

MINES AND MINING LOCATIONS FOR SALE.

CORRESPONDENCE SOLICITED.

Office and Residence:

47 ST. GEORGE ST., TORONTO, ONT.

CANADIAN REPRESENTATIVE:

HENRY DE Q. SEWELL, Dominion and Ontario Land Surveyor,
Mining Engineer, etc., Port Arthur, Ont., A. M. Inst. C.E.

LONDON REPRESENTATIVES:

LANE GAGGE & ANDREWS, Solicitors, Arundel St. Strand, London.

R. C. CAMPBELL-JOHNSTON, (of Swansea, India and the States), Metallurgist, Mining Engineer, Vancouver, B.C.

Crabb's Patent Clip

FOR

Endless Rope Haulage

The latest and most efficient Clip in the market; does not damage the rope; cheap, simple and substantial in construction, and certain in action on rising and falling gradients; automatically attaching and detaching itself at Crosses, Junctions, and Terminals; drags the tub or wagon on the centre line; requires no adjusting, it being always in position to receive the rope; can be adapted either to the top, bottom or side of the tub. A sample one forwarded for one month's trial, purchase or return, to any Colliery in the United Kingdom, carriage paid.

Further particulars and testimonials may be had on application to

G. H. CRABB,

Bunker Hill, Fence Houses,

DURHAM, ENG.

LEDOUX & COMPANY,

9 Cliff St., New York.

**Engineers, Metallurgists &
Assayers.**

Public Ore Sampling and Storage Works

All the principal buyers of furnace materials in the world purchase and pay cash against our certificates of assay, through New York banks.

By special permission of the Secretary of the Treasury of the United States, cars of ore or Copper matte passing through in bond can be opened and sampled at our works.

Consignments received and sold to highest bidder. Send for circular giving full particulars.

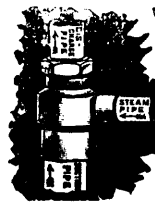
Mines examined and sampled. Assays and Analyses of all kinds.

FRANCIS WYATT, Ph. D.

Consulting, Analytical and Technical Chemist

12 OLD SLIP, NEW YORK.

(Near Hanover Square.)



VANDUZEN STEAM PUMP
THE BEST IN THE WORLD.
Pumps Any Kind of Liquid.
Always in Order, never clogs nor
freezes. Every Pump Guaranteed.
10 SIZES.
200 to 12000 Gallons per Hour.
Cost \$75 to \$750 each. Address
GARTH & CO.,
536 to 542 Craig St. MONTREAL

**E. E. BURLINGAME'S
ASSAY OFFICE & CHEMICAL
LABORATORY**

Established in Colorado, 1886. Samples by mail or express will receive prompt and careful attention.
Gold & Silver Bullion Refined, Melted and Assayed, or Purchased.

Address, 1736 & 1738 Lawrence St., Denver, Colo.

WM. HAMILTON MERRITT, F.G.S.

Associate Royal School of Mines, &c.,

MINING ENGINEER and METALLURGIST,

Will report on Mines and Mineral Properties

ADDRESS:

15 Toronto St., Toronto, Ont.

F. H. MASON, F.C.S.

Member of the American Institute of Mining Engineers
Member of the Society of Arts, Crafts and Industries, London
Member of the Mining Society of Nova Scotia.

**CONSULTING METALLURGIST,
CHEMIST AND ASSAYER.**

Mines and Mineral Lands Sampled, and Assays made. The treatment of Refractory Gold Ores and Concentrates, a specialty.

QUEEN'S BUILDING,

HOLLIS STREET, - - HALIFAX, N.S.

R. T. Hopper & Co.,

**MINERS AND SHIPPERS OF
MINERALS.**

BOARD OF TRADE BUILDING,

MONTREAL, CAN.

Asbestos, crude and manufactured. Phosphate, Mica,
Plumbago, Soapstone, &c.

MICHIGAN MINING SCHOOL.

A State School of Mining Engineering, located in the heart of the Lake Superior mining region, giving practical instruction in Drawing, Blue-printing, Mechanics, Mechanism, Properties of Materials, Graphical Statics, Mechanical and Electrical Engineering, Shop-practice, Analytical and Technical Chemistry, Assaying, Ore Dressing, Metallurgy, Plane, Railroad and Mine Surveying, Hydraulics, Mining, Mineralogy, Petrography, General, Economic, and Field Geology, etc. Has Summer Schools in Surveying, Shop-practice, and Field Geology. Laboratories, Shops and Stamp Mill well equipped. Tuition free. For Catalogues apply to the Director Houghton, Mich.

ROBIN & SADLER

MANUFACTURERS OF

Leather Belting
SPECIALTIES
DYNAMO BELTS
WATERPROOF BELTING
MONTREAL TORONTO
2518 & 2520 NOTRE DAME ST. 129 BAY ST.

W. PELLEW-HARVEY, F.C.S.

Mining, Analytical & Assay Work undertaken

Information concerning the Mining Industry
and Mines of British Columbia given.

ASSAY AND MINING OFFICES: VANCOUVER, B.C.

**ORFORD COPPER CO.,
Copper Smelters**

Works at Constable's Hook, N.J., opposite New Brighton, Staten Island. Copper Ore, Mattes, or Bullion purchased. Advances made on consignments for refining and sale. Specialty made of Silver-bearing Ores and Mattes.

—SELL—

INGOT AND CAKE COPPER.

President, **ROBERT M. THOMPSON,**

Treasurer **G. A. LAND.**

Office 37 to 39 Wall Street, New York.

H. H. FULLER AND CO.

41-45 UPPER WATER STREET, HALIFAX, N.S.

WHOLESALE AND RETAIL DEALERS IN

BUILDERS', BLACKSMITHS' and GENERAL HARDWARE.

MINING AND MINE SUPPLIES

A SPECIALTY.

SOLE AGENTS FOR NOVA SCOTIA FOR

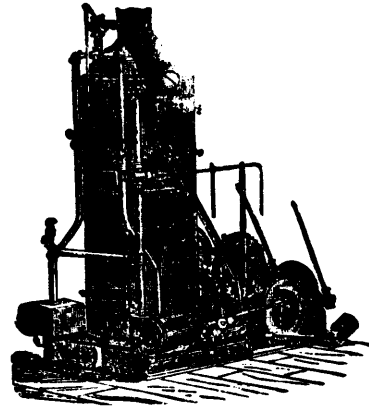
BOSTON BELTING CO'S RUBBER GOODS,
REEVES WOOD SPLIT PULLEYS.

CORRESPONDENCE SOLICITED.

P. O. Box 178. Shipments promptly and carefully attended to.

M. BEATTY & SONS,

WESTLAND, ONT.



HOISTING
ENGINES.
—
ENGINES
FOR
Mines
AND
Inclines.

Horse-Power Hoisters,
Stone Derrick Iron,
Centrifugal Pumps,



DREDGES, DERRICKS, STEAM SHOVELS,
SUSPENSION, CABLEWAYS,
AND OTHER CONTRACTORS PLANT.

J. G. STEWART, . MONTREAL.

OTTAWA POWDER CO., LIMITED.

ESTABLISHED 1891.

MANUFACTURERS OF DYNAMITE AND TRIOLINE.

Dealers in Safety Fuse, Platinum Fuses, Detonators, and all Blasting Supplies.

CENTRAL OFFICE: CENTRAL CHAMBERS, OTTAWA, ONTARIO.

ALL ORDERS PROMPTLY ATTENDED TO UNDER GUARANTEE OF EXCELLENCE.

Pumps

& HYDRAULIC
MACHINERY

STOCK SIZES ALWAYS ON HAND

DRAWINGS AND ESTIMATES
PROMPTLY FURNISHED . .

THE **NORTHEY CO. LTD.** TORONTO, ONTARIO.

THE MINING REVIEW

Canadian
Established 1882

Official Organ of The Mining Society of Nova Scotia; The General Mining Association of the Province of Quebec; The Asbestos Club; and the Representative Exponent of the Mineral Industries of Canada.

B. T. A. BELL, Editor.

Published Monthly.

OFFICES: Slater Building, Ottawa.

VOL. XIV., No. 12

DECEMBER, 1895.

VOL. XIV., No. 12

Mining Legislation in Nova Scotia.

Elsewhere in this issue we publish the report of a committee of the Mining Society of Nova Scotia on the broad subjects of existing and proposed mining legislation, and on the general policy of a Government towards the industry of mining. This report will attract attention not only from the importance of the subjects discussed but because, sooner or later, a similar discussion of like subjects will be provoked in every Province of the Dominion in which mining plays an important part.

The report bears on its face evidence of hasty preparation, many of the subjects being treated in an inadequate way, and the Mining Society has done well in referring the whole matter back to an enlarged committee for revision; nevertheless it is worth while to notice, both favorably and adversely, some of the salient points.

It must be remembered that the suggestions and criticisms contained in the report are not only the gleanings from members of the Society, but embody also the opinions of persons interested in mining who are not members of the Mining Society, but to whom circulars were sent.

Naturally, the first and most important subject is the question of title, and its tenure: for upon security in this respect must rest all claim for capital. It is noteworthy that whereas ten years ago the lease of 21 years duration was rarely criticised in Nova Scotia, there is now a very decided and unanimous opinion that if a leasehold title *only* can be given, that lease should be for very long periods, as for one hundred years; and this too obtains in spite of the fact that six years ago the Act increased the length of a gold lease from 21 to 40 years. The suggestion offered in the report of an indefeasible lease, or lease in perpetuity, under proper and suitable restrictions, was advocated by the old Gold Miners' Association in 1889, and, we believe, was presented to the Government with other recommendations, some of which were adopted.

Such a lease is the inevitable and legitimate conclusion of the best thought on the subject, strengthened by the experience of the attempts which have been made to enlist foreign capital in the mining industry of Nova Scotia. No one is anxious to invest money in any mining enterprise, the title to which is in the nature of a lease surrounded by restrictions and forfeiture penalties, which imperil the title to all personal property acquired, and which an accidental oversight may any day throw into the courts for never-ending litigation.

We suggest to the committee which is to revise the present report, the careful and thorough study of the new Spanish code on the points of title, tenure, forfeiture and exemption, with the expressed opinion that no better system of leasehold title has ever yet been formulated.

The practice of granting leases for precious metals and leases for base metals over the same territory comes up in the committee's report, e.g., a lease of one square mile for copper is granted to one lessee, and to another lessee a portion of the same square mile is granted for gold and silver. The manifest opportunities for disagreement, litigation and so on, need no comment. But we do not think the remedy sug-

gested in the report at all meets the difficulty. To undertake to impose a metallurgical distinction of "free milling" or "refractory" upon ores that are just discovered and not worked (the usual condition of property at time of acquirement from the Government) is piling Ossa upon Pelion in a vain attempt to reach wisdom. The governing principle of laws for the acquisition of undeveloped mineral lands is simplicity and clearness of the conditions imposed, which the suggestion made does not meet. Another difficulty that is apparent to any experienced mining manager is the frequent change in the character of ore from free milling to refractory, and occasionally *vice versa*. A title to all the mineral contained within a given area appears to us the only solution of this difficulty, or, at any rate, a clear prior right to obtain title to all such mineral, with an owner's privilege of sub-leasing, and with the owner's responsibility for all Government dues and royalties.

And, speaking of royalties, we note the emphatic demand of the report for their entire abolition. The report is obscure in this respect, not specifying whether coal, as well as gold, royalties are meant. If the affirmative is true the report is deficient in failing to mention any equivalent source of revenue for the Government. It would appear, however, that only gold royalties are meant, as the report goes on to suggest a royalty on *net values* of gold produced. We must say that we think the member suggesting a fixed net value of \$4.50 per oz. of melted gold is rather giving his case away, and would be inclined to go into the question of the average cost of producing an ounce of gold in Nova Scotia were it not for two reasons, the first of which is lack of space in this already very large issue of the REVIEW, and secondly the utter impracticability of any Government system of royalties upon *net values*.

The Quebec Act has a clause to the effect that royalties may be imposed upon "the value at the mine, after deducting the costs of the extracting," but the clause has never been enforced, it being recognized as impossible of application, and is today a dead letter.

So far as the Government is concerned a royalty upon net values would be a jump from the frying-pan into the fire, for the opportunities such a law would afford for fancy book-keeping, and the fearful and wonderful costs that would be revealed would shut out foreign capital most effectually and for ever. The REVIEW has long been of the opinion that the royalty question in Nova Scotia can safely be left until titles and more important reforms are effected.

The difficulty of dealing with the subject of stolen gold is only fully appreciated when one has endeavored to prosecute and convict workmen who have been found with gold in their possession to which they had no right and by which they could not have honestly come. The Provincial and Dominion Statutes have been pleaded in the courts over and over again, but the offender goes free. It is on account of this difficulty that the managers of gold mines of Nova Scotia are so anxious to have remedial legislation.

The establishment of a Provincial office where all smelted gold must be presented, weighed, stamped and its source noted before it can be sold or offered for sale is a suggestion made by one of the oldest and

most experienced men in gold mining in Nova Scotia, and is worthy of serious consideration. The legal point of whether legislation creating such an office should be Dominion rather than Provincial, since it might be held to belong to banking in some form, is one the committee should have given an opinion upon, as two able lawyers were members of that committee. We suggest that branches of the Dominion Savings Bank should be available for such a purpose, in collaboration with the Provincial authorities. But we are not sanguine that such a scheme will prevent pilfering, nor illegal sales of gold, and it is certain that no machinery is so effectual as the changing-house system which has had the experience of forty years in Australia and the western United States; individual efforts must continue to be made, if backed by statutory enactments so much the better.

We had hoped that the oft-mooted bonus for deep mining had taken a more serious shape than the old story of so much per foot for each foot beyond a prescribed depth. Formerly when this question was raised the bonus was for each foot below 500; now that individual, or rather unaided, efforts have reached and exceeded that depth in several districts, the limit has been increased to 800 feet, and it seems to us that this experience of the last six or seven years is a sufficient argument against Government aid taking the form of a bonus per foot. It is a matter of personal knowledge to us that the Government of Nova Scotia is anxious to encourage deep mining and very willing to give financial help whenever the representatives of the gold mining industry unite upon a measure for aid which is equitable and which shall be applicable to each and every district. Furthermore it is expected that such aid as may be given shall benefit the industry as a *whole*, rather than any single district or company.

Many of the minor difficulties mentioned in the report would vanish, or find their remedies, in an adequate system of inspection. There have frequently appeared in this paper paragraphs respecting the inefficient inspection of Nova Scotia gold mines, but the root of this difficulty is in a mistaken economy which compels the efficient chief inspector to also fill the onerous position of deputy commissioner. This does not excuse, however, the bad appointments which have been made of deputies for the gold fields, who are notoriously unpopular with the managers, and who are not fitted by training or experience for such a responsible position.

The various criticisms upon the "Mines Regulation Act" are from competent practical men of large experience in the coal fields, and their suggestions deserve the most serious consideration.

As much, however, cannot be said for the suggestion regarding the establishment of a school for the training of mining engineers in Nova Scotia. The topic is too broad for a thorough discussion within the limits of this article, but we wish to endeavor to disabuse the minds of the committee that any education "easily and cheaply obtained" is worth the having.

More than any other profession, engineering or otherwise, that of the mining engineer is the hardest to thoroughly master, and embraces a wider range of subjects than any other. Not alone does it require civil, mechanical and hydraulic engineering training, but also that of the chemist, geologist and man of business.

The report is full of thought-provoking matter, and it is an important contribution to the records of the Society. The committee to whom it has been referred, have an opportunity rarely afforded, of producing a second report which shall thoroughly represent Nova Scotia opinion on Nova Scotia mining, and as such be sought for as a reference pamphlet for some time to come.

The Canadian Mining Institute is now *un fait accompli*. A meeting of the delegates from the various societies in the federation will probably be held at Montreal during the sessions of the General Mining Association to consider a programme for the year.

The Cape Breton Coal Trade.

The season of 1895 has not been a particularly bright one in Cape Breton and will not be looked back upon with any very lively feelings of satisfaction either by those who have money invested in its coal fields or by the men who work at and around the mines. For the miners it has been a year of somewhat intermittent work, which, in many cases must have left them with but scant means wherewith to face the rigors of the coming winter. The General Mining Association must be excepted in making these remarks. Although their shipments are a little short of last year's total, the year has been a good one, both for the company and their workmen. Beyond the lengthening of their shipping wharf, which was practically rebuilt last spring, the acquisition of more rolling stock, and the introduction of one or two coal-cutting machines, there has been no noteworthy departure in the conservative management of this company, but the excellent quality and widespread popularity of the "Old Sydney" coal have stood them in good stead once more, and brought them through a slack season with better proportionate results than can be claimed by their powerful neighbors. With congratulations to Mr. Brown and his staff upon the excellent results of their season's work, we pass to a short notice of the Dominion Coal Company's record.

Every one knows, of course, that periods of depression, of more or less severity, occur with unfailling regularity, in the coal trade as in most other lines of business, and have to be borne with equanimity like other inevitable evils that mankind is heir to. It sometimes happens that the business of a particular district is destroyed or permanently injured by competition from fresh sources more highly favored either in the cost or quality of their production, or both, but no blow of this nature has fallen from any quarter to affect the position of Cape Breton coal. In the markets that it has held for some years, at any rate, its position is as sound as it ever was, and we may therefore hope that the depression of 1895 once past, the outlook will once more brighten and the old cheerfulness be restored. The present season opened inauspiciously in every way. Stocks of coal remaining on hand in the spring at many of the large consuming points were larger than usual, while railway and manufacturing interests in the Dominion were so depressed that quantities contracted for, to be delivered over the shipping season, were cut down to as fine a point as possible. The feeling of uncertainty preceding a general election (which, at the time contracts were made, was believed to be imminent) no doubt helped to make consumers more cautious than usual in buying; and though this cause of anxiety passed away, trade throughout Canada remained quiet to the extent of dullness during the year. This state of affairs was not helped out by any opportune strike in the United States, during which a nice round quantity might have been shipped to American ports, as had been the case 12 months back, when the chance was not nearly as welcome as it would have been last spring. The abnormally low price of coal in the States throughout the year has indeed made it impossible to ship coal to that country with much better results than getting back a new dollar for an old one. Thus it comes about that the returns from Cape Breton will show a falling off of something like 150,000 tons as compared with last year, and for this shortage the Dominion Coal Co. will be responsible for about 140,000 tons. On the other hand, although the production has fallen off, prices have been maintained at the old level. What a difference in this respect and what a scramble there would have been in the old days when each colliery was under separate ownership!

One noticeable and satisfactory feature of the season's work has been the manner in which the facilities for rapid handling of the coal have been utilized, resulting in a great saving of time, both in loading and discharging, over previous years. Quite a large saving of money must have been effected in this way as a set-off to disappointments in other directions. It is true that the unprecedented lowering of the river at and above Montreal, caused by the long drought, was a serious drawback, necessitating as it did the shutting out of a large proportion of

cargo each trip for a couple of months from the two "Turret" steamers that had been specially constructed to pass through the Lachine canal. This, notwithstanding the cost of freighting coal to Montreal, must have shown up well as compared with previous years. It may be mentioned that the company have half-a-dozen of these "Turret" steamers chartered for a period of five years.

The system of loading by the Ludlow tower with buckets has been thoroughly tested on the International pier, and it has been conclusively proved that coal shipped in this way turns out far better in appearance than coal shipped by means of the old-fashioned drops. To obviate the expenditure of a large sum in acquiring more buckets and flat cars on which to carry them, the company's engineers have perfected a plan whereby the ordinary hoppers are discharged into a pocket underneath the wharf. From this pocket the coal is dropped easily into a bucket which is hoisted by the tower and lowered into the hold of the vessel alongside the wharf. One bucket does the whole business, and the time saved on the original process of coupling and uncoupling each bucket and swinging it back when empty to its place on the flat car, is very considerable, while the breakage to the coal is little, if any, greater. Usually a steamer is about half loaded by this method and then finished from the shutes. It is said to be the intention of the company to erect another tower on the wharf, and the practice of shipping from the drops will in this case be altogether abandoned. About 450,000 tons will have been shipped at this wharf by the end of the year, or about three-fifths of the whole output of the company's nine collieries. A night shift has been worked during the greater part of the season, and the wharf and approaches are brilliantly illuminated at night by the arc electric light furnished from the company's own plant. The new wharf at Louisburg is considerably higher than the International, and much narrower. The method of shipping there is by shutes altogether. The capital expenditure on construction and improvements has again been large. In addition to the new wharf in Louisburg harbor mentioned above, the railway to that port has been completed and equipped in first class style. A great deal has also been done in developing and equipping the collieries, particularly at "Dominion" and the "Hub," as will be seen by reference to the illustrations given elsewhere in our columns. With the erection of a commodious and well-furnished machine shop at Glace Bay, the plan of centralizing the works at that point may be said to have been finally completed. The mines are now well provided with improved facilities for cutting, hoisting and screening coal, the railway department is in first class working order, well stocked with new and powerful locomotives and hoppers to a capacity of some 8,000 tons, and the two new piers at Sydney and Louisburg are in a position to ship all the coal that the rolling-stock can give them. The company should therefore be able to cry a halt in their lavish expenditure for a while. They are now ready to reap the benefits of their enterprise, from larger outputs and cheaper production and shipments f.o.b. The opportunity has not been afforded them this year, but they are quite prepared for it when it comes, and we hope that next year they will have the chance of doing a greatly increased business and thoroughly testing the value of all their improvements.

By the centring of shipments at the two terminal piers, Sydney and Louisburg, the smaller out-ports of Port Morien and Glace Bay, at which large shipments were made up to the present year, have naturally suffered, and, quite as naturally, people owning property and doing business at these places have not been slow to air their grievances and to complain bitterly of the company's policy. The directors, of course, shape their policy according to business principles, undeterred by sentiment, but it is difficult to persuade a man to see the logical beauty of this when he sees his business dwindled to a shadow of its former state. Port Morien has suffered most severely in this respect. Not only has the quantity of coal shipped there fallen to below 30,000 tons, but the output from the Gowrie mine has fallen off in nearly the same proportion, only a few thousand tons of this coal having been shipped at the terminal

piers. The coal for some reason has lost the popularity it enjoyed in the days when the Archibalds worked the mine, and consumers have preferred coals from the company's other mines at the same price. A new manager, with a record of much good and effective work accomplished at "Bridgeport" and "Dominion," has recently been placed there, and with good clean coal coming from the "Gowrie" again, we may hope for a return to something like the old times. As a shipping port, however, Port Morien may be said to be practically dead, and we presume that Glace Bay is *in extremis*, or approaching that state. Only a few of the smaller steamers were loaded there this year, and the shipments from the Glace Bay and Caledonia piers fell away to a third of the quantity shipped last year. As a set-off in some measure to the loss of shipping, the inhabitants of Glace Bay can count the centring of the company's offices and works in their midst and also the opening up of the "Hub" mine. They do not seem to look upon these as a *quid pro quo*, but are kicking vigorously and loudly lamenting the "good old days." To judge from certain articles and letters in the local press, one might imagine that the resident manager, Mr. David McKeen, M.P., himself ruthlessly dictates these changes, while the real truth is, we believe, that but for his efforts in opposition, the lopping off and shutting up would have been far more sensational and much less gradual than has actually been the case. And this reminds us that a rumor is now and again set afloat to the effect that the Dominion Coal Co., its properties and franchises, are destined ere long to drop into the maw of Pennsylvania coal barons. For ourselves we place no sort of credence in these reports, but the question is one that, in a somewhat different aspect, creates a mild panic among the company's workmen in Cape Breton whenever the future of the company comes up for discussion. Mr. McKeen has recently purchased a residential estate in Halifax, and it is known and regretted that his health has been uncertain for some time past. Hence the impression that has gone abroad that his resignation from the cares of his responsible post may be looked for at no distant date. The horny-handed sons of toil are vexing their souls with conjectures as to who his successor will be. Will it be another Canadian, accustomed to and in sympathy with Cape Breton miners and their little ways, or will it, they ask, be a smart, up-to-date American from Pennsylvania, who will want to work Sundays as well as week-days, a "hustling" slave-driver from the regions where Poles, Hungarians and Italians, Jews, Turks and infidels are employed? As a Canadian paper, writing for Canadians, we hope, in the first place, that Mr. McKeen may not feel called upon to resign for some years to come, and, secondly, that when he does step down, another Canadian may be found to succeed him. Mr. Whitney and his associates have, we believe, so far treated their employees in Cape Breton with all possible kindness, and they can be trusted, we feel sure, to deal considerately with the natural ingrained preferences and prejudices of the large body of men who came into their employ with the properties they acquired three years ago.

To resume at the point where we digressed, Port Morien and Glace Bay are not the only places with grievances against the company. Sydney, the shire town, has also its tale of woe. Disappointed in its expectations that the head offices and shops would be located within its borders, it now finds that the Reserve wharf, which has been used during the year as an auxiliary to the International, is closed down and likely to remain permanently idle. This is a blow to the town, and some of the citizens talk heroically of bridging the area of the harbor known as Muggah's creek, and thus bringing the International pier within easy distance of their stores. We should like to see the citizens of Sydney unite for once in carrying through this enterprise, but we fear the millennium is a long way off yet.

The Victoria wharf has shared with the Reserve most of the bunkering business and the loading of sailing vessels, and inasmuch as the Victoria colliery is the only one which is not connected with the Sydney and Louisburg Railway, this pier seems to have a chance of remaining in operation for some time to come—at any rate, until facilities are pro-

vided at the International for bunkering steamers and loading sailing craft, without interfering with the loading of the large cargo boats.

The Dominion Coal Co. have during the past 12 months received rather more than their customary share of criticism and abuse at the hands of the local press, but, curiously enough, political parties have changed sides. It is now the Liberal organ that mercilessly belabors the outcome of its leader, Mr. Fielding's legislation, while the Conservative press, so unkind in its remarks at the outset, now magnanimously defends the management from the grave charges brought against it. The *Island Reporter* smites its bosom and protests to heaven against "bulldozing tyranny," "iron-heeled monopoly," "soul-less corporation," &c., and all, forsooth, because Mr. David McKeen is again the nominee of the Conservative party to contest the county at the next general election! In its attempts to bring him into disrepute, the *Reporter* has been industriously, nay, voraciously, "eating crow" for some months past and taking back all it ever said in favor of the syndicate legislation, very much to the amusement of those who remember the same paper's affectionate slobbering over what it now abuses so roundly. It has, moreover, with most manifest injustice, laid directly to the charge of Mr. McKeen every change made by his company in their business whereby any district or class of individuals may have suffered. Mr. McKeen's bitterest opponents must surely see that he is at the present time all that stands in the breach between the people of Cape Breton county and that "soul-less monopoly" and "iron-heeled tyranny" (to use their own phrases), and if their recantation of faith in the Dominion Coal Co. is sincere, they must at the same time confess that he is the best friend of every man whose livelihood depends directly or indirectly upon that company.

Some local Liberals have gone so far as to threaten Mr. Fielding with secession, not only from himself and party, but with the total severance of Cape Breton from Nova Scotia and the establishment of a parliament in Sydney which will speedily legislate out of existence the unspeakable tyranny that Mr. Fielding has imposed upon the island,—all of which is very funny. The *Reporter* is rapidly making good its claim to a front rank among the weekly comic papers of this continent. It has made rather a mess of the "company's stores" question. His political enemies say that these stores were forced upon the president and directors, sorely against their wills, by that omnipotent arch-fiend, Mr. McKeen, but the attempt to convince the workmen that their welfare and ultimate salvation were bound up in the extinction of company's stores, was a signal failure as might have been expected. The quarrel has now, however, been taken up by some of the merchants who have formed a league, with the object of bringing pressure on the Local Government to deprive the company of the power they possess under their charter, of running their own stores. If the tone of the *Island Reporter* is any reflection of the feeling of the Liberals throughout Nova Scotia, the Merchants' League has an easy task before it. It strikes us that if these merchants had the business of the company's stores in their hands at the present time, they would be pretty badly "in the soup" by the month of May. Either that or the miners would have been starved in the meantime. If mines' stores are abandoned the step will not be taken in the interests of the men, but of the company.

The bad feeling that undoubtedly exists in Cape Breton in regard to the Dominion Coal Co. is much to be regretted. It is traceable in a great measure, we believe, to the fact that times have been dull and earnings below the average. Money is scarce and everybody is grumbling. The Dominion Coal Co. have turned things upside down and it will take some time before people get used to the changes. But given a prosperous year of steady work and we prophesy that the friction will disappear, and we close these remarks with an expression of hope that before another twelve months have passed, even the *Island Reporter* will have ceased to abuse the Dominion Coal Co.

EN PASSANT.

Mr. John E. Hardman, S.B., Mining Engineer, has been offered and, we understand, has accepted the chair of mining engineering at McGill University, vacated by Prof. Carlyle. This is an appointment which will meet with universal satisfaction among the mining profession, and the faculty of applied science is to be congratulated on the acquisition of an engineer of so much ability and wide experience in mining and metallurgical practice. Mr. Hardman, we believe, will hereafter make his headquarters at Montreal, still, however, retaining his connection with active mining and consulting work.

Mr. F. A. Halsey, for many years associated with the business of the Rand Drill Company of New York and the Canadian Rand Drill Company of Sherbrooke, will shortly become editor of that very excellent technical journal the *Scientific Machinist*. Mr. Halsey will, however, retain his connection with the Rand company as consulting engineer.

Dr. George M. Dawson, C.M.G., has had the grim satisfaction of perusing in a number of foreign scientific and technical journals several highly eulogistic obituary notices, the esteemed director of our Geological Survey evidently being the victim of an exceedingly unfortunate mistake in the transmission of the announcement of the death of Dr. Lawson, of Dalhousie College, Halifax, another eminent Canadian worker in the field of natural science. Perhaps some of our exchanges will kindly make this correction.

The annual meeting of the General Mining Association of Quebec will be held in the New Club Room, Windsor hotel, Montreal, on Wednesday, Thursday and Friday, 8th, 9th, 10th, January next. The election of officers and council will be held, as in former years, at the morning session on Wednesday. Thursday evening will be devoted to the mining students, for which a number of papers have been entered in competition for the Association's awards. Among the contributors of papers we notice:— Dr. R. W. Ells, Ottawa; Mr. H. P. H. Brumell, Ottawa; Dr. R. W. Raymond, New York; Mr. George E. Drummond, Montreal; Mr. J. S. Higginson, Buckingham; Mr. H. C. Baker, B.A.Sc., Templeton; Mr. J. Obalski, M.E., Inspector of Mines, Quebec; Mr. John Blue, C. & M. E., Capelton; Mr. John J. Penhale, Black Lake; Mr. B. T. A. Bell, Ottawa; Mr. J. B. Hobson, M.E., Vancouver, B.C.; Mr. W. T. Bonner, Montreal; Mr. R. Greene, Montreal; Mr. J. T. Donald, M.A., Montreal; Mr. W. Morton Webb, Montreal; Mr. R. W. Brock, Kingston; Mr. F. J. Pope, Kingston, and Mr. C. Garnett Rothwell, Kingston.

It is generally conceded that the Quebec mining law as it now stands, thanks to our good friend the Hon. Mr. Flynn, is a fairly liberal and equitable legislative enactment, although there still remains on the statute book various clauses which might be abolished with benefit to the industry and investment in minerals. Doubtless Dr. Raymond, probably the greatest authority we have on mining law, Mr. Hardman, and others experienced in the legislation of the countries, will have something of value to contribute to the discussion on this part of the proceedings.

The mining laboratory at the School of Mining, Kingston, has been engaged in testing several lots of gold quartz, and has already demonstrated its usefulness in this sphere. A number of lots have been shown to be too poor to warrant further development, to the great but natural disappointment of the owners. But this was not the case with a quantity lately crushed and amalgamated. The yield was a brick weighing 9 oz. 15 dwt. 9 grs. from 1990 lbs. of rock milled. The mill extracted 94 per cent. of the assay value and produced 185 lbs. of concentrates worth \$38.03 a ton. This ore was from the Wahnapietæ region.



DOMINION COAL CO. Ltd.—NEW PIT HEAD HUB COLLIERY, CAPE BRETON.



DOMINION COAL CO. Ltd.—DOMINION No. 1 COLLIERY CAPE BRETON.

St. Lawrence Coal Deliveries, 1895.

We are indebted to Messrs Carbray, Routh & Company, Montreal, for the following comparative statement of the deliveries of Nova Scotia and foreign coal to St. Lawrence ports during the season of navigation just closed. The figures show a marked decrease over the previous year of the returns of lower port coal, while the foreign deliveries were increased by 14,771 tons. This may be accounted for to some extent by the general dullness of trade last winter, but another explanation is to be

found in the fact that in 1894 about 30,000 tons were taken from the Montreal market to fill American orders consequent upon the great strike in the U. S. During the year about 30,000 tons of slack coal were imported from Great Britain in excess of usual receipts. American bituminous and anthracite (which is admitted free) were sold at lower rates, and the former found a market even at Montreal in competition with Provincial coals. Coke, which is also admitted free, was sold at the ovens in Pennsylvania under \$1.00 per ton.

