

Prof. J. C. Williamson

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INDEX

CANADIAN MINING JOURNAL. VOL. 33

JANUARY 1, 1912, TO DECEMBER 31, 1912

- Absorption of Gold by Amalgamated Copper Plates, The, E.
Abstract of Minutes of Meeting of National Mine Rescue and First Aid Conference, 707.
Acadia Coal Co., New Bankhead at Albion Mines, 650-4.
Accidents in Quebec in 1911, Mining, 562.
Action of Alumina in Copper Slags, 775.
Advance Statement of the Mineral Production of the Province of Quebec, During the Year Ending December 31st, 1911, 189-191.
A. I. M. E., 542.
A. I. M. E. Affairs, 539. E.
Air Lift Agitation of Pulp Slime, 378.
Alaska, 542.
Alaska Coal and the Pacific Coast Fuel Supply, 561.
Alaska Coal-Land Problems, 585.
Alaska Treadwell, 591.
Alaska-Treadwell, The, 328. E.
Alaska-Treadwell Concentrates, 272.
Alberta—General Mining News, 69.
Alberta, Coal Stripping in, by D. B. Dowling, 543.*
Alberta Government, The Rescue Stations of the, by H. Mortimer Lamb, 705.
Alberta Oil Signs and Prospects in Colorado, by Arthur Lakes, 271.
Alberta, Province of, Mining Examinations, 127, 100.
Alberta—Special Correspondence, 316.
Alberta, The Annual Report of the Coal Mines Branch, 124, 93.*
Albion Mines, Acadia Coal Co., New Bankhead at, 650-4.*
Aleph Anrep, 326. E.
Allis-Chalmers Re-organization, 284.
Alumina from Feldspar, Potash, Silica and, by Edward Hart, 732.
Alumina in Copper Slags, The Action of, 775.
Aluminum, 764.
Amalgamated Asbestos, 34, 173.
Amendments to the Mining Act of Ontario, 254. E.
Amendments to the Yukon Placer Mining Act, 326. E.
Amherst Graphite Mine, The, 435.*
Analysis of Tin Ores, The, 420.
Announcement, 109. E.
Announcement, 213. E.
Annual Report of the Coal Mines Branch, Alberta, The, 124, 93.*
Annual Report of the Director of the United States Bureau of Mines for the Fiscal Year Ending June 30, 1911, from the Forthcoming, 332.
Annual Report of the Minister of Mines for British Columbia for 1911, by E. Jacobs, 495-8.
Annual Report of the Trethewey Silver-Cobalt Mine, Ltd., 203-6.*
Annual Report, the Coniagas Mines, Ltd., 26.
Anthracite Mines, Sheep Creek, The Burns, 845.*
Apparatus for Control of Over-speeding and Over-winding in Winding Engines, 734-742.*
Appeal for Co-operation, An, by Walter Henry Prest, 742.
Armstrong L. O.—
On Mineral Occurrences and Investment Opportunities, 152.
On the Natural Resources Department of the C.P.R., 464.
Asbestos, 527.
Asbestos, 576.
Asbestos History, by W. J. Woolsey, 745.*
Asbestos Industry in Canada, The Present Condition of the, by H. Mortimer Lamb, 457.
Asbestos Mining in Quebec, 453.*
Asbestos Production of the World, 456.
Ashcroft, J. W., on The Flotation Process, 797.*
Ashworth, James—
Correspondence—Mr. J. G. S. Hudson's Report on the Bellevue Disaster, 198-9.
Explosions from Falls of Roof in Mines, 765.
Australia, Mining Developments in Western, 746.
Baelz, Walter, on The Gold Fields of New Ontario, 299-304.*
Barite, Nova Scotian, 661-2.*
Barlow, A. E., on More History—Correspondence, 731.
Basic Slag Works at Sydney, Nova Scotia, by C. R. Walker, 608.*
Bateman, G. C.—
On Determining the Angle of Diamond Drill Holes, 167.*
Correspondence, 255.
Bathurst Iron Deposit, New Brunswick, The, 686, 710.*
Bear River Coal Field, B.C., by C. F. J. Galloway, 335, 368.
Beaver Consolidated Mines, Limited, 353, 250, 790.
Bell Asbestos, 107.
Bellevue Disaster, 198-9.
Bellevue Explosion, The, 794. E.
Bellevue Mine Disaster, The, by R. W. Coulthard, 79.
Benjamin Franklin Pearson, 111. E.
Book Reviews—
Mining Without Timber, by R. B. Brinsmade, 5.
Types of Ore Deposits, by H. Foster Main, 43.
The Commercial Handbook of Canada and Boards of Trade Register, by Ernest Heaton, 113.
American Civil Engineers Pocket Book, by Mansfield Merriman, 114.
Stamp Milling, by Algernon Del Mar, 114.
A Manual of Fire Assaying, by Chas. Herman Fulton, 114.
Searchlights on Some American Industries, by Jas. Cooke Mills, 218.
Petrographic Methods, by Dr. Ernst Weinschenk, 218.
Observations on the West of England Mining Regions, by J. H. Collins, 219.
The Mining Manual for 1912, by Walter R. Skinner, 219.
Text-book of Cyanide Practice, by H. W. MacFarren, 336.
Introduction to the Study of Minerals, by Austin Flint Rogers, 408.
Efamination of Prospects, The, by C. Godfrey Gunther, 489.
Bounties in 1911, 595.
Bounty, The, 73. E.
Boyd, W. H., on The Topographical Division of the Geological Survey, 458.
Bradford Chas. E.—
On Sherbrooke, Que., 153.
On Sherbrooke as a Mining Centre, 586.
Brakpan Slimes Plant, The, 216. E.
Braschi, V. M., on the Influence of Smelting, Electricity and the Cyanide Process on Mexican Silver Mining.
Brennan, Edgar H., on Gold Mining in Nova Scotia—Correspondence—on Oldham Gold District, Sterling Mine—Correspondence, 476.
Brick Co., Ltd., Sydney Pressed, by H. C. Burchell, 713.*
Brief Historical Sketch of Gold & Copper Mining in Quebec, A, 422.
Brief Review of Mining in British Columbia, 837.
Britannia Mines, British Columbia, Marble Bay and, 196.
British Coal Situation, The, 111. E.
British Coal Strike, The, 144. E.
British Columbia, Brief Review of Mining in, 837.
British Columbia Copper Company, 138, 289, 354.
British Columbia—General Mining News, 34, 69, 137, 248, 288, 319.
British Columbia in 1911, by E. Jacobs, 7.
British Columbia 1911, Mr. Hedley on Mining in, 222.
British Columbia—Special Correspondence—32, 135, 210, 286, 317, 351, 381, 415, 471, 501, 531, 565, 596, 692, 725, 757, 788, 822.
British Notes on Canadian Coal, 172.
Brock, R. W.—Correspondence—on Execution of Mr. White, 78.
Browne, D. H., on The Idol of Quick Returns, 193-196.
Brule Lake Coal Claims, Extracts from Report on the, by Jas. McEvoy.*
Brule Lake Coal Mines, by R. G. Drinnan, 159.
Brumell, H. P. H., on Graphite in Quebec, 433.