Name of Company.	Montreal.		Sorel.		Three Rivers.		Quebec.		Totals.	
	1894	1895	1894	1895	1894	1895	1894	1895	1894	1895
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
General Mining Association.....	74,359	73,273	8,485	8,686	3,952	1,843	22,555	31,633	109,351	115,435
Dominion Coal Co.....	512,269	415,081	3,151	8,223	5,529	7,957	23,173	23,252	544,122	454,513
Intercolonial Coal Co.....	69,151	66,571							69,151	66,571
Nova Scotia Totals.....	655,779	554,925	11,636	16,909	9,481	9,800	45,728	54,885	822,624	636,519
Scotch, English, Welsh and American Bituminous (By sea only.)	55,849	79,777	1,932				15,877	8,652	73,658	88,429
Total deliveries.....	711,628	634,702	13,568	16,909	9,481	9,800	61,605	63,537	796,282	724,948

Gold Mining in Nova Scotia.

We are indebted to Mr. W. H. Brown of the Mines Office for the following returns of the gold reported for royalty since those given in our last issue.

Name of District.	Name of Mill or Co.	Months in which Crushing was done and Returns Made.	Quartz	Yield of Gold.			Total Yield		
			Crushed.	—			—		
			No. of Tons	ozs.	dwt.	grs.	ozs.	dwt.	grs.
Sherbrooke.....	McNaughton Co.....	October, November.....	450	235	10	0			
".....	Stellarton Gold Co.....	November.....	26	42	17	0			
".....	New Glasgow Co.....	October, November.....	619	232	5	0			
			1,095	510	12	0	510	12	0
Moose River and Caribou.....	Moose River Gold Mining Co.....	October, November.....	500	140	0	0			
".....	Damas Touquoy.....	October, November.....	1,103	70	15	0			
".....	W. A. Sanders.....	October.....	712	123	15	0			
".....	A. M. Jack.....	October.....	28	28	0	0			
			2,343	362	10	0	362	10	0
Uniacke.....	Golden Lode.....	October.....	25½	224	6	4			
".....	John Madill.....	October.....	265	22	18	16			
".....	D. McDonald.....	September.....	22	11	8	0			
			312½	258	12	20	258	12	20
Lake Catcha.....	Jno. Anderson.....	November.....	50	5	10	0			
".....	Oxford Mill.....	July, August.....	11	19	17	0			
			61	25	7	0	25	7	0
Stormont.....	Richardson Gold Mining Co.....	October.....	892	154	7	0			
".....	Antigonish Gold Mining Co.....	July, August, September.....	228	90	1	23			
			1,120	244	8	23	244	8	23
Brookfield, Queens.....	W. L. Libbey Mill.....	October, November.....	1,008	715	9	15	715	9	15
Montague.....	Nova Scotia Gold Mines.....	July, August, September, October, November.....	254½	118	5	0	118	5	0
Kemptville.....	Kemp Mining Co.....	October.....	35	10	0	0	10	0	0
15 Mile Stream.....	New Egerton Co.....	October, November.....	1,147	710	18	0	710	18	0
Wine Harbor.....	W. A. Adams.....	September, October.....	248	145	12	11	145	12	11
Gold River.....	T. N. Baker.....	October.....	30	54	6	0	54	6	0
Liscomb Lake.....	John Powers.....	November.....	49	26	7	0	26	7	0
							3,182	8	21
		Reported in last issue.....					13,249	15	8
		Total.....					16,432	4	5

The second volume of Transactions, being the journal of the Association for the years 1894-95, was issued to members on 13th instant. It is a highly creditable production, nicely bound and illustrated, the contents extending over some 300 pp., containing many papers of interest and value to the mining operators of the Dominion.

Mr. Frank T. Shutt's able paper on "Phosphoric Acid in Agriculture," contributed at the Quebec meeting and published lately in these columns is, by order of the Hon. Minister of Agriculture, being reproduced in the annual report of the department. The Quebec and Ontario Governments might emulate this example with advantage to the farmers and the phosphate and fertilizer industries.

Mr. W. A. Carlyle, M.E., left Montreal on 26th instant to take up his duties as mineralogist to the Government of British Columbia. Needless to say the hearty good wishes of a large circle of friends in the mining profession follow him to his new sphere of labor.

The interpretation of the law respecting the free admission of mining machinery still creates friction at a number of ports of entry, and a strong and united effort will shortly be made to have this matter placed upon a more uniform basis. In all likelihood a deputation will interview the Government early next month.

Rapid progress is being made with the construction of the smelting works at Trail Landing, B.C., and the first furnace will be blown in some time this month. Mr. F. A. Heinze, of the Montana Ore Purchasing Co. at Butte City, Montana, the owner of the works, has kindly furnished us with the following particulars:

"The capacity of the smelter will be in the neighborhood of 125 tons daily. It is located on the bluff of the Columbia River, just above the town of Trail, and will be connected by some 15 miles of railroad, narrow gauge, with the town of Rossland. The plant proper consists of 150-ton sampling works and O'Hara calcining department, containing O'Hara furnaces and circular calciners of the most approved pattern, and a smelter building 70 feet wide by 130 long, and 40 feet from the sill to the bottom of the chords of the building. This building will contain two reverberatory furnaces of the most approved pattern and design, as lately erected for the Butte smelting practice, and one blast furnace. The works, besides the individual reverberatory stacks, will have a large stack connecting with the calciners and blast furnace dust chambers, which will be 16 feet square at the base (outside diameter), and 150 feet high, containing half a million brick. As soon as the buildings are completed and the stacks up we will be pleased to forward you photographs. The works when completed will cost a little over \$200,000.00."

The Eastern Development Co., Ltd., owning the Coxheath copper mines, Cape Breton, is being reorganized under name of the Cape Breton Copper Company. Captain Gragg, of Boston, one of the principals, and Messrs. Macdougall and Gillies, members of parliament for the county, were in Ottawa the other day making arrangements for the new works, which, we understand, are to be built forthwith.

One of the most striking improvements that have taken place in the iron trade of late years has been the economy in the consumption of coal for all metallurgical purposes. The average consumption of coal in the pig-iron industry of Great Britain was as follows in each of the years 1873 and 1894:

	Tons.
1873.....	2'54
1894.....	2'00

From which it follows that in twenty years the Mother Country has saved more than half a ton of coal for every ton of pig-iron smelted. On an output of over 17½ million tons a year—which this year will witness—this is a considerable item.

The German papers give some interesting accounts of the means taken in the Dortmund district to provide miners with the means of changing their wet, dirty clothes on leaving the mines, and washing and dressing before they go home. A series of experiments were made as to the best methods of enabling the miners to perform their ablutions, and dress before going home. At first opposition to the baths was experienced, and then the benefits of the plunge baths were recognized, and crowds of miners availed themselves of them, and it was found that a great deal of water would be required. Finally the shower bath was seen to be the bath of the future, as less water was required a greater number of men could be accommodated: they had all privacy, and the rain drops falling on the body exercised quickly a cleansing effect. Now there are provided in the Dortmund district alone 209 lavatories at 167 galleries with 22 shafts, and they afford full washing accommodation to 132,450 men, or about 95.7 per cent. of the entire mining population.

The ironworks of Mr. F. Buttgenbach are situated on the left bank of the lower Rhine, in a regular thunderstorm track, and are hence amply provided with lightning conductors, which are duly tested from time to time. In spite of this, the men often reported that lightning struck the heaps of iron on the yard or went down the blast furnaces far more frequently than it appeared to travel down the much higher lightning conductors close by. This year, Mr. Buttgenbach, who takes a special interest in meteorology, had an opportunity of convincing himself that his men were right. He was standing near the mouth of a furnace in operation when a storm approached. He was suddenly knocked down; several others nearer the mouth were stunned for some moments, and declared that they saw a column of fire rush down the furnace. A dense cloud of smoke and dust followed the flash. The men down below came up because they heard a terrible roar, which they ascribed to a stroke of lightning. The slag which had been flowing sluggishly streamed out more rapidly for some time. Chemical analysis revealed nothing abnormal, and the furnace did not show much damage.

The mention of hoisting speed of 1,700 feet per minute, in a Hungarian mine, in a recent report, has called out some interesting facts on this subject. The following communication is from W. M. Ruth, of the Edward P. Allis Company, of Milwaukee, Wisconsin:

"I notice in a recent number an item on the hoisting speeds employed in a Hungarian mine, *i.e.*, a speed of 1,700 feet per minute, or 19.3 miles per hour. At the Tamarack mine, in the Lake Superior copper region, thirty-nine cars per hour were recently raised from a depth of 3,186 feet for six consecutive hours. This is equivalent to an average hoisting speed of 3,180 feet per minute, or 36.1 miles an hour, allowing a trifle over one minute for loading and unloading the cages. The load of rock 6,720 pounds. This work was performed with a direct-acting or first motion hoisting engine made by the Edward P. Allis Company. The steam cylinders are 42x84 inches, and the hoisting drum 30 feet in diameter. It has been in service several years. At another shaft owned by the Tamarack Mining Company, a trip was made some days ago, from a depth of 4,500 feet in one and one-quarter minute, equivalent to a speed of 3,600 feet per minute, or nearly 41 miles an hour. At this shaft, the engine, which was also built by the Edward P. Allis Company, is 32x84 inches, and the hoisting drum, a double cone, 13½ feet and 36 feet diameter; each cone will carry 6,000 feet of rope. For short periods speeds as high as 4,200 feet per minute have been observed."

This year Florida will market not less than 325,000 tons of high grade phosphate. This output will be increased next year about 15 per cent. About 80,000 tons are now on hand, and practically all of this has been sold at prices ranging from \$4 per ton for 78 per cent rock to \$3.25 and upward for the 75 per cent grade.

Two things confront the phosphate miners in Florida today: first, the low price of the product, caused by over production; second, the really great danger of the extinction of many of the mines, and the necessity of having to find new grounds for the expensive plants which must before long be moved. The ruling prices today are very low. The shipments from this State for the year will approximate 325,000 tons, with an estimated increase of 25,000 to 50,000 tons additional in 1896.

MINING IN BRITISH COLUMBIA.

The Secretary-Treasurer of the Kootenay and Columbia Prospecting and Mining Co., Ottawa reports the following smelter returns on four carloads of ore shipped from the Wellington mine, Slocan district:—

1st shipment.	27,780 lbs., 175.4 ozs. silver	\$1,186 99
	4,915 " @ \$83.24	198 24
2nd shipment.	31,830 " @ 73.67	1,172 45
3rd shipment.	20,992 " @ 150.26	1,577 12
4th shipment.	34,155 " @ 172.47	2,907 96
		<u>\$7,042 76</u>
Less cost of extraction		3,002 00
Net profit		\$4,040 76

The last shipment gave 320 ozs. silver and 14 1/8 % lead to ton of 2,000 lbs. The first two cars went to Canadian smelter at Pilot Bay and the last to United Smelting Co., Smelter, Montana.

The working force on the Wellington will be doubled next month. Eleven men are now employed. A shipment made the beginning of this month returned 158 ozs. silver and 15 % lead, and netted \$1,160.14, sufficient to pay expenses for the month.

The Le Roi Mining Co. is said to have declared another five-cent dividend on December 1st.

The mining companies registered to do business in West Kootenay since January 1st, 1891, have a combined capitalization of \$35,675,000.

The management of the Le Roi mine believes in the diamond drill. Recently a trial was made of six days at a cost not to exceed \$100, which would have required not less than sixty days and an expenditure of \$1,200 in the old way. In the Silver King mine at Nelson all of the exploring is done with diamond drills. Recently they sent the drill across the ledge and at 300 feet the ore body was 8 feet wide. From a different point the drill was sunk to 600 feet and the vein was 9 feet wide, and at 800 feet the ore body held its own. There is no uncertainty about this; the owners know that they have ore at those depths.

The brick work on the Trail Smelter has not progressed as rapidly as was expected. The furnaces will not be ready by January 1. The Smelter Company is now receiving ore as per their contract from the Le Roi and more than 10,000 tons are already piled up.

The Canadian Pacific Mining and Milling Company has completed its wharf at Woodbury creek, and some 28,000 feet of lumber for a flume have been delivered. The force is busy at present putting in the timbers for the flume and power building. The water wheel and compressor are expected next week, having been shipped from San Francisco some ten days ago. This mine will soon be a shipper, a large body of ore being reported in sight.

At the Hall Mines smelter at Nelson, the office and assay building is nearly completed, the sampling works building is ready for the machinery, the boiler and engine room looks as if steam only was needed to set the machinery in motion, the frame of the furnace building is up, the flue-dust chamber is completed, a reservoir that will hold 25,000 gallons of water is nearly completed, the sidchill grading for the railway spur will be finished in a few days, a boarding-house is enclosed, the tramway is delivering ore, and it looks as if the smelter would be in operation by New Year's day.

Arrangements have been completed for the erection of a cyanide reduction works at Bakerville. The plant will be used for treating the ores of the Black Jack Quartz Milling Company, and any that may be sent for complete mill runs. The milling, as far as cyanide is concerned, will be under the management of the Cassel Gold Extracting Co., of Glasgow, represented by W. Pellew-Harvey, F.C.S. The resident manager will be Mr. S. J. Marsh. The plant will be built at once by the British Columbia Iron Works Co., of Vancouver. It is not at all unlikely that a mill will be erected at Alberni, B.C., under the same auspices, as the Alberni ores have proved particularly amenable to the cyanide process.

The first claim in the Slocan was located on Sept. 9, 1891, and recorded on Sept. 26. During the balance of that year 191 claims were recorded. In 1892 the number reached 633, in 1893, 398; in 1894, 270; and in 1895, with part of the year yet to be heard from, the number has been 635; making this the banner year since the famous district was first discovered.

Since 1891, forty-eight mining companies have been incorporated in the West Kootenay district, with a capitalization of \$35,675,000. The largest of these are the Le Roi and Hall mines, limited, each with a capital of \$2,500,000. There are four companies with a capital of \$2,000,000 and over nine of \$1,000,000, one of \$800,000, one of \$600,000, nineteen with \$500,000, one of \$400,000, four with \$250,000, one of \$225,000, one of \$200,000, six with \$100,000, and one of \$50,000. This is considered a pretty good showing for a district not five years old and shows the great possibilities of the country. There are other mines not incorporated which will be thoroughly developed next year, and no doubt add largely to the wealth of the district—mines in new districts which have been discovered during the past summer. In fact, there can be no estimate made of what the next season will do for West Kootenay. With the increased transportation facilities now being offered there will be increased production.

The memorandum of association of the British Columbia Pottery Co., Ltd., is published in the British Columbia Gazette. The trustees are James Dunsinuir, Charles A. Vernon and Joseph Hunter, of Victoria, and the principal place of business is 22 1/2 Pandora street, Victoria. The capital stock is \$150,000. The object of the company is to acquire the business now carried on under the name of the British Columbia Pottery Co.

In the fore part of the year the *Tribune*, Nelson, estimated that the output of the mines of Kootenay for the year 1895 would be worth \$3,000,000. That estimate is not far wrong. It now predicts that the output in 1896 will be worth \$10,000,000, and makes the following estimate:

	Value of Product
Hall Mines smelter, Nelson	\$1,725,000
Pilot Bay smelter	725,000
Heinze smelter, Trail	1,400,000
Slocan Star mine, Sandon	1,825,000
Alamo concentrator and mines, Three Forks	730,000
War Eagle mine, Rosland	1,400,000
Josie, Crown Point, and other Trail Creek district mines	730,000
Noble Five, Reco, and other Slocan district mines	912,500
Poorman and other gold mines at Nelson	50,000
Mines at Ainsworth, in addition to ore shipped to Pilot Bay smelter	100,000
North Star and other mines in East Kootenay	273,750
Placer mines in East and West Kootenay	50,000
Total	\$10,040,750

The Le Roi has had a compressor plant for some time and has had a number of power drills at work. The company, says the Rosland *Mines*, has just added a diamond drill to its equipment, and this, driven by an electric motor, is doing some fine prospecting work on the west end of the Le Roi ground. The new drill plant of the War Eagle will soon be installed. It will have a capacity of twenty drills and will be one of the most substantially constructed plants in the country. This will be in operation by January 1 and will revolutionize the output of the War Eagle and its associate properties. The Center Star Company will have its seven-drill plant ready for service within thirty days. The building is complete and the machinery all on the ground ready for installation. A two-drill plant has just been set to work on the Lee and Maid. If the Cliff deal goes through a drill plant will be put up on that property immediately. The same can be said of every mine to be worked by the English syndicate for whom J. H. Clemes is acting. The largest drill plant of the camp will probably be put in for the Kootenay and Columbia. The Trail Mining Company, the owners of these properties, will send here one of the thirty-drill compressors now in use by Messrs. Mason, Hoge & Co. on the big Chicago drainage canal. This plant will be installed as early next spring as the machinery can be got in. Both the Crown Point and Iron Horse Companies have asked for bids on supplying drill plants and these bids have been handed in. Neither plant will be of less capacity than five drills. Arrangements have been made by both the Josie and the St. Elmo Companies to put in compressors.

The Fishback Hydraulic Gold Mining Co. has been incorporated at Seattle, Wash., with a capitalization of \$300,000, by J. H. McGraw, J. P. Hoyt, C. H. Fishback, H. G. Struve and M. McMicken, to operate in British Columbia.

The St. Mary Mining Co. has been incorporated at Spokane by V. D. Williams, C. S. Voorhees, J. L. Wilson, R. H. Voorhees, of Spokane, and J. H. Burke, of Rosland, the objects being general mining in British Columbia.

The owners of the Yakima group and Cumberland mine, Slocan district, have organized two companies to work these properties. The one to work the Yakima group is called the Sunshine Mining Company and the one to work the Cumberland is called the Cumberland Mining Company. Each company's capital is \$500,000 and both have the same officers, namely, W. H. Yawkey, president; N. D. Moore, vice-president and manager; and W. C. Yawkey, secretary and treasurer. Head office of both companies, Three Forks.

The Horselly Hydraulic mine has been shut down for the season. It is reported that the recent and last clean-up at the Horselly will net about \$7,000 or \$8,000, which will bring the output of the mine up to about \$49,000 or \$50,000 for the present year, and an additional clean-up of \$6,000 for last season would aggregate \$55,000 or \$56,000 as the total output of the mine. The running expenses of the mine are about \$7,000 a month since its equipment, so that enough has been taken out to pay for one year's work on the mine. When it is considered that only about 60 or 70 days' pipping all told gave the above output mining men will agree that the Horselly is a good producer. The physical difficulties have been great, however, and it is a matter for congratulation that the cement which gave so much trouble is about run out. It has been followed to a thin streak that cannot now give any trouble to speak of, and it is not probable it will be met again in the direction now being followed. Everything at the Horselly is in readiness for work to commence as soon as the frost vanishes next spring.

A correspondent writing from the Cariboo district says:—"Mining here is yet in its infancy, although over \$50,000,000 has been taken out of the creek, yet if all the ground which has been mined either by drifting or hydraulicing were put side by side it would not average over five miles square, and I think I am within a safe limit when I say it would not amount to more than that. In my opinion they have not commenced to mine here yet. There are many places that twenty-five years ago it would not pay to work, which today would pay handsome dividends. You can take a pan of dirt anywhere on the hillsides, even in the rocks, and get colors of gold—sometimes three, four and five cents to the pan. But the great drawback to mining here is the lack of means to bring the water to where it is required for hydraulicing; and, on the other hand, the presence of too much water in the miles and miles of unworked streams whose bottoms have never been worked because the water could not be kept down. The cost of pumping was too great in the olden days. When one mine stopped pumping on any creek, all had to stop. In these days of electricity, however, we may look for a revival of mining in the old deep workings which will surprise the world with their hidden treasures. Already borings have been put down to test some of the creek bottoms, and the prospects obtained have been astonishing, some of which I will give later on. The Cariboo Gold Fields Company is rushing its flume to completion, and by the end of the month will have it ready for blocking. There are about seventy men at work for the company in the woods, and on the flume and at the mill. Peter Egan is rushing out the lumber from his portable mill for the works, and there are four teams of four horses each hauling lumber and timber. Another contract for 150 feet of a tunnel on the Piness group of claims, owned by the Cariboo Gold Reef's Company, has been let to Mr. Blackwood, who now has a force of men at work driving day and night. The first contract of 100 feet having proved profitable, it was decided to go on with the present work. The Cariboo Gold Fields Company is also driving a tunnel on a ledge on Prosperpine mountain, which is showing up in good shape. There have been some very fair samples of ore brought in this summer as the result of careful prospecting, and some of them have yielded well in assaying, more of which I will tell you when I come to quartz."

COAL MINING IN NOVA SCOTIA.

General Mining Association (Limited)—Mr. R. H. Brown, manager of the Old Sydney mines, has kindly furnished the following particulars of operations during the year:

"An air compressor (Ingersoll, 14¼x18 in.), has been set up on the surface to pump the water from the 'dip' portion of the workings to the shaft bottom. The air is carried a distance of one mile underground to the furthest pump. This air compressor also operates two coal cutting machines, (an Ingersoll and a Harrison), this being the first application of machinery to coal cutting at this colliery. Steam is supplied to the air compressor by a tubular boiler at a pressure of 75 or 80 lbs. to the square inch. The underground pumps employed in connection with the air compressing plant are a Northey, 7½x4x10 in., and a Worthington, 4½x2¾x4 in.

The old pulley legs and pithead frame at the pumping shaft at Princess pit, where the workmen are lowered into and raised from their work underground, have been replaced by new ones, made of pitch pine.

A bore-hole five inches in diameter has been put down to a depth of 155 feet for obtaining a supply of pure water for the use of the workmen of the colliery.

Ten new cottages of improved design have been this summer added to the large number of houses for workmen at the colliery.

The superstructure or trestle work of our eastern pier at the loading ground at North Sydney, has been replaced by new, of increased height and with new drop and shutes for shipping the coal. The approach to this pier over the public road has also been renewed; rolled steel girders with pitch pine supports taking the place of the oak stringers hitherto used.

As for our output of coal I hope to make it 250,000 tons, though if December shipments do not come up to last year's we may fall short of that quantity. There is no predicting what December's trade may be. Of course an output of 250,000 tons does not mean a sale to that amount, for a proportion of the coal must always be used for working the mines and providing the workmen with fuel gratuitously. For instance in 1894 our actual gross output was 256,000 tons, while our sales were:

Shipped.....	218,028
Sold to Intercolonial Railway.....	4,756
Other sales by land, &c.....	9,159

Total number of tons sold..... 231,943

The labor employed at this colliery for the year 1895 may be put down as 490 men and boys employed underground, and 265 men and boys on the surface.

Acadia Coal Co., (Limited)—Mr. H. S. Poole writes:—The Acadia pit took some time to get into full operation again after the surface fire, but it is now equipped with a more thorough screening apparatus than before, Briart and other shaking screens and picking belts. At the Vale there has been no change whatever. At the Albion the Ford pit continues to be used as a pumping station only for the rest of the works. The fan at the third seam has been replaced by a Walker's Indestructible, driven by a compound engine of greater capacity.

Chignecto Colliery—This colliery has been operated in a small way, under lease, by Mr. James Baird, and the shipments for the year will not exceed 600 tons.

ASBESTOS AND CHROMIC IRON.

(From our own Correspondent.)

There has been the usual amount of activity at the asbestos mines of Thetford and Black Lake during the season just closing, and the output in most cases has been up to former years. A small falling off may be noticed in one or two instances, but on the whole I believe the output for 1895 will probably exceed that of 1894. Prices range about the same as at the beginning of the year.

Improvements in the methods of cleaning the fibre have reduced the cost of this branch considerably, enabling the miner to place a very clean, superior grade on the market, and at the same time to recover all the short fibre which, under the old system of hand cobbing, was sent over the dumps.

Bell's Asbestos Co., at Thetford, have a very complete mill for cleaning fibre and are able to turn out a large quantity daily, in addition to the standard grades, produced from their mine.

Johnson's Co., also, have a well equipped plant, and prepare a quantity of short fibre for the market in addition to the higher grades.

These two mines, with Messrs. King Bros., are the only ones operating at Thetford Mines, the Beaver Asbestos Co. having closed down early in the year.

At Black Lake the Anglo-Canadian Asbestos Co., the American Asbestos Co. and the United Asbestos Co. have been working during the season with about the same force as last year. Nearly all the pit work has been suspended for the winter, but all the mills are still in operation cleaning up accumulated stock.

The American Asbestos Co. are making some improvements to their plant and putting in some additional plant for preparing fibre.

At Danville work is being carried on with a large force of men and many improvements are being made in addition to the large fibrizing plant in course of construction.

Some work has been done in the neighborhood of East Broughton by two or three parties during the summer, but chiefly of an exploratory character. The United Asbestos Co. have been doing some work on the lots owned by the Glasgow and Montreal Asbestos Co. Some splendid fibre has been taken out of the Fraser mine, and we understand that this property has been leased and will be operated by the United Asbestos Co. next year. Another lot has been explored and opened up by

Messrs. Trotter, Briere and others with fair success. Some work has also been done on the property of Messrs. Walsh and Mulvena at the same place.

Chrome iron continues to occupy the attention of the people in the Black Lake district, and the output from the various pits during the past summer has been very steady. The shipments of this mineral for 1895 have been much larger than last year and will reach 3,000 tons. The demand for good ore continues, and a ready market is found for 48% and upward. There is also a fair demand for low grade ore.

At the Brompton Lake Asbestos property at Brompton work has been resumed, and we understand will be continued during the winter. This property, it will be remembered, was worked some years ago by the Brompton Lake Asbestos Co., comprising chiefly Montreal and Quebec parties. This property has recently been leased from the above company by a party of Boston capitalists for a term of seven years, and we understand that a strong force of men will be employed during the winter under the direction of Mr. John McCaw of Sherbrooke.

MINING IN ONTARIO.

The Black Donald Mining Co. is the name of an Ottawa company just organized to mine graphite in Renfrew county, Ont. The principals comprise: G. P. Brophy, J. W. McRae, S. H. Fleming and Hector McRae, all residents of Ottawa. The property comprises lots 16, 17, 18 and 19, township of Brougham, and is located at White Fish Lake, the purchase consideration, we understand, being \$30,000. The deposit is one of great promise, and of very superior quality. Some 320 feet have been stripped, giving an average width of workable material about 20 feet, while the depth, as ascertained by diamond drill boring at date, is something like 61 feet of solid graphite. The analyses range from 65 to 88 per cent. carbon. The mine is equipped with steam drills, hoists, boilers, pumps, etc., and is now in full working order. 1,500 tons of ore will be shipped to Calabogie station, Kingston and Pembroke Railway, this winter.

The new iron-smelting works of the Hamilton Iron and Steel Co., Ltd., at Hamilton, are approaching completion, and are expected to be in full blast early in the incoming year. They have been in course of construction for the past three years. The plant will be in every respect up to date, with modern furnaces, machinery and appliances, and both railway and shipping connections direct to the works, and will be capable of producing 3,000 tons of cast iron pig per month. The blast furnace, hot air ovens, gas-fired steam boilers, forced blast engine, steam hoists and handling tackle are built and erected from the most recent designs, so as to economise as far as possible the labor of the employees, and improve the quality of the output. About 300 tons of iron ore, 120 tons of coal or coke, and about 30 tons of limestone and other materials, will be required daily, including Sundays, to keep the works in operation. A very large proportion of the ore will be mined in Canada; still there will be a considerable quantity imported to get the grades of iron required by the trade. The company will have their own locomotives to handle the materials at the works, having provided every facility to receive the ore, etc., from vessels or from their railway connections, either incoming or outgoing. These works stand nearly in the centre of the iron-consuming district, and the company claim that they will be in a position to supply iron with greater advantage to the consumer than any of its Canadian competitors. It will be the means of centering and distributing a large amount of money in Ontario that would leave it for imported iron, and as Hamilton is a manufacturing centre using a large quantity of iron, it will have a tendency by reason of the cheapness and proximity of these works to bring other iron-using industries to this city.

One of the best known gold mines in the Lake of the Woods district is "The Regina," operated by an English company, of which Lieut.-Gen. Wilkinson, C.B., is president, and Mr. W. G. Motley, M.E., the resident manager. The company was organized under the name of the Regina (Canada) Gold Mines, Ltd., with a capital of \$750,000. The mine is situated on the south side of White Fish Bay, a part of the Lake of the Woods, about two miles from the Hudson Bay trading post, and 45 miles from Rat Portage. The property comprises an area of 200 acres, 76 of which are owned by the company, the balance being operated under a mining lease. There are five partly developed veins, known as numbers one, two, three, four, and the west vein, the latter being a recent discovery. At present operations are centered on number three vein. This is what is known as a true vein. It cuts the granite formation, slightly dipping to the west, and has a trend to north, ten degrees east and south, ten degrees west. At 300 feet from the lake shore the country rock changes to altered trap, and from this point the vein takes its course between the two formations, forming a contact vein, which is traceable on the surface 750 feet from the lake front, and having an average width of 2 feet 6 inches. The character of the ore is quartz carrying free gold, and is easily treated with a stamp mill.

The Regina is being rapidly developed by means of a tunnel, 7 by 5 feet, now drifted 120 feet from the main shaft, which has opened up 54 feet of ore preserves above the tunnel. The main shaft has been sunk to a depth of 75 feet, and two levels are now being drifted at a depth of 60 feet. The north level has been extended 25 feet and the south one 45 feet. The south drift will form a connection with the winze, or air shaft, now being sunk in the tunnel 75 feet from the main shaft. The winze is already down 40 feet, and when completed will give perfect ventilation to the lower workings, in addition to providing means of escape in case of accident to the main shaft. The main hoist is 6 feet square and the manhole 6 feet by 4 feet. The latter is thoroughly fitted with substantial ladders and strongly partitioned from the hoist, in order to protect the men from rock liable to fall out of the ore carriers.

A modern ten-stamp mill has been erected on the property, right on the lake shore, and is now operating night and day. The mill is of the Homestake pattern, with inside amalgamation, the stamps weighing 900 lbs. each. The concentrating tables are of the Gilpin county type, and the slime floors were specially designed by the company's manager. The mill is fitted with a No. 7 Blake ore crusher and two Tulloch automatic ore feeders, the whole outfit making one of the most substantial and best arranged mills in Canada. All of the buildings, and even the road leading to the camp, are thoroughly lighted with electric light, the effect as seen from the lake being not only pretty but impressive.

The ten-stamp mill which this company have erected on their property at the Regina mine has been fitted up with the most modern mining machinery supplied by the Gates Iron Works of Chicago.

At present 45 miners are steadily employed, the result of their labors being the production of a good-sized gold brick, which is brought in each Monday and shipped to the United States mint at New York. Thus far the results have been most satisfactory and the prospects are steadily brightening.

The Training of an Engineer.*

By MR. ARCHIBALD DENNY.

The first question I should like to touch upon is the education proper for a budding engineer, and naturally all through you must take my remarks to refer principally to the two professions of shipbuilding and marine engineering, while I believe you will find them to have a direct application to the other branches of engineering. Each man has his own idea as to what the education of an engineer should be, and I observe that many of your past presidents have dealt with this subject from their point of view.

I think all young men should start with a good English education, with Latin and Greek not a necessity, and indeed, curtailed to the minimum possible. I must say I am not in love with the prevailing system adopted in most English and some exotic schools in Scotland, where Latin and Greek occupy about four-fifths of the boy's time, and recreation roughly the other fifth, and I am glad to think that the modern board school, especially in Scotland, is doing much to leaven the whole lump.

Mathematics—at least the elements of it—and the elements of mechanics, chemistry, and physics should be thoroughly mastered, so that at the age of sixteen, or at least seventeen, provided the boy's physique is fairly developed, his apprenticeship might begin.

Now I think it must be beyond dispute that, given a lad who intends to tread the higher walks of the profession, and not merely to begin and end as a workman, it is not necessary that he should spend five years at the bench to learn his trade, to gain sufficient expertness in handling the tools and to study practically the qualities and properties of materials; hence my ideal course is as follows:—

Begin by spending alternately six months (the six summer months) at the bench and then six months (the winter months) at a first-class technical school or college. As the college or technical school course is generally one of three years, at the end of this time, or in four years at most, the youth should have had enough of the bench and should be quite ready for the drawing office; the shorter period should suffice in the shipbuilding yard and the longer period for the marine engineer.

If a shipbuilder, then he must remain in the drawing office or fight his way up through manager to principal as his ambition, opportunity, and ability lead him. If a marine engineer, then after a year or two in the drawing office, he should certainly proceed to sea, and, if possible, get his chief and extra chief's certificate, and thereafter work his way upwards on shore.

This is my ideal course roughly sketched, and one which is being followed out in our yard and engine works whenever possible. Of course, every man cannot afford or has not the opportunity of following out this course; then all that can be done is to study in the evening (not too late an hour) and take evening classes. Some of our most brilliant men have succeeded in this way alone, but who can say what they would have been if they had had the advantage of such a course as I have sketched out?

Endeavour to be apprenticed, if possible, to a firm who do not take premium apprentices. The policy of taking premium apprentices is, in my opinion, a mistaken one, both for the employer and the apprentice. The foreman in the works, and the heads of departments generally, have the feeling that premium apprentices must be more leniently treated than the ordinary apprentice, and this feeling is sometimes so strong that we need not wonder at it reacting upon the premium apprentice, and inducing a state of indifference in those who do not start with strong moral fibre. If there are many premium apprentices their effect on discipline in the works must be detrimental, and even supposing that a few out of the many have a higher ideal than their fellows, it is difficult for them to strike out a different course of action from that of the majority. Not having had personal experience of premium apprentices, my views upon this subject may be rather strong, and I know that many young men find it impossible to learn their profession by any other means; but I think it would be an improvement if firms who do take premium apprentices made it a rule that these apprentices were to be treated in exactly the same way as ordinary apprentices—paid the same wages, expected to fulfil the same conditions, and to be advanced only as a reward of real merit. In that case the premium apprentice would either, as the result of lack of application, simply finish his time an ordinary workman; or as it should be his superior initial education, with equal application, would ensure his being advanced more rapidly than those who started with fewer advantages, through the drawing office to a position of trust. I have great sympathy with premium apprentices. I think their surroundings render it difficult for them to do their duty, and the spur of necessity is lacking in many cases, but this is all the more reason why I should point out the dangers and impress the necessity for facing the difficulties and dangers of the position with a strong determination to overcome them.