Burchell, G. B., on Maritime Ry. and Power Co., Ltd., 714.*
Burchell, H. C.—
On Sydney Pressed Brick Co., Ltd., 713.*
On Sydney Cement Co., Ltd., 720.*
Bureau of Mines, Quebec, 447.
Burns Anthracite Mines, Sheep Creek, The, 845.*
By-Product Coke Manufacture at Sydney, by F. E. Lucas, 641-3.*
Cadeby Mine Explosions, The, 779.
Cairnes, D. D., on Quartz Mining in the Klondike District, 811.
Canada Iron Corporation, 790.
Canada's First Rescue Car, 390. E.
Canadian Gold Fields Syndicate, Limited, 334.
Canadian H. W. Johns-Manville Co., Ltd., 348.
Canadian Mica, 506. E.
Canadian Mining & Exploration Co., Ltd., 389. E.
Canadian Mining Institute, 378
Canadian Mining Institute, 562.

*Illustrated. E. Editorial.

- Canadian Mining Institute, Journal of The, 280.
- Canadian Mining Institute, Porcupine Trip, The, by E. Jacobs, 219.
- Canadian Mining Institute, The Fourth Annual Meeting of The, 180-2.*
- Canadian Mining Institute, The Semi-Annual Meeting of The, 767.
- Canadian Mining Institute — Western Branch, 206-9, 235, 527.
- Canadian Mining Institute, The Western Meeting of The, 704.
- Canadian Mining Journal Students' Prize, The, 591.
- Canadian Oil Shales and Their Comparison With Some Elsewhere, The, by Arthur Lakes, 314.
- Canadian Patent Relating to Mining and Metallurgy, New, 402.*
- Carbon Monoxide, The Physiological Effects Of, by Henry S. Munroe, 546.
- Cariboo, B. C., Coal Lands In Northern, 278.
- Carter, W. E. H., on Whiskey Lake Area, 483-5.*
- Casualties, 298. E.
- Cement Company, Limited, Sydney, 720.*
- Cement For Steam and Water Pipes, 573.
- Characters Of The Cobalt Silver Ores, by R. E. Hore, 850.
- Chibougamou Region Of Quebec, 579.*
- Chibougamou Report, The, 77. E.
- Chilian Mills, 827. E.
- Chilian Mills, by G. A. Denny, 832.
- China Clay, 420.
- China Clay Industry, The Quebec, by James G. Ross, 439.*
- Chrome Ore, The Price Of, 594.
- Chromite In Quebec, 467.
- Clark, H. H., on The Factor of Safety In Mine Electrical Installations, 485-489.
- Clay and Shale Deposits Of The Western Provinces, The, 564.
- Clay Deposits Of Middle Musquodoboit, Nova Scotia, 656-8.*
- C. M. I.—
- The Semi-Annual Meeting of The, 752.
- Western Meeting, The, 731. E.
- Coal, 558, 576.
- Coal, and The Pacific Coast Fuel Supply, Alaska, 561.
- Coal-bearing Formation of The Yukon, The Ore and, 407.
- Coal, British Notes on Canadian, 172.
- Coal Co., Ltd., The Colonial, 683.*
- Coal Field, B. C., Bear River, by C. F. J. Galloway, 335, 368.
- Coal Fields, B. C., Geology of Comox and Squash, 849.
- Coal Fields, Conservation of Nova Scotian, by Neil A. Nicholson, 671.
- Coal in Glace Bay District, C. B., Early Mining Of, by J. C. Mitchell, 547-551.
- Coal In Storage, Deterioration Of, 561.
- Coal, Investigation of the Price Of, 137.
- Coal-Land Problems, Alaska, 585.
- Coal Lands In Northern Cariboo, B.C., 278.
- Coal Mine Fatalities in Canada, by F. W. Gray, 115.
- Coal Mines Branch, Alberta, The Annual Report of The, 93, 124.*
- Coal Mines, Explosions from Falls of Roof In, 715.
- Coal Mines of Alberta, Wages In, 133.
- Coal Mines of the Nova Scotia Steel & Coal Co., 626-632.
- Coal Mining In Alberta During 1910, 75. E.
- Coal Mining In New Zealand, 523.
- Coal Mining At Depth, 535.
- Coal Shipments, Nova Scotia, 386.
- Coal Strikes, 215. E.
- Coal Stripping In Alberta, by D. B. Dowling, 543.*
- Coal Trade of Nova Scotia During 1911, The,—A Resume—by F. W. Gray, 48.*
- Coals of Canada, The, 294. E.
- Coalfields Of Alberta, The, 534. E.
- Cobalt and Porcupine Shares During 1911, by E. D. Warren, 59.
- Cobalt Bullion, 695.
- Cobalt Dividends, 474. E.
- Cobalt Dividends, 534.
- Cobalt Lake Mining Co., 289, 249, 828.
- Cobalt Returns, 72.
- Cobalt Silver Ores, Characters Of The, by R. E. Hore, 850.
- Cobalt—Special Correspondence, 31, 67, 104, 134, 210, 245, 286, 316, 350, 413, 469, 499, 530, 564, 595, 689, 723, 755, 786, 821, 853.
- Coke Manufacture At Sydney, By-Product, by F. E. Lucas, 641-3.*
- Cole, A. A.—
- On The Relation of Transportation To Mining In Cobalt, 795.
- Collieries, The Jasper Park, 750.*
- Colliery, Electrical Equipment of a South Wales, 405.*
- Colliery Manager (New Style), The, 58.
- Colonial Coal Co., Ltd., The, 683.*
- Colorado and Alberta, Oil Signs and Prospects In, by Arthur Lakes, 271.
- Colvocoresses, G. M.—
- On Gowganda During 1911, 257.*
- Combination Of The Contact Process With The Ordinary Lead Chambers, by Wm. Wilkie, 703.
- Company Notes—
- Alaska Treadwell, 591.
- Amalgamated Asbestos, 34, 173.
- Beaver Consolidated, 250, 353, 790.
- Bell Asbestos, 107.
- British Columbia Copper Co., 289, 354, 412.
- Canada Iron Corporation, 790.
- Cobalt Lake, 249, 828.
- Coniagas Mines, 321.
- Crown Reserve, 107, 388.
- Crow's Nest Pass Coal Co., 250.
- Dome Mines Co., 138.
- Dominion Coal Co., 34, 291.
- Dominion Graphite Co., 564.
- Dominion Steel Corporation, 34, 289, 355.
- Granby Consolidated, 354, 727, 758.
- Hesley Gold Mining Co., 248.
- Hillcrest Dividend, 727.
- Hollinger Gold Mines, 106.
- Hudson Bay, 828.
- International Coal & Coke, 138.
- International Nickel Co., 289, 564.
- Jupiter Mines, Ltd., 385.
- Kerr Lake Mining Co., 173, 289.
- La Rose, 249, 289, 321, 534.
- Le Roi No. 2, 503.
- Minto Coal Co., 534.
- Mond Nickel Co., 503.
- New Dominion Copper Co., Ltd., 694.
- Nipissing Mines Co., 34, 249, 289, 321, 323, 420, 534, 591.
- Northern Ontario Exploration Co., 248.
- Nova Scotia Steel & Coal Co., 34, 420, 792.
- Ore Concentration Co. (1905), Limited, 250.
- Pearl Lake Gold Mines, Ltd., 320.
- Plenarum Mines, 173.
- Rea, 320.
- Robertson Asbestos Co., 320.
- Swastika, 503.
- Temiskaming Mining Co., 34, 249, 353, 534.
- Tilt Cove Copper Co., 34.
- Wettlaufer Lorrain Co., 321, 354.
- Yukon Gold Mining Co., 249.
- Compensation, 360. E.
- Coniagas Mines, 321.
- Coniagas Mines, Ltd., Annual Report, The, 26.
- Conservation, Concerning—Correspondence By James, White, 42.
- By H. J. Stevens, 43.
- Conservation of Nova Scotian Coal Fields, by Neil A. Nicholson, 671.
- Consolidated Mining & Smelting Co., 138.
- Consolidated Mining & Smelting Company of Canada, Ltd., 28.
- Consolidated Ophir Mines, Limited, The, 122.
- Consulting Engineer, The, 348.
- Consulting Mining Engineer, The, 74. E.
- Control of Over-speeding and Over-winding in Winding Engines, Apparatus For, 734-742.*
- Co-Operation, An Appeal For, by Walter Henry Prest, 742.
- Co-Operation In Mining, 729. E.
- Copper Cliff Smelter, Improvements At The, 790.
- Copper Deposits of Eastern Quebec, The, by Jno. E. Hardman, 462.
- Copper Mine, Ascot Township, Quebec, Suffield, 466.
- Copper-Nickel Deposits in South Africa, 404.
- Copper Slags, The Action Of Alumina In, 775.
- Cornish Tin Mining, 521-2.
- Correction, A, 827. E.
- Correspondence—
- Ashworth, James, 198, 765.
- Barlow, A. E., 731.
- Bateman, G. C., 255.
- Brennan, Edgar H., 476.
- Brock, R. W., 78.
- Goodwin, W. L., 699, 765.
- Hille, F., 145.
- Jacobs, E., 199, 587.
- Lamb, H. Mortimer, 217.
- Latimer, J. F., 4.
- Miner, The, 767.
- Rickard, T. A., 573.
- Soloan, David, 828.
- Stevens, H. J., 43, 78.
- White, James, 42.
- Coulthard, R. W.—
- On The Bellevue Mine Disaster, 79.
- Courthope, T Forster—
- On A Modern Power Plant, 613-619.*
- C. P. R., The Natural Resources Department of The, by L. O. Armstrong, 466.
- Crown Reserve, 107, 385.
- Crow's Nest Pass Coal Company, 250.
- Current Technical Literature, 557.
- Currie, H. H.—
- On Nelson, B.C., 153.
- Cyanide Process on Mexican Silver Mining, the Difficulties of Smelting, Electricity and the, by V. M. Braschi, 276.
- DeBlois, W. H.—
- On A Simple Dynamite Thawer, 379.*
- Decrease of Values In Ore Shoots With Depth, by Reginald E. Hore, 260.
- Denis, Theo, C.—
- On Mineral Industry In The Province of Quebec During 1911, 23.
- On Ungava, 442.
- Denny, G. A.—
- On Chilian Mills, 832.
- De Schmid, Hugh S.—
- On Mica Mining In The Province of Quebec, 423.*
- Description of Explosion Test at the Experimental Mine of the United States Bureau of Mines, February 24, 1912, by Geo. S. Rice, 231.
- Detecting Carbon Monoxide, 327. E.
- Deterioration of Coal In Storage, 561.
- Determining the Angle of Diamond Drill Holes, by G. C. Bateman, 167.*
- Development of Fine Grinding in Connection with Gold Ore Treatment, The, by Henry Hanson, 166.
- Devlin, Hon. C. R.—
- On Provincial Mines Branch and The Mineral Resources of Quebec, 429.
- Diamond Drill Results at Pearl Lake, Porcupine, Ontario, by G. H. Thomson, 238.

- Diamond Drilling at Point Mamainse, Ont., 552.
- Diamond Vale Explosion, The, 305.*
- District of Patricia, The, 666. E.
- Dome Mine, Porcupine, Opening of The, 263.
- Domes of Nova Scotia, The, by T. A. Rickard, 224, 273, 310, 345.*
- Dominion Coal Co., 291, 34.
- Dominion Coal Co., Ltd., The, by F. W. Gray, 609-612.*
- Dominion Department of Mines, A, 572.
- Dominion Department of Mines, The, 293. E.
- Dominion Explosives Act, A, 793. E.
- Dominion Graphite Co., 564.
- Dominion Holidays, 391. E.
- Dominion Iron & Steel Co., 791.
- Dominion Mining Company at Tangier, N. S., 663-4.*
- Dominion Steel Corporation, Ltd., 34, 289, 355.
- Dominion Steel Corporation, Limited, Extracts from Annual Report, 409.
- Dowling, D. B.—
- On Coal Stripping In Alberta, 543.*
- Dreams, 761. E.
- Drill, An Electrically Driven Percussion, by F. C. Perkins, 810.*
- Drill Contest, A, 716.
- Dulieux, E.—
- On The Titaniferous Ores and the Magnetic Sands on the North Shore of the St. Lawrence, 450.
- Dunn, Capt. William A., Obituary, 556.
- Duplex Process at Sydney, Nova Scotia, by A. P. Scott, 632-637.*
- Duty of Grinding Pans, 280.
- Early Mining of Coal in Glace Bay District, C.B., by J. C. Mitchell, 547-551.*
- Early Mining Legislation in Quebec, and Other Notes, by J. Obalski, 432.
- Eastern Ontario Gold Mine, An, 700.*
- Eastern Ontario Gold Mining, 698. E.
- Editorial Notes, 4, 41, 78, 112, 216, 298, 328, 360, 392, 475, 508, 540, 572, 604, 667, 699, 731, 764, 795, 827.
- Efficiency in Ore Roasting, by Arthur S. Dwight, 61.
- Eight-Hour Day Again, The, 697. E.
- Eight-Hour Day, The, 665. E.
- Electric Furnace Process as Applied to the Metallurgy of Steel, 337.*
- Electric Furnace, The, 327. E.
- Electric Mining Appliances, by E. A. Lof, 513-519.
- Electric Power for Underground Winding and Hauling Engines, 165.*
- Electric Smelting of Tin in England, 831.
- Electric Smelting of Titaniferous Ores, by Alfred Stansfield, 448.
- Electrical Equipment of a South Wales Colliery, 405.*
- Electrically Driven Percussion Drill, An, by F. C. Perkins, 810.*
- Electricity and the Cyanide Drill, An, Mexican Silver Mining, The Influence of Smelting, by V. M. Braschi, 276.
- Elk Lake—Special Correspondence—67, 104, 286, 316, 469.
- Elmore Vacuum Process, 130.
- Emily Edith Mine, Slocan, B.C., The, 410.
- England, Electric Smelting of Tin in, 831.
- Estimating Iron Ore Reserves, 594.
- Ethics or Expediency, 540. E.
- Eustis Mine, Eustis, Quebec, The, by J. M. Passow, 463.
- Exaggerated Statements from Nelson, B. C.—Correspondence—by E. Jacobs, 199.