During apprenticeship, a lad will doubtless have many opportunities of bringing himself prominently, by good work and conduct, to the notice of his employer and foreman, but while he should seize every favourable opportunity of doing so, he should avoid making himself objectionable by pushing himself forward in season and out of season. To do so will only disgust his superiors, and gain him the dislike of his fellow-workmen. Favourable opportunities of bringing himself before the notice of his employer will occur most frequently when in the drawing office, and the best opportunity is when he is given a piece of investigation work, involving probably the carrying out of experiments. If any of you are ever in this position you should be most careful in carrying out the experiments; only draw conclusions after these have been confirmed by a frequent repetition of experiments. Some men have a natural bent towards experimenting; it seems natural to them to tabulate an experiment in the best possible way, and their work at completion is so thoroughly well digested that the results are easily assimilated by the principal, and hearty commendation follows. Under these circumstances it is certain that this man's services will be frequently requisitioned; he is thus brought in close contact with the principal, and his rapid advancement ensured. Such cases have often occurred in my own experience. The careful and accurate man appeals to one immediately, and if this is combined with rapidity in carrying out work his services are highly prized.

Another point I want to notice, and one which has been already touched upon by a recent president, is the question of loyalty to your employers. Undoubtedly this is one of your first duties, and a duty that you owe not only to your employer, but also to yourself, because an act of disloyalty to your employer is really an act of degradation to yourself, even if not found out, a constant repetition of which will so undermine your moral character that you become an object of contempt to yourself, which appears to me a more serious thing than being an object of contempt to your fellow-men; indeed the latter only becomes possible long after the former is an accomplished fact.

I know it is the practice of many draughtsmen to appropriate information from the drawing office in which they are employed, to copy plans and tabulated data. Now this, in my opinion, is immoral, besides which I consider it, so far at least as plans are concerned, and also as far as a good deal of tabulated data is concerned, a

great waste of time. I have a friend who was once a draughtsman, and he has told me that there are now in his possession many plans cribbed in this way, and that he was incited to do this by the needless prohibition and difficulties placed in his way by a suspicious employer. As a matter of fact, he did not gain any advantage from this as from the day he cribbed them till now they have never been looked at.

Progress is so rapid nowadays that the mere copyist will always be left behind, and if a man has not sufficient ability from his past experience to scheme out improvements he will soon be left in the rear along with his cribbed information. May I read you a few sentences from the general order book in force in our yard?

"As there is growing in our office a large amount of special and organized information, procured and organized at considerable expense by us, it must be clearly understood by every member of our staff that we consider this information private, and to be used only in our service. Any member of our staff found copying or removing any of this special organized information will be considered to have acted against honour, and will, on our coming to know his action, be immediately and without further warning expelled from our offices. To such a person we will decline to give either reference or character. We consider that the opportunities afforded to the members of our staff in their ordinary work and for private study by our library are sufficient to enable them to acquire a knowledge of all methods of working, by means of which, should they leave our service for that of some other firm, or to start on their own account, they can collect and organize information for their employers or for themselves. There is therefore no excuse for their acting against honour in the way we have now forbidden."

I think these sentences put the matter very clearly and fairly, and may assist young men in deciding upon their course of action. I would therefore counsel you to gain experience, and store it in your brain, and make notes only of such general principles as you find in use or discover for yourselves, and do not run the risk of lowering yourself in your own estimation by taking that which is another's.

You should be absolutely loyal to your employer while with him; identify yourself with him in every way, and make his interests yours; and when you leave one employer to go to another, you should carefully consider how much special information you shall impart to your new employer, more especially if he happens to be a rival to your last.

I would like to give another warning to young men. Cases have come to my knowledge where foreign competitors have by specious promises induced able young men to leave the employ of a specialist in this country, so that he might assist a foreign rival in establishing a similar business abroad. The object was perfectly apparent, and was recognized by both parties—I mean both the foreigner and his dupe. A much larger salary was fixed than he was in receipt of previously, with an agreement for a certain term of years. Everything went smoothly until the information possessed by the young man was transferred to his new employer and then the position became uncomfortable, in fact, so uncomfortable that, long before the expiry of the agreed-upon term of years, the young man was glad to leave and return to England, sadder and wiser.

A last hint, and one which I have often found it necessary to give—hold your tongue about what goes on inside the drawing office, especially in regard to proposed work. It frequently happens that, from the lack of this precaution, information passing from one drawing office to another induces competition of an unfair nature, which otherwise might have been avoided.

Now, if you become chief draughtsman, you will for the first time have control of a number of other men, and you have added to you a serious responsibility in the management of them. Some men are by nature fitted to rule others; other men—good men, no doubt—are by nature quite unfitted to do so, but much can be done to correct this latter imperfection. Constant remembrance of the golden rule, "Do as you would be done by," will help; treat those under you with kindness and justice, but, at the same time, you must be firm in enforcing rigid discipline. One fault which principals find it difficult to excuse, and which should always be avoided, is shunting the responsibility for mistakes on to a subordinate, with the remark:—"I am very sorry, but Mr. So-and-so made the mistake." This is most disagreeable, and points to a lack of manliness.

A chief draughtsman should take the entire responsibility of the work passing through the office; should take the blame of any mistake upon himself, and not endeavor to shunt any blame on to the shoulders of a subordinate. This should not prevent him at the same time from passing on the remarks of the principal, with a few additional ones of his own, in order that the same mistake may not occur again.

Be punctual yourself, and insist upon absolute punctuality in your subordinates. When several pieces of work appear equally important, and it is a question in your mind which to tackle first in the morning, choose the one you like least, and, this once finished, the others will go down before you like corn to the scythe of the reaper; this is a golden rule, imparted to me by my late brother, which by long experience I have found invaluable. You will find it a useful thing to keep an agenda or question book, and go over it every day yourself, also, if possible, with your superior, noting his instructions.

Suppose now that you go a step higher, and become manager. Your responsibility is further increased, and you have now a new set of conditions to deal with. You should still more closely, if possible, link up your principals' interests with your own. The most serious part of your duty will be in maintaining discipline in the works. Man in general is a most complicated machine to deal with, and the working man is perhaps the most complicated machine of the human species. In most machines, given a certain set of conditions, you can predict what will happen when the machine works, but often with the human machine exactly the reverse happens to what you might have expected. No minute rules can be therefore laid down for the management of men, but you will go a long way towards success if, following out the treatment of your men in the drawing office, you deal with the men in the works in a firm but pleasant way. Be definite in the orders you give, and see that they are promptly and cheerfully carried out. Do not be unreasonable in your demands, and in all your dealings with the men, and the arrangements you make with them, be perfectly honest and straightforward, trying if possible to put yourself in their place. If you have profited by your time at the bench you will not find this very hard to do. Where necessary, make written notes of any arrangements as to wages, etc., immediately they are made, read them to the men, sign them yourself, and get them to countersign. Leave nothing ambiguous, nothing doubtful, and, if possible, deal directly with the men and not with paid agents. You will find, under these circumstances, that, with few exceptions, the working man is to be trusted and admired.

You will find it advantageous to spend an hour in the factory before breakfast. An hour thus spent is worth two later in the day, when it may be difficult to spare the time, pressed as you probably will be by other business, visitors, outside contractors, etc.; besides which it allows the foremen to get their instructions for the day, and you have a clearer mind, and are undisturbed by the thought that you are wanted elsewhere. Another reason is that any slackness or waste of time on the foremen or workmen's part is more likely to occur then than later in the day.

Never force a man upon an unwilling foreman. You are often asked, mostly by soft-hearted clergymen, to give some poor weak soul a chance. As a rule, resist the appeal. There are, and should be exceptions, but as a rule you will find it labor

*Pre-idential Address delivered before the Institution of Junior Engineers, Westminster, November 1, 1895.

wasted. Remember the cripples. There are always a dozen or so of easy berths, which should be kept either for the old or maimed; and, even if an able-bodied man gets employment in them, he should at once be removed if a cripple comes along. Of course, I mean your own cripples; don't saddle yourself with other people's.

An important question is the amount of interference you should allow yourself between foremen and workmen. Theoretically there should be none, practically it should be the minimum possible, otherwise your time will be entirely taken up in perpetually listening to two sides of stupid differences. At the same time, you should reserve the absolute power of dismissal or employment, always, however, through the foreman; and, further, your ear should be open to any well-founded complaint of injustice on the part of a foreman to a man. If you are careful in the first two or three cases to dispense absolute justice you will be little troubled later, because both foremen and men will be watchful of what they do. Keep in view the possibility of nepotism in foremen, and you must be quick to stamp it out; it is most detrimental to discipline. In both these cases you will observe that, to manage properly, you must have an intimate knowledge of your men.

In case of any man doing a piece of meritorious work, you will find it a good thing to take personal notice of it. It is the right thing to do, and encourages the man. I have often seen cases where a kind word, some tobacco, or a few cigars, given on the spur of the moment, have been more appreciated than a money gift. You should take a personal interest in your apprentices, they are your future workmen; encourage them to continue their education in every way possible at evening classes; the better educated they are, and the more they are on a par with yourself, the more easy it is to get on with men.

MINING IN QUEBEC.

The production of chromic iron in the Eastern Townships shows a marked increase over the previous year, when for the twelve months 915 tons were shipped. Up to the 15th September last there were shipped via Quebec Central Railway:

To Philadelphia.....	958 tons
" Baltimore	600 "
" Pittsburg	498 "
" England	440 "

Total for 8½ months.... 2,476 "

of an estimated value of from \$35,000 to \$40,000, delivered at the Quebec Central Ry. About 70 persons employed.

In his report to the Hon. the Commissioner of Crown Lands, Mr. J. Ohalski, Mining Inspector for the Province, gives information of value respecting the various industries, from which we have excerpted the following:

The Lambly mine, from which the first pocket worked yielded 600 tons of chromic iron, containing over 50 per cent, has been worked successfully and another deposit has yielded up to September about 800 tons. The total yield has thus been about 1,400 tons, working a force of fifteen men, 1200 tons of which were shipped. The deposit now being worked is in the form of a vein running north for a distance of from 200 to 300 feet, and appears to dip 45° west, with variable depths, reaching as far as 9 ft., but the present thickness is less.

The total output of the Jobodin mine is estimated by Mr. Ohalski at 172 tons.

The Hall mine, operated by G. B. Hall, of Quebec, was opened in July. A good deposit was discovered and 75 tons taken out, a carload of which was shipped.

The Lake Caribou Mining Co. working near Lake Caribou produced about 400 tons.

The output of the Bloudeau and Koberge mine was about 200 tons, 120 tons of which were shipped.

The Dumais mine, worked last winter, resumed mining in the spring and the output is placed at 160 tons, 125 of which were shipped.

The output from the Frechette mine was about 100 tons, shipments being made from Black Lake station.

From the Lemieux property, about 70 tons were won from two small excavations. The ore here appears in the form of veins, the first a solid one from one to two feet in thickness, and the other running north for about a hundred feet with a thickness varying from one to four feet.

The Lemelin mine was worked regularly from July, 1894, up to the end of August last, yielding about 430 tons, 300 tons of which were shipped. The ore contains a fairly high percentage. It has been followed in a north-easterly direction by a cut 200 feet long and from 25 to 30 feet high at its extremity. The thickness of the deposit varies, being as much as four feet.

The Anglo-Canadian Asbestos Co. has taken out about 70 tons of chromic ore in the south-western part of its territory. The indications are reported to be sufficiently good to justify more extensive work. The mineral is of good quality.

From the Leonard & Morin mine the output is reported to be 1,100 tons, of which 600 tons were shipped. This output was taken altogether from surface. This property will be worked during the winter.

The Topping mine yielded about 50 tons, two carloads being shipped.

Work on the Naves property has been resumed and about 35 tons of high grade being taken out.

In the Township of Garthby a certain amount of mining has also been done, the Leonard mine yielding 300 tons of high grade ore and the shipments amounting to 236 tons.

With respect to asbestos mining Mr. Ohalski has the following to say:— "The demand for asbestos is fairly steady but prices continue low, so that work was carried on only to meet demands. However this industry seems to be entering upon a new phase if we may judge by the two very large mills erected by the Bell's Asbestos Company and the Danville Asbestos and Slate Company for the purpose of extracting from the Serpentine all the small fibres which were thrown away and were considered useless. This product it seems will be used in making paper and there is no doubt that if the price is remunerative, and the demand sufficient, this industry may become an important one. Last year (1894), 8,091 tons were shipped, making a good season; it is probable that the quantity will be about the same this year, although up to now there have been fewer shipments. Last winter only the Bell's Asbestos Company and the Danville Asbestos and Slate Company worked, but in the spring, work was resumed at Thetford by King Brothers and the Johnson's Company, and at Black Lake by the Anglo-Canadian Asbestos Company, the United Asbestos Company, the American Asbestos Company, and Dr. Reel, with 400 men at Thetford and 150 at Black Lake. In the month of August last, the Broughton mine belonging to the Glasgow and Montreal Asbestos Company was re-opened by the United Asbestos Company with a dozen men.

"Last winter the Bell's Asbestos Company built a mill at Thetford for the mechanical separation of the fibres of asbestos and the finest fibres were utilized. The treatment consists in breaking up the rock with a Gates breaker; the rock is then run through two rollers and afterwards on endless picking tables where women and children pick out the longest fibres. The conveying from one story to another is effected by elevators. What remains on the picking tables then goes into a cyclone pulverizer which sends the fibres, well separated, to the upper story and they then pass over shaking screens from which a fan drives the final product into a room, where it is put in bags. The apparatus is driven by a Laurie steam engine; the mill has been in operation since the summer. It is lighted by electricity and runs night and day.

"At Danville the Jeffrey mine was worked up to the first of July of this year by the Danville Slate Company. From that date the Danville Asbestos and Slate Company, Limited, took possession while still continuing to get out slate and is carrying on operations on a large scale. The capital of the company is \$250,000, its head office is at Danville, and it now employs about 400 men, 225 of whom are working at the asbestos mine, 75 in the slate quarry, 75 at the new buildings and 25 at a small saw-mill and experimental mill for asbestos. They are about to build a mill at the mine with a large capacity for extracting the finest fibres from the rock, as experiments have shown that the debris contains a considerable proportion of fibres and that some parts of the serpentine itself are very fibrous. The mill is a large frame building with stone foundations 160 feet by 60. The process of mechanical separation will consist in breaking and crushing the rock which will then be drawn by hand to endless tables for the purpose of removing the long fibres; the product will then be taken into a continuous cylindrical dryer and passed through a cyclone pulverizer and finally separated from the last vestiges of rock by screening and fanning, the finished product being collected in receiving rooms. The building is three stories high and the materials will be transported by elevators. The plant consists of a Blake crusher, 30" x 24", with an opening of 7" to 8" in the upper story, another duplex one lower down 40" x 10" with an opening of 2½" to 3" and finally one of 46" x 6" with an opening of 1" to ½", of picking tables, elevators, a continuous cylindrical dryer, 6 cyclone pulverizers and fans which will drive the final product into a separate building consisting of 4 receiving rooms which will be filled and emptied alternately.

The whole of the machinery will be driven by a double Laurie engine of 550 horse power fed by four tubular boilers. The engine and boilers occupy an annex separate from the main building and from the receiving rooms, the store rooms and a water tank. The largest breaker is said to have a capacity of 250 tons per 10 hours. The building of the mill was commenced in June this year and it is expected to be finished in October and in operation for the winter at the rate of one hundred tons a day. Work will be carried on day and night and the mill will be lighted by electricity. In addition to the ordinary qualities of crude asbestos, there will be three qualities of asbestos obtained from the mill; the finest, which will be the most plentiful, will be used for making paper. The company hopes to get a very great yield of fibres. Experiments were made this year with a smaller mill driven by water power and are said to have been satisfactory. There are 225 men employed in the mines including the cobblers, and in order that the yield of the mines may supply the demands of the mill, new machinery will have to be put in and the boom derricks will have to be replaced by travelling or cable derricks.

The same company also works the slate quarry situated one mile from the mill and which employs 75 men including those employed in splitting and preparing the slate at the mill. Roofing slate is prepared as well as school slates and slates for various purposes, the capacity of the mill representing an annual value of \$40,000 of products. The mine and quarry are at a distance of from three to four miles from Danville station on the Grand Trunk Railway and the transport costs from 50 to 80 cents per ton. In view of the increased production, the company intends shortly to build a small electric railway for the mine, the quarries and the mills. Alterations and improvements will also be made to the slate quarry. In connection with the new treatment of fine fibres I may say that similar experiments were made some years ago, but on a smaller scale, on the serpentine in the Templeton mines.

In the Ottawa district, I visited an asbestos mine on lot L.42 of Denholm. Last year that mine was worked by the International Mining and Manufacturing Company of Newark, N.J. This year the property is in the name of the Asbestos Mining and Manufacturing Company represented by Mr. N. J. Smith. The mine was worked the whole of last summer and this year 18 men have been employed since May. There are three or four large excavations provided with two horse-derricks. The asbestos is of the variety usually found in the Laurentian serpentines, that is to say, short, the longest barely exceeding five-eighths of an inch, specimens of one inch and over being found only by accident. The company makes two qualities without separating the fibre from the rock, which is shipped to be treated at Newark.

At the date of my visit in June, this mine had yielded 230 tons, a portion of which had been shipped.

Of the Wallingford mica mine in Templeton the Inspector says:— "This mine is now the most important one in the region. The company claim to get out five tons of rough mica a day, corresponding to one ton or one ton and a half of split and

thumb trimmed mica. This mine had been worked for two years and was said to have yielded 500 tons of mica. The quality is amber mica, generally of large dimensions; it is at once put in barrels after being first thumb-trimmed. There were in store a good many pieces which sized 4" x 6" and 4" x 7" and also 10" x 12" and over. The largest piece I measured can give sheets 14" x 18". The work consisted in a deep pit 150 feet long and 100 feet deep with a width of from 9 to 12 feet running in a W. E. direction. Towards the east the work was a tunnel but they were about to cut down the upper part which was rich in mica. The deposit affected the form of a vein dipping vertically and containing, with the mica, calcite, pyroxene and phosphate, the mica being remarkably abundant."

GOLD MINING IN ONTARIO.

(From our Correspondent at La Seine, Ont.)

The past fifteen days were conspicuous for the reappearance of many of our pioneer prospectors and capitalists, as well as the advent of some new, and decidedly energetic business men. Mining, consequently, has received a great impetus, and as winter approaches the rush is general along the margin of La Seine River and the Manitou Lakes, to get in supplies and complete examinations and other necessary preliminary surface work.

Foremost among the pioneers come Colonel Ray, who after completing a thorough examination of the adjacent interests of "Wiegand," acquired by purchase complete control of the balance of what is currently regarded as the most attractive group of claims in the protogine belt—a particular mention of which appeared in October issue.

Meantime Mr. Ferguson, M. E. of London, England, has not been idle. His miners are now en route from Tower Minn, while a force of carpenters are rapidly putting the finishing touches upon their winter quarters.

At the Foley Mine, A. L., 74, 5 and 6, sinking in two shafts, with rock drills, goes on unceasingly and with the same satisfactory results—the value of the ore on their dumps being of such high grade as to warrant the utmost vigilance of the company's officers. Visitors are now present between La Seine and the Manitou from various western cities and mining centres between San Francisco, Denver, Texas and Washington Territory, and all are apparently favorably impressed with our prospects. Already the important question of the establishment of a customs reduction works for this immediate section is being considered by visitors of reputed experience, who believe, even at this early stage of development, that the output of ore from a given group of claims, in this section, would, if vigorously opened up, pay handsomely for the venture of a large reduction works.

Capital, however, notwithstanding the fine showing of native and free milling gold ores is, I repeat, deliberately slow in taking hold; and in this respect—as in other essential ones,—our case is very similar to that, which for several years prevailed around Johannesburg and the Transvaal generally. But all things come, etc., even our mails. Thanks, however, to the much superior mail service of the United States, we shall be enabled to avail ourselves of these facilities (two mails per week for winter) by sending (paying) a special courier from here to Fort Francis (some 40 miles), that is, if we cannot await the regular (?) bi-monthly dog train via Lake of the Woods.

Meantime, by sending communications for La Seine River via Koochiching, Minn., it makes a difference of eight mails instead of two in our favor, which, in the absence of telegraphic connection, is a most important advantage, and one that even our ordinary workmen here fully appreciate, as evidenced in a voluntary contribution in aid of our very limited government allowance.

Mining development upon the "Foley claim," A L 74, 5, and 6—under bond from Colonel Ray—goes on with the most encouraging results. They are now down to a depth of 95 feet in both shafts, and the veins gain opening out to their usual dimensions of 2 and 3 feet 6 inches respectively. The bond or option of purchase referred to expires early in January next, when it is anticipated that important changes will occur at this very interesting mine.

The "Bill Wiegand's claims," consisting of A L 103, 4, 5 and 6, all partially developed—at least superficially—are still attracting considerable attention from local and outside capitalists. Already many propositions have been made the owners, W. Wiegand *et al.* Their lots are traversed by the same series of fissure lodes as at the Ray and Foley group, and as the conditions are also identical with the foregoing, now under active development, the eyes of the would-be mining and investing visitors (as well as owners) are centered upon the A L 76-7. Already and presumably in anticipation of a continuance of bonanza ore, prices of immediately surrounding claims have gone up.

The Bull Claims, consisting of 669 P, J O 12, 13, 14, 15, S 22, and P 317, all of 40 acres each, are now attracting attention. The first four lots are being partially developed, and all are traversed by a series of three fairly well defined quartz veins, that carry, in many places tested by sinking, a very appreciable quantity of coarse and fine gold, visible to the naked eye, while upon at least two of these claims the showing of native gold is very fine indeed. This estate is now being examined in the interests of foreign capitalists. It is, however,—unfortunately for its owners—situated upon the unsettled (so-called) "timber herth," where "several millions of valuable pine, etc." (?) was said to be in danger of fire from the dreaded invasion of the gold-hunter, etc., but whereon—as a matter of cold, and for the owners of this timber, unpalatable, fact—the original estimates by wire (and wool) pullers were seriously overdrawn; in consequence of which sweeping reductions are now being made in the choppers sent in there to clear off this timber, for the purpose of making the work "spin out" for all winter, and probably all summer too. Consequently there is no probability of deeds or leases being issued by the Ontario Government.

The Ottawa Prospecting Co., with several promising claims, remain inactive *pro tem.*

The Ferguson Developing Co., embracing A L 110 and 11, the Kilby Alisher lots, and at least one of the Wilson-Barley lots adjacent to "Bill Wiegand's," have

let another contract from 50 to 100 feet in both shifts, drilling and hoisting by hand and horse power. This is the property bonded to Mr. Ferguson, of London, Eng. This is also contract work. Like the Ray-Foley's, the Ferguson lodes are fissures and in the protogine, at or near the intersection or merging of the granites with the gabbro. Mr. W. D. Ferguson, now in London, is due here early in January next.

COMPANIES.

Lillooet, Fraser River and Cariboo Gold Fields, Ltd.—The directors have issued a circular to the shareholders giving information as to the properties recently acquired. These include three miles of the old bed of the Cayoose creek; a property overhanging Cayoose creek covering an area equal to 525 claims in the Transvaal, in connection with which arrangements are being made to erect a thirty-stamp mill; and a property known as the Abbott group, situated in the Lardeau district, covering an area equivalent to 187½ claims in the Transvaal.

Hall Mines, Ltd.—The directors have issued the following circular to the shareholders:—The directors have now much pleasure in being able to inform the shareholders that the wire tramway from the mine to the smelting works at Nelson has been completed, and is in operation, bringing down ore to the bins at the rate of ten tons per hour. The buildings at the smelting works also are now approaching completion, and the smelter is expected to be in operation towards the end of the year. Water from the creek close at hand will be supplied to the works. The smelter will have a capacity to smelt 100 tons of ore per day, and the lines of the Canadian Pacific Railway Company will run directly into the works. Development work at the mine has also been making good progress, and the existence of the ore-body to the depth of upwards of 400 feet from the surface has been proved by boring. It will also be satisfactory to the shareholders to learn that the chairman of the company is now at Nelson, inspecting and pushing forward the works, and that he hopes to remain there until the smelting works are in full operation. On his return to this country, early next year, the directors will be able to place before the shareholders his full report for their information.

Islander Gold Quartz Mining and Milling Co., Ltd., was registered at Victoria, B.C., with an authorized capital of \$100,000 in shares of \$1, for the purpose of taking over and working the Islander mineral claim, situated on a branch of Granite creek, Alberni district, Vancouver Island, B.C., and for the purpose of purchasing and working such other mineral claims as the company may determine.

Returns from assays made of the surface ore have varied from \$2 to \$15 per ton in gold and copper. The character of the ore is similar to those produced by the Le Roi and other mines at Trail Creek in West Kootenay. It is believed that as depth is attained the value of the ore will greatly increase, as was the case with the Trail Creek ores. Assays have been made by Price, of San Francisco; Tacoma Smelting and Refining Co., Tacoma; W. Pellew-Harvey, Vancouver; Government Assay Office, Victoria. Only surface work has, so far, been done on the ledge, which is from four to eight feet in width. It is proposed to sink shafts and otherwise prospect the mine, so as to thoroughly prove its extent and value. Directors: John Irving, M.P.P., Victoria, B.C.; Wm. Munsie, Victoria, B.C.; W. G. Mackenzie, Victoria, B.C.; Thos. H. Prosser, 18 Broad street, Victoria, B.C., Secretary.

Tilt Cove Copper Company, Ltd.—The seventh ordinary general meeting of shareholders in the Tilt Cove Copper Company, Ltd., was held last month at the office, 6 Queen Street Place, London, the chair being occupied by Mr. J. R. Francis.

The Secretary (Mr. E. C. Leaver) read the notice convening the meeting. The Chairman called upon Mr. J. C. Leaver to make a statement regarding the company's position.

Mr. J. C. Leaver said: Gentlemen—The Chairman desires me to say that these accounts only bring us up to August 31, 1894. As a matter of fact this concern, as you know, is being carried on by the Cape Copper Company, and in the course of a few weeks they will issue their report which will include an account of the working of this company up to August 31, 1895; so that, practically, our present accounts are not of much interest. Beyond this I have really nothing to say, but we can promise you that the accounts, which will be presented to you shortly, will be very much better than those now before you. How much better they will be I must not say, because they are now being compiled for audit by the Cape Copper Company. This is merely a formal meeting, held in compliance with the statute.

A shareholder asked if the accounts to be submitted shortly would not show a material improvement owing to the rise in copper.

Mr. Leaver: We quite hope that our next accounts will show a very much better state of affairs, but I shall be telling you the Cape Copper Company's business if I say more. We consider that with the present price of copper we are in a much improved position. Our losses have stopped.

On the motion of the Chairman, seconded by Mr. John Taylor, the report and accounts were adopted.

On the motion of the Chairman, seconded by Mr. Sexton, Mr. J. C. Leaver and Mr. John Taylor were re-elected as members of the committee of management.

The auditor, Mr. William Barclay Peat, having been re-appointed, the proceedings terminated in the usual manner.

Canada Iron Furnace Company, Ltd.—The Hon. E. J. Flynn, Commissioner of Crown Lands, has given notice in the Quebec Legislature of the following resolutions respecting this Company:—Resolved (1) That the Canada Iron Furnace Company, a body corporate and politic, incorporated by Dominion Letters Patent, with its head office in the city of Montreal, and its works at Radnor, in the district of Three Rivers, shall be recognized as a colonization society within the meaning of section 10, of chapter 7 of title fourth of the Revised Statutes, (Articles 1725, and following). Resolved (2), That it shall be lawful for the Commissioner of Crown Lands, with the approval of the Lieutenant-Governor in Council, on a requisition on behalf of the said company for lands for the settlers whom it is desirous of establishing from time to time, to assign, as provided in Article 1734 of the said Revised Statutes, to the said company, a township or part of a township for its operations. Resolved (3), That in no case shall a township or part of a township be thus reserved for more than ten years.

Northumberland Stone Co., Ltd.—This company is applying for incorporation with an authorized capital of \$10,000, in shares of \$10.00, to carry on the business of quarrymen in New Brunswick. The directors are: James Frier, B. E. Tweed, W.

C. Milner, Napoleon Leblanc and Foster Packard. The business is to be carried on in the village of Shediac, Westmoreland County, N. B.

Caledonia Consolidated Mining Co. has been registered with headquarters at Spokane, Wash., and a capital of \$500,000 to carry on mining in British Columbia.

Dixie Mining and Milling Co., Ltd., has been registered with headquarters at Spokane and an authorized capital of \$500,000, to carry on mining in British Columbia.

Homestead Gold Mining Co., Ltd., has been formed to take over the property and assets of the Homestake Gold Mining Co. of Spokane. Authorized capital, \$500,000. Head office: Vancouver, B.C. Directors: Thomas Dunn, J. E. W. Macfarlane, and Ernest E. Evans.

Wolf Hill Mines Co., Ltd., has been formed in British Columbia to purchase certain mineral claims on Wolf Creek, in the district of Sooke, known as the "War Horse" and "Empress," for the sum of \$25,000, to be paid for in fully paid shares of the company, and for carrying on the business of miners. Authorized capital, \$100,000, in shares of \$10.00. Head office: Victoria, B.C. Directors: James Dunsuir, William Ralph, Theodore Lubbe, and C. E. Pooley, all of Victoria, B.C.

O. K. Gold Mining Co., Ltd., has been registered under the Foreign Companies' Acts, with an authorized capital of \$1,000,000, to carry on mining in British Columbia.

The Delta Mining and Development Co., Ltd., is being incorporated in British Columbia to acquire the mineral claims on Lulu Island and recorded as "The Setting Sun," "The Gladys," "The Diablo" and "The Valkyrie," and to pay for the same in fully paid up shares of the company. Authorized capital, \$100,000. Head office: Vancouver. Directors: John Clark, A. C. McArthur, and J. W. Jackson.

The Silver Key Mining Co., Ltd., is being incorporated in British Columbia with an authorized capital of \$100,000, and headquarters at New Denver, West Kootenay, B.C. Directors: Cornelius M. Getting, James Gilhooly, and George D. Long.

Gabriola Coal Co., Ltd., is being incorporated in British Columbia to acquire coal lands and to carry on the business of miners. Authorized capital, \$1,000,000, in shares of \$10. Head office: Nanaimo, B.C. Directors: Marcus Wolfe, A. E. Rand, A. J. Hill, Elijah Priest, and W. W. B. McInnes.

North Saanich Coal Co., Ltd., is being incorporated in British Columbia, with an authorized capital of \$25,000, in shares of \$10. Head office: Victoria. B. C. Directors: T. W. Paterson, Wm. Templeman, and E. B. Marvin.

Golden Group Mining Co., Ltd., is applying for incorporation in Nova Scotia to carry on mining in that province. Authorized capital, \$100,000. Directors: A. A. Hayward, Waverley, N.S.; F. S. Andrews, South Essex, Mass.; H. H. Bell, of Halifax. Head office: Halifax.

Colliery Managers.*

By MR. M. WALTON BROWN.

The colliery manager of the present, and more especially of the future, must be a man of education, and, as time advances, the requirements of his profession will become more and more exigent. A colliery manager cannot accept theories which he does not understand; his education must be exact and thorough, otherwise he will be classed as a workman, and not as a professional man. The management of mines must be more efficient in the future than it has been in the past, and the individual must become part of the profession.

The objects of the National Association of Colliery Managers are to improve the social, scientific and intellectual position of the colliery manager; to support and protect their character, status and interests . . . ; to originate and promote improvements in the law . . . and in administration . . . ; to defend individual members . . . and to assist members to obtain employment.

The status of the profession of a colliery manager can be improved by intercourse between members, so that he may know the capabilities of others, and be known to others, and thus render the work of one the work of the profession.

The publication of professional papers is an essential object of the association, and they become the tools to be used in the management of mines. Papers only begin to be useful after they are read to the members; they induce discussion, and in this manner increase the common knowledge of the members.

The papers appearing in the *Transactions* are good, and, although creditable to the authors, they do not appear to induce that full discussion which would prove invaluable to the members. Suggestions have been made from time to time that prizes should be given for the best paper communicated during each year; but would it not be more desirable to give a prize to the writer of the paper which produced the best discussion of the year?

The elevation of the status of the members is the essential feature of the association. It should ensure that the members do the very best work in their profession; it should teach them that they are fellow-workers, and produce a profession culture until it becomes impossible for any member of the association to be an inefficient colliery manager.

The association must, however, promote the interest of the profession rather than that of the individual, and strive for the advancement of theoretical and practical skill and the maintenance of high professional position. The affairs of the individual must be left untouched; it must not impose scales of payment, otherwise it would become a trade union. The status of the colliery manager can only be improved by the individual being merged in the profession, and not by agreement to restrict the right of

* Presidential address delivered before the North of England Branch of the National Association of Colliery Managers.

the individual to receive payments in accordance with his skill. Each member should endeavor to add to the knowledge of his fellow colliery managers by recording the results of his experience for their information, and in return he will learn from their keen, but friendly, criticism. At the meetings the members benefit by personal contact with fellow managers and from the mutual exchange of experiences and of suggestions as to modes of overcoming difficulties met with in their daily duties.

Although vast strides are now being made in this country by the provision of numerous opportunities and facilities for the technical training of colliery managers, this development cannot be allowed to stand still, but must keep pace with that of the best practice of the profession, otherwise mining education will become a study of ancient history, and of no advantage to the student as aids in overcoming the technical difficulties of his work.

The education of a colliery manager is necessarily very comprehensive. As a schoolboy he should acquire a knowledge of several modern languages, in order that he may hereafter be able to read the valuable works on mining published in other countries; and if he can also acquire a little Latin and Greek, it will certainly prove useful to him in his profession.

A knowledge of mathematics and the physical sciences is essential in utilizing the forces of nature and directing them to the service of mankind. He should, therefore, acquire a knowledge of geology, physics, chemistry, and every science appertaining to his profession. He need not endeavor to acquire more than the general principles of these sciences, so that he may know where to find detailed information when required, and to follow the present rapid development of knowledge in all its branches.

A colliery manager is required to apply machinery to multitudinous purposes. He should have a knowledge of the nature and strengths of building materials, so as to utilize both material and labor in the most efficient manner.

Geology is the essential study of a colliery manager, being utilized in directing the search for minerals, and the miner has often assisted the conclusions of the geologist. Water supply and surface drainage are now becoming prominent questions for satisfactory solution.

Heat is studied in relation to the efficiency of steam and other heat engines. Cold is used for the freezing of water-bearing rocks. Compressed air is used for working pumping, coal-cutting, rock-drills, and other machinery. Coal is distilled for the production of coke and lighting-gas, and the bye-products should all be utilized. Electricity is used as a source of light, for the working of fans, pumps, and other machinery, for the ignition of explosives, for signalling, and many other purposes. High explosives are likely to play an important part in coal mining of the future. The prevention of smoke still awaits the invention of an efficient remedy. Variations of temperature and pressure of the atmosphere may give warnings of possible issues of gas in mines. Calculating machines, such as the slide-rule, the planimeter, etc., lighten the labor of calculation.

The preceding remarks only convey a slight notion of the aids afforded by the sciences to the colliery manager. The colliery manager should especially study mankind, political economy, and statistics, so that he may be able to decide upon the commercial advantages of any mining enterprise, and to secure the confidence of those who may have to base their decisions upon the results of his plans and estimates. He should be competent to draft the details of the necessary works, the capital required for their execution, the costs of working, and to substantiate his views before unfriendly critics.

Although this is an age of immense enterprises, attention should be given to every small matter of detail, which possibly form the elements of successful management.

To a large extent, the success of a colliery manager depends upon his tact, his powers of speech and genial manners. The writing of papers provokes accuracy of thought and clear description, but it is more important to be able to make extemporaneous speeches; and members should attend every meeting and take part in the discussions, even if they have nothing new to bring forward.

The practical colliery manager affects to despise technical training and all scientific results or theory; but he constantly, consciously or unconsciously, applies theory to all the items of his daily duties. Theory is merely the expression of the results of experience made available for application under similar conditions, and, however practical a colliery manager may be, reason leads him to form opinions or theories, based upon the results of his actual past experience. It is certain that the success of the "practical" manager is dependent as much upon the application of scientific theories as that of the manager who may have received a scientific training and served a term as an apprentice to his profession.

The old-fashioned colliery manager achieved successful results by sound common sense, shrewdness in acquiring knowledge, and from his capacity to manage workmen and to select qualified assistants. These qualifications are still essential to the successful management of collieries, accompanied with scientific knowledge based upon youthful training in mathematics and the physical sciences.

The Training of a Mining Engineer.*

By PROFESSOR HENRY LOUIS.

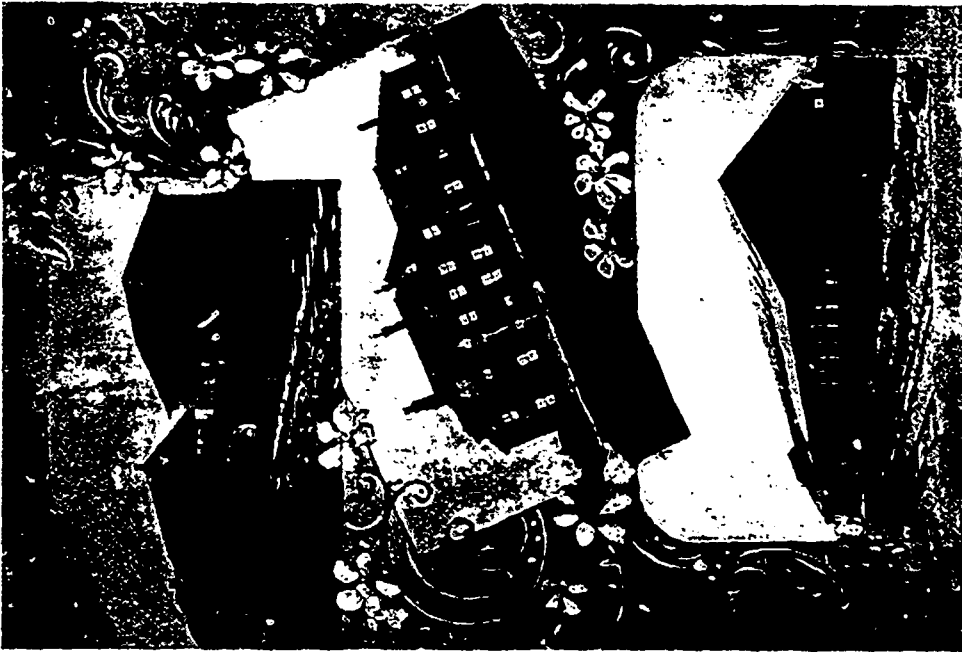
Physics, again, not only teach the student the laws that govern the motion of matter, but is every day becoming of greater practical importance. Electricity, especially, has been playing a most important part in mine engineering; I need only mention electric coal cutting, electric underground and surface haulage, and the electric transmission of power, to remind you of the number of applications that this science has found of recent years; and indications are not wanting that further developments of this force will be produced before long that will almost revolutionize some aspects of mining. There seems little doubt that we shall have to look to electricity in the near future to provide us with a really perfect form of safety lamp, and that if even explosions in coal mines are to become a thing of the past it will be through the agency of the electric light. It may indeed be said that there seems scarcely any limit to the potential application underground of this most convenient force. I hold, therefore, that besides theoretical physics, a mining engineer's training should include a short time in an electrical laboratory or shop, where the student may be familiarized with the construction of electrical machinery and the application and measurement of electric currents. Of the importance of mechanics little need be said; such subjects as machine construction, strength of materials, the steam-engine, water-motors, and many others, come so obviously into the every-day practice of the mining engineer that he must perforce study their principles thoroughly.

A mining engineer is so often called upon to design machines for various purposes, or to test the efficiency of a machine already constructed, that he must be a good mechanic. I hold that it is not necessary for him to actually serve any time as work-

* Inaugural Address delivered at the Durham College of Science, October 17, 1895.



New Trestle to convey Dumping Material over the Quebec Central Railway recently completed at King Bros. Asbestos Mines, Thetford, Q.



Dominion Coal Co. Warehouse at Glace Bay, C.B., New General Offices, New Machine Shops.

shops, although he will often find it an immense advantage to be able to use some of the simpler engineers' tools, and more especially to do a little smithing. In out-of-the-way corners of the world I have found the ability to sharpen a drill or to point a pick of greater value to me than might be supposed by those who have never prospected in remote regions.

These three sciences—chemistry, physics and mechanics, together with the all-pervading mathematics—form the basis of the mining engineer's training. Next come what may be called secondary sciences, more closely connected with the miner's special work. These are geology and mineralogy. Geology is, to a great extent, the scientific basis of mining; the man whose daily duty is to exploit certain portions of the earth's crust must know thoroughly the rocks of which it is composed, their appearance, their composition and the mode in which they were formed. He must not only know geology thoroughly, but must also have some knowledge of the subjects most closely connected with it. For instance, he must know something of paleontology. Evidently, the more he knows the better; but a fair general knowledge, without entering into recondite details, is all he needs. Thus he ought to be able to recognize a trilobite when he sees one, and to know that if he comes across strata containing these fossils he need not waste money in sinking deeper in search of coal beds. This knowledge is quite enough for practical purposes, and he would not be any better off, practically, for being able to name the genus and species to which the trilobite might belong.

Similarly as regards lithology: this science, in its ultimate development, is best left to specialists. All a mining engineer really requires is to tell broadly what class of work he is dealing with. It does not matter much to him, as a rule, whether a certain rock that he might come across is (say) a diorite or a diabase, provided that he knows, beyond the possibility of mistake, that he is not dealing with a stratified rock, and what the effect of a dyke of igneous rock is likely to be upon the strata which it traverses. In fact, for the mining engineer physical geology is the most important part of the subject, and one which he must have at his fingers' ends. It is perhaps, needless to say that geology must be studied in the field no less than in the lecture room, and that the mining engineer ought to be familiar with all the various indications by which geological phenomena can be recognized and traced.

Mineralogy, including crystallography, deserves more attention than is usually devoted to it. The ability to be able to recognize at once any mineral that he comes across is of immense use to the mining engineer, and in this he is always greatly assisted by crystallographic indications. I may quote a case in point. I was once sent to report in a great hurry upon a deposit of magnetite in Nova Scotia that was offered for sale as a Bessemer ore. I found, on examining the ore, that it contained minute needle-like crystals, which, under the lens, appeared as hexagonal prisms, and which, from their crystallographic characters, I concluded to be a mineral called apatite, consisting of phosphate of lime. I accordingly broke off the negotiations at once, and subsequent analysis confirmed the correctness of my diagnosis. Here, then, was an instance in which a knowledge of crystallography saved much time and, possibly, a heavy pecuniary loss. Another instance that came under my cognizance was that of an engineer who had to report on a silver lead mine. He took his samples from various points along the levels, and as his assays gave very satisfactory results, he was preparing to report favorably when a close examination of some crystals of galena that he had broken out from the roof of a level showed Portland cement on the back of the specimens. Needless to say, this discovery was enough to show him that the mine had been "salted." These two examples will, I hope, suffice to show how the knowledge of what is really a pure science can have a very practical value, even in the commercial sense, for a mining engineer.

We now come to the course on mining proper, to which the previous subjects serve as foundation, so to speak. I have not attempted, and in a college like this, with a staff of professors whose duty it is to teach these sciences, and whose eminence in their respective subjects is too widely acknowledged to need any word from me, I would not venture to do more than indicate what bearing these sciences have upon the training of a mining engineer, and to what extent he needs their aid. The first part of a mining course usually consists of what is, strictly speaking, a portion of geology—namely, an account of the various forms in which mineral deposits are met with, the mode in which these deposits have been formed, and the various classes of dislocations and interruptions to which they are subject. These matters need dwelling on in more detail than is usually possible in a course of geological lectures; indeed, in some continental universities these subjects are elevated to the rank of a separate science, and professional chairs have been devoted to it. The student has next to attack mining proper, and here he comes at once into a new world. He has hitherto been studying pure science; now he has to learn an art, and must from the first be taught to consider it in its trade aspects. All such subjects as prospecting, boring, shaft sinking, exploitation, haulage, winding, pumping, ventilation, and so on, have to be considered in their economic, as well as in their technical, aspects. Of course, it is absolutely impossible to learn mining either from lectures or from books alone. Not very long ago I saw in a newspaper an advertisement from someone who proposed to teach mining by correspondence, and I could not help wondering how a mine would fare, the manager of which had been taught in this fashion. All that a lecturer on mining can do is to describe to his students the practice in various parts of the world, and the principles upon which it is based, drawing especial attention to those methods that have proved economically successful, and also whenever possible contrasting with them other systems that have proved failures or have been superseded by better ones. After all is said and done, mining must perforce be learnt in the mine. A combination of practical work with lectures is the best way of learning, but then it is always preferable, whenever possible, that elementary lectures should precede the practical work, so that the student may know what to observe and how to observe it. After he has learnt all the pure science he needs, let him attend a course on elementary mining, and not till then let him go underground. Advanced lectures of a more specialized nature should then be attended, say, during two days a week, while the student is working in the mine for the rest of his time. Furthermore, there should be special short courses on such matters as mine accounts, mineral legislation and mineral statistics. Mine surveying should be thoroughly taught in a course of demonstrations, in which the students themselves are made to execute surveys, if possible, underground, or, if not, at any rate, under somewhat analogous conditions. They should be taught to calculate and plot their own surveys, and especial attention should be directed to the calculation of quantities upon a systematic basis.

A branch of mining that requires special training is that of ore dressing, in which term is included all the mechanical preparation of minerals after they have been brought to bank in order to fit them for the market. All methods of crushing minerals and of dressing them, whether the object of the process is to save the heavier portions as in lead dressing, or the lighter ones as in coal washing, are also included. This subject is best taught by laboratory demonstrations. A laboratory for this purpose should be filled with various types of crushing machines, and with experimental jigs, shaking tables, &c., so that the student can test for himself the effect of various processes and of various ways of carrying out the same process upon a given ore; there should also be facilities for assaying the products of the operations, so that the student can prove to his own satisfaction the value of his work. Properly conducted, such a laboratory course has immense educational value, in addition to the training it affords in the treatment of minerals, and a student who has gone through such a course will

have a grip of his subject and an intimate knowledge of minerals, such as no amount of mere lectures or reading can give him. I am, accordingly, inclined to lay especial stress upon the importance of a course of practical ore dressing.

Finally, the mining engineer must have a good general knowledge of metallurgy. It is no exaggeration to say that nine-tenths of all the products of mines, whether coal or metalliferous, are intended to undergo metallurgical treatment. In fact, minerals are mined and prepared for that object. Unless the mining engineer knows exactly what the processes are by which the mineral he raises will have to be treated, he is not in a good position to judge of the most suitable condition in which they should be delivered, and without such knowledge he is likely to produce an article less readily marketable than the man who knows what after-treatment he is preparing his ores for. Obviously, therefore, the man who knows metallurgy is likely to get better prices for his products than the man who does not. In addition, the study of metallurgy completes and rounds off his knowledge of minerals, and thus puts a finish on his technical education. The minor details of metallurgy are not, indeed, required, but a general knowledge is, and no man can be considered a really thorough mining engineer unless he is a metallurgist as well.

I have now laid before you, briefly, the main elements that should, in my opinion, compose the technical training of a mining engineer, and I venture to think that a man thus trained is in a position to take his place in a mine, and to be of some use from the day he enters it, although, of course, he will have to spend a good many years underground before he can attain to any mastery over his subject. It may be objected that such a training as I have sketched out will require a good deal of time. So it will. I do not consider five years any too much to devote to the study of mining engineering. I do not know of any profession that can really be learnt in less, and hold very strong opinions as to the injury inflicted upon the mining industry in every way by the admission into the ranks of mining engineers of men only partly qualified for their duties. Unfortunately, mining is, to some extent, a hazardous career, and chance plays a far larger part in it than in most other pursuits. Hence it may happen that an untrained man now and then finds himself in charge of so good a mine that all his ignorance cannot prevent its paying its way. I remember an instance in South Africa, where a certain mine manager had control of a very successful mine, and for a time enjoyed quite a reputation as a mining authority; yet all this gentleman knew about mining was what he had been able to acquire while following his former occupation of a ship's steward! Such things will occur as long as the duties and training of a mining engineer remain vague and undefined, but it is pretty evident that a clearer public opinion on this point is gradually springing up. One thing is quite certain, and that is that in the face of the keenness of competition all over the world to-day no mining engineer can afford to neglect any item of training that is likely to help him in the struggle for existence, and that no mine can pay so well, in the long run, as the mine that is controlled by a properly qualified manager.

Do not think that I am taking too candid a view of the mining engineer's duties; the sole justification for his existence is that he can make mining pay, and mining, I repeat, is a purely commercial pursuit. Accordingly, as I have said, the mining engineer must be first and foremost a man of business, and must study science, not for its own sake, but for the profit in pounds, shillings, and pence that he can get out of its application. If any of you are inclined to contrast unfavorably such a purely utilitarian career with the pursuit of science for its own sake, I would ask you to remember that, while the scientist passes his life in adding to the knowledge of mankind, the technician spends his in adding to the stock of human comfort by his labors; and I venture to assert that of the two the latter object is at least as important as the former one.



Ordinary General Meeting of the Mining Society of Nova Scotia.

The Ordinary General meeting of the Mining Society of Nova Scotia was held in the rooms of the Society, Halifax, on Wednesday, the 4th of December. There were present:— R. H. Brown, (General Mining Association) President; W. Blakemore, (Dominion Coal Company, Limited); G. W. Stuart, Truro; Charles Fergie, (Inter-colonial Coal Co.) Westville; B. C. Wilson, Waverley; D. W. Robb, (Robb Engineering Co.) Amherst; George Francklyn, Halifax; B. F. Pearsall, Halifax; A. A. Hayward, Halifax; C. C. Starr, Halifax; Geoffrey Morrow, Halifax; Doctor Gilpin, Inspector of Mines, Halifax; C. E. Willis, Halifax; Charles Archibald, Halifax; Alexander Dick (Canada Coals and Rail Company), Joggins; W. A. Saunders, Lake Loide, Caribou; F. H. Mason, F.C.S., Halifax; G. Dick, C. & M.E.; Duncan McDonald, Truro; T. R. Gue, Halifax; J. H. Austen, Halifax; W. L. Libbey, Brookfield Queens Co.; Edward T. Jenner, Sherbrooke; Clarence H. Dimock, Windsor; and H. M. Wylde, Halifax.

The proceedings opened at half past ten in the forenoon, the President, Mr. R. H. Brown, in the Chair.

The Minutes of the annual meeting were read and on motion adopted.

New Members.

The following new members were elected:

Mr. Thomas Spry,
Mr. E. T. Jenner,

Mr. C. Rood,
Mr. D. K. Grant,

G. A. Orrick.

Delegates to the Federated Board.

A communication from Mr. John Blue, President of the General Mining Association of Quebec, asking that the society appoint delegates to the Federated Board for the ensuing year was read.

THE SECRETARY—The constitution gives us one delegate for every forty members or fraction thereof. We will thus have three delegates in addition to the President. We have in the neighborhood of one hundred members.

Mr. BLAKEMORE—Having joined the Federation, we must comply with the regulations, and therefore there is no possible ground for refraining from the necessary procedure in electing representatives, but unless we know definitely the place of meeting I do not see that we are in a position to appoint them. I presume the place will be appointed by the majority of the Board. I take it for granted that delegates will have their expenses paid either from the joint funds or from the funds of each society.

THE SECRETARY—That question has not been raised before. I do not think that our society can bear any such expense. It might possibly come out of the three hundred dollars we pay in. In the previous discussion of federation it was understood that it would not cost us more than three hundred dollars.

Mr. B. C. WILSON—If the delegates have to pay their own expenses we will have to draw lots.

On motion the following were appointed delegates:— Mr. John E. Hardman, Mr. Charles Fergie, and Mr. K. G. Leckie.

The Duty on Mining Machinery.

Mr. W. BLAKEMORE—I would be much obliged if some gentleman would inform me what mining machinery can be brought into the country free of duty.

THE PRESIDENT—Machinery of a class or kind not manufactured in Canada.

Mr. FERGIE—That test will not always apply.

Mr. ROBB—The article must differ in some special way from a like article made in Canada.

Mr. BLAKEMORE—Suppose, for instance, a pump manufactured in England or the United States, and of a different character to one made here, and superior on account of the principle of its construction: it seems to me that should be free, yet I have found that it is not so in practice.

THE PRESIDENT—The Worthington pump could be imported at one time but now they make them of the same pattern in Canada.

Mr. FERGIE—The customs house people say they will not admit any machinery except actually in connection with the mining of coal. That bars air pipes and lamps. We should get through the medium of this society some expression from the customs house people as to what they will class as mining machinery.

Mr. LIBBEY—I have been importing shoes and dies of a special make from New York. I made a statement that they were not manufactured in this country and they were admitted free.

Mr. BLAKEMORE moved that the Secretary be requested to communicate with the Secretary of the Federated Board, asking him to communicate with the customs authorities on the subject of the importation of mining machinery and that members furnish him with every possible information on the subject.

Mr. FERGIE seconded and the motion passed.

Mr. BLAKEMORE—We have paid duty on ten miles of large size iron pipe.

Mr. AUSTEN—There is another matter in this connection worth noting. We buy iron pipe in the States at a certain discount. We receive certified invoices from the makers and put in an affidavit that these are the actual values. The government, however, compels us to amend our entries and fix a certain discount, more than which they will not allow.

Amendments to the Mines Act.

The following report of the committee appointed to suggest amendments to the Mines Act was then read:—

To the President of the Mining Society of Nova Scotia:

GENTLEMEN, At a meeting of the Mining Society held in the rooms in Halifax on Nov. 14, 1894, the undersigned were appointed a committee for the purpose of securing, if possible, further legislation which might be in harmony with good mining practice and the best interests of this Province.

Your committee decided, after careful consideration, that a full opportunity should be offered all interested in mining to express themselves on the subject, and that they should be invited to give their opinion, not only as touching the legislation which is already on the Statute Book, but with regard to any point or points which it might be desirable to embody in future legislation; and also, as to the most desirable general policy of the Government towards the mining industry as a whole; and suggestions were also asked for regarding any point or points which looked to the prosperity of the mining industry, either particularly or as a whole.

With these objects in view, your committee issued circulars, soliciting suggestions upon the three following groups of subjects:—

1. Amendment to the present Mining Act.
 - (a) Of title and tenure.
 - (b) Of mining regulations.
 - (c) Of special rules.
 - (d) Of royalty and rentals.
 - (e) Of applications for locations of areas.
 - (f) Of forfeiture, etc., etc.
2. As to the general policy of the Government towards the mining industry as a whole.
 - (a) Looking to improved facilities.
 - (b) Looking to general topographical and geological surveys of the province, and extended information of our mineral resources.
 - (c) Looking to extension of markets for the raw products of our mines.
 - (d) Looking to the investment of foreign capital in this industry.
 - (e) Looking to technical mining education.
3. Generally of a policy which will look to the prosperity of the mining industry, either particularly or as a whole.

In response to this circular the Secretary of the Society has received replies from several members making suggestions on these various points.

The suggestions sent in by most of the writers are devoted to Subject No. 1, relating to the amendment of the present Mining Act, and most of these refer to sub-section (a), on the question of "Title and tenure." Nearly all of the suggestions sent in on this sub-section refer to gold mining; while, on the other hand, sub-section (b), "Mining regulations," is noticed by some of the members interested in coal mining, and are intended principally to simplify the working and management of collieries. For the purpose of focussing the whole matter for convenient consideration the committee proposes to present:—

1. The various suggestions classified under their several headings as given in the circular issued.

2. A few remarks and criticisms upon these suggestions for the purpose of placing before the society in a form which will be ripe for criticism.

[As No. 2 really embodies the whole of No. 1, we propose omitting the latter in this very lengthy report.—ED. C. M. R.]

MINING LEASES.

Regarding the length of the mining lease there seems to be a considerable difference of opinion as to what it ought to be. One member thinks that 100 years is a proper term and another suggests 50 years. A suggestion is made that an absolute lease should be given indefeasible, when a certain number of dollars have been expended per area.

A question of granting one lease for gold and silver and another for base metals over the same territory as is at present permissible by the mining law is freely discussed by all of the members. One suggests that any lease granted by the Commissioner of Mines should give the lessees power to mine all minerals irrespective of class.

On the other hand, Mr. F. H. Mason suggests that properties leased for metals, other than gold or silver, and which contain either of these metals, ought not to be re-leased to other parties for gold or silver unless it be proved to be a free milling gold or silver ore, and that even if the ore be a free milling ore the property shall not be re-leased to other parties so long as gold or silver are abstracted by the lessee in working base metals. If, however, the lessee does not extract the free milling gold or silver from the ore as a by-product, or by any of the various metallurgical processes, he must then pay a rental for such gold and silver areas for the whole property, or the Government may have power to re-let it for gold and silver leases.

A very sensible suggestion is made by another member, that sub-leases may be recorded in the county record office. Mr. Stenshorn raises a critical point, in suggesting that a quartz crusher be considered a necessary building at a gold mine, for which expropriation should be allowable, as in the case of shaft houses. It seems reasonable with Nova Scotia gold ore, that such should be the case, but holders of surface property have a stipulation in their grants from the Government, which only binds them to agree to so much land being expropriated as is necessary to "raise and carry away" minerals contained therein, and no mention is made of powers of expropriation of land for manufacturing purposes, and it might be reasonably argued that the quartz crusher is the thin end of the wedge, opening a way to greater concessions for large chlorination plants, etc.

ROYALTIES AND RENTALS.

All the suggestions sent in on this point are emphatic in demand for their entire abolition. Various arguments are used in support of this. An alternative, however, is proposed in case it may be proven inadvisable to abolish royalty, namely:—"That royalty should only be paid after cost of labor and explosives are deducted, say an outlay of fifteen dollars per oz. of smelted gold."

It will be observed that Mr. Stuart makes a suggestion regarding the establishment of a government assay office. Such an office would prevent the pilfering of gold which is going on at the present time and which finds a ready sale, even amongst the bankers, brokers and jewellers. It would also prevent the smuggling of gold out of the country without having first made returns and paid royalty therefor. This office could be made a reasonable source of revenue to the government and thereby substitute to some extent any loss sustained by the removal of royalties and would insure the return of all gold raised, which is not the case at present, and effectually prevent the pilfering of gold, which is the greatest drawback to the gold mining industry. Mr. B. C. Wilson suggests that the size of gold areas be increased to say about 10 acres in extent. Mr. E. Jenner's suggestion regarding a bonus for deep gold mining is one that has been discussed before, but it may be worthy of some further notice from the members of the society.

FORFEITURES.

On this point considerable difference of opinion is expressed. In some cases three months' notice is suggested as a time which should be given to a lessee before a forfeiture could be effected. In another case, it is suggested that discrimination should be made in favour of lessees who have made improvements in their properties, and that even, although the property may not be actually in operation at the expiration of the annual term, the government should have power to levy for the amount of rental due, as in real estate transactions. Another suggestion which is made, is that when a certain amount has been expended per area on any property, that such amount shall form a bonus which shall render the property non-forfeitable for a given number of years. Another member holds that no property should under ordinary circumstances be forfeitable, unless application has been made at the Mines Office for the property by some other party, and that even in that case the former lessee should have one month's notice. There is one feature noticeable in this suggestion, which might render its operation somewhat difficult, namely, that the fact of an application being presented at the Mines Office for some property which may have been lying dormant for several years, would in many cases be an indication that the applicant had discovered something which had rendered the property more valuable than its former owner had any idea of, and it would give to the former owner a prior, or it might be said a "breathing space" of thirty days, to make up his mind whether he had better relinquish or pay up his dues. Such an opportunity for "absentee landlordism" might perhaps be more injurious to the mining industry of Nova Scotia, than is even the "laying in wait game" which is so notorious at present.

MILL LICENSES.

Mr. Wilson draws attention to the injustice to bondsmen perpetrated by the government in allowing a mill to run for a year or two without returns, and states that, in some cases, the bondsmen have to make good the royalty due; the lessee having probably left the country. In such a case as this it is a pure contravention of the Mines Act on the part of the mill owner. According to section 51 every licensed mill owner shall file and return on or before the 10th of each month the weight of all quartz crushed and the actual yield in gold from the same. According to section 52 if no work has been done at the mill during the month, the owner shall make returns to that effect. If the government does not force the law, it is certainly a pity that the bondsmen should be made to suffer; although on the other hand it is easy for any bondsman who has certainly financial interest in the matter, to find out whether the owner in question is making his monthly returns.

MINES REGULATION.

Mr. R. H. Brown makes a very useful suggestion regarding the daily underground supervision of a colliery which might well be commended to the government for its careful consideration. The Mines Regulation Chapter contains a number of inconsistencies, some of which may have been passed over, while the Act was before the House where but few members had sufficient technical knowledge to be able to detect them. Nevertheless these inconsistencies render some of the most valuable sections inoperative, as may be seen from a perusal of Mr. Brown's suggestions, and it only requires a short Act, incorporating the existing Acts, and the removal of some incongruities, to place the entire Act on a sensible basis. Mr. McKeen suggests a number of amendments in the Mines Regulations. Regarding the use of explosives in mines he proposes to rescind sub-section 2 of section 8. This would have the effect, as he states, of allowing more latitude to the management. It

is undoubtedly true, as he says, that many of the clauses of this sub-section are of a cast-iron nature, and no doubt some workmen will always be found in every mine who will not obey the law regarding explosives. That is an experience which has been met with wherever coal mining has been prosecuted. The rescinding of the entire sub-section, however, would again allow the storage of gunpowder in the mine, or to put it in other words, whereas in Nova Scotia today any workman can have only six pounds of gunpowder in any one part of the mine, and even then must carry it in a canister. Such a rescinding would make it legal to carry a full keg of loose gunpowder into every chamber. In considering this question it might be well to look at what they are doing in other countries on the matter, and to read experiences regarding the use of explosives in mines.

In England, at the present time, miners are not only restricted to five pounds per blast, but they are obliged to have their cartridges ready made before entering the mine, and the result is that in English mines the explosion of gunpowder is very rare. In most of the mining States of America, regulations regarding the use of explosives in mines are very loose, each squad of men having a keg of loose powder from which their cartridges are made as they require them. The law in some cases insists that, in making cartridges, no person shall have a light within five yards of the powder. It can be readily imagined what amount of illumination any man can have in making the cartridges under these conditions; and it is not to be wondered at, therefore, that the law is openly violated, with the result that in the United States of America at the present time five per cent. of all accidents occurring underground are due to the premature explosion of blasting powder, and we think that these regulations should be carefully argued before they are rescinded. It will be observed that Mr. McKeen makes some very pointed comments on the existing system of granting certificates. He would suggest that in Nova Scotia the whole matter of certificates began at the wrong end of the ladder. The first class to require a certificate in this Province was the low class of mine officials, and it is only within the past few months that the head of the house, the mine manager, has been able to obtain a Nova Scotian certificate of competency.

Here again we have the experience of England and the States with which to compare. In England there are only two grades of certificates—namely, the mining manager and the underground manager. These certificates are known as first and second class respectively, and there has not yet been any attempt to carry the matter any further. In the United States, notably in Pennsylvania, the custom is to compel every man, mine foreman, boss and miner, to hold a certificate according to his station. The two higher grades of certificates are obtained from examining boards similar to those we have in Nova Scotia. But the miners' certificates are granted by local committees who obtain as their bonus a percentage of the fee paid by each miner in applying for his certificate. The law in the anthracite districts will not give a miner a certificate until he has served a certain period as a miner's laborer, but the fact of the matter is that, in spite of the law, hundreds of Poles, Slovaks and Hungarians secure their certificates within a short time of their arrival in the country and even before they can speak the English language, and the result is that any intelligent miner is afraid to trust his life in the same working. A very pretty problem has been unfolded in that region by the recent opinion given by Attorney-General Heisen of Pennsylvania, that a miner means "any laborer, loader, roadsman, repairman, or any other person who works in the mines but who does not actually mine coal."

If this opinion be correct certificates will soon become a common property, although it cannot be said in such cases that they are any guarantee of either intelligence or safety to life. This all tends towards ridiculing the system of granting certificates.

In Nova Scotia a third class of certificates to overmen is required, and this Mr. McKeen proposes to abolish, as well as the American system, which is also in vogue here, of granting certificates to miners. It will be observed that Mr. McKeen also maintains that certificates granted by other advanced mining countries should be legalized here. It used to be that such was the case, and it is only since the passing of the new Mine Law in 1892, that any foreigner, coming into the country as manager, can only act under an English certificate, until the next following examination comes round, when he is required to compete for a Nova Scotia certificate.

It is said that a Nova Scotia certificate is not legal in any other country, although, perhaps, there is no case on record where attempt has been made to contest this point, but if we in Nova Scotia are content to accept members of, say, the medical profession holding English degrees, and permit them to practice on an equal footing with ourselves, it is absurd to reject a certificate of competency granted by Her Majesty's Secretary of State for the Home Department, in a country where the technical and practical training of mining managers is more complete than in any other country on the face of the earth.

WHAT SHOULD BE THE GENERAL POLICY OF THE GOVERNMENT TOWARDS THE MINING INDUSTRY?

On this point a number of suggestions have been made.

One member, in speaking of the inspection of gold mines as it at present exists, states that the whole thing is inadequate, and an opinion is expressed that for the purpose of affording improved facilities, the Mines office should be separated from the office of the Commissioner of Works and should be placed under a competent mining man. It is well known that the present Inspector cannot possibly devote as much time personally to the inspection of the mines at present in operation in the Province as he ought, and considering the fact that the mining industry contributes nearly one half of the entire revenue derived by the Province, it is inadequately served in the matter of mine inspection. The coal mining section is supplied with two deputy Inspectors, but with the exception of a hasty 10 days' run through some of the gold districts, by temporarily appointed men, there is really nothing done whatever in the matter.

The annual report of the Department gives but scant information as to what the various mines are doing, and members thus operating in the gold mines of the Province frequently complain that the inspection of their property rarely, if ever, exceeds an annual visit to the surface works. Regarding the suggestion that the head of the Mines department should be a non-political appointment, it is only necessary in considering the matter to compare the high state of efficiency which mine inspection and mine statistics have arrived at under the regime of non-political public service in England, or the really first-class service in certain portions of the United States, which in this respect is also non-political, with the want of "back-bone" which must necessarily exist where officialdom is obliged to be subservient to the pull of the voter.