- Exculpation of Mr. White—Correspondence—by R. W. Brock, 78.
- Exit Hawthorne, 38. E.
- Experimental Mine of the Bureau of Mines, 372.
- Experimental Mine of the United States Bureau of Mines, February 24, 1912, Description of Explosion Test at the, by Geo. S. Rice, 231.
- Explosion, The Cadeby Mine, 779.
- Explosions from Falls of Roof in Mines, by James Ashworth, 765.
- Explosions from Falls of Roof in Coal Mines, 715.
- Explosion Test at the Experimental Mine of the United States Bureau of Mines, February 24, 1912, Description of, by Geo. S. Rice, 231.
- Extension of Provincial Boundaries, 253. E.
- Extracts from Report on the Brule Lake Coal Claims, by Jas. McEvoy, 155.*
- Factor of Safety in Mine Electrical Installations, The, by H. H. Clark, 485-489.
- Feldspar, Potash, Silica, and Alumina from, by Edward Hart, 732.
- Few Remarks on Some of the Gold Deposits of Ontario, A, by F. Hille, M.E., 332.
- Firebricks, Manufacture of, 654-5.*
- Flotation Process, The, by J. W. Ashcroft, 797.*
- Foolish Criticisms, 762. E.
- Fourteenth Annual Meeting of the Canadian Mining Institute, The, 177. E.
- Fourteenth Meeting of the Canadian Mining Institute, The, 180-2.*
- French Process, The, 6.
- French's Zinc Process, 475. E.
- From the Forthcoming Annual Report of the Director of the United States Bureau of Mines for the Fiscal Year Ending June 30, 1911, 332.
- Fuse, the Rate of Burning of, 556.
- Galloway, C. F. J.—
- On Bear River Coal Field, B.C., 335, 368.*
- Gas Fields of New Brunswick, The, 537. E.
- Geological Society of America, The, 40. E.
- Geological Survey and Mines Branch During 1911, The, 38. E.
- Geological Survey During 1911, Work of The, 44.
- Geological Survey, Geological Division, This Summer's Work of The, 464.
- Geological Survey, Summary Report, 730. E.
- Geological Survey, the Topographical Division of the, by W. H. Boyd, 458.
- Geology of a Portion of Lillooet Mining Division, B.C., 843.*
- Geology of Comox and Squash Coal Fields, B.C., 849.
- Geology of Nanaimo, B.C., Coal District, 334.
- Gibson, Thos. W.—
- On Mining in Ontario, 1911, 56.
- Gillies Limit to Prospectors, The Re-Opening of the, 553.
- Going Some, 304.
- Gold, 558.
- Gold and Copper Mining in Quebec, A Brief Historical Sketch of, 422.
- Gold and Silver in Quebec, 428.
- Gold Deposits of Ontario, A Few Remarks on Some of the, by F. Hille, M.E., 332.
- Gold Fields' Mines, Work at, 849.
- Gold Fields of New Ontario, The, by Walter Baily, 299-304.
- Gold Milling, Some Notes on Modern, 528.
- Gold Mine, An Eastern Ontario, 700.
- Gold Mining in Nova Scotia—Correspondence—by Edgar H. Brennan, 476.
- Gold Mining in Nova Scotia—Correspondence—by T. A. Rickard, 572.
- Gold Mining in Nova Scotia, by H. B. Pickings, 644-9.*
- Gold Mining in Ontario, 748.
- Gold Mining in the Lake of the Woods District, by R. H. Moore, 153.
- Gold Mining in the Transvaal, 509.
- Gold on Meule Creek, Seigniorship of Rigaud—Vaudreuil, Quebec, Placer, 777.
- Gold Ore Treatment, The Development of Fine Grinding in Connection With, 166.
- Goldschmidt Thermit Company, The, 315.
- Goodwin, W. L.—Correspondence—
- A Matter of History, 699.
- Still More History, 765.
- Gowganda, 180. E.
- Gowganda During 1911, by G. M. Colvocoresses, 257.*
- Gowganda—Special Correspondence — 31, 67, 104, 210, 245, 286, 316, 350, 413, 469, 499, 530, 691, 723, 755, 786, 821, 853.
- Graham, Stanley N.—
- On The McIntyre Mine and Mill, Porcupine, 233.
- And On Some Old Methods in Mexican Mining and Metallurgy, 308-310.*
- Granby Company Matters, Notes on, 775.
- Granby Company's Hidden Creek Mines, 525.
- Granby Consolidated, 354.
- Graphite in Quebec, by H. P. H. Brumell, 433.*
- Graphite in the United States, 404.
- Graphite Mine, The Amherst, 435.
- Gray, F. W.—
- On Coal Trade of Nova Scotia During 1911, A Resume, 48.
- On Coal Mine Fatalities in Canada, 115.
- On The Dominion Coal Co., Ltd., 609.*
- Great Cobar, Limited, The, 581-3.
- Groves, S.—
- On Ernest Adolf Sjostedt — Obituary, 343.
- Gwillim, J. C.—
- On Nicol Hall, School of Mining, Kingston, 264.*
- Gypsum Deposits of Nova Scotia, The, 10.*
- Haileybury Captures the Prize, 327. E.
- Hanson, Henry—
- On Development of Fine Grinding in Connection with Gold Ore Treatment, 166.
- Hardman, John E.—
- On The Copper Deposits of Eastern Quebec, 462.
- Hart, Edward—
- On Potash, Silica and Alumina from Feldspar, 732.
- Haultain, H. E. T.—
- On University of Toronto and the Mineral Industry, 394-399, 510-513.*
- Hedley Gold Mining Co., 248.
- Hedley, Mr.—
- On Mining in British Columbia, 1911, 222.
- Hidden Creek Mines, Granby Company's, 525.
- High Duty Gravity Stamp Mill, The, 18.
- Hillcrest Dividend, 727.
- Hille, F.—
- On A Few Remarks on Some of the Gold Deposits of Ontario.
- Hills, Victor G.—
- On the Scheelite Deposits of Nova Scotia, 679.
- History of the Nickel Industry in Canada and the United States, The, 817.
- Hobson, The Late Mr. John B., by E. Jacobs, 131, 102.
- Hodge, C. A.—
- On Tests of Some Species of Nova Scotia Mine Timber, 669.
- Hollinger Again, 215. E.
- Hollinger Gold Mines, 106.
- Hollinger Mill, The, 230.
- Hollinger Report, The, 109. E.
- Hollinger Statement, The, 762. E.
- Homestake, The, 794. E.
- Hore, Reginald E.—
- On Characters of the Cobalt Silver Ores, 850.

- On Decrease of Values in Ore Shoots With Depth, 260.
- Hudson Bay—Company Notes, 828.
- Hughes, Ben.—
On Northern Ontario—The Land of Promise, 150.
- Humidifier, A New Type of Mine Air, 780.*
- Hydraulic Mining in Beauce County, Quebec, 519-520.*
- Idol of Quick Returns, The, 178. E.
- Idol of Quick Returns, The, by D. H. Browne, 193-196.
- Impressions of the Institute Meeting, by T. A. Rickard, 180.
- Improvement at the Copper Cliff Smelter, 790.
- Incineration of Mr. White—Correspondence—by H. J. Stevens, 78.