The various suggestions made by Messrs. Poole and Mackay regarding publication of maps, statistics, condensed geological reports, etc., etc., are well worthy of recommendation, as are the other points regarding appointments of the Provincial Analyst, and the question of paying a bounty on the production of gold to be set aside for the development of the gold mines.

MINING EDUCATION.

Its Necessity.—An opinion is expressed by some members that the time is now ripe for some form of mining education in the Province. It might with equal propriety have been said that the time has been ripe for quite a number of years. There is no

Province or State from which there is a greater exodus of youth than Nova Scotia. We have the most diversified wealth of minerals and metals of any territory of similar size, and there is a wide field for the chemist, geologist, mineralogist and miner. The trouble all along has been, however, that unless a young man has a taste for the bar, the pulpit or the surgery, and cares to run the risk of earning a mere pittance in one of these already overcrowded professions, his only resource is to fall back on the farm or to emigrate to the States. If further proof of the necessity of such an education was required we have only to read the history of mining in Nova Scotia, to recall the blunders and blindfold policy which has all along been indicative of our provincial mining knowledge. With the exception of here and there an able miner, and he not native in every case, the industry has been in the hands of men whose ideas were crude and whose methods of prospecting and mining were of the rule of thumb or divining rod order. It is the experience of many members of this Society that where fathers have made application to have their sons "put to something," it was but seldom that their knowledge could be valued at over \$1.00 per day, and as that could be earned at the farm, back the lad went. If an opportunity could be offered of obtaining such an education as would fit our youth for the mining business, there are many who would respond. The only necessary stipulation is, that an education must be easily and cheaply obtained to make it attractive. To do this we must have the aid of the Government. What is our claim for Government aid? According to the accounts of the Provincial treasurer, the entire income from the Province, independent of the Dominion subsidy, was \$542,168.13 for the year ending Sept. 30, 1894. Of this amount \$242,053.13, or nearly 45% of the whole, was derived directly from the mining industry. The total expenditure of the Province during the same period was \$1,004,419.43, and the total amount expended on the mines was \$12,899.25, or about 1% of the entire expenditure. These figures are not presented with any idea that the mining or any other industry should obtain as great a percentage of the Government expenditure as it contributes towards the income of the Province. The statistics are simply given for the purpose of comparing with the agricultural industry, which already possesses a State-aided technical school in the Province.

The total income derived from the agricultural industry is \$587.49, or 1% of the whole, while the Government expends \$20,041.74 on agriculture, of which \$2,955.84 goes to the school of agriculture. This is equal to nearly 2% of the provincial expenditure.

Of the \$12,899.25 expended on mines \$599.95 was for instruction to coal miners preparing for their examinations. This year the amount of this item will be over \$1,000.00. The foregoing figures show that considering the relative importance of the two industries, the one in which we are interested is not by any means receiving its share. It may seem at first sight that these figures show a want of appreciation on the part of the government, but it is questionable whether it is not as much due to a lack of community of idea on the subject on our own part. The agriculturalists are united as to the form of education and experimental farming most suitable to their requirements and they thus get their slice of the government bounty. It behooves us therefore to formulate some system of education and show the government our unity of desire in the matter, which is the first step towards obtaining the desired assistance.

Nature of Instruction Required.—The suggestion made by Mr. H. T. Harding is that a "School of Mines" be established in Halifax, possibly as an annex to Dalhousie. At that college there is at present a lecture on mining and one on surveying, and according to the calendar of the college for 1895-96 there were no students last year. The reason for this is probably due partly to the fact that the matter is not brought before the public with sufficient prominence to secure good attendance. Another reason, however, and a more important one, is that the subject of mining at Dalhousie is what might be termed "a small side dish." It is not reasonable to suppose that a young man whose aim is to take a degree of mining engineer will look with much desire upon such a course as the faculty affords him at Dalhousie, so long as he can reach the higher and more coveted degree to be obtained at one of the better known universities which make a specialty of a mining course.

It may therefore be readily seen that to have weight and influence which will attract and hold classes some school must be established, such as a School of Mines, where chemistry, physics, mechanics, etc., will all be taught, not only in a general way, but more particularly in their relation to mining, and with the constant aim of eventually turning out first-class mining engineers. It might be well at this point to refer to what is being done in the Upper Provinces of Canada in the way of mining education. At Kingston, Ontario, a School of Mining has been established and incorporated by Act of Legislature. Three and four year courses are given, intended to fit young men for the professions of mining engineers and metallurgists. The fees for the four years' course aggregates to about \$200. There are three professors, five lecturers, and two laboratory demonstrators. The expenditure last year was about \$16,000. Against this there were three sources of income, (1) *A grant from the Provincial Government of \$10,000*, (2) fees amounting to \$2,249.00, and (3) public subscriptions to the amount of \$2,600.00, making a total of \$15,949.00, so that the two sides of the ledger would have been about equal, had it not been for the fact that there is a "Dairy School" whose accounts are mixed up with the School of Mining, with the result that there is a total balance on the wrong side of over \$2,000. Evidently agricultural education in Ontario is as big a drain to the Government as in our own Province.

Besides the ordinary mining engineering course there is a prospector's course for mine foremen, etc., which lasts for eight weeks each year, and for which a fee not exceeding eighteen dollars is charged. There is another feature in this question of technical education which is well worth looking into. This is the English system of sending out lecturers to the various mining centres to deliver lectures on chemistry, geology, prospecting, mineralogy, assaying and practical mining. These lectures are free to every one and the entire expense of this method of tuition is borne by the various county councils at a cost of a thousand to fifteen hundred dollars per county per annum. The advantage claimed for this system of instruction is that it takes the education to the student, instead of requiring the latter to leave his work for a season to attend classes every winter. The Government of Nova Scotia has for some years by means of local instructors, been expending considerable sums on this form of instruction amongst the coal miners for the purpose of raising the general standard of their knowledge and assisting those who intend presenting themselves for an underground manager's certificate.

In Nova Scotia where gold and coal mining industries are both so important classes would be required to be formed dealing with all points of the subject of mining, and to best maintain interest in the school it would be necessary, we think, to embrace the Kingston School system, with the English method of district lectures. Mr. Poole's suggestion that primers on mining be introduced into all schools in mining localities is a good one and should be brought to the notice of the educational department.

The whole subject dealt with in this report is worthy of the appointment of a committee which would have power to formulate a thorough programme for presentation at a special meeting of the society, to be held during the first week of the Legislature, with the object of submitting the same to the Government and Legislature, or the committee might have power as the representative of the society, after fully preparing the plan, to present it without further delay to the Government.

MR. BLAKEMORE moved a vote of thanks to the committee for the able and exhaustive report which had just been read.

MR. MASON seconded the motion, which carried.

MR. PEARSON suggested that the members take with them copies of the circular issued by the Secretary and note on them any comments they might wish to make during the discussion at the afternoon session.

Meeting then adjourned.

Discussion on the Report.

The afternoon session opened at three o'clock, the President in the chair.

MR. BLAKEMORE—I would suggest that as gold mining legislation occupies the bulk of the report, the gold miners commence the discussion.

MR. HAYWARD—I notice a clause in the report recommending that the Government encourage deep mining by allowing a rebate on royalties for such. I think the distance mentioned was about 600 feet. I believe we have reached in some of our mines a greater depth. If they would offer a bonus per foot for every foot over 800 in all shafts it would encourage deep mining.

MR. AUSTEN—If my recollection serves me, we had a committee appointed to look into the amendment of the Act relating to Gold Mining, and we have somewhere a report of that committee. In talking over the matter with some of the members of the Association, more particularly the gold miners, they suggested that at this meeting a committee should be appointed to look over the suggestions of the former committee and make any alterations they thought necessary and bring it before the Government.

MR. WILSON—I thought this was the only committee, and that the idea was that another committee should be appointed to draft an Act. As far as discussion by the gold miners is concerned, we believe we were somewhat in the position of the young man who posted his prayers at the foot of his bedstead and said, "Lord, those are my sentiments."

THE SECRETARY—Mr. Austen, I think, is referring to the old committee of the Gold Miners' Association. I thought their amendment was presented to the Government and went through.

MR. G. W. STUART—The consensus of opinion among gold mining men is for the abolition of royalties altogether, if that can be accomplished, and in that case the necessity of making any distinction between gold taken from the upper and lower levels would be done away with. There would be difficulty in determining in what part of the mine the gold was obtained. It is not at all improbable that gold obtained from levels above 600 feet might be credited to lower depths.

MR. BLAKEMORE—If the Government helps you to sink that shaft, why would you not be willing to pay the same royalty, the supposition being that you need help to go lower?

MR. STUART—The suggestion is not only to ask the Government to relinquish the right to royalties on gold found at lower depths, but to give a bonus for gold found at lower depths.

MR. BLAKEMORE—I quite agree with the committee that the Government should assist persons prospecting at lower depths, but the other question of the abolition of royalties is one by itself entirely.

MR. HAYWARD—The Government should assist by a subsidy per foot measuring on the slope of the vein, or by relinquishment of the royalties.

MR. AUSTEN—Some years ago the Government were approached and asked to grant a subsidy of about \$10,000 for the first mine that would sink a shaft to a greater depth than \$1,000 feet.

MR. HAYWARD—Mr. James Fraser and myself presented that to the Government. I suggested that they relinquish their royalty on all gold found under a certain level.

MR. STUART—I have always maintained, ever since the Government adopted the system of rentals, that they should relinquish the right to collect royalties. The rentals make up an amount about equal to that of royalties. Instead of being a benefit to the gold mining community the adoption of the system of rentals has been an additional burden upon us. I am prepared to support the only suggestion I made, embodied in the report, that of abolition of royalties, adopting a system of a Government assay office where all gold will have to be produced and assayed. I will withdraw that part as to assaying. I must admit that it would be putting the Government to considerable expense, perhaps more than they would be disposed to incur in establishing an assay office wherein they could determine the exact value of every piece of bullion presented, but let the gold be presented and weighed, the weight stamped thereon, and the Government's official mark, before it could be offered for sale. You would simply make your returns to that official instead of to the department; then your gold could be presented anywhere for sale as being legitimately obtained. As it is now, any one may offer a piece of bullion to a banker, broker or jeweller without being asked a question. He may have stolen it. I can quite assure you that any man in business would hesitate before undertaking to purchase a piece of bullion without the Government mark if it could be confiscated if found in his possession. The Government would be doing an injustice, not only to themselves, but to the mining community did they permit us to obtain our gold and not be obliged to make returns somewhere. They must have some system of determining the amount of gold obtained. I don't see how it could be considered a hardship on any man producing gold to compel him to have it officially stamped. If he were in the country, he would not have to come to Halifax to dispose of it. He could hand it to the nearest bank and make a statement how it was obtained. The bank's office in Halifax could produce it before the Government official, who would weigh it, stamp it, and place his official mark upon it. The miner would not be put to one cent more of expense in connection with it except the nominal fee which might be charged for the duties performed by the official.

MR. MASON—If you had the specific gravity taken also you might approximate the value.

MR. AUSTEN—The banks do not allow the full amount now. They keep back a certain percentage.

MR. STUART—Gold sent out of the country without the official stamp could be followed and confiscated anywhere.

MR. AUSTEN—I should think that it would be something that the Government would jump at because they would be more certain to have the returns.

MR. HAYWARD—I would suggest that the Government be asked to subsidize all mines worked over 800 feet \$15 per foot.

MR. STUART—I am not wedded to any particular system in order to obtain the full actual amount of gold that is produced. All I want is to prevent if possible the pilfering that is going on at present. I know a mine in Nova Scotia that was worked for a number of years. It was a good mine and a productive one, and it has been said, and I believe it to be true, that the manager of that mine made two trips abroad every month. I know two bricks were made every month at that mine. It is said returns were made on one brick, while the other was spirited off to the United States. There may have been an object further than that of defrauding the Government of the royalties.

MR. AUSTEN—There is supposed to be another mine in Nova Scotia that never makes any return and the manager has been working for years.

MR. STUART—In the particular instance I speak of it is a well known fact that the manager made periodical visits to the United States and his grip was a very heavy one.

MR. HAYWARD—How would the stamp on the gold prevent that?

MR. STUART—You could seize the grip. I am quite satisfied that if such a system were adopted the returns would be swollen at least one-third over what they are at present.

MR. HAYWARD—I was in a broker's office some time ago and a fellow out of our mine came in and sold six-and-a-half ounces of gold.

MR. MORROW—I have listened with a good deal of interest to the discussion, and thought there would be some suggestions from the others on the committee. It appears to me that the best thing for us to do would be to let this Report be discussed here in a cursory way and then let it be referred back to the committee. We should also nominate additional members to that committee, men posted on the different branches. Then the committee so enlarged might appoint three sub-committees, one for each matter, the coal, gold, and other mining interests. When they prepared some scheme for each of these let them go back to the whole committee and get their report in shape for submission to the Government. This is apparently vague, but I only make this suggestion thinking it might help us to come to some decision.

MR. B. F. PEARSON—I may say that the last part of the report suggests that course. The committee has not met often and I am afraid that they have not tried to gain for the report the full sanction of the committee. Really, the only meeting we had was that of last evening, and some question was raised as to how far we should go in making suggestions, which, of course, are numerous, and some of greater importance than others.

The really important one, it seems to me, and the one lying at the base of successful mining, is the question of the title to mines. Of course, I quite recognize the necessity of preventing stealing by employees, yet if they start with a poor title it makes no difference. You go to the Mines Office and everything is run on a basis on which no two intelligent men would trade at all. No man would rent a house on a lease containing such restrictions as are embodied in the one on which we take a mine. No one would rent a house, for example, under a lease which would give the landlord power to decide when and how the agreement was broken, enabling him, having reached a decision to turn the tenant out. No one would invest one hundred dollars in Nova Scotia mines if we were really obliged to conform with the provisions of our leases; and, therefore, the only security the miner has is in the negligence of the Government in failing to inform themselves whether or not the conditions of the leases given by them are carried out by the lessees. In other countries the title is a freehold one, but in Nova Scotia a different system is adopted, and the Government owns the mine and simply leases its interest in the soil. It stands also in another capacity of representative of the public interest; and, unfortunately, when it legislates with regard to mines the fact that it should legislate as a landlord as well as the representative of public rights is entirely lost sight of. The Government as landlord has a right to have equitable security for the payment of its rentals, that is all. Of course we all recognize on the other hand its right to see that the mine shall be so operated that there is no danger to employees. They give you a lease that they can forfeit in thirty days. If you are brought before the court by summons the court will order three or four months' notice to be given where necessary; but here we have a man with his whole capital endangered if he does not get a notice which they may stick up somewhere in the woods. Forfeiture should only extend to the case of non-payment of royalties. We thought last night of the two or three classes who dabble in mines. There is one special class who never invest a dollar and who take up single areas in the midst of those owned by others simply to cause annoyance and have themselves bought off. I do not speak on behalf of that class. I do not think any sympathy should be shown them. But in the case of a man who really intends to operate a mine and be of value to the Province, I think there should be some provision in the law by which he could get a lease fully protecting his rights. We thought the law should be amended to provide for a permissive lease, say for fifty years or some longer time, with all these provisions struck out, and letting a man pay his rental in advance or for five or ten years. Under the present condition of things a man has to go to the capitalist and give him two dollars worth of stock for one dollar, but if he could show a lease granted by the Government with only one condition of forfeiture, namely the non-payment of rent, and say "I have paid ten years in advance," his security would be good and he could give a bond on it. There is a great deal to be said on that point and I think the mine owners will approve of it. We should therefore start with the question of getting the title all right.

Take a coal mine. The owner represents capital and the employee the labor. Everything should be done to protect the latter below ground, but to say that no man can go under the turf without a certificate is preposterous. Mind you the mine owner has not a word to say about that certificate, but I am informed that the man who issues it is the man who works at the pit-head. The mine owner whose property is imperilled has not a word to say about the granting of these certificates. Who does the law recognize in the granting of certificates to medical men? The Medical Society. Therefore I think the mining certificates should emanate from this Society, which represents the proprietors of the mines.

There are other questions that could be talked of relating to coal and gold mines. I am not a practical miner, but I am very much interested in mines in this Province, as they are not developed to one-fifteenth of their capacity. Every legislature says, "Let the mine owners tell us what they want." It was for that purpose that this committee was appointed, and no Government can ignore what this Society demands, if it is proper and is properly submitted.

A great deal may be said on the question of school instruction. It seems to me that a proper mining school would not cost more than \$25,000 to equip as well as the Massachusetts Institute of Technology. Every proprietor will recognize that the greatest difficulty is not a plethora of men, but to get men who can and will do the work. If you find the right man you are prepared to give the best wages. The only way to do is to establish schools on the plan of the Agricultural School, which would be visited and examined by the members of this Society and be somewhat under its supervision and control. I think this committee should be enlarged. There are a number of men even outside the Society who would strengthen it politically. We should be prepared to go to the Government during the first week of the legislature. If the Government did not grant what we required, we could ask for a committee of the House. I therefore support Mr. Morrow's suggestion.

MR. BLAKEMORE—I have felt all along that this is too big a subject to be threshed out at a meeting of this kind. It can only be dealt with satisfactorily in committee. The concluding part of the report just meets my views, viz., that we should re-elect the present committee with power to add to their number and take the matter in hand with a view of bringing it to the conclusion foreshadowed in the last clause. I am quite sure that so far as the coal mines regulations are concerned, there is enough to consume a day or so. The members can send in any suggestions they may wish to offer in writing and let the committee put them in shape and deal with them. I would have every confidence in such a committee and would give them carte blanche. This is a composite Society, and the coal men do not take much interest in.

gold matters and *vice versa*, but that difficulty does not exist in a committee where all interests are represented.

I might be allowed to say a few words on behalf of the coal interests. We have a considerable number of difficulties, which to my mind are likely to become intensified. From what I can glean, the parties responsible for these difficulties are probably in sympathy with progression in the same direction. The first thing to consider is the safety of the men employed in that industry, and no capitalists have the right to weaken the security which the men get at their hands. It is difficult to frame an Act which will give the maximum of security to the men employed in all the mines coming under the Act. Mr. Fergie has a mine full of gas, and the rules which would be safe in my mine would not be safe in his, and you must give separate legislation for each of us. There are as great divergences in Great Britain, but there is one Act for the whole country, and you must inflict a hardship on the majority in order to protect the minority. Over there they have special rules. Every mine has a right to formulate them according to their own peculiar conditions. After being drawn up, it is imperative that these rules be posted, and during a month any man may make a formal objection. In the event of that the rules are tested. If there is no formal objection at the end of the month they must be accepted by the Government. That has not been taken advantage of in our mines, and it would help us out materially.

Mr. FERGIE—It has been taken advantage of in Pictou county.

Mr. DICK (Loggins)—And in Cumberland.

Mr. BROWN—We use that system in Sydney.

Mr. BLAKEMORE—In reference to certificates I would point out how the present system is a hardship to the employer. The men who grant these certificates are working themselves and have absolute and arbitrary power, and there is no appeal. Suppose there was a matter in dispute between an employer and his men it would be impossible to have other men employed there if the man granting the certificate should say that any particular man should not work there. It gives this man too much power. As to the necessity for the certificates there can be no question. In England it is only as a rule that the manager and his deputy should have certificates, and it seems anomalous that in this country where there is not so much danger, certificates should be required from others.

There is one other matter which was brought up by Mr. Brown. The Act says that the mine shall be under the daily supervision of the manager. In England that was the first thing which came up for discussion, and it was got over in this way. It was assumed that that must be interpreted liberally and not literally, and so long as there was a resident certificated manager, and he had his proper deputies, their examination would be considered as his, and the deputy could do so far as the "daily" examination was concerned. That interpretation was accepted by the judges. If they would not accept such a rendering here the Act should be amended.

I have been very much struck that in a country like Canada, with our population and the extent of coal mining, there should be such a diversity in the Coal Mining Acts in the different Provinces. This Society has a position and we should take advantage of that position to place our views before the Government in the proper form.

I will conclude my remarks by making a motion, viz:—"That the report of the committee be accepted; that the committee be reappointed with power to add to their number, subject to the approval of the President; and that they be respectfully requested to carry out the intention of the report as foreshadowed in the concluding paragraph."

This was seconded by Mr. Willis and passed.

THE PRESIDENT—Suppose you are a certificated manager of a colliery, and you take a trip to England, if an accident were to happen during that time the question would be raised how could you, being absent in England, make a daily examination?

Mr. FERGIE—Your underground man can make that daily examination.

Mr. PEARSON—A law is made which cannot be carried out. If an accident occurs, and the company is sued for damages, it is not what the Government may or may not say, but the company is held strictly to the construction of the law. It seems to me that we might get together the nucleus of a library. Mining statistics and the mining statutes of the different countries are interesting and a large number of such might be donated by the members. I have a number of books which I shall be happy to present to the Society. I would move that the President be empowered to appoint a library committee of such number as he sees fit for the purpose of forming a library and increasing our exchanges.

This was seconded by Mr. Fergie and passed.

Mr. STUART moved that the Secretary be instructed to have a number of the findings of the Committee on Legislation struck off and distributed among the members, together with a copy of Mr. Blakemore's resolution.

Seconded by Mr. Blakemore and passed.

Mr. WYLDE moved that a resolution of condolence be conveyed to the members of the family of Mr. Reid, who died since the last meeting of the Society.

Seconded by Mr. Fergie and passed.

Meeting adjourned till 8 p.m.

The evening session opened at 8 o'clock, when the following papers were then considered:—

On the Occurrence of Galena at Smithfield, N. S.

By JOHN E. HARDMAN, M. E., Montreal.

At intervals, during the last dozen years or more, public attention has been drawn to the attempts which have been made to imbue with economic importance the deposits of galena found at and near Smithfield, in the County of Colchester, N.S. Numerous examinations and reports have been made by different men, but these reports, to the writer's knowledge, have never been published in full, only garbled or incomplete extracts having been given to the local and the mining press.

During the past summer the writer has had opportunities, as consulting engineer for the Dominion Smelting and Refining Co., Ltd., for a somewhat extended examination of these deposits, and, by the courtesy of the directors of that company, he is enabled to lay before you the following brief account of the deposit and its history.

Beginning about a mile or more west of the settlement known as "Smithfield," and extending easterly as far as the settlement of Pembroke, both in Colchester county, there have been found along the line of junction of the lower carboniferous shales and limestones, numerous pebbles, boulders and occasional masses of both coarse and fine-grained galena, accompanied with pyrite, and occasionally with sphalerite or zinc blende. Many of the shales are gritty and are interstratified with sandstones, and much of the limestone is dolomitic, and impregnated with small cubes of pyrite. Little or no quartz is seen in place, and no structure resembling veins can be observed.

The large quantity of float galena, and its comparative purity, found at Smithfield, early drew attention to the locality, and a considerable amount of lead ore was seen in the first openings made. The dip of the rocks at this point varies from 60° to 80° to the southward, occasionally reaching 90° or vertical; the strike of the measures is not

uniform, but the general trend is east and west. The limestones overlie the shales and sandstones, and are conformable. The country is remarkably free from faults or dislocations of the strata.

In 1883-1884 an attempt was made to work the ore at Smithfield by Messrs. Brown and Edwards, the latter being a metallurgical student from Swansea, with much experience there.

A small brick shaft furnace was built, having two 5-in. tuyeres, and the blast was furnished by a Sturtevant blower; I regret that the furnace is in such a dilapidated condition as to preclude any measurements being taken of its interior dimensions, nor is there any dump of slag in the vicinity from which to judge of the quality of the work done. But it is known that the attempt to smelt was unsuccessful, and the remains of one or two roasting piles (for heap-roasting was all the preparation the ore received) show that the ore entered the furnace practically in the raw state.

No records are available from which to obtain the amount of ore raised during this period of activity, and the mine openings unfortunately give no clue to the percentage of galena in the rock extracted.

After the failure of this attempt the property lay quiet for several years, being examined in the interim by Capt. John Nichols, well known to the gold-mining members of this Society by the fiasco at Mt. Uniacke, and at "Jumbo," near Westfield. It was also examined by another English mining captain, named Evans, whose report was most favorable, and who saw no difficulty in raising 50 tons of ore a day.

In 1894, the Dominion Smelting and Refining Co. took over the property on the strength of these reports, and decided to ascertain the commercial value of the deposit.

Prior to 1894 all the development done had been confined to about 150 feet in length of the strata lying immediately to the eastward of the highway at Smithfield. Three shafts had been sunk to depths ranging from 30 to 60 feet, from two of which came the ore which the furnace was erected to smelt. From reliable information received from Mr. Edwards, and from men living at Smithfield, it appears that both of these shafts passed through the ore body (?) and entered barren ground.

The Dominion S. & R. Co. sunk two shafts, one to the eastward, the other to the westward of all previous work, during the winter of 1894-95. The east shaft (No. 1) reached a depth of about 47 feet; at 45 feet levels were run both on the strike of the measures, and cross-cutting the same, but failed to find any ore, though a considerable amount of pyrite boulders, carrying some galena, were found in the surface before reaching bed-rock. In the west shaft (No. 2) no ore was found, though a cross-cut was driven to the south for 21 feet.

As the Dominion S. & R. Co. was distinctly a commercial undertaking, it was manifest that the first thing it had to ascertain was whether there did, or did not, exist on the property a defined vein, bed or deposit of lead ore of sufficient magnitude and value to warrant development, and the subsequent erection of a proper mining and smelting plant. To this end the company were advised to purchase a coring drill. During the summer of 1895 holes were bored by this drill at various points on the property, and one of the oldest shafts was upwatered and subjected to a careful and thorough examination of its headings.

None of the cores obtained showed galena, excepting in one instance, and in this one case subsequent tests showed the core to be from a boulder. It was found that there were several beds of dolomitic limestone that carried pyrite, but the deepest bore-hole failed to reveal any deposit of galena.

An examination of the old workings confirmed the view obtained from surface examinations and from the cores, viz., that the galena occurs in decomposition cavities in the limestone, associated with a reddish clayey gonge which is doubtless colored by the iron occurring in the limestones. The ore in these cavities varies in size from mere strings or nodules the size of a walnut to masses containing several hundred weight, which rarely are connected with each other.

It would appear that the pyrite in these deposits was formed before the galena, as a specimen obtained from No. 1 shaft showed three globular nodules of pyrite cemented together by a fine-grained galena. A section of the pyrite nodules showed concentric structure.

In a cross-cut driven 32 feet across the strata were seen exposed beds of fine-grained dolomite impregnated with pyrite, in some cases to the extent of 20 per cent. Also beds of dolomite entirely barren of mineral.

In this cross-cut were clearly seen two ore-zones (if they can be dignified by such a name), in each of which it was observed that the small deposits of galena found lay in a limestone pocket associated with a stiff red clay or gonge.

It was also noted that these small stringers and nodules of galena were more frequent near the surface than in depth, but the rarity of their occurrence at all was a more striking fact.

The mode of occurrence of these small and widely scattered patches of ore, their irregularity, and the failure of any of the deep bore-holes to locate any deposit at depth, led to the conclusion that the property does not possess lead ore in quantity sufficient for a commercial venture.

The similarity of this occurrence of galena with the deposits of lead ore in southwestern Missouri might lead one to expect larger and perhaps profitable deposits along the line of these mineralized strata in Colchester, and it is possible that extended exploration may yet discover them, and form the basis of a lead industry.

DISCUSSION.

Mr. F. H. MASON—I regret that I was out of the room when Mr. Hardman's paper was read, but I have had an opportunity of reading the paper since and there is one statement which might be misleading to those not acquainted with the lead smelting industry. Mr. Hardman refers to Mr. Edwards (the metallurgist who superintended the erection of the furnace and working of the same when the Southfield mine was in operation) as having had considerable experience in Swansea. From this remark it might be inferred by the uninitiated that Mr. Edwards was using Swansea methods. So far as I have been able to learn Mr. Edwards came to Nova Scotia directly he had completed his apprenticeship at a Swansea smelter establishment. But be that as it may one thing is certain, Mr. Edwards was not using Swansea practices at Southfield. In 1891 I paid an extended visit to the Swansea and Llanely smelting works, and except in one or two cases where Piltz furnaces were being experimented with, the Reverberatory furnace alone was used in the smelting of lead there. As Mr. Hardman states in his paper the furnace at Southfield is too dilapidated to get a very accurate idea of its construction, but so far as I was able to judge it appeared to me to be a modification of the Scotch Hearth. I took some samples of the pile of roasted ore when I visited Southfield, and as far as I can remember they averaged a little less than 30% of lead. I venture to state that no experienced Swansea smelter would operate on raw ore of less than 60% lead, while as a rule they like it dressed to 80% lead.

In the Flintshire lead district of North Wales, it is no uncommon thing to find large boulders of galena often associated with blend in the carboniferous limestone, and at the Halkya mine in that district, a mine which paid its shareholders from 100 to 125 per cent. for several years, a deposit of clay containing boulders of galena was profitably worked. The true veins in Flintshire are usually found at the junction of the limestone and chert, but a considerable amount of mining for boulders in the limestone has been carried out there.

A Mineralized Zone in Nova Scotia.

By HENRY S. POOLE, M.A., A.R.S.M., M.E.

In connection with the workable deposits of limonite, pyrolusite, galena and barytes in lower carboniferous rocks of Nova Scotia it was only recently¹ that the writer realized that an important fact of economic importance, hitherto but partially understood, has been made evident by the researches of officers of the Geological Survey, Messrs. Hugh Fletcher and E. R. Faribault.

Before proceeding further it may be well to premise that this paper is to be taken as purely local in character, that its generalizations are confined to Nova Scotia alone; at the same time it will be apparent that the conclusions stated are based on an experience very similar to that acquired in other parts of the world, but which it has not been possible to here apply, until a detailed topographical and geological survey map had been prepared.

Hitherto a discovery in a new locality of either one or other of the minerals in question has been followed by prospecting more or less efficient. The skill brought to bear in the search has been practical, though often without system, until experience has supplied a local knowledge for the broad fact which now seems to be established, the limitation of such mineral deposition to a particular zone in rocks of this horizon, has not as yet become generally known. Nor would proof of the statement be so confidently expressed now but for the negative results that have attended explorations outside the zone that is limited by the immediate neighborhood of the contact of the carboniferous limestone series with rocks of older groups or formations.

The fact presented may be said to centre in the mapping of certain localities by Mr. Fletcher and the distinct division of groups of rocks hitherto generally shown together as lower carboniferous; the distinction he has drawn would appear to be clearly justified by this fact which it itself makes evident and of practical value.

As to the age of some of the older series of rocks in contact with the limestones, plaster and associated beds of the carboniferous limestone division there has been and probably is still a difference of opinion among geologists, but whether the rocks in question are members still lower in the carboniferous system, or whether they are of the highest series of the Devonian system is of small importance to the miner so long as he is able to distinguish them apart by their physical characteristics alone. This is not difficult to do after studying some well defined locality; and an examination of the upper series will show the presence, besides plaster, which does not occur in quantity in the lower beds, of flaggy and well bedded sandstones and grits, suitable if not for building purposes at least for foundations; while the sandstones of the older series it will be seen cannot be dressed under the hammer, but breaking with a cross fracture, are unsuited for any but the roughest of walls.

Great disturbance and faulting have taken place in both groups, but the older has been shattered and brecciated to a very marked degree. When the argillaceous or clay beds in both are compared together, especially when hand specimens are taken, the difference is not so easily seen, but in mass the red shales of the older series have a slaty appearance and most of them will be found to break into knife-edged fragments, a form which those of the newer or carboniferous limestone series are not found to take.

The value of the contact of the rocks of two geological systems as a site of metallic deposits has long been recognized in several localities; and without attempting to follow the history of this recognition it will be sufficient to mention the following instances:

Sir William Dawson in his *Acadian Geology*, 1868, page 272, quotes Mr. Barnes and Professor How of King's College, as reporting a deposit of fibrous brown hematite at Brookfield at or near the junction of rocks probably of Devonian age, with ordinary lower carboniferous shales and limestones which would seem to be unconformable to them.

Mr. Donald Fraser, of Springville, who conducted explorations for iron ore along the East river of Pictou, dwelt on the importance of the "junction"; and Dr. Gilpin writing in 1874 of the same locality, said:—"As far as investigations have been carried the limonite has been found at the point of contact of lower carboniferous with upper silurian strata." Sir William Dawson² referring to the same ground, wrote:—"At the line of junction of the carboniferous and older rocks on the east side of the East river of Pictou occurs the great limonite vein of the district, forming a vein of contact of exceeding richness and value. It follows the sinuosities of the margin of the older rocks and varies in thickness and quality in different places." In the following year Dr. Gilpin notes the importance of the limestone at the contact and writes:—"From Springville for several miles up the East river the line of contact of the marine limestone and silurian follows closely the course of the river. At several points the ore has been proved to rest on the silurian clay slates and has limestone on the hanging wall and in places holds notable quantities of manganese."

The writer³ in his report for 1874 on referring to the galena deposit at Gay's river said the limestone beds in which the ore is disseminated "lie horizontal on the irregular surface of the unconformable silurian (Cambrian) rocks, and judging by the fossils found in the extension of the beds further west, are lower carboniferous, and contemporaneous deposits with the auriferous conglomerate worked five miles away to the eastward."

The auriferous conglomerate here referred to was spoken of in his previous report as a contact deposit in a district that was described in 1866 by Dr. Honeyman.⁴

At Smithfield in Guysborough County explorations in 1875-77 on a vein of galena led the writer to remark⁵ that hopes were entertained an improvement would be found "at the intersection of the vein with the change of formation, which is presumed to be near at hand." This locality is fully described by Mr. Faribault in his report for 1886. He goes on to say:—"Galena was found in large quantity at Smithfield on the south bank of the West river of St. Mary's, two miles west of Glenelg, where it occurs in small veins cutting the narrow belt of quartzite left between the granite of the south side of the river and the overlying carboniferous conglomerate."

Professor How in his *Mineralogy of Nova Scotia*, 1868, page 45, referring to the report of Mr. H. Poole to the Government in 1860, remarked:—"Mr. Poole found a conglomerate, resting unconformably on slates near Avour's Head, Digby County, which contained gold and native copper."

These references are sufficient to show that the mineralized character of the base of the carboniferous system at several localities had been noted years ago; but these and similar records of isolated spots were not sufficient to warrant any general conclusion respecting the value of the contact beds of the lower carboniferous, nor to have

them classed as the exclusive mineral zone of that system, nor indeed so far as is known was any general deduction respecting it either published or suggested. Now, however, in the reports and in the unpublished works of the Geological Survey we have in addition available for generalization a mass of data from which a few extracts bearing on the subject in question, may be taken.

On turning to the official reports referring to Cape Breton we find Mr. Fletcher⁶ remarks:—"Mention has already been made of a number of places showing traces of copper glance, oxydized to carbonate, impregnating a conglomerate, often at its contact with an overlying bed of limestone, as at Irish Cove, East Bay, Washaback, Middle and North Rivers. At Loran, two or three miles east of Louisburg, coarse red carboniferous conglomerate overlies the older rocks. The matrix of this conglomerate sometimes consists of hematite which also discolours the underlying felsites."

Everything¹⁰ tends to prove that the iron ore (of Big Pond) is a deposit at the contact of the carboniferous and precambrian formations like those seen near McDougall's Point and elsewhere; and in mining these deposits this circumstance should be kept in mind and the ore followed along the line of contact. . . . "Further explorations have been made in Cape Breton County and elsewhere by persons interested in the contact deposits of red hematite."

"A considerable quantity of galena was discovered in the limestones overlying the Devonian at the head of Arichat Harbour."

"The pyrolusite of Loch Lomond is probably of the same nature and origin as the hematite, and forms at times a cement for the pebbles of the conglomerate. 'As already remarked many of the lower carboniferous limestones hold traces of galena. At Pleasant Bay near the mouth of McKenzie River, calespar veins in a dark bituminous limestone, surrounded by the underlying gneiss hold galena, which is also disseminated in the limestone and grit, contains both silver and gold, and is associated with copper pyrites, iron pyrites, fluorspar and bitumen.' 'The copper ores of Cheticamp are situated in the vicinity of the trap and sandstone of the base of the carboniferous.'"

Coming now to reports of more recent date having reference to Nova Scotia proper, Mr. Fletcher remarks:—"At Brierly Brook on the Ohio river and near Beaver Meadows, copper ore is found at the contact of the carboniferous limestone and conglomerate good specimens of yellow and purple copper pyrites being obtained at many points."

"At Smithfield,¹⁴ Colchester county, galena, pyrite, blende and calespar are intermixed in what appears to be a brecciated vein at the contact of the limestone with quartz-veined Devonian rocks. At Pembroke galena is in fossiliferous limestone, also near the contact with red and grey Devonian slates."

"In the neighborhood¹⁵ of the iron mines at Upper Brookfield a vein of reddish and white barite, said by Prof. How to be 15 feet in thickness, is exposed on the side of the hill, mixed with iron ore." . . . "Next to the gypsum in Hants county the most interesting member of the carboniferous limestone formation is the red basal limestone, along which the manganese ores are found. . . . Boulders of pyrolusite¹⁶ found one mile north of Kennetcook Corner, perhaps indicate a contact with the carboniferous limestone now concealed by drift." . . . "Nearly all the other worked deposits of manganese, however, occur in or near the limestone described above as lying at the base of the carboniferous formation, the ore being near the top at Cheverie, at the bottom at Walton, and in 37 feet near the bottom at Tenny Cape Mines.¹⁷ . . . Devonian sandstone or quartzite forms the floor or footwall of the mine. . . . The ore of this belt has been traced for a great distance east and west and is also found in small outliers among Devonian rocks."

"The Goshen¹⁸ iron mine is situated at the contact of this limestone with the Devonian, just as are those of Clifton, Selina, Brookfield and the East river of Pictou. Here a mixture of limonite, hematite, barite and calcite is found in a dark grey limestone. Barite occurs in considerable quantity in veins in limestone at Walton and Pembroke."

The red hematite of Newton Mills is a deposit at the junction of the carboniferous limestone and conglomerate with the Cambrian gold-bearing series, and similar ores may be expected at other points along the line of contact. . . . The limonite of the Brookfield iron mine is also at or near the base of the carboniferous. At the same horizon, probably, are the manganese mines of Tenny Cape, Walton, Cheverie and East Onslow. . . . A careful survey of the Devonian rocks and carboniferous limestone of the East mountain of Onslow and Penny's mountain, in Clifford's and Farnham's brooks, has shown that the latter rests in small patches on the former, with the most complete and satisfactory evidence of unconformity, and unconformity scarcely less evident is seen also at Walton and Cheverie."¹⁹

Mr. Faribault remarks:—"A belt of fine grey limestone at Gay's river corner carries a good percentage of argentiferous galena; it runs east and west and rests unconformably upon the lower quartzite group." . . . "This lower auriferous conglomerate is wholly composed of debris of the adjacent lower Cambrian rocks, apparently in an old river-bed, and rests on the lower graphitic ferruginous slate group. Beds of conglomerate similarly situated along the northern boundary of the gold-bearing rocks may prove sufficiently rich to be worked, but the great excitement caused two years ago by exaggerated reports of discoveries of gold in various places, remote from the gold-bearing rocks, have led a great many to take up valueless ground."

Dr. Gilpin also wrote in his *Mines and Mineral Lands*:—"At the mouth of the Shubenacadie river, the lowest visible carboniferous bed is a dark laminated limestone, which, with the overlying sandstones and marls, contains small veins holding limonite and specular ore, with ankerite, barite, calcite, goethite, manganese and siderite. In the same formation . . . at Clifton, similar ores are found." . . . "In Cape Breton, near McDougall's Point, Big Pond, a limited deposit of excellent quality was seen at the junction of carboniferous conglomerate with syenite; at McNeil's mill on the Glengarry road, similar traces have been met and large boulders occur at Loch Lomond post office."

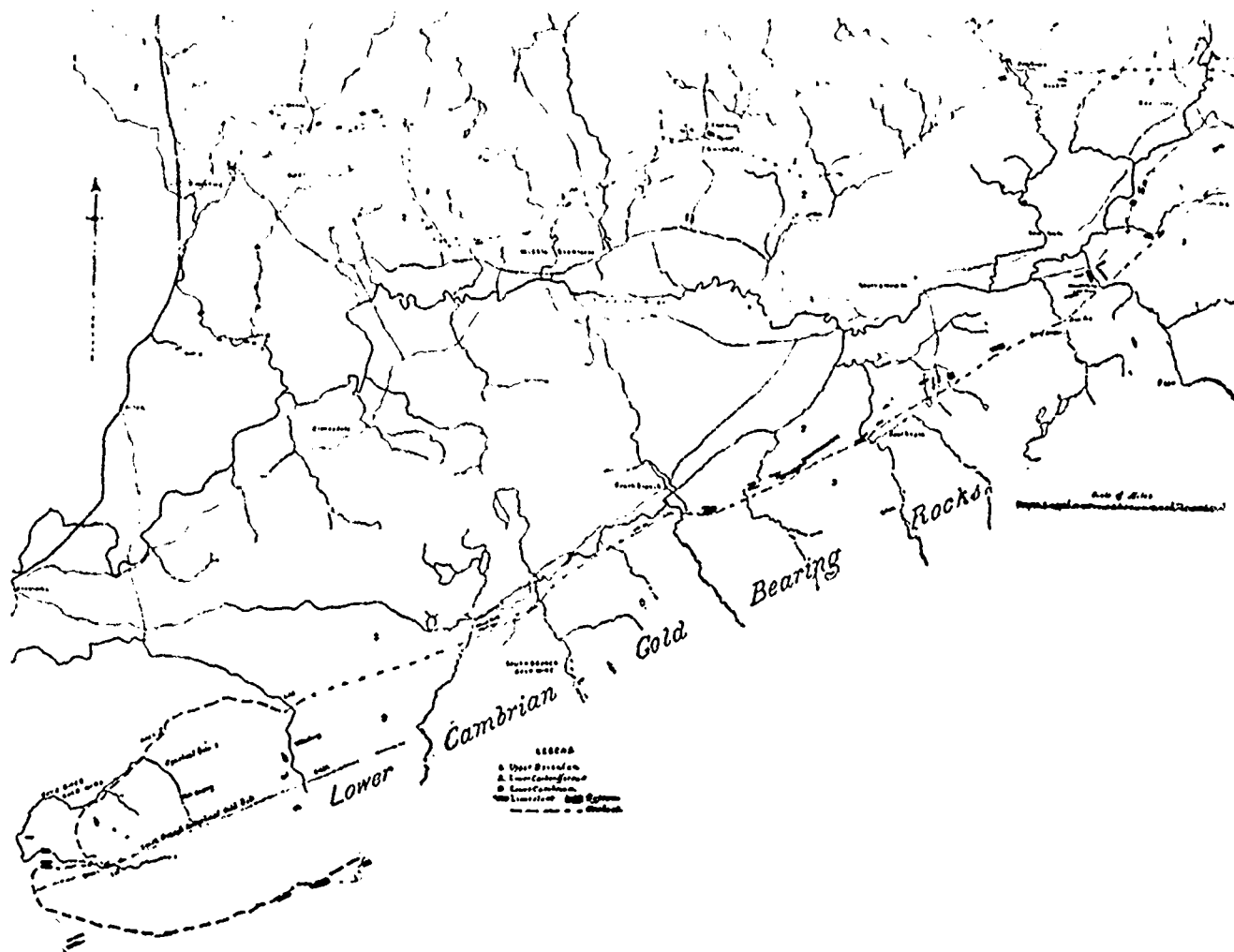
On discussing this subject with Mr. Fletcher, he added: "I have no doubt about the lowest limestone being nearly always more or less mineralized, even when, as at Brierley brook and Washaback in Cape Breton it has a great thickness of the conglomerate beneath it. There seems to be always at this horizon a great unconformity. But in Nova Scotia proper I think no good deposits are found at the base of the conglomerate. It is not, however, well developed until you come to the Cobequid hills, after leaving Antigonish; and the Cobequid conglomerate is of doubtful age."

Suggestive as the foregoing extracts and comments are they fail to convey so clear an idea of the concentration of mineral deposition along the line of lower carboniferous.

¹ December, 1894.² N. S. Instit. Trans. Vol. 17, p. 141. Ibid, Honeyman, p. 461.³ American Assoc. 1879.⁴ Mines and Mineral Lands of N. S., 1880, p. 65.⁵ Report of the Department of Mines, 1874, p. 55; for 1873, p. 35; for 1875,

p. 64.

⁶ N. S. Instit. Trans. Vol. II, p. 76.⁷ Report Department of Mines, 1877, p. 47.⁸ Geol. Sur. C. Rep. 1886, p. 162 P.⁹ G. S. C. Rep., 1876-77, p. 450.¹⁰ G. S. C. Rep., 1879-80, p. 122 F.¹¹ G. S. C. Rep. for 1878-80, pp. 55 and 123 F.¹² G. S. C. Rep. for 1882-83-84, p. 92 H.¹³ G. S. C. Rep. for 1886, p. 121 P.¹⁴ G. S. C. Rep. for 1889-90-91. Part P., p. 186.¹⁵ P. 192.¹⁶ G. S. C. Summary Rep. 1893, p. 41.¹⁷ P. 42.¹⁸ P. 43.¹⁹ G. S. C. Summary Rep. 1890, p. 40.²⁰ G. S. C. Rep. for 1889-91, p. 7, li. 3.



ous contact as a glance at a plan of any of the districts will do, and the accompanying outline maps of well known districts will illustrate the more forcibly the point it is desired to make. Sheet No. 1 shows the chief source of manganese in the County of Hants at many places along the line of contact. Where mines have been opened away from the contact they are in outliers of the carboniferous limestone that have been left in depressions of the older rocks out of the general course of the contact line. Much of the ore mined is of great purity and brings high prices, analyses of the various kinds and mention of the associate minerals, are given in How's Mineralogy of Nova Scotia, and in the Transactions of the Nova Scotia Institute of Science, and the mineral statistics published by the Geological Survey gives data between the years 1868 and 1882 of 4,560 tons of an invoice value of \$117,831.00.

Sheet No. 2 is of the Stewiacke Valley where lower carboniferous rocks are flanked by upper Devonian on the north and lower cambrian on the south, deposits of barite, gypsum, iron, lead, copper and gold occurring along the contact. The iron near Brookfield is in the form of limonite, at Newton Mills it is as hematite. The gold lies on the lower cambrian in the basal bed of the carboniferous in washings of that age. The Gay's River gold mine has been regarded as workings in an ancient river-bed, but when it is considered that the auriferous conglomerate is apparently a deposit contemporary with the plaster and limestone resting also unconformably on the cambrian, and they are unquestioned deep sea deposits, it seems more probable that the Gay's River auriferous conglomerate had a littoral origin similar to that of to-day at the ovens near Lunenburg. It may also be surmised that the section of country about Gay's River has been less elevated than that about Newton Mills. In the portion of the contact between Pembroke and Smithfield the mineral deposits along it are in the form of sulphides of iron, lead, copper, and zinc, a form which they also take on the south side of the valley five miles beyond the gold mine in Gay's River. Galena has been found on the surface and in prospect holes at other localities.²¹

Judge Morse speaks of lead ore having been sent about one hundred years ago from Cumberland County to Paris, and from it sufficient silver was extracted to make cups now in his possession. The source of this ore is not now known, but he thinks it may have been got near the head waters of Doherty's creek towards Wallace, where there is certainly lower carboniferous, but if it came from a deposit in contact with older rocks one would have to look towards Westchester.

In the County of Pictou the sulphides of iron, lead and copper are found infiltrating the tissues of plants scattered in permian strata, and in spots sufficient to induce prospecting from time to time, although the deposits are hopelessly valueless.

In the coal measures between the seams and even in veins cutting the coal, the sulphides of iron, lead and zinc occur in minute quantities.

There is yet another feature in connection with this mineral zone to be noted, and that is, the aggregation of some minerals about certain centres along the zone. In Hants County the contact carries both the oxides of manganese and iron, the former in greater abundance and in parts of exceptional purity, while in Pictou County where both are also present iron predominates, and although manganese is generally diffused it is only in spots concentrated enough for separation. In the Stewiacke Valley the iron ore there is believed to be free of manganese.

²¹Acad. Geol., p. 275; Reports Dept. of Mines; 1873, p. 35; 1874, p. 55; 1875, p. 63.

²²G. S. C. Rep. for 1877-78, p. 24 F. Rep. for 1879-80, p. 123 F. Rep. for 1886, p. 122 P.

²³Gilpin, Mines and Mineral Lands, p. 82.

²⁴How's Mineralogy, p. 74.

In these notes it is not desired to convey an idea that mineral matter is absolutely confined to the contact, or that the contact is uniformly mineralized. Thin veins of ore do traverse the older series of rocks near the contact, but they have not been found to lead to deposits of value in them. In a search for ore along a contact the uncertainty of finding any may be largely reduced by confining operations to such portions of the contact as are touched by limestones of the carboniferous. Along the East river of Pictou it has been observed that where there are natural pits in the soil near the contact there is almost a sure promise of valuable deposits of limonite, the natural depressions being indicative of limestone beneath. A similar experience, it is understood, has been acquired at Tenny Cape in the manganese mines; and the same may be expected in the galena district of the Stewiacke valley, although explorations have been as yet too limited to speak positively.

To the prospector this information should be of very great importance, for next to knowing where to go it is well to know where not to go in search of metallic minerals. But in the use of the geological maps some caution should be exercised; it should be remembered that these maps are not complete, that the facilities placed at the service of the Survey have not enabled the officers to trace with unerring exactitude the actual line of contact at all points and this incompleteness is indicated by broken or open dotted lines on the maps. And further the prospector should not entirely ignore the finding of "float" ore away from the line until he has satisfied himself that it does not come from an outlier of the carboniferous limestone, similar to those at the Parker and Whale creek manganese mines; or perhaps the converse condition, from a limestone resting on a boss of the older rock protruding through the newer series well within the line of contact.

To repeat the conclusion reached, it may be said that while ores of value occur both in beds and in veins through older formations, in the lower carboniferous it may be accepted as proved that deposits worth working are only to be found in the basal beds and at the contact with older rocks, with a strong probability that they are exclusively confined to the basal limestone.

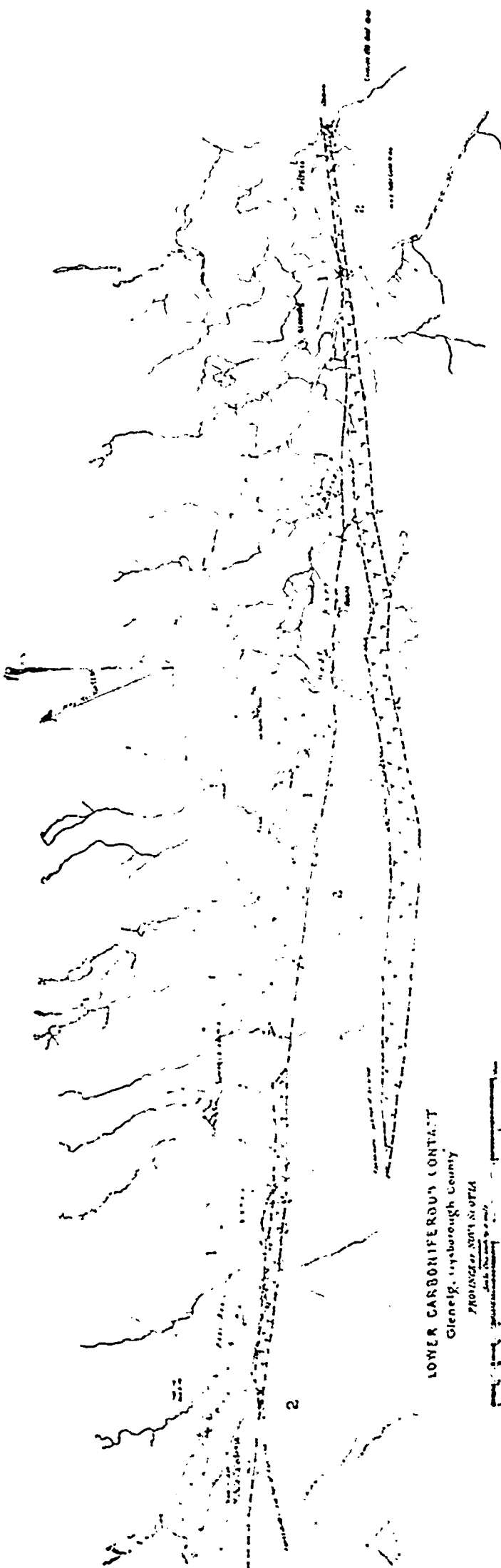
The experience here given as exclusively Nova Scotian, seems also applicable to the Magdalen Islands where manganese ores also occur in lower carboniferous limestone at the contact with brecciated red sandstones and shales probably of Devonian age.

DISCUSSION.

MR. R. G. LECKIE—I regret very much that I have had time only to give a very hurried reading to Mr. Poole's excellent paper. It must prove of much practical value to those engaged in exploration for mineral deposits and to those charged with their development.

The Devonian formation in many parts of the world is rich in a variety of minerals of immense importance, notably in Somersetshire, England. Near its contact with the lower carboniferous in the Mendip and Brendon Hills extensive deposits of iron ores, both spathic and limonite have been long worked and lead ores are said to have been raised there before the advent of the Romans. In Derbyshire and Cumberland both lead and iron ores occur in considerable abundance in these formations, and also in the Upper Ward of Lanarkshire at Leadhills.

In this Province extensive deposits of iron ores are traced continuously for many miles in the geological horizons to which Mr. Poole calls attention. The great deposits worked at Acadia mines are met with in the upper portion of the Devonian, and within a few hundred yards of its contact with the lower carboniferous. Indeed, at East mines a coal seam, much faulted and broken, was opened within four hundred yards of the iron ore, but by an over-turn it dips towards the Devonian and is soon cut off.



LOWER CARBONIFEROUS CONTACT

Glenelg, Inverburg County

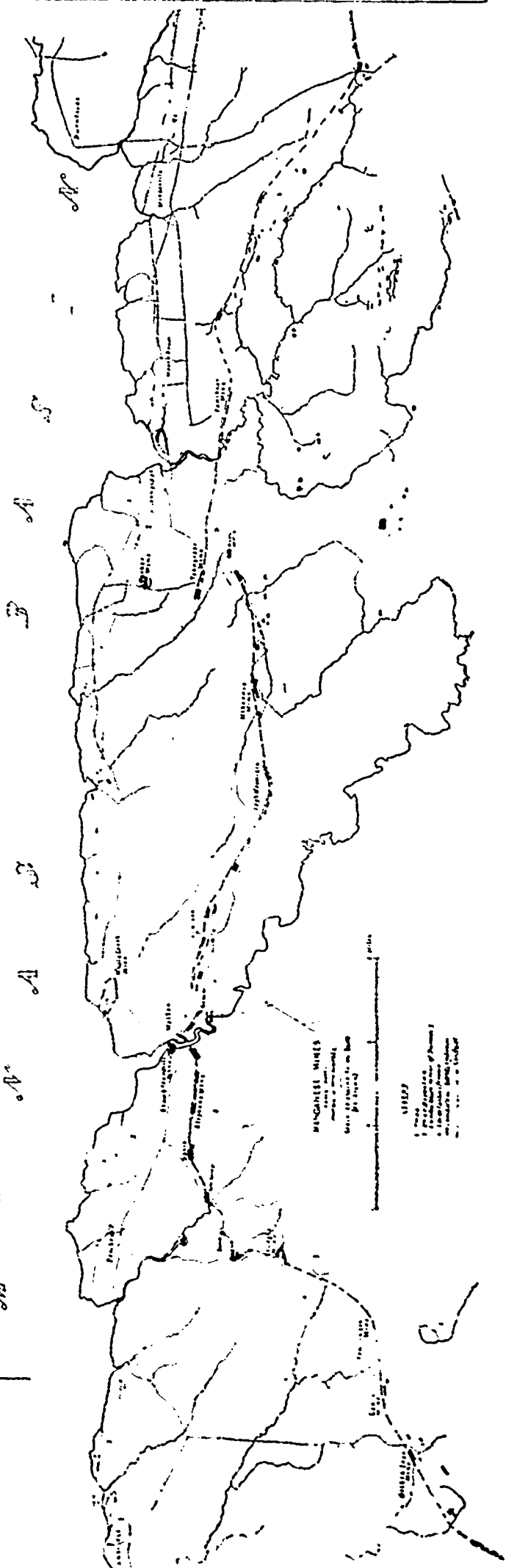
PROVINCE OF NOVA SCOTIA

LEGEND

- 1. Lower Carboniferous
- 2. Lower Silurian (Heldberg series)
- [E.T.] Granite



Scale bar with markings for 0, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000 feet.

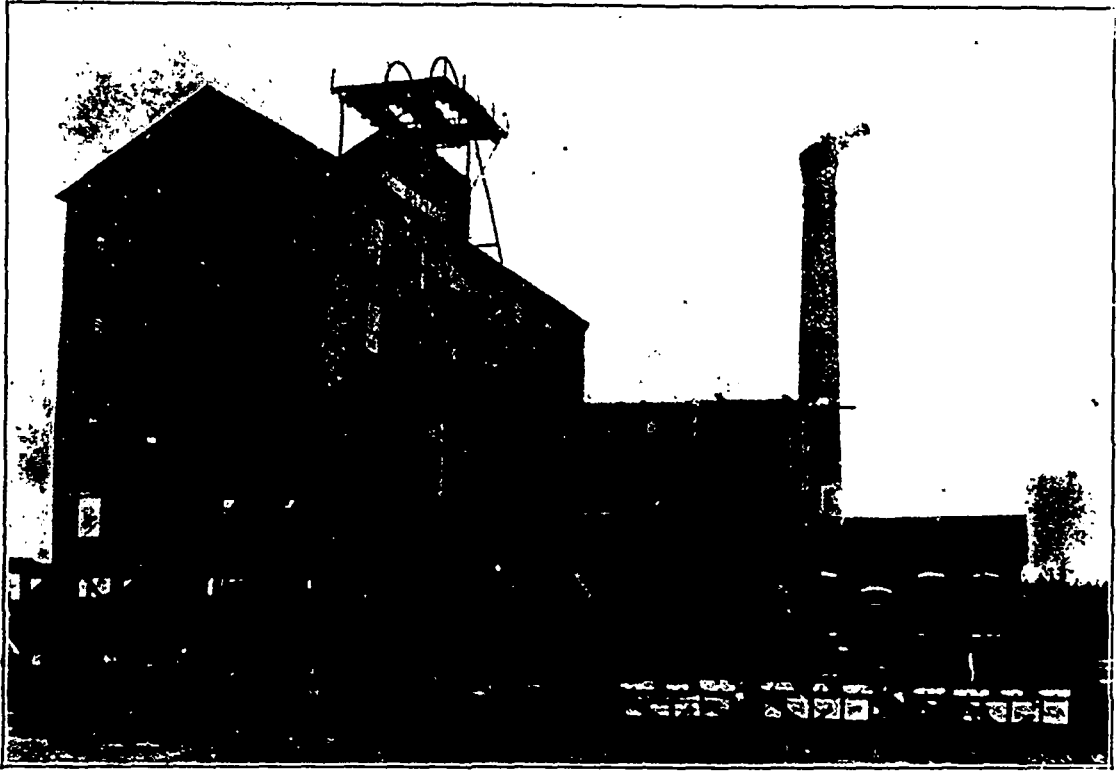


PINGISH MINES

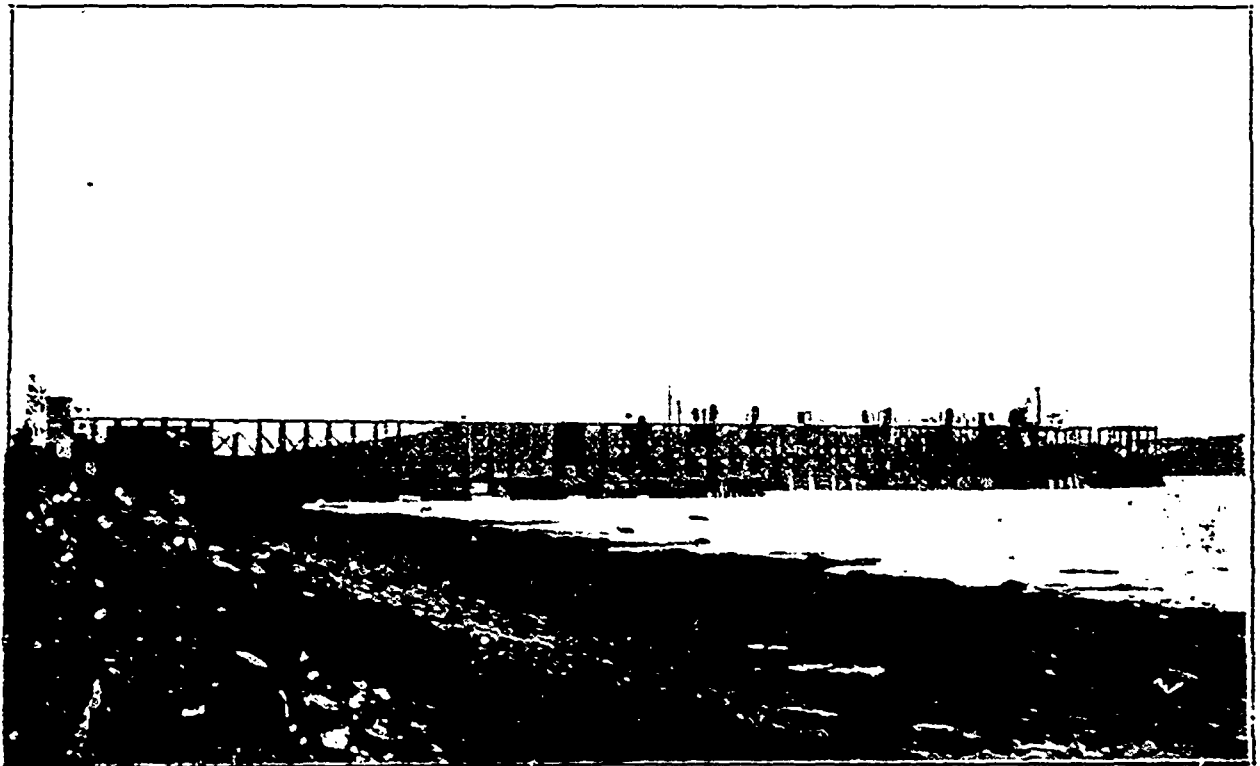
Scale bar with markings for 0, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000 feet.

LEGEND

- 1. Road
- 2. Geological boundary
- 3. Boundary of Province
- 4. Boundary of County
- 5. Boundary of Township



DOMINION COAL CO. Ltd.—DOMINION No. 1 COLLIERY CAPE BRETON.



DOMINION COAL CO. Ltd.—NEW SHIPPING PIER AT LOUISBURG, CAPE BRETON.

From below Economy in Colchester County eastwardly to the Pictou line, the limonite and spathic ore can be traced with much regularity, preserving a distance of about 300 yards from the contact of the two formations. On the opposite side of the Bay of Fundy the limonites found at Old Barnes, Selma and Goshen, appear to be confined to the lower carboniferous limestones, but near the Devonian slates and sandstones, but the red hematite of Big Pond, Cape Breton County, is apparently a contact vein of very irregular width.

An irregular deposit of manganiferous iron associated with gypsum occurs at Doherty Creek, Cumberland County, at the base of the carboniferous limestone.

The extensive beds of magnetites and hematites in Annapolis County, stretching from the Kings County line to Clements Port, passing through Torbrook and Nictaux, are from their numerous fossils, evidently of upper Devonian age, but the carboniferous has not yet been found in this locality, so far as I am aware.

The marvellous auriferous deposits of the Transvaal are not veins, but extensive and regular beds of fine conglomerate. I do not know to what geological horizon these beds have been relegated by local geologists, but coal is worked at no great distance from the gold mines, and it may be that these conglomerate beds occur at or near the contact of the two formations to which Mr. Poole so ably and practically calls attention.

The Capacities of Coal Cutting Machines.

By W. BLAKEMORE, M.E.

The subject of coal cutting by machinery has become increasingly important during the last few years, both by reason of keener competition in the production of coal, and in consequence of serious disturbances in the labor market. Inventors and manufacturers have exercised much ingenuity, and expended large sums of money in endeavoring to produce a machine which, on practical and economic grounds, would enable the colliery proprietor to increase the yield of his mine without additional manual labor, and at the same time, if possible, to reduce the cost of production. The result achieved has undoubtedly been a success regarded from the standpoint of practicability. Machines are in the market which are adapted to all kinds of coal cutting, which can easily be handled by the workmen, and which in the hands of an average cutter will yield an increased tonnage, beyond what it is possible to procure by hand cutting, fully proportionate to the reasonable expectations of the mine owner, and the claims of the manufacturer.

The other question, as to the economic result, requires more careful handling, because there are important considerations outside the mere question of coal cutting, which have a bearing upon the subject, and which must be taken into account before it is possible to arrive at a final conclusion in the matter.

I have recently had an opportunity of conducting a careful test trial of three machines, under conditions which precluded the possibility of any unfairness or partiality, as the trial was made under the control of the officials of the Dominion Coal Company, who had no interest to serve except to ascertain the capacity of the several machines; and while I wish at once to disclaim the reliability of a test run as affording any criterion of the actual amount of work which can be expected under ordinary circumstances, it is none the less interesting and reliable as illustrating the relative values of the machines, and the maximum amount of work which they will perform under given conditions. The trial took place in the Dominion No. 1 mine of the above company, and extended from the 29th of July until the 10th of August. The cutting was done in the Phalen seam, which is about 8 feet thick, and a fairly strong semi-bituminous coal. The roof is a silicious rock line, and the floor a strong dark latt. The seam lies at an inclination of 1 in 14. The system of working is pillar and room, with the rooms advancing on the full face of the coal, and almost on the crop. Three machines were used, the Ingersoll, the Yoch, and the Harrison. The conditions were that each machine should be worked by the same runner for the whole of the test, that each runner should be allowed a helper to shovel away the coal and to assist him in moving the machine from room to room, but that the helper should not be allowed to touch the machine whilst it was in operation. The compressed air which worked the machine was turned on every night at seven, and turned off every morning at four, the cutting all being done at night to furnish an opportunity of taking away the coal in the day-time. The Ingersoll and Harrison machines were moved from room to room by the cutter and his helper; the Yoch machine, being heavier, was by arrangement moved around by the help of a horse and driver. In order to give the full particulars of the machines, their dimensions, weight, etc., I now append tabulated statement No. 1.

DESCRIPTION OF MACHINES IN DOMINION NO. 1 MINE.