- Industrial Empires of the Pacific, The, 569. E.
- Industrial Notes, 562.
- Influence of Smelting, Electricity and the Cyanide Process on Mexican Silver Mining, by V. M. Braschi, 276.
- In Praise of the Geologist, 4. E.
- Inspection of Explosives, 254. E.
- Institution of Mining and Metallurgy, 60.
- International Geological Congress, 241.
- International Geological Congress, The, 357. E.
- International Geological Congress, 12th Session, Canada, 1913, 372.
- International Nickel Co., 289, 564.
- Investor, The, 143. E.
- Iron, 559.
- Iron and Steel, 477.
- Iron and Steel in Nova Scotia, by J. H. Plummer, 605-8.
- Iron Deposit, New Brunswick, The Bathurst, 686, 710.*
- Iron Deposits, Torbrook, 637-641.*
- Iron Industry in Canada, Opportunities in, by A. B. Willmott, 148.
- Iron Industry, The Quebec, 465.
- Iron Mine, Moose Mountain, by F. A. Jordon, 807.
- Iron Ore Reserves, Estimating, 594.
- Iron, The World's Production of, 60.
- Jacobs, E.—
On Rainy Hollow, B.C., and Southwestern Yukon, 478-483.*
On Annual Report of the Minister of Mines for British Columbia for 1911, 495-8.
On the Slip Palpable, 587.
On Slocan City Mining Division, 592.
On British Columbia in 1911, 7.
On Metallurgy in British Columbia in 1911, 82.
On The Late Mr. John B. Hobson, 102, 131.
On Exaggerated Statements from Nelson, B.C., 199.
On The Canadian Mining Institute Porcupine Trip, 219.
On Slocan District, B.C., 680.
- Jasper Park Collieries, The, 750.*
- Jordon, F. A.—
On Moose Mountain Iron Mine, 807.
- Journal of The Canadian Mining Institute, 280.
- Jupiter Mines, 385.
- Jupiter Report, The, 359. E.
- Kingston School of Mining, 749.
- Lake of the Woods, by H. A. C. Machin, 147.
- Lake of the Woods District, Gold Mining in the, by R. H. Moore, 153.
- Lakes, Arthur—
On Oil Signs and Prospects in Colorado and Alberta, 271.
- On Canadian Oil Shales and Their Comparison With Some Elsewhere, 314.
- Lamb, H. Mortimer—
On The Rescue Stations of the Alberta Government, 705.
On The Present Condition of the Asbestos Industry in Canada, 457.
"Lame Ducks," 507. E.
- Larder Lake—Special Correspondence—209, 286, 691.
- Large Electric Hoisting Engine, A, 684.*
- La Rose Mines, 534, 321, 249, 289.
- Latimer, J. F.—Correspondence—
On Origin of Petroleum, 4.
- Law—Its Faults and Suggested Changes, The Mining, by Horace V. Winchell, 266.
- Law of the Pay-Streak, The, 473. E.
- Law of the Pay-Streak in Placer Deposits, by J. B. Tyrrell, 362.*
- Laws in the Province of Quebec, Mining, 431.
- Lead and Zinc, United States Duties on, 838.
- Lead Bounties, 848.
- Lead in Quebec, Zinc and, 426.
- Lead Mining and Smelting in Scotland, 678.
- Lead Poisoning, 525.
- Leasing, 297. E.
- Legislation in Quebec, and Other Notes, Early Mining, by J. Obalski, 432.
- Le Roi No. 2, 111. E.
- Le Roi No. 2, 503.
- Letter from Atlin, B.C., A, 720.
- Lillooet Mining Division, B.C., Geology of a Portion of, 843.*
- Literature and Mining, by J. C. Murray, 829, 733.
- Lof, E. A.—
On Electric Mining Appliances, 513-519.
- Lucas, F. E.—
On By-Product Coke Manufacture at Sydney, 641-3.
- Lucky Cross Mines, Swastika, 20.*
- Machine Stopping at Simmer Deep, 379.
- Machinery and Equipment Notes, 412.
- Magnesite Deposits of Grenville Township, Quebec, The, by Harold J. Roast, 444.*
- Manganese at New Ross, N.S., Occurrence of, 660.
- Manganese Co., Ltd., The Nova Scotia, 659.
- Manufacture of Firebricks, 654-5.*
- Manufacture of Sewer Pipe in Nova Scotia, 684.
- Marble Bay and Britannia Mines, British Columbia, 196.
- Marble Industry in Quebec, The, 446.*
- Maritime Ry. & Power Co., Ltd., by G. B. Burehell, 714.*
- Markets, 36, 71, 108, 140, 176, 212, 252, 292, 324, 356, 388, 419, 504, 536, 696, 728, 760, 792, 824, 856.
- McConnell, R. G.—
On Observatory Inlet, British Columbia, 783, 814.
- McDonald Mine, Weedon, Quebec, 467.
- McEvoy, James—
On Mount Robson, 113.*
On Extracts from Report on the Brule Lake Coal Claims, 155.*
- McGill's Success, 4. E.
- McGill University, The Special Research Work of the Mining Department of, 437.
- McIntyre Mine and Mill, Porcupine, The, by S. N. Graham, 233.*
- McKenzie Gold Mine, The, 118.*
- McLeish, John—
On Preliminary Report of the Mineral Production of Canada During the Calendar Year 1911, 183-9.*
- McLellan, J. J.—
On Mining and Milling in the Joplin District, 159.*
- Merrill Filter Presses, 336.
- Metallurgy at the University of Toronto, 76. E.
- Metallurgy in British Columbia in 1911, by E. Jacobs, 82.
- Mexican Mining and Metallurgy, Some Old Methods in, by Stanley N. Graham, 308-310.*
- Mexico, Some Features of Mining in, 305-8.
- Mica Mining in the Province of Quebec, by Hugh S. de Schmid, 423.*
- Mine Centre Mining District, Ontario, The, 584.
- Mine Reports, 358. E.
- Mine Rescue Service of the State of Illinois, by H. H. Stoek, 24.
- Miner, The—Correspondence—Eight-Hour Day in Mining, The, 767.
- Mineral Industry in the Province of Quebec During 1911, by Theo C. Denis, 23.
- Mineral Occurrences and Investment Opportunities, by L. O. Armstrong, 152.
- Mineral Production of Canada During 1911, The, 179. E.
- Mineral Production of Canada During the Calendar Year 1911, Preliminary Report of the, by John McLeesh, 183-9.
- Mineral Production of Ontario, 1911, 191-2.
- Mineral Production of Quebec During 1911, The, 178. E.
- Mineral Production of the Province of Quebec During the Year Ending December 31st, 1911, Advance Statement of the, 189-191.
- Mineral Resources of British Columbia, The, 553-6.
- Mineral Wastes, 667. E.
- Minerals and Mines of Nova Scotia, 601. E.
- Minerals of Nova Scotia, The, 676.
- Mines Branch, 66.
- Mines Branch of the Department of Mines, Ottawa, 1911, Work of the, 46.
- Mines Branch Summary Report, 761.* E.
- Mines Reports of British Columbia and Quebec, The, 571. E.
- Mining Accidents in Ontario, 827. E.
- Mining Accidents in Ontario in 1911, 213. E.