No.	Name.	Diameter of Cylinder.	Length of Stroke.	No. of Strokes per Minute.	Working Pressure in Lbs.	Weight.
1	Ingersoll....	4 in.	11 in.	200	80	750 lbs.
2	Yoch.....	6 "	14 "	120	80	1,100 "
3	Harrison....	3 3/4 "	12 "	200	70	700 "

No. 2 statement shows the amount of work done on each shift during the fortnight that the trial lasted, and from the summary you will notice that in the eleven working days a total 5,635 square feet were under-cut, being an average per day for each machine of 509, and an average per hour for each machine of 57.50, and that they produced during that time a total tonnage of coal equal to 4,460, being an average daily of 403 for three machines, or 134 for each machine. This, so far as I know, establishes a record in this class of coal. To give a clearer idea of the work done I may say that as the rooms were 20 feet wide, it represented the under-cutting of about five rooms each shift, the depth of under-cutting being 5 feet. Two of the machines, the Ingersoll and the Yoch, worked very evenly all through, and at the finish the difference was not considerable; about 10 square feet per day in favor of the Ingersoll. The Harrison was far behind, averaging only 440 feet per day, as against 549 and 539 respectively for the Ingersoll and Yoch; but it is only fair to say that this difference does not represent the actual difference in the merit of the machines, because the Harrison was unfortunately hampered with defective valves, which have since been remedied; and was also worked by a much smaller and lighter man, and while I do not think that a moderate difference in this respect would materially affect the result, I do think that the difference in this case was sufficiently considerable to do so. I may say that the operator of the Ingersoll machine weighed 220 pounds; the operator of the Yoch, 200; and the operator of the Harrison only 150.

To compare the result achieved by these machines with the work done by an ordinary coal cutter with a pick shows a considerable difference; for where—as in the test under consideration—the machines averaged 134 tons per day, a pair of cutters, who load their own coal, would produce in the same seam about twelve tons per day; but, assuming that the process of loading represents half the labor (an excessive estimate), their cutting could not be taken to represent more than twenty-four tons, which is between a fifth and a sixth of the work done by each of the machines. It must not, however, be forgotten that whereas the man who cuts the coal by hand carries all his paraphernalia with him, walks into his working place, cuts and loads his coal, and goes away without any further trouble; the man who cuts by machinery requires a great deal of attention both before and after the process, the sharpening of picks, constant attention and frequent repairs to a machine, piping up of rooms every day as the work progresses, in addition to the great question of motive power.

After carefully watching the test, and summarizing the results, I came to the conclusion that the machines had done all that we had expected of them, and had fairly demonstrated that under the conditions that existed in Dominion No. 1 mine they were capable of producing a larger tonnage of coal in a given time, and at less cost, than by any other method with which I am acquainted. The advantages are apparent, viz., more rapid development of the mine, and procuring a larger output in a shorter time than would be possible by hand labor. The restricted area of workings to produce a given output, and consequently an important saving in the maintenance of roads, air ways, and working places. Greater resources for producing coal in an emergency; and in a well equipped mine, an undoubted saving in the cost of production. On the other hand, it must not be forgotten that this paper deals exclusively with coal cutting machines and their work, and we must not forget that before this work can be done a large expenditure is necessary in providing motive power and conducting it to the working places; and it is not until the cost of supplying this, together with the cost of maintenance, and a fair allowance for depreciation of plant and machinery has been added to the cost of mining, that we are able to compare it with the labor method.

I think it may be interesting to refer to the subject again in the future, as I shall no doubt be in a position to speak more definitely in the course of a year or so.

Dominion No. 1 mine is laid out to be worked entirely by machinery, and no coal is cut by hand. It will be therefore much more reliable to refer to the working cost after a longer experience, than to base opinions upon a trial test; but I may say that while the ordinary work has fallen below the test above referred to, the net result has been to confirm the practicability and economy of cutting coal by machinery.

STATEMENT No. 2.

DOMINION NO. 1.

July & Aug.	INGERSOLL				YOCH				HARRISON.			
	Rooms	Cuts	Sq. ft.	Hours.	Rooms	Cuts	Sq. ft.	Hours.	Rooms	Cuts	Sq. ft.	Hours.
29....	4	1	504	7 1/2	4	2	540	9	4	—	470	9
30....	4	2	571	8 1/2	4	1	509	9	4	—	402	9
31....	4	2	558	8 1/2	3	2	467	9	4	—	417	9
1....	4 1/2	1	535	9	4 1/2	1	638	9	4	—	425	9
2....	4 1/2	1	574	9	4 1/2	—	524	8 1/2	4	—	411	9
3....	3	—	332	5	3	—	351	5	2	—	231	5
5....	4	3	565	9	4 1/2	—	486	9	4	—	441	9
6....	5	—	537	9	4	—	463	9	4	—	460	9
7....	5	—	541	8 1/2	5	—	538	9	4	—	450	8 1/2
8....	5	—	477	9	5	—	543	8 1/2	4	1	578	9
9....	5	—	523	9	4	1	508	9	4	—	447	8 1/2
10....	3	—	321	5	3 1/2	—	362	5	3	—	268	5
	51	10	6038	97	49	7	5929	99	45	1	4940	99

(Only worked from 7 a.m. till 12 a.m. Saturdays.)

SUMMARY.

Machine.	Sq. ft. Cut.	Full days.	Sq. ft. per day	Hrs. work'd	Sq. ft. per hour.
Ingersoll.....	6038	11	549	97	62.24
Yoch.....	5929	11	539	99	59.88
Harrison.....	4940	11	440	99	49.89
Total.....	16907	33	1528	295	172.01
Average.....	5635	11	509	98	57.30

COAL CUT.

Machine.	Total tons.	Tons per day.
Ingersoll.....	1627	147
Yoch.....	1557	141
Harrison.....	1276	115
Total.....	4460	403
Average.....	134

[At the request of Mr. Blakemore, Statement No. 3 is withheld.—EDITOR.]

DISCUSSION.

Mr. FERGIE—The paper is a most interesting and instructive one. I would like to ask Mr. Blakemore what he would allow for cost of plant, interest on machinery, wear and tear, etc.

MR. BLAKEMORE—I will be happy to reply to all questions, and will note each one as it is asked and answer them later on.

MR. BROWN—What is the width of the rooms you are driving?

MR. BLAKEMORE—Twenty feet. The actual cost of the powder was \$1.60, 5 tons of coal to every pound of powder.

MR. BROWN—At Sydney we produce 6 and 7 tons to a pound of powder.

MR. BLAKEMORE—I would not regard the consumption of powder on that occasion as a criterion. The cost of shot firing was excessive.

MR. DICK—Was the coal screened? How about the size?

MR. BLAKEMORE—I will give you that later.

MR. ROBB—Would the machine require to be repaired very frequently during the progress of the test?

MR. BLAKEMORE—No repairs were done on any of the three machines during the test. They were not damaged or appreciably worn.

MR. DICK (Halifax)—Was the floor even? What about an undulating floor?

MR. BROWN—Was the floor hard or soft?

MR. DICK (Halifax)—Has any test of the three machines been made worked by the same man?

MR. BLAKEMORE—Yes.

MR. DICK (Halifax)—What was the difference in the amount of coal undercutting with the machine and compared with hand labor? Does the machine waste any more coal?

MR. BLAKEMORE—I will deal with that.

MR. FERGIE—You stated that less pit room was required for the machine. Does it not require two rooms for each machine? Do you not prepare the coal one day in one room, and go at the next while it is being prepared?

MR. BLAKEMORE—In all mines the output depends upon the cutting of the coal. Where you have a machine producing five times as much in a given time as a man it would be a question of employing more men to load, blast and produce your coal in a small place.

The first question asked by Mr. Fergie is in reference to the cost of the motive power and depreciation of plant. The expenditure on plant is elastic and depends upon the ideas of the engineer. I may say, however, that the result of our experience for nine months work on this system would lead us to add about ten cents to the ton to cover cost of maintenance of plant, pipe ways, repairs to machines and pipes, flexible hose, depreciation, and interest on cost. As to that test I may say that we could not get as much coal in ordinary working and the cost would therefore be higher. What I have said as to the ten cents, however, would be perfectly safe. When you have added that to the other items given, the cost is below what you can possibly do it for by hand.

As to the percentage of coal and slack, our figures show that we cut a larger percentage of round coal than by hand. We did not at first because we did not give them the same chance as now. There is no difference in the coal brought down. Your saving will be in the undercut. A man by handpick will take 18 to 20 inches on the face, and with the machine you can do with 12 or 14 inches. After taking 14 inches off the face you follow down to a narrow groove. At the back of the cutting you only have 3 to 4 inches. In the case of hand labor you must leave a larger space. You get five per cent. more coal with the machine than you do by hand.

As to the inequalities of the floor. A man cutting by hand can humor his work to the inequalities of the floor. You do not do that with the machine. You are obliged to leave coal on the floor equal to the height of the swell. That has to be taken up by hand. That, however, only means a few inches.

I have been asked as to one man running the three machines. I cannot settle their merit beyond what I have told you. I think I may say, however, that there is very little to choose between the three. We have had as much coal cut by the one as by either of the other two when the same man worked the machine. The Yoch machine, which is the heavier one and has the larger cylinder, is no doubt better adapted to very hard seams than either of the others.

There are just three other points of interest that you might like to hear about. You might ask how the men received these machines. Of course at first they did not receive them with open arms. I recollect the Right Hon. Jos. Chamberlain once made a remark that he had never known a machine introduced in any trade, and which was opposed by the workmen, which in the end was not beneficial. In the first instance we had to bring outsiders to work them. Now we can get better average results with our own men than we did with the experts who came down to work them. No man will go back to hand labor who can get a machine. The machine looks too big for a man to handle, but I believe it is not so hard on the man as cutting by handpick, which is laborious work, as each bit has to be cut out. With the machine he can be in a sense resting part of the time. The machine is fixed on a board sloping towards the face, 700 pounds on an inclined plane. Then you have your motive power, and the effect is to draw the machine back and the weight of the machine re-asserts itself. He has only to guide the machine and just to aim it at the point which will the more readily break down his coal. When he has learned to steer it properly it is not so laborious as hand labor. Another thing to make it popular is the fact that a man can earn more money by it. Men who were getting with the hand-picks an average of \$2.00 to \$2.50 per day are getting with the machine from \$3.00 to \$3.50 and \$4.00, and as high as \$5.00 per day. In the face of that you cannot wonder that there is no further opposition to the machine.

As to its utility in regard to ventilation. You cannot ventilate the mine with it, but the escape of free air from it is a help to ventilation. In driving a heading the escape of air helps to keep the face sweet and free from gas. We are still using the longwall machine. We have not done any better than when the former test was made. We once cut 500 lineal feet on the face and 3 feet undercut in a day's run of eight hours with it as a trial test. It now averages per day about 200 lineal feet on the face with a 5 feet undercut.

At the conclusion of that test we talked about what would be a fair price. We agreed to assume the basis of half the work done during the test, and upon that basis a price was fixed. We find that any of the men can do about half the amount of work that was done in that test.

MR. DICK—What is the steepest up-hill grade you have worked against?

MR. BLAKEMORE—One in twelve. It is a question whether it could be worked at 30 degrees. It is certain that you could use it on steeper grades than 1 in 12 by elevating your tail-board.

Lignite Briquettes.—The manufacture of lignite briquettes is becoming a considerable industry in Germany. The first briquette plant in the Rhenish district was established at the Rodder mines, near Bruhl, in 1876. At the present time in the Vorgeberge district, including the one at Herzogenrath, there are 15 briquette-making establishments, with 50 presses in operation, the annual output amounting to about 550,000 tons.]



MICA MINERS IN SESSION.

Further Discussion on Standard Grades and Prices for Canadian Mica.

The adjourned meeting of owners of mica property and producers of Canadian mica was held under the auspices of the General Mining Association of the Province of Quebec, in the Russell House, Ottawa, on Wednesday afternoon, 11th December.

There was a representative attendance of miners, Mr. T. G. Coursolles (Wallingford Mica Co.) in the chair.

MR. B. T. A. BELL, (Ottawa) moved the adoption of the following resolution: Resolved that the mica miners and owners of mica property in Canada form a section of the General Mining Association of the Province of Quebec, to be known as the Mica Section, and that this section be represented by a chairman, secretary, and an executive of five.

He did not think it wise to organize a separate organization when a representative organization such as the General Mining Association already existed, and many of the mica miners were already members of it. The Association was distinctly protective in its character, and had, as most of them were aware, exerted during the five years of its existence, a very beneficial influence in promoting good laws and in extending a knowledge of the value of the resources of the country. They all remembered the pernicious influence of the Mercier Mining law, and the tax on powder magazines. Even at this moment there were clauses in the mining law, which, although inoperative, might be put into force by the administration at any moment with serious consequences to the investment in mines. He instanced the clause regarding royalty.

MR. MORRIS—What clause is that?

MR. BELL—Sec. 1435, by which the Government may, if it thinks proper, claim at any time the royalty due to the Crown "upon any land already sold, conceded or otherwise alienated by the Crown or which may be hereafter sold, but only five years after the date of such alienation." The royalty did not exceed 3 per cent. at the mine after deducting the cost of extraction. While they had the assurance of the present commissioner, the Hon. Mr. Flynn, a gentleman who had shown himself to be alive to the necessity of encouraging the mineral industries, that the royalty would not be collected, it was imperative in the interests of mining that it should be wiped out of the statute books, and he had no doubt that efforts would be made by the Association to secure this at an early date.

MR. W. F. POWELL—That is one reason why everyone should join the Association.

MR. M. MORRIS—I agree it would be a very good thing.

MR. BELL (in answer to questions)—Our Association was formed in 1891 and has held altogether about 20 meetings. The membership at present includes representatives of every mining company. The annual subscription is ten dollars.

MR. G. S. DAVISON (Vavasour Mining Association) seconded the resolution.

MR. G. S. MACFARLANE—It would be well to ascertain how many would become members.

MR. BELL—That is immaterial just now as the principal producers are already members.

After some further discussion the resolution was put to the meeting and carried.

MR. LEWIS McLAURIN (Templeton), seconded by Mr. W. F. Powell, moved that the standard grade for Canadian mica, rough, split and edge-trimmed, be 1 x 3 in. to 2 x 4 in., 2 x 4 in. to 3 x 6 in., 3 x 6 in. to 4 x 7 in., and 4 x 7 in. upwards.

MR. COURSOLE (Wallingford Mica Co.)—Do you think the first grade should be 1 x 3 in. to 2 x 4 in.?

MR. H. C. BAKER (Templeton)—I think that is the proper grade.

MR. WALLINGFORD (Templeton)—There is only one company using 1 x 3 in. and I do not think it would be advisable to mix it with 2 x 4 in. I think the grade should be 1 x 3 in. to 2 x 3 in. and 2 x 3 in. to 2 x 5. There is no demand for 1 x 3 in.

MR. McLAURIN—If you want to get rid of your 1 x 3 in. put it in with the 2 x 4 in. The closer together the sizes are the harder it is to grade. 1 x 3 in. to 2 x 4 in. is about as close as you want to get. 1 x 3 in. to 2 x 3 in. is very close for a man to grade by eye and if you put 1 x 3 in. to 2 x 3 in. alone it will be always left on your hands. The reason is that people are selling larger stuff at nearly the same price.

MR. WALLINGFORD—I have offered 1 x 3 in. mica closely trimmed, as good as could be produced in Canada, and offered it for mostly anything, and consumers would not have it at any price. There is only one company I know of that is using it, that is the Westinghouse Co., and they could not use half what is in the country today. I do not think it would be advisable to put 2 x 4 in. with 1 x 3 in. It would be better to throw the 1 x 3 in. away. It is not worth handling, not worth trimming.

MR. BAKER—I do not know about 1 x 3 in., but I have sold quite a lot of 1 1/2 x 2 1/2 in., quite a quantity; and that was not to the Westinghouse Company.

MR. COURSOLES—We have sold 1 x 3 in. too, but not lately.

MR. BAKER—The only question is whether we should try to make them take 1 x 3 in.?

MR. COURSOLES—Can you force the buyers to take 1 x 3 in. in any shape?

MR. WALLINGFORD—I do not think they would take it. It would only be in a case where there was no mica in the country.

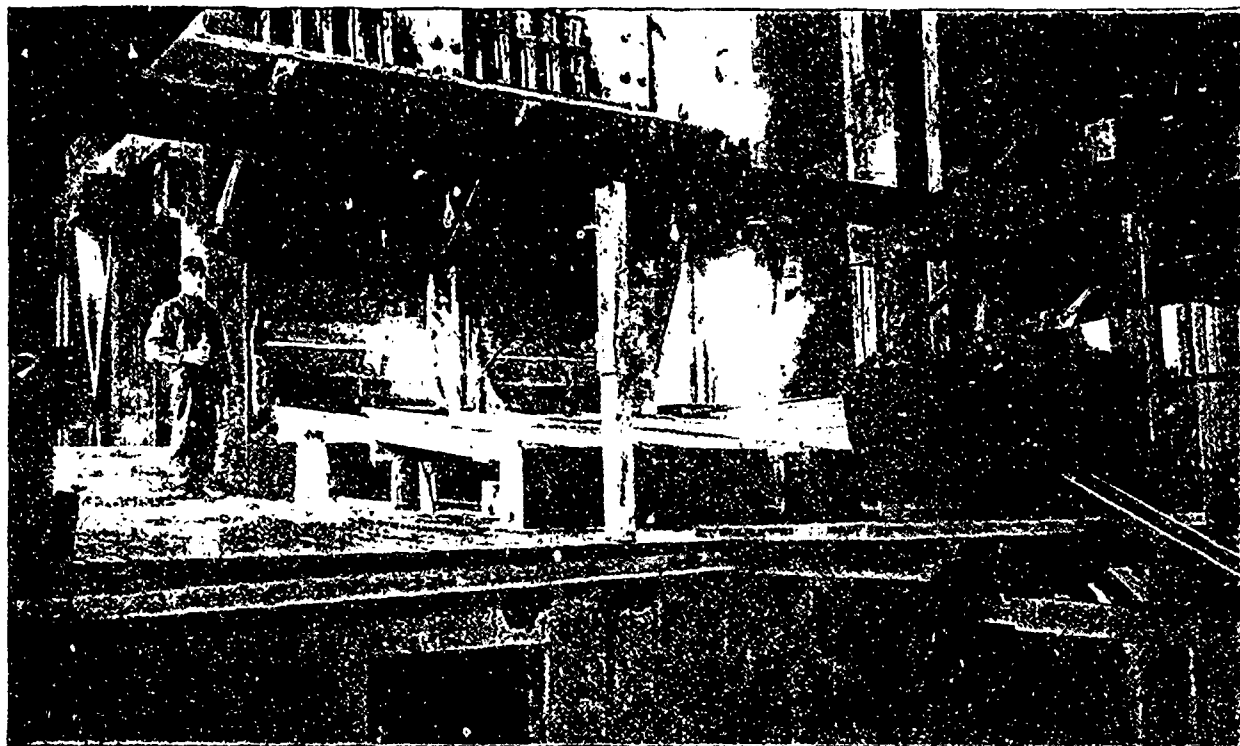
MR. G. S. DAVISON—Here are the men producing the mica. Our grades are 1 x 3 in. to 2 x 4 in. and we are all resolved to stick by them. It is not for you to say "We will take so and so," it is for us to say what you will take. Make your other mica sell the 1 x 3 in. If all will stand together and say here are our grades, it will give us the advantage. Put up all our 1 x 3 in. to 2 x 4 in. and stamp it, and the next grade the same way, ready to sell.

MR. WALLINGFORD—They would not call for it, if you have larger mica. What about a piece of 3 x 3 in., where would that go? It would not go into 2 x 4 in.

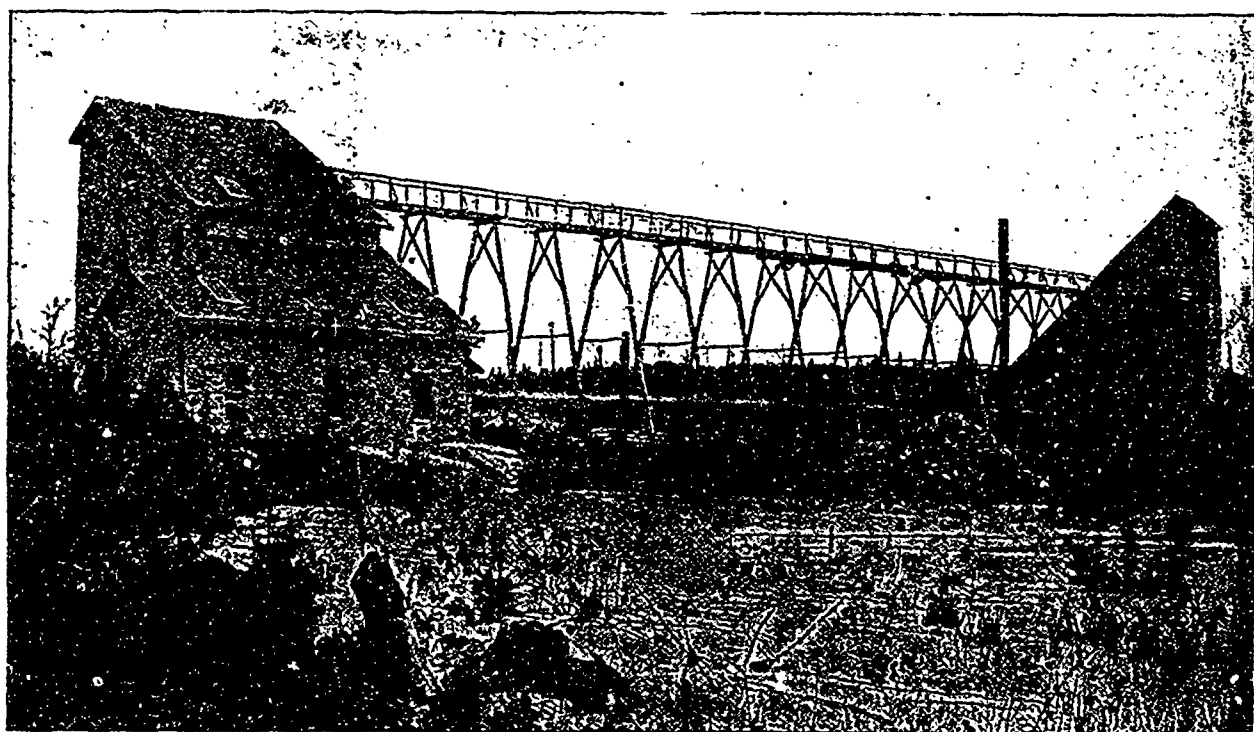
MR. DAVISON—You do not want to mine a pound of stuff for nothing.

MR. BAKER—Taking Mr. Wallingford's side of the question: If you leave out the 1 x 3 in. you can get a higher price for the 2 x 3 in.

MR. DAVISON—You go to work and mine a greater amount of 1 x 3 in., for which you get nothing. You produce a big amount of mica for which you have no sale. You must make something by increasing prices of the smaller grades. If you put in the 1 x 3 in. you work off all your small mica.



CARIBOU GOLD CO.—INTERIOR OF TEN STAMP MI. L.



CARIBOU GOLD CO.—MILL AND SHAFT HOUSE.

MR. WALLINGFORD—If a consumer sends an order for 50 pounds of 2 x 4 in. could you send him 50 pounds of 2 x 3 in.

MR. BAKER—If he knows our grades are 1 x 3 in. to 2 x 4 in., he will have to send an order for so many pounds of that grade. If he does not like it let him pay the price for a higher grade.

MR. COURSOLES—It would be hard to force consumers to take what they cannot use. It is the same with all kinds of goods. You go to a merchant and he offers you all sorts of cottons at different prices and you take what you want.

MR. DAVISON—But he has some half a yard wide, some a yard wide and so on for all standard widths. We want standard sizes for mica.

MR. COURSOLES—What do you intend by grades? Do you sell by such grades or by the ton?

MR. DAVISON—To sell in quantity not less than a ton lot. We have four grades, and in an order for five tons 2x4 in. to 3x6 in. the buyer must take so much 1x3 in. to 2x4 in. and he pays the price fixed by the producers. When you have it laid down that these are the grades in which you put up the mica to be sold in large lots the public will very soon appreciate the fact. If they come to any mica producer he will say, here are our prices and grades. If the man says I want 1x4 in. to 4x6 in. he will be told we have 1x3 in. to 2x4 in., etc., how much of each do you want. He pays for the proportion of each grade he takes. The thing is not unreasonable, and having the grade settled it facilitates packing.

MR. WALLINGFORD—Have you got any experience in the 2x4 in. grade? A man who has not a very rich mine does not go beyond that and you can get just as much for 2x3 in. as for 2x4 in. It is a long jump from 2x4 in. to 3x6 in. Instead of making two sizes in 2x4 in. we are making one size. That mica which does not cut 1x3 in. is of not much account. What we want to find out is your view on the 2x4 in. It is a long jump from 2x4 in. to 3x6 in. I am ready to back you in this idea but you will find out it is to your disadvantage to grade in that way. My idea of the grades is this: 1x3 in. to 2x3 in., 2x3 in. to 2x5 in., 2x5 to 4x6 in., and 4x6 in. up.

MR. WALLINGFORD then put his ideas in the form of a motion which was seconded by Mr. Powell, as follows:—That the grades of mica be 1x3 in. to 2x4 in., 2x3 to 3x5 in., 3x5 to 4x6 in., 4x6 to 5x7 in., and 5x7 upwards.

MR. BAKER—Before the question comes to a vote we must not lose sight of the fact that this meeting was called to prevent the consumers dictating to us how we should put up our mica. If we agree with them and put up the sizes they say they want we are coming back to the same old thing and not getting rid of our 1x3 in. at all. When we met here it was with the idea that we should dictate to the consumers. If we fix our grades to suit them they are dictating to us.

MR. WALLINGFORD—We are selling to our best advantage.

MR. BELL—We have heard both sides of the question. I would suggest that the best plan now is to put the motion and amendment to a vote and whichever is adopted let that be the standard grade, draw up an agreement for signature by every producer and have that agreement sent out by the Secretary to the trade as the standard grades of Canadian mica. If you decide upon grades it must be understood that each producer binds himself to that grade.

MR. COURSOLES—These grades should be only by the ton. It is quite understood that if consumers want other grades they will have to pay higher prices of course. The question of price comes in and we must set a minimum price from the 1x3 in. for all grades included for a ton of mica and other prices for separate grades.

MR. MAC FARLANE—You might get an order for half a ton and then another for the same quantity, and so forth.

MR. DAVISON—It will prevent peddling orders.

MR. WALLINGFORD—If they do not want 1x3 in., sell them 2x4 in. and ask a better price.

MR. POWELL—We have got to consider the large quantities of small mica that are really the run of the mine. The large sizes are not so important.

MR. E. D. INGALL—If you do manage to make consumers take this small stuff, having it on their hands, they will hustle to make a use for it. If you can manage to make them take a proportion of it, it is quite possible they will find uses for it.

MR. WALLINGFORD—Any mine at all can produce 1x3 in. and in time it would cut the price of bigger mica.

MR. INGALL—I refer, of course, only to new uses which will no doubt be found.

The resolution, as amended by Messrs. Wallingford and Powell, was then put and carried.

MR. BELL—I move that this resolution be embodied in the form of an agreement, and that the Secretary be instructed to see that every one signs it, and send the resolution of this meeting to the principal consumers of mica in the United States and Europe.

MR. POWELL—I have much pleasure in seconding that. The motion was put and carried.

MR. COURSOLES—What about prices?

MR. BELL—That is a question which cannot be settled now.

MR. WALLINGFORD—What advantage will it be if we agree on grades and not on prices? If everybody is going to sell at his own price and not let anybody know there is no use in organizing at all.

MR. BELL—Let us leave the question of a minimum price for standard grades to be considered by a small committee. I would move that Messrs. Edward Wallingford, L. K. McLaurin, Mr. Blackburn or Mr. Baker, Mr. T. J. Waters and Mr. Davison, be a committee to consider the price for the grades that have been adopted; the committee to report to an early meeting of the Mica Section.—Carried.

It was resolved that this committee meet on Wednesday afternoon, 18th Dec.

The meeting then adjourned.

MEETING OF THE COMMITTEE.

At a meeting of the committee held on Wednesday afternoon, the 18th instant, in the Russell House, Ottawa, Mr. T. G. Coursolles in the chair, a minimum standard of prices for the standard grades was drawn up.

A Coal-Unloading Device.—Descriptions and illustrations are current among our contemporaries of the long coal-car dumping machine, which has been erected by the Excelsior Ironworks Company, of Cleveland, and which is stated to have unloaded three ordinary cars of lump coal into a vessel in 3 minutes. The apparatus consists of a hollow cylindrical riveted steel frame, into which a car is run on a switch. The car is rigidly held by hydraulic clamps and the cylinder is rolled over half the circumference 180° around its horizontal axis, so as to invert the car and discharge its contents into a horizontal chute. Then the cylinder is rolled back into its original position in line with the delivery track, and while the car is withdrawn and another one placed in it the chute is lowered and gently delivers the coal into the vessel's hold. Both the cylinder and chutes are operated by wire ropes, and the simple mechanism is actuated by an engine taking steam at 80 lb., and requiring the services of only three men altogether.

CORRESPONDENCE.

The Dominion Smelting and Refining Co.

To the Editor:

SIR,—Among the Nova Scotia mining notes sent in by your correspondent and published in the November issue of the REVIEW is one referring to the winding up of the Dominion Smelting and Refining Co., which calls for notice from me, as I have been acting as consulting engineer for that company.

Your correspondent is badly misinformed as to facts and woefully rash in his conclusions.

What I did state in my report to the directors under the date of Oct. 25th was as follows:

"I am not willing to ask you to recommend further work to the shareholders as the result of the work hitherto done is so unfavorable. There are equal chances that further exploration and boring would discover a larger and better deposit than has yet been met with, but under the agreement to which the shareholders subscribed, it is for them to decide." (The agreement referred to requires the assent of two-thirds of the shareholders before further calls upon the stock subscribed can be made.) In arriving at "this conclusion" less than \$1,000 was expended under my direction, the other \$4,000 had been expended before I was called to the Board of Directors.

Because, in a report of Dr. Gilpin's, made at a time when the largest and richest pocket of ore yet found had just been taken out, it was stated that, by estimation and without test, the ore shown might average 15 per cent. of galena (which means about 12 per cent. metallic lead), your correspondent assumes the "large body" still in existence and *in situ*; and proceeds to indicate the proper metallurgical plant for initiatory proceedings.

If your correspondent had gone over the Smithfield property at any time during the last two years, with his eyes open, his mind in a receptive condition and Capt. Evans' report in his hand, he would in all probability have said what several shareholders (who were "practical miners") have said in my hearing, "Where is all this ore that Evans saw?" or, "did he ever see it?"

As to your correspondent's insinuation that the company would have fared better if they had secured a "practical lead miner" instead of myself, I can only say it is quite possible.

I am a little at a loss to know the difference between a "practical miner" and a theoretical one in this connection, but doubtless that is due to the same stupidity on my part which your correspondent seems to think has led to the winding up of the Dominion S. and R. Co.

I am,
Yours, etc.,

J. E. HARDMAN.

Montreal, 7th December, 1895.

Gold Mining at Trail Creek, B.C.

To The Editor:

SIR,—Perhaps the following notes respecting mining in this district may be of interest to your readers.

The Le Roi mine was the first location made here in 1890, and samples of ore from it were at first rejected as being too low in value to be worked with profit. Nevertheless the owner, after several attempts, sold to a Mr. Durant who, in turn, organized a company and commenced work with only a pack trail for the transportation of supplies. A shipment of two carloads proved so profitable that mining was vigorously begun and the first thousand tons yielded a profit of more than \$25,000. The mine has now been opened to a depth of some 400 ft., and the owners have contracted with the Montana Ore Purchasing Co. of Butte City, Mont., now erecting a smelter near the mine, to furnish not less than 100 tons per day. The new smelter is expected to be finished and ready for work by the 1st of March next. Its site is at Trail Landing on the Columbia river, seven miles from the mine.

The War Eagle mine, of which your readers have doubtless heard, is on a parallel vein, a short distance above the Le Roi. Like the Le Roi the first assays were no criterion of its value, but within a year it has paid \$132,000 in dividends.

The Josie, another mine to the west of the Le Roi and War Eagle, has been shipping ore all summer.

These and other claims are on the same hill (Red Mountain.)

In the immediate vicinity are situated the 'Centre Star,' 'Iron Mask,' 'Silver-ine,' 'Evening Star,' 'Monte Cristo,' 'Iron Horse,' 'Great Western,' and other claims, upon which more or less development has been done during the past summer with promising results.

The 'Iron Horse' and 'Evening Star' have shipped ore varying from \$25.00 to \$40.00 per ton.

East of Monte Cristo mountain, where these claims are situated, is the Columbia mountain. The "Georgia," "Columbia," "Kootenai" and many others are located here and have made experimental shipments. The gold is sometimes free milling, but more frequently is found in combination with iron and copper. West of Red Mountain many promising claims are being developed. About one mile south is the South Belt. Many locations made there since May are improving rapidly. The "Crown Point," "Robert Lee," "Maid of Erin" and "Homestake," are waiting for snow in order to begin shipping. The above does not include all the mines, only the most prominent. The veins trend north-east and south-west and dip to north and can be traced on the surface by an iron capping which must be worked through before value is found. This cap in places has the appearance of rich ore, but rarely gives value and varies in thickness. Thus in some mines no ore of value is found for 50 to 100 ft. in depth.

The ore is a sulphide containing something like 10 to 60 per cent. iron per ton, 2 to 20 per cent. copper; trace to \$200.00 in gold per ton, trace to 190 oz. silver.

The camp is accessible at all seasons from the Canadian Pacific Railway, via Columbia River to Trail Landing seven miles thence by stage. Work is now being pushed on the 13 miles of narrow gauge railway from Trail Landing to the shipping mines, and it is expected that the line will be open in March.

With the smelter reducing ore and railroad to transport same, we look forward to rapid development after midwinter, as many of the claims with ore on dumps which cannot afford to ship at present rates, will then do so in sample lots of a few tons to determine value.

I am,
Yours, etc.,

A PROSPECTOR.

Trail Landing, B.C., 2nd Dec., 1895.

Mica Mining in British Columbia.

To the Editor:

SIR,—Notwithstanding that mining heretofore, as at present, formed the most important of our industries, the fact remains that the mineral resources of this portion of the Dominion are only now becoming rightly understood. This is true in respect of all the known minerals of this Province. The particular mineral to which it is my intention to call the attention of your readers is the muscovite, or white mica, and the extensive area over which it occurs in the Province of British Columbia in that region known as the Canoe River and Tete Juane Cache. In the summer of 1894 I visited the mines with guides and found high in the summit of a range of mountains, divided from the Rockies and the Selkirk ranges by the Canoe and Fraser rivers valley (rightly the gold range, as it is the same range of mountains extending to the north-west and embracing the Cariboo gold fields), numerous quartz veins of different thickness, running parallel from northeast to southwest, liberally impregnated with mica in crystals of various sizes. At Canoe river the most of these were capped with black or biotite mica to the depth of from 4 to 6 inches, connecting in some cases with the white mica which comes in immediately at that depth. The mica taken, though in small crystals as yet, is of a first class quality, tough and flexible. At Tete Juane Cache, 20 miles farther north, where we have done the most work so far, the same number of veins are visible, although not so easy of access from the camp which is generally made at the edge of timber line. I was there only a few days last year before snow came, consequently had not the time to satisfy myself how far south in the direction of Canoe river these veins could be traced. This, however, my visit during the past summer has cleared up. I arrived at the mines at a little earlier date than the previous year. After I had my men fairly at work I started on a tour of investigation, as up to that time I was not quite satisfied with the spot I was working, for, though it was producing large crystals, they were more or less defective, checked and stained, and I could not trace the deposit farther than about 100 yards, while all the other veins could be traced for miles. I therefore ascended the cliff immediately above our workings and there, under an immense glacier, lay exposed the break from which that immense body below had some centuries ago broken loose and slid to where it is now being mined. It is fair to estimate (judging the output at present, and the immense body of mineral exposed at the break) that there are thousands of tons of mica in the fault. The vein can be reached from a point to the west of the mountain. This vein, which runs along and nearly the very top of the mountain, is the main lead; the other can be recognized as leaders although carrying a great deal of mica. Continuing my investigations to the south, I found the most of the underlying veins outcropping all the way for about ten miles. The mica shows itself in fair sized blocks and from the fact of it not being disturbed it is like that of Canoe river, firm, tough and flexible. I took out a small crystal with my pole-pick from the edge of the quartz. Though found in an exposed position, it shows very little stain, and the cleavage is excellent. The position of this new discovery, owing to its accessibility, is of all the locations the best in this vicinity to handle cheaply. I made two locations at this point of 1,300 feet square each. Altogether my operations for the past summer were entirely satisfactory, having packed out in crates 1,500 lbs. of mica. Time and men were limited to such an extent as to oblige the bringing of the cargo in the rough, but there are crystals weighing as high as 140 lbs. in the solid. The entire lot will cut from 4 x 4 in. to 12 x 20, allowing for waste and discoloration. I estimate the net clean clear mica at between 900 to 1,000 lbs. As will be remembered, I stated last fall that it was almost a matter of impossibility for anyone to exaggerate the extent and possibilities of these mica bearing areas. My investigations during the past summer have satisfied me still further as to the correctness of that assertion, as I have almost connected the two previous localities of 20 miles apart, by my discovery of this year. I am pleased to be able to state that negotiations are now pending for the transfer of the locations at Canoe River and those at Tete Juane Cache to a company of American capitalists at Chicago, which will also, it is expected, take the product.

(Signed) JOHN F. SMITH.

LOUIS CREEK, Kamloops, B.C., 9th Dec.

MINING IN NOVA SCOTIA.

(From our own Correspondent.)

We recently paid a visit to the Indian Post gold mine, Lunenburg Co., which is being reopened after a rest of nearly 30 years. The vein, which is from five to seven feet wide, was looking very well, the gold being very fine and evenly shot through the quartz. The old ten stamp mill is being fitted up, and new amalgamating tables 10 feet in length, will replace the old ones, which were only four feet long. It is expected that crushing will be started about the middle of December, and unless our judgment of the ore is at sea, the first yield will be an eye-opener, although to the uneducated eye the quartz does not appear to be anything out of the ordinary. A neat and very clean miner's lodging has been erected, together with other buildings. The prospect looks very promising and we hope this district will be in operation for some time to come.

The North Brookfield mine is continuing its splendid record. Mr. W. L. Libby was in town with 394 oz. of gold. This is particularly good as there were two or three days' stoppage for repairs.

The Modstock mine has been bonded to Mr. R. Dickson, one of the owners, who is trying to interest New York capital in it. The mine was recently reported on by an expert from New York.

The New Halifax Gas Co. has chosen as a site the old penitentiary. The stock in this company is held for the most part by the same people as the Dominion Coal Co. It is, we are informed, the thin end of the wedge for a neat little metallurgical plant in Halifax. The illuminating gas is really to be a by-product in the manufacture of coke for foundry purposes, and an attempt will be made to manufacture a high class coke, with a view to replacing hard coal for household use. The company are starting on a sound basis, and are putting up a plant to save all possible by-products. It is not improbable that at a later date iron smelters will be added to this plant. This industry will of course open up a considerable amount of trade for the Dominion Coal Co. The only regrettable part is that the site chosen is in the midst of one of the best residential parts of Halifax, and it is consequently meeting with a considerable amount of local opposition.

The plans for the erection of a reduction works at the Coxheath copper mine are to be ready by the middle of February, when it is proposed to start on the erection of the same with all possible speed.

That good old district of Molega is once more coming to the front. Herbert Dixon has a lot of very good looking quartz on deck and has started crushing. The Boston company are also doing a considerable amount of work on their property in this district.

Notwithstanding the very emphatic heading over the gold returns for the nine months ending Sept. 30th, 1895, published in our last issue, complaints have been made to us that we have not given the full returns, the complainants thinking our returns were for the year ending Sept. 30th. We therefore wish it to be distinctly understood that those returns were for nine months and that we intend giving the full returns for the year ending Dec. 31st, 1895, in a later issue.

Since penning the note in our last issue that the returns of gold for the Provincial mining year were below the average, further returns have been made, which we are pleased to say have raised the figures above those of last year.

A new find of heavy nuggety gold quartz is reported from the Tangier district.

We had a call recently from Mr. J. D. Copeland, who has a genuine grievance in the bad state of the roads in the Forrest Hill district. He informed us that the hauling of boards from the corner of the Guysborough road to the Modstock mine, a distance of three miles, cost him \$10 per thousand. This matter of bad roads is affecting all the mines in the district. Mr. Copeland's is by no means an isolated case; we have had complaints from other mine owners. The exorbitant figures paid for the haulage of supplies considerably increases the expenses of mining and is undoubtedly a genuine grievance which requires looking into.

The new pumping and hoisting gear on the Plough lead development work is completed and operations, which have been at a standstill for some time past, have been once more resumed. Recent developments have satisfied the company that they are on the right track to recover the continuity of the rich strike. The development work is in the hands of Mr. George Stuart.

At Goldenville Mr. J. A. Fraser, although confining himself almost entirely to development work has been raising sufficient gold to more than cover expenses. The McArthur-Partridge mine in this district is still keeping up a steady yield, while the Wentworth mine, which produced so largely and profitably in the early part of the year and which has recently been shut down ostensibly for repairs, has started up again. It is rumored that a former trusted employee, on a bed of sickness and fearing the approach of death, made such extraordinary disclosures and substantial restitution that fresh confidence was given to the much-wronged company.

Fifteen-Mile stream is again to the front with 300 oz. of gold for the month, notwithstanding delays from unusually heavy rains; in fact these have been felt through the whole of the Province.

Some 20 men are at work at Crow's Nest mine under Messrs. Hood & Weston, who are contemplating purchasing the property. A Rand drill has been started to push the underground exploration.

The following item from the "Iron and Coal Trades Review" will be of interest to Nova Scotian iron manufacturers:—"Under the lee of a big demand which keeps up the United States, the manufacturers of Canadian iron are doing a good business. Beyond question the present season is the best one the Nova Scotia furnace men have ever had. In their early days they were kept back by the competition of British irons which was often carried as ballast across the Atlantic. When at last the British irons began to give ground in the interior, especially in Ontario, it was not before the Nova Scotia brands they retreated. A new competitor of the latter, United States iron, was capturing the Ontario market. With American irons in Ontario and British irons to struggle against in Quebec and the Maritime Provinces, the Nova Scotian iron industry found the problem of existence hard enough. Finally British iron practically withdrew. Then a more spirited contest was made with American iron by that of New Glasgow, Londonderry and Ferrona furnaces, which, having captured the Montreal trade from the British, was in a better position to dispute that of Ontario with the United States. But the extraordinary depression in American iron prices told against the Nova Scotians; at last prices went up in the United States. All iron made there was wanted at good prices at home. The American iron withdrew, and though stocks in Ontario were full when the advance came there has been time since for them to run down and make room for the absorption of several thousands of tons of the home article."

The Golden Lode mine produced 323 oz. 2 dwt. of gold last month, the quartz running about 11 oz. per ton.

The coal deposits of Broad Cove, C.B., have recently been examined by Mr. Fell, who has been sent out by the well known firm of Messrs. Bainbridge & Seymour, in the interest of British capitalists.

Among our illustrations this month we reproduce two excellent photographs of the fine new milling plant built last year by Mr. Saunders for his mine at Caribou. Both mine and mill are equipped with the latest and most approved machinery and appliances for economic production.

The autumn meeting of the Mining Society was one of the most interesting held since its organization. An excellent series of sessions concluded with a quiet dinner at the Queen's. A full report of the proceedings is, as usual, given in the REVIEW this month.

THE MINING REVIEW

Established 1882

Official Organ of The Mining Society of Nova Scotia; The General Mining Association of the Province of Quebec; The Asbestos Club; and the Representative Exponent of the Mineral Industries of Canada.

B. T. A. BELL, Editor.

Published Monthly.

OFFICES: Slater Building, Ottawa.

Vol. XIV—1895.

INDEX TO CONTENTS.

1895—Vol. XIV.

Air Compressor, A Water-Driven....	106	Cape Breton.	Consolidated Gold Lake Mining Co .	103	General Mining Association of Que-	bec.....	1, 28, 39, 122, 136, 202
Alamo Mining Co.....	168	Coal Trade of, in 1895	209	Consolidated Gold Mining Co.	61	General Phosphate Corporation..	80, 96
Albert Mines and Capelton Chemical Works	22	Coal Cutting by Machinery in	138, 229	Correspondence.		Geological Survey of Canada	15, 39, 100
Alexandria Mining and Dredging Co.	103	Mineral Resources of.	67	26, 46, 61, 73, 100, 148, 152, 169, 231		Geological Survey and Mining Statistics	61
American Metallurgy.	191	Cape Breton Coal, Iron and Ry. Co	61	Credit Forks Mining and Milling Co.	168	Geological Survey of Gold Mines.	157
Argonaut Gold M. Co. of Kootenay	205	Cape Breton Copper Co.	214	Creighton Gold Mining Co.	49	Glendower Iron Deposit, Ont	40
Asbestos Club	71, 77	Cariboo District, B.C.	104	Crown Point Mining and Milling Co.	137	Golden Group Mining Co.	220
Asbestos Industry, Canadian	6	Caril Gold Fields, Ltd.	48, 74, 167	Crow's Nest Coal Fields, B.C.	72	Golden Lode Mining Co.	27
Asbestos Mining Notes.	182, 216	Cariboo Hydraulic Mining Co., Ltd.	27, 74, 95, 103, 134, 137, 151, 167	Cumberland Ry. and Coal Co., Ltd.	48	Gold Hill Mining Co. of Spokane.	205
Assay Furnace, Sargent's Improved	35	Cariboo and Kootenay Prospecting and Mining Co.	27	Danville Asbestos and Slate Co., Ltd.	69, 97, 134, 138, 167, 218	Gold Hill Mining Co. of Ontario.	167
Auriferous Gravels of British Columbia	18	Cariboo Reefs Development Co.	137	Dawson, Dr. George, C.M.G.	32, 112	Gold Milling with Colorado Stamp Mill	182
Barachois Gold Mining Co.	62	Caribou Gold District, N.S.	104	Deep Sinking in Queensland	164	Gold Mines, Our.	51
Bar Iron, Canadian	105	Carlyle, Prof. W. A.	47, 103	Delta Mining and Development Co.	220	Gold in Nature.	171
Bath Houses for Miners.	214	Car Wheels, Cast-iron Chilled.	121	Derrick, A Large.	73	Gold in Ontario and its Associated Rocks	42
Beaver Mouth Hydraulic Co.	168	Cassiar District, B.C.	104	Diabase Dykes of the Sudbury District, Ont.	25, 43	Gold Nuggets, the Origin of.	24
Bellingham Bay Hydraulic Co.	27	Central Rawdon District, N.S.	48	Diamo: 1 Drill, Curvature of the	34	Gold Mining.	
Bell's Asbestos Co., Ltd. 48, 61, 62, 166, 218		Centre Star Mining & Smelting Co.	134, 151	Dick, A.	139	British Columbia.	68, 231
Belmont Bessemer Ore Co.	95	Chandos Mining Co., Ltd.	205	Dixie Mining and Milling Co.	220	Ontario.	164, 169, 219
Black Creek Hydraulic Mining Co. of Cariboo	61	Charcoal: Its Bearing on our Forests.	11	Dominion Coal Co., Ltd.	27, 48, 61, 64, 97, 102	Quebec	6, 79, 182
Black Donald Mining Co.	216	Chemical Notes	156	Dominion Developing and Mining Co.	205	New Brunswick.	152
Black Jack Mining Co.	135	Chromic Iron.		Dominion Smelting and Refining Co.	202, 231	Nova Scotia.	47, 154, 232
Blasting Tool, A New	67	In Newfoundland.	194	Dunsinane Mining Co., Ltd.	48	Trail, B.C.	231
Blast Furnaces.		In New South Wales.	72	Eastern Development Co.	214	Gold Ores, Determination of in the Field.	81
Condensation of Fumes	105	In Quebec	216, 218	East Kootenay District, B.C.	214	Gold Output of N.S., 1895.	26, 190, 213
Economics in Coal Consumption.	214	Cinnabar Mining Co. of B.C.	134	Electric Apparatus in Mining	122	Gold Solvents, Notes on the Behaviour of	56
New Lines for.	109	Coal.		Electric Coal Cutting.	110	Good Hope Mining and Milling Co.	102
Struck by Lightning	214	Calorimeter, A New	150	Electric Furnace for Lecture Table.	34	Grand Trunk Coal Contract	33
Boilers.		Cannel as an Enricher.	136	Electricity in Gold Dredging.	159	Granite Boulder, A Rocking	66
Down Draught Furnace for	150	Cargoes, Spontaneous Combustion of Cutting, Electric.	110	Electric Haulage.	64, 186	Granite Creek Mining Co., Ltd.	103
Firing by Waste Heat from Coke Ovens.	106	Cutting in Cape Breton.	138, 229	Electric Mining Machinery.	66	Guelph Norway Iron and Steel Co.	96
Water Tubes.	113	Cutting Machines, Capacities.	229	Electric Pumping Machinery.	135	Gunpowder and Nitro-Glycerine.	83
Boundary Creek Mining Co.	134	Cutting Machine, A New	64	Electric Transmission of Power.	191	Hall Mines, Ltd.	
Bras d'Or Marble Co.	62	Imports into Quebec, '94.	6, 142, 213	Elliott's Patent Coal Washer.	64	Halsey, F. A.	27, 135, 137, 151, 167, 219
Bridge River Gold Mining Co.	168	Long Spans in Screening Structures	67	Eureka Concentrating and Mining Co.	103	Hamilton Iron and Steel Co., Ltd.	82, 116
British American Mining Co., Ltd.	151	Long Wall Working	113	Eureka Consolidated Mining Co.	134	Hand Rock Drills in Tunnelling.	73
British Columbia.		Long Wall in N. Illinois.	145	Eustis Mining Co.	138	Hand-boring Machine, A.	35
Auriferous Gravels of.	18	Mining in Cape Breton.	209	Evening Star Mining Co.	168, 205	Hardman, John E.	212
Coal Output	71	Mining in Nova Scotia	216	Explosions, Colliery.	35	Haulage, Underground.	107
Gold Mining in.	68	Mining in Cumberland & Pictou, N.S.	191	Explosion of Lightning in a N. S. Colliery	79	H. H. Vivian & Co., Ltd.	48
Gold Yield, 1894	100	Tipples, Steel for.	105	Explosion, Sampling Gas from.	36	High Ore Gold Mining and Smelting Co.	151, 168
Hydraulic Mining in	20	Washing Machinery.	136	Explosives.		Hoisting Speed.	214
Mineral Development of.	155	Washing, Theory and Practice of.	33	Characteristics of.	77	Homestead Gold Mining Co., Ltd.	220
Mining Bureau for.	140	Cochrane Hill District, N.S.	47, 103	Experiments for ascertaining effects of.	178	Horseshy Gold Mining Co.	134, 215
Mining Legislation for.	47	Coking from Inferior Coals.	73	Flameless.	36	Horseshy Hydraulic Mining Co., Ltd.	27, 74, 96, 103, 134, 137, 151, 165, 215
Mining Notes.	104, 181, 202, 215	Collieries, Distribution of Power in.	184	Limitation of.	150	Hydraulic Mining in British Columbia	20
Silver Mining in.	132	Collieries, Steel Structures for.	35	Mining.	147	Idaho Gold Mining and Smelting Co.	134, 137
Silver Smelting in	149	Colliery Explosions	220	New Safety.	105	Illinois Steel Co. Report.	52
Slocan, District of.	148	Colliery Managers	220	Ferro-Manganese Troup.	59	Intercolonial Coal Co., Ltd.	61
Trail Creek Camp.	234	Colliery Surface Works.	34	Fertilizers—Canada a Natural Mnf. Centre for.	129	International Asbestos Mining and Mfg. Co.	27
Trail Creek Shipments	150	Colliery Winding Drum, A Large.	28	“ —Home Market for.	130	Iron Horse Mining and Milling Co.	137, 151
West Kootenay as a Field for Investment	100	Colonial Iron and Coal Co., Ltd.	48	Fifteen Mile Stream District, N.S.	47, 103, 202	Iron.	
British Columbia Gold Fields Exploration Con. Co., Ltd.	62	Colorado Stamp Mill on Arizona Ores	182	Finch Mining Co.	95	Canadian Industry, 1894	3
British Columbia Terra Cotta Co.	95	Columbia Hydraulic Gold Mining Co., Ltd.	134, 151	Florida Phosphate Production.	214	Ore Sampling.	113
Byron N. White Co.	152, 167	Company Notes.		Flux, use of in the Blast Furnaces.	35	Removal of Impurities During Casting	106
Caledonia Consolidated Mining Co.	220	Compressed Air in Mines.	106	Fort Steele Mining Association	82	Islander Gold Quartz Mining and Milling Co.	219
Canada and the Gold Boom.	187	Connice, James, M.L.A.	33	Fraser River Mining and Dredging Co.	49	Kamloops Mining & Development Co.	134
Canada Iron Furnace Co.	219			Gabriola Coal Co.	220		
Canadian Electric Forging and Smelting Co.	167			Galena, occurrence of at Smithfield, N.S.	225		
Canadian Exploration Syndicate.	151			General Mining Association, Ltd.	27, 90		
Canadian Mica Co.	138						
Canonto Mica and Mineral Co.	137						

MICA MINE FOR SALE

A Valuable Property for Sale in the Township of Bedford, County of Frontenac, Ontario—Conveniently Situated.

Address: **SMYTH, SMITH & LYON, Solicitors, Kingston, Ont.**

JOHN B. HOBSON,
Mining Engineer and Metallurgist.

L. F. WARNER, Jr.
Hydraulic and Mining Engineer.

HOBSON & WARNER
MINING ENGINEERS

Quesnelle Forks, - - - British Columbia.

The Equipment and Opening of Deep Gravel Drift, Hydraulic and Gold Quartz Mines a Specialty.

Agents for the Joshua Hendy Machine Works, Hydraulic and Mining Machinery, and the Well's Lights, for use in Hydraulic Mines.

REPRESENTED AT VANCOUVER BY

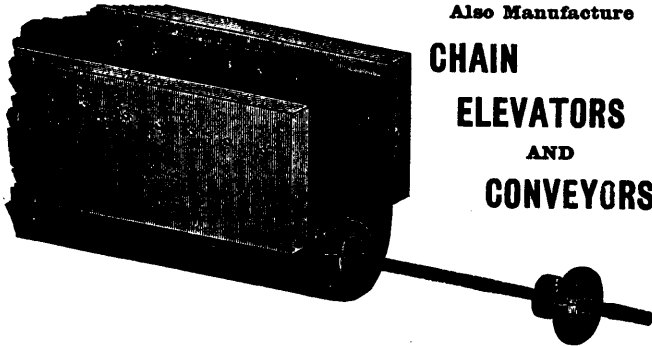
J. M. BROWNING

Corner Granville and George Streets, Vancouver, British Columbia.

JEFFREY STEEL CABLE CONVEYORS, SIMPLE IN CONSTRUCTION

For Handling Coal, Ores, Chemicals, Refuse, Etc.

Also Manufacture



**CHAIN
ELEVATORS
AND
CONVEYORS**

SEND FOR CATALOGUE

The JEFFREY MFG. COMPANY, Columbus, O.

Also, 163 WASHINGTON STREET, NEW YORK.

Chemical AND Assay Apparatus

AGENTS FOR THE DOMINION FOR THE
MORGAN CRUCIBLE CO. BATTERSEA, ENG.

AND FOR THE

**ANALYTICAL and ASSAY BALANCES and WEIGHTS
OF BECKERS SONS, ROTTERDAM.**



Baker & Adamson's C. P. Acids and Chemicals, Brown's Portable Assay Furnace, Hoskin's Gasoline Blowpipes and Furnaces, Dangler Laboratory Lamp, Microscopes of E. Leitz, Wetzlar,

Kavalier's Bohemian Glassware; Royal Berlin and Meissen Porcelain

Platinum Wire, Foil,

Crucibles and Dishes, Swedish and Rhenish Filter Paper.



LYMAN, SONS & COMPANY,

380, 382, 384, and 386 St. Paul Street, MONTREAL

H. W. JOHNS'

Sectional ASBESTOS Coverings

FOR ALL HEATED SURFACES.

Steam Packings, Round, Square, Sheet—Asbestos, Fire-Proof Cements, Fabrics, Tubes, Blocks, Etc.

H. W. JOHNS MANUFACTURING CO.

87 Maiden Lane, N.Y.

NEW YORK,
PHILADELPHIA,

JERSEY CITY,
BOSTON,

CHICAGO,
LONDON.

J. BURLEY SMITH

CIVIL & MINING ENGINEER.

(30 Years' Experience.)

Undertakes the
Prospecting of Mines and
Mineral Lands . . .

**GLENALMOND,
Buckingham, Que.**

Diamond Drill Borings made by Contract for all Minerals (Earthy and Metalliferous), Artesian Wells and Oil Springs, also Deep Soundings for Harbours, Rivers, Canals, Tunnels & Bridge Foundations.

QUARRY SITES AND CLAY FIELDS TESTED

Plans and Sections made Showing Result of Borings—Gold Drifts Tested to Ledge by the New Pneumatic and Hydraulic Tube System and the Yield Ascertained—Flumes, Ditches, Monitors and Placer Mining Plant Generally Designed and Constructed.

PROPERTIES EXAMINED and REPORTED ON and ASSAYS MADE.

REDDAWAY'S PATENT



Specially Adapted for Heavy Drives in Damp or Exposed Places, in Mines, Saw Mills, Paper and Pulp Mills, etc.

**CHEAPER, LIGHTER, MORE PLIABLE AND
MORE DURABLE THAN DOUBLE LEATHER**

W. A. FLEMING, Sole Agent for Canada,

57 St. Francois Xavier Street, Montreal.
Victoria Chambers, Ottawa.

SCHOOL OF MINING,

KINGSTON, ONTARIO.

The following Courses are Offered_____

1. *Three Years' Courses for a Diploma in*

- (A) Mining Engineering.
- (B) Analytical Chemistry and Assaying.

2. *Four Years' Courses for a Degree in*

- (A) Mining Engineering (M.E.)
- (B) Chemistry and Mineralogy (B. Sc.)
- (C) Mineralogy and Geology (B. Sc.)

3. *Post-Graduate Courses for the Degree of*

Doctor of Science (D. Sc.)

For further information see the calendar of Queen's University for 1894-95, p. 117.

4. *Prospector's Course.*

The School offers to Mine Foremen, Assayers, Prospectors and Mining Men generally, Special Courses of Instruction beginning January 8th, 1896, and continuing eight weeks.

5. *Extramural Classes for Prospectors and Mining Men.*

Lecturers will be sent to Mining Centres to conduct Classes in Elementary Chemistry, Mineralogy and Geology as applied to the discovery and winning of valuable minerals.

The School is provided with well equipped Laboratories for the study of Chemical Analysis, Assaying¹ Blowpiping, Mineralogy, Petrography and Drawing. In the Mining Laboratory recently built, the operations of Crushing, Amalgamating, Concentrating, etc., can be studied on a large scale.

FOR CALENDAR OF THE SCHOOL AND FURTHER INFORMATION APPLY TO

WM. MASON, Bursar,

SCHOOL OF MINING, - KINGSTON, ONTARIO.

MINING

IN

CANADA

BY

B. T. A. BELL,

*Editor Canadian Mining Review,
Sec'y Gen'l Mining Ass'n. Proc. Quebec,
Sec'y Ontario Mining Institute,
Hon. Sec'y Mining Society of N. S.*

. 1896 .

Crown Svo.
Handsomey Bound and Illustrated.

POST PAID, FOUR DOLLARS.

CAPITAL
DIRECTORS
MANAGEMENT
PROPERTIES
DIVIDENDS
METHOD OF WORKING
LABOR
MACHINERY
OUTPUT
MARKETS
SALES
EXPORTS
IMPORTS
of the
COLLIERIES
METAL MINES
BLAST FURNACES
ROLLING MILLS
METALLURGICAL WORKS
and
QUARRIES
of the
DOMINION OF CANADA.

ANNOUNCEMENT...

The Sixth Annual Edition of the Canadian Mining Manual will be issued early in 1896.

Entirely Re-Written.

Greatly Enlarged.

SPECIAL CONTRIBUTORS.

W. PELLEW HARVEY, F.C.S., VANCOUVER.
JOHN E. HARDMAN, S.B., HALIFAX.
R. C. CAMPBELL JOHNSTON, M.E., VANCOUVER.
DR. E. GILPIN, JR., HALIFAX.
T. W. GIBSON, BUREAU OF MINES, TORONTO.
L. A. KLEIN, M.E., BLACK LAKE, QUE.
AND OTHER EMINENT AUTHORITIES.

ILLUSTRATED WITH 100 ENGRAVINGS

TABLE OF CONTENTS.

CHAPTER I.—Asbestos.
CHAPTER II.—Gold Mining and Milling.
CHAPTER III.—Coal Mining and Trade.
CHAPTER IV.—Iron and Steel.
CHAPTER V.—Copper and Nickel.
CHAPTER VI.—Silver.
CHAPTER VII.—Mica.
CHAPTER VIII.—Petroleum and Natural Gas.
CHAPTER IX.—Phosphate and Gypsum.
CHAPTER X.—Structural Materials.
CHAPTER XI.—Chromic Iron.
CHAPTER XII.—Graphite.

ENDORSED BY THE PROFESSION AND THE PRESS.

ABSOLUTELY
INDISPENSABLE
to the
PROSPECTOR
MINER
CHEMIST
ENGINEER
METALLURGIST
MANUFACTURER
BANKER
INVESTOR
LEGISLATOR
—
All previous Editions
entirely sold out.



PROVINCE OF NOVA SCOTIA.

Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

PRECIOUS STONES.

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

GOLD AND SILVER.

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

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

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

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

MINES OTHER THAN GOLD AND SILVER.

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

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

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

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

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

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

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

THE HON. C. E. CHURCH,

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.

DRUMMOND, McCALL & COMPANY.

IRON, STEEL & GENERAL METAL MERCHANTS.

OFFICE: New York Life Building, - MONTREAL, QUE.

CANADA IRON FURNACE COMPANY, Limited,

MANUFACTURERS OF

CHARCOAL PIG IRON

(From the Famous Ores of the Three Rivers District.)

Offices: NEW YORK LIFE BUILDING, MONTREAL, QUE.

GEORGE E. DRUMMOND, Managing Director.

Plants at RADNOR FORGES, QUE., GRANDES PILES, QUE., LAC-A-LA-TORTUE, QUE., THREE RIVERS, QUE., LA PÊCHE, QUE.

MONTREAL CAR WHEEL COMPANY

MANUFACTURERS OF

RAILROAD CAR WHEELS

STREET CAR & LUMBER TRUCK WHEELS A SPECIALTY

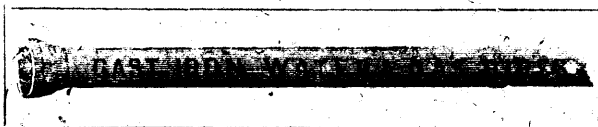
Works: LACHINE, QUE. Offices: NEW YORK LIFE BUILDING, MONTREAL.

THOMAS J. DRUMMOND, - - GENERAL MANAGER.

DRUMMOND, McCALL PIPE FOUNDRY CO. Ltd.

MANUFACTURERS OF

Cast Iron Pipes



Special Castings, &c.

WORKS: LACHINE QUEBEC

OFFICES: NEW YORK LIFE BUILDING MONTREAL.

LUDLOW HYDRANTS, VALVES, &c., ALWAYS ON HAND

THE DOMINION WIRE ROPE COMPANY, LTD.

MONTREAL

Manufacturers of LANG'S PATENT WIRE ROPE.

FOR

TRANSMISSION AND COLLIERY PURPOSES.

SOLE CANADIAN AGENTS for the

WHEN NEW

SOLE CANADIAN AGENTS for the

JEFFREY

STEEL CABLE CONVEYORS

FOR

Handling Coal, Ores, Minerals,
Refuse, Etc.



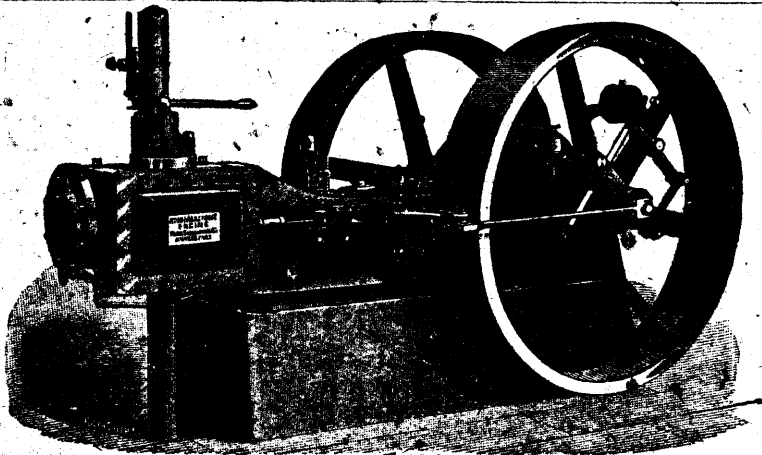
CELEBRATED

"BLEICHERT"

TRAMWAYS.

Also Ropes for Hoisting, Mining, Elevators, Ship's Rigging and Guys, Etc., Etc.

Send for Catalogue and Estimates to P.O. Box 2274



ROBB-ARMSTRONG AUTOMATIC ENGINES

SIMPLE, TANDEM and CROSS-COMPOUND.

Combining the best features of the leading American
High Speed Engines with several improvements.

ROBB ENGINEERING COMPANY, LTD.



AMHERST, NOVA SCOTIA.

Dominion Coal Company, Limited.

Owners of the Victoria, International, Caledonia Reserve, Gowrie, Little
Glace Bay, Bridgeport and Gardner Collieries.

OFFERS FOR SALE

STEAM, GAS and DOMESTIC COALS of HIGHEST QUALITY

Carefully prepared for Market by improved appliances, either F.O.B. or Delivered.

It is also prepared to enter into Contracts with Consumers covering a term of
years. Its facilities for supplying Bunker Coals with promptness is unequalled.

APPLICATION FOR PRICES, ETC. TO BE MADE TO

J. S. McLENNAN, Treasurer, 95 Milk St., BOSTON, MASS.

DAVID McKEEN, Resident Manager,
Glace Bay, Cape Breton.

M. R. MORROW,
50 Bedford Row, Halifax.

KINGMAN BROWN & CO., Custom House Square, Montreal.

HARVEY & OUTERBRIDGE, Produce Exchange Building, New York, Sole Agents for New York and for Export.