- Mining Accidents in Quebec in 1911, 562.
- Mining and Milling in the Joplin District, by J. J. McLellan, 159.*
- Mining and Water Powers of Nova Scotia, 325. E.
- Mining Costs, 330.
- Mining Developments in Western Australia, 746.
- Mining Examinations, Province of Alberta, 100, 127.
- Mining in British Columbia in 1911, 279.
- Mining Industry and the Dominion Government, The, 570. E.
- Mining Industry and the T. & N. O. Railway, The, 295. E.
- Mining in Ontario, 1911, by Thos. W. Gibson, 56.
- Mining Law—Its Faults and Suggested Changes, The, by Horace V. Winchell, 266.
- Mining Laws in the Province of Quebec, 431.
- Mining Society of Nova Scotia, The Twentieth Annual Meeting of the, 296. E.
- Minto Coal Co., 534.
- Mitchell, J. C.—
On Early Mining of Coal in Glace Bay District, C.B., 547-551.
- Modern Power Plant, A, by T. Forster Courthope, 613-619.*
- Molybdenum, 557.
- Mond Nickel Co., 503.
- Moore, R. H.—
On Gold Mining in the Lake of the Woods District, 153.
- Moose Mountain Iron Mine, by F. A. Jordon, 807.

- More Petroleum—Correspondence—by F. Hille, 145.
- Mother Lode Gold Mine—Sheep Creek—Nelson Mining Division, 527.
- Mount Robson, by Jas. McEvoy, 113.*
- Mr. Hedley on Mining in British Columbia, 1911, 222.
- Muckraker, The, 78. E.
- Munroe, Prof. Henry S.—
On Physiological Effects of Carbon Monoxide, 546.
- Murray, J. C.—
On Natural History of Hartz-Forest, The, 53.*
On Literature and Mining, 829, 733.
- Murray Laboratory, Halifax, N.S., Notes on the, 722.
- Murray Laboratory of Mining Engineering, Halifax, N.S., The, by F. H. Sexton, 400.
- Musquodoboit, Nova Scotia, Clay Deposits of Middle, 656-8.*
- National Mine Rescue and First Aid Conference, Abstract of Minutes of Meeting of, 707.
- National Waste in Mining, 563.
- Navy, The, 825. E.
- Natural Concentration of Gold, The, 4. E.
- Natural History of Hartz-Forest, The, by J. C. Murray, 53, 116.*
- Natural Resources Department of the C. P. R., The, by L. O. Armstrong, 466.
- Nelson, B.C., by H. H. Currie, 153.
- New Bankhead at Albion Mines, Acadia Coal Co., 650-4.*
- New Brunswick, The Bathurst Iron Deposit, 710.*
- New Canadian Company, A—C. O. Bartlett & Snow Company of Canada, 718.
- New Canadian Patent Relating to Mining and Metallurgy, 402.*
- New Dominion Copper Co., Ltd., 694, 704.
- New "Harmet" Fluid Compression Plant of the Nova Scotia Steel & Coal Co., Ltd., at Sydney Mines, N.S., 620-625.*
- New Ontario, the Gold Fields of, by Walter Baelz, 299-304.*
- New Professor of Metallurgy at the University of Toronto, The, 91.*
- New Tin Process, A, 731. E.
- New Type of Mine Air Humidifier, A, 780.*
- Nicholson, Neil A.—
On Conservation of Nova Scotian Coal Fields, 671.
- Nickel, 577.
- Nickel Industry in Canada and the United States, The History of the, 817.
- Nicol Hall, 730. E.
- Nicol Hall, School of Mining, Kingston, by J. C. Gwillim, 264.*
- Nicol, J. M.—
On Vertical Versus Incline Shafts in Precious metal Mining, 281.
- Nigeria, Tin Mining in, 403.
- Nipissing Mines Co., 289, 249, 34, 321, 323, 420, 534, 591.
- Nitroglycerine When Heated, The Behaviour of, 595.
- No. 3 Mine, Near Sudbury, The, 304.
- Northern Ontario Exploration, 248.
- Northern Ontario—The Land of Promise, by Ben. Hughes, 150.
- Notes on the Murray Laboratory, Halifax, N.S., 722.
- Nova Scotia, Clay Deposits of Middle Musquodoboit, 656-8.*
- Nova Scotia Coal Shipments, 386.
- Nova Scotia During 1911, Coal Trade of, a Resume, by F. W. Gray, 48.*
- Nova Scotia for 1911, Report of the Department of Mines of, 200-203, 242.*
- Nova Scotia—General Mining News—33, 69, 288, 318, 352, 383.
- Nova Scotia, Gold Mining in, by H. B. Pickings, 644-9.*
- Nova Scotia, Iron and Steel in, by J. H. Plummer, 605-8.
- Nova Scotian Coal Outputs, 538. E.
- Nova Scotia Manganese Co., Ltd., The, 659.
- Nova Scotia, Manufacture of Sewer Pipe in, 684.
- Nova Scotia Mine Timber, Tests of Some Species of, by F. H. Sexton and C. A. Hodge, 669.
- Nova Scotia—Special Correspondence—134, 173, 285, 348, 414, 469, 723, 785, 820.
- Nova Scotia Steel & Coal Company, 420, 34, 72.
- Nova Scotia Steel & Coal Co., Ltd., at Sydney Mines, N.S., New "Harmet" Fluid Compression Plant of the, 620-625.
- Nova Scotia Steel & Coal Co., Coal Mines of, 626-632.*
- Nova Scotia, The Domes of, by T. A. Rickard, 224, 273.*
- Nova Scotia, The Gypsum Deposits of, 10.*
- Nova Scotia, The Minerals of, 676.
- Nova Scotia, The Scheelite Deposits of, by Victor G. Hills, 679.
- Nova Scotian Barite, 661-2.*
- Nova Scotian Coal Fields, Conservation of, by Neil A. Nicholson, 671.
- Obalski, J.—
On Rare and Radium-Containing Minerals in Quebec, 449.
On Early Mining Legislation in Quebec and Other Notes, 432.
- Observatory Inlet, British Columbia, by R. G. McConnell, 783, 814.
- Occurrence of Manganese at New Ross, N.S., 660.
- Oil Shales of Pictou County, N.S., 674.
- Oil Signs and Prospects in Colorado and Alberta, by Arthur Lakes, 271.
- Oil Versus Coal, 390. E.
- Oldham Gold District—Sterling Mine—Correspondence—by Edgar H. Brennan, 477.
- One Excursion, 245.
- Ontario—General Mining News—34, 68, 105, 137, 247, 288, 318, 353, 383.
- Ontario Gold Mine, An Eastern, 700.*
- Ontario, Gold Mining in, 748.
- Ontario-Manitoba Boundary, The, 313.*
- Ontario Mines—First Quarter of 1912, 429.
- Ontario, 1911, Mineral Production of, 191-2.
- Ontario—Special Correspondence—31, 67, 104, 134, 209, 245, 286, 315, 349, 380, 413, 469, 499, 530, 564, 595, 689, 723, 755, 786, 821, 853.
- Opening of the Dome Mine, Porcupine, 263.
- Opportunities in the Iron Industry in Canada, by A. B. Willmott, 148.
- Opportunities in the West, 148.
- Opportunities, Mineral Occurrences and Investment, by L. O. Armstrong, 152.
- Ore and Coal-Bearing Formation of the Yukon, The, 407.
- Ore Concentration Company (1905), Limited, 250.
- Organized Labour in Canada, 473. E.
- Origin of Petroleums—Correspondence—by J. F. Latimer, 4.
- Ottawa Meeting of the Canadian Mining Institute, The, 76. E.
- Over-Speeding and Over-Winding in Winding Engines, Apparatus for Control of, 734-742.*
- Pantologist, The, 358. E.
- Parks Electro-Cyanide Process, The, by John R. Parks, 493-5.
- Parks, John R.—
On the Parks Electro-Cyanide Process, 493-5.
- Parral Tank Slime Agitation, 297. E.
- Passow, J. M.—
On the Eustis Mine, Eustis, Quebec, 463.
- Pay-Streak in Placer Deposits, Law of The, by J. B. Tyrrell, 362.*
- Pearl Lake Gold Mines, Ltd., 320.
- Pearl Lake, Porcupine, Ontario, Diamond Drill Results at, by G. W. Thomson, 238.
- Pearson, The Late Hon. B. F., K.C., 144.
- Peat and Its Utilization for Power Purposes, 493.
- Peat Industry in Quebec, The, 493.
- Peat Production, 491.*
- Perkins, F. C.—
On Electrically Driven Percussion Drill, 810.*
- Personal and General, 30, 55, 91, 112, 172, 217, 255, 313, 330, 361, 368, 393, 427, 498, 522, 559, 588, 667, 718, 755, 781, 819, 839.
- Petrological Department, by G. S. Scott, 92, 120 284, 490-1.*
- Phosphate in Quebec, 426.
- Photography Underground, 583.
- Physiological Effects of Carbon Monoxide, by Prof. Henry S. Munroe, 546.
- Pickings, H. B.—
On Gold Mining in Nova Scotia, 644-9.*
- Picturesque Mr. Hooley, The, 141. E.
- Placer Deposits, Law of the Pay-Streak in, by J. B. Tyrrell, 362.*
- Placer Gold on Meule Creek, Seigniorie of Rigaud-Vaudreuil, Quebec, 777.
- Plummer, J. H.—
On Iron and Steel in Nova Scotia, 605-8.
- Point Mamainse, Ont., Diamond Drilling at, 552.
- Porcupine—Special Correspondence—104, 134, 209, 246, 286, 315, 349, 380, 413, 500, 530, 565, 596, 690, 691, 724, 756, 786, 821, 854.
- Porcupine Strike, The, 794. E.
- Porcupine Trip, The Canadian Mining Institute, by E. Jacobs, 219.
- Portfolio of Mines at Ottawa, A, 538. E.
- Portland Canal Mining Company, 376, 412.
- Potash, Silica and Alumina from Feldspar, by Edward Hart, 732.
- Preliminary Report of the Mineral Production of Canada During the Calendar Year 1911, by John McLeish, 183-9.
- Present Condition of the Asbestos Industry in Canada, The, by H. Mortimer-Lamb, 457.
- Preservation of Mine Timber, The, 520.
- Prest, Walter Henry—
On An Appeal for Co-Operation, 742.
- Progress at Porcupine, 327. E.
- Progress of the Mining Industry in Quebec, 430.
- Prospector and the Mining Law, The, 391. E.
- Provincial Mines Branch of the Mineral Resources of Quebec, The, by Hon. C. R. Devlin, 429.
- Provision for Mine Rescue Work in B.C. 375.
- Publications Received, 732.
- Publicity for the Geological Congress, 538. E.
- Quartz Mining in the Klondyke District, by D. D. Cairnes, 811.
- Quebec, 421. E.
- Quebec, A Brief Historical Sketch of Gold and Copper Mining in, 422.
- Quebec, Advance Statement of the Mineral Production of the Province During the Year Ending Dec. 31, 1911, 189-191.
- Quebec, and Other Notes, Early Mining Legislation in, by J. Obalski, 432.
- Quebec Annual Report, The, 505. E.
- Quebec, Asbestos Mining in, 453.*
- Quebec Bureau of Mines, 447.
- Quebec China Clay Industry, The, by Jas. G. Ross, 439.*
- Quebec, Chromite in, 467.
- Quebec During 1911, Mineral Industry in the Province of, by Theo. C. Denis, 23.

- Quebec—General Mining News—33, 68, 247, 353, 383.
 Quebec, Gold and Silver in, 428.
 Quebec, Graphite in, by H. P. H. Brummell, 433.*
 Quebec, Hydraulic Mining in Beauce County, 519-520.*
 Quebec in 1911, Mining Accidents in, 562.
 Quebec Iron Industry, The, 465.
 Quebec, Mica Mining in the Province of, by Hugh S. de Schmid, 423.*
 Quebec Mineral Statistics—Railway Shipments, 452.
 Quebec, Mining Laws in the Province of, 431.
 Quebec, Phosphate in, 426.
 Quebec, Progress of the Mining Industry in, 430.
 Quebec, Provincial Mines Branch and the Mineral Resources of, by Hon. C. R. Devlin, 429.
 Quebec, Slate in, 451.
 Quebec, Special Correspondence from, Thetford Mines, 333.
 Quebec—Special Correspondence—689.
 Quebec, Structural and Non-Metallic Products in, 467.
 Quebec, The Copper Deposits of Eastern, by John E. Hardman, 462.
 Quebec, The Marble Industry in, 446.
 Quebec, The Magnesite Deposits of Grenville Township, by Harold J. Roast, 444.*
 Quebec, Unprospected Areas in, 432.
 Quebec, Zinc and Lead in, 426.
 Queen's University, 143. E.
- Radium-Containing Minerals in Quebec, Rare and, by J. Obalski, 449.
 Railways and the Mineral Industry, 429.
 Rainy Hollow, B.C., and Southwestern Yukon, by E. Jacobs, 478-483.
 Rand Developments in 1911, Some, 329.
 Rand Outputs, 416.
 Rapid Estimation of Zinc, 379.
 Rare and Radium-Containing Minerals in Quebec, by J. Obalski, 449.
 Rate of Burning of Fuse, The, 556.
 Rea, 320.
 Rea Mine, Porcupine, The, by T. H. Rea, 16.*
 Rea, T. H.—
 On Rea Mine, Porcupine, The, 16.*
 Refining Silver at the Mine, 474. E.
 Relation of Transportation to Mining in Cobalt, The, by A. A. Cole, 795.
 Removal Notice, 293. E.
 Renold Silent Chain, The, 315.
 Re-Opening of the Gillies Limit to Prospectors, The, 553.
 Report of the Department of Mines of Nova Scotia for 1911, 200-203, 242.*
 Rescue and First Aid Conference, Abstract of Minutes of Meeting of National Mine, 707.
 Rescue Stations of the Alberta Government, The, by H. Mortimer-Lamb, 705.
 Rescue Work in B.C., Provision for Mine, 375.
 Rhodesian Working Costs, 19.
 Rice, George S.—
 On Description of Explosion Test at the Experimental Mine of the United States Bureau of Mines, February 24, 1912, 321.
 Rickard, T. A.—
 On Gold Mining in Nova Scotia—Correspondence, 572.
 On Impressions of the Institute Meeting, 180.
 On The Domes of Nova Scotia, 224, 273, 310, 345.
 Rigaud-Vaudreuil, Quebec, Placer Gold on Meule Creek, Seigniorship of, 777.
 Roast, Harold J.—
 On The Magnesite Deposits of Grenville Township, Quebec, 444.
 Robertson Asbestos Co., 320.
 Rock-Drill Dust Collector, 329.
 Ross, James G.—
 On The Quebec China Clay Industry, 439.*
 Safety Crossheads for Hoisting Buckets, 578.*
 Safety in Mine Electrical Installations, the Factor of, by H. H. Clark, 485-489.
 Sand Filling of Stopes, The, 838.
 Sand Filling Used on the Rand, A System of, by R. E. Sawyer, 841.*
 Saved by the Mine Telephone, 197.
 Sawyer, R. E.—
 On System of Sand Filling Used on the Rand, 841.*
 Scheelite Deposits of Nova Scotia, The, by Victor G. Hills, 679.
 Scotland, Lead Mining and Smelting in, 678.
 Scott, A. P.—
 On The Duplex Process at Sydney, Nova Scotia, 632-637.*
 Scott, G. S.—
 Petrological Department, 92, 120, 284, 490-1.*
 Semi-Annual Meeting of the C. M. I., The, 752.
 Semi-Annual Meeting of The Canadian Mining Institute, the, 767, 752.
 Sewer Pipe in Nova Scotia, Manufacture of, 684.
 Sexton, F. H.—
 On Tests of Some Species of Nova Scotia Mine Timber, 669.
 On The Murray Laboratory of Mining Engineering, Halifax, N.S., 400.
 Shale Deposits of the Western Provinces, The Clay and, 564.
 Share Market, 36, 71, 108, 176, 212, 252, 291, 324, 355, 388, 419, 504, 536, 568, 600, 696, 728, 760, 855.
 Sherbrooke as a Mining Centre, by Chas. E. Bradford, 586.
 Sherbrooke, Que., by Chas. E. Bradford, 153.
 Sie Transit, 357. E.
 Silica and Alumina from Feldspar, Potash, by Edward Hart, 732.
 Silver, 508.
 Silver, 359. E.
 Silver Hoard Cave, The, by Francis A. Thomson, 830.*
 Silver in Quebec, Gold and, 428.
 Silver-Lead, 558.
 Silver Mining, The Influence of Smelting Electricity and the Cyanide Process on Mexican, by V. M. Braschi, 276.
 Silver Ores, Characters of the Cobalt, by R. E. Hore, 850.
 Silver Prices, 36, 72, 108, 140, 176, 212, 252, 292, 324, 356, 388, 419, 504, 536, 568, 600, 696, 728, 760, 792, 824, 856.
 Simple Dynamite Thawer, A, by W. H. DeBlois, 379.*
 Simple Reading Device for Burettes, 378.
 Sir James Decides, 111. E.
 Sjostedt, Ernest Adolf (Obituary), by S. Groves, 343.*
 Slate in Quebec, 451.
 Slime Treatment, 378.
 Slip Palpable, The—Correspondence—by E. Jacobs, 587.
 Slocan City Mining Division, by E. Jacobs, 592.
 Slocan District, B.C., by E. Jacobs, 680.
 Smelting, Electricity, and the Cyanide Process on Mexican Silver Mining, The Influence of, by V. M. Braschi, 276.
 Some Features of Mining in Mexico, 305-8.
 Some Notes on Modern Gold Milling, 528.
 Some Old Methods in Mexican Mining and Metallurgy, by S. N. Graham, 308-310.*
 Some Rand Developments in 1911, 329.
 South Africa, Copper-Nickel Deposits in, 404.
 South African Half Year, The, 574.
 South Belt at Rossland, B.C., The, 591.
 South Lorrain—Special Correspondence—31, 67, 104, 134, 210, 245, 286, 316, 350, 413, 499, 530, 564, 595, 689, 691, 723, 755, 786, 821, 853.
 Special Correspondence from Quebec, Thetford Mines, Quebec, 333.
 Special Research Work of the Mining Department of McGill University, The, 437.
 Stamp Mill Model, A, 238.*
 Stansfield, Alfred—
 On Electric Smelting of Titaniferous Ores, 448.
 Statistics and Returns, 34, 70, 107, 138, 174, 212, 251, 290, 322, 354, 386, 417, 503, 534, 567, 598, 694, 727, 759, 791, 823, 855.
 Steam Hydraulic Forging Plant, 721.
 Steel, Electric Furnace Process as Applied to the Metallurgy of, 337.*
 Sterling Mine—Oldham Gold District, by E. H. Brennan, 477.
 Stevens, H. J.—Correspondence—
 On Concerning Conservation, 43.
 On The Incineration of Mr. White, 78.
 St. Lawrence, The Titaniferous Ores and the Magnetic Sands on the North Shore of the, by E. Dulieux, 450.*
 Stock, H. H.—
 On Mine Rescue Service of the State of Illinois, 24.
 Stopping, A Cheap Method of, 578.
 Strike Aftermath, the, 296. E.
 Structural and Non-Metallic Products in Quebec, 467.
 Students' Competition, 293. E.
 Sudbury, The No. 3 Mine, Near, 304.
 Suffield Copper Mine, Ascot Township, Quebec, 466.
 Sullivan Machinery Company, 315.
 Sulphuric Acid Industry in the United States, The, by Utley Wedge, 772.
 Summer's Campaign, A, 327. E.
 Swastika, Lucky Cross Mines, 20.*
 Swastika Mining Co., 503.
 Swastika—Special Correspondence — 104, 134, 209, 246, 286, 315, 349, 380, 413, 500, 530, 565, 596, 690, 691, 724, 757, 786, 821, 854.
 Sydney Cement Company, Limited, by H. C. Burchell, 720.*
 Sydney, N.S., 153.
 Sydney Pressed Brick Co., Ltd., by H. C. Burchell, 713.*
 System of Mine Taxation, 826. E.
 System of Sand Filling Used on the Rand, A, by R. E. Sawyer, 841.*
 T. & N. O. Railway and the Mining Industry, The, 295. E.
 Taxation Affecting Mining in British Columbia, 245.
 Technical Literature, 523, 557, 575, 836, 804.
 Technical Writing—Some Suggestions to Students, 371.
 Temiskaming & Northern Ontario Freight Rates, 137.
 Temiskaming Mining Co., 249, 34, 353, 534.
 Tests of Some Species of Nova Scotia Mine Timber, by F. H. Sexton and C. A. Hodge, 669.
 Thanks, 604. E.
 This Summer's Field Work of the Geological Survey—Geological Division, 464.
 Thomson, Francis A.—
 On Silver Hoard Cave, The, 830.*
 On Diamond Drill Results at Pearl Lake, Porcupine, Ont., 238.
 Tilt Cove Copper Co., 34.
 Timber, Tests of Some Species of Nova Scotia Mine, by F. H. Sexton and C. A. Hodge, 669.
 Tin in England, Electric Smelting of, 831.
 Tin Mining, Cornish, 521-2.
 Tin Mining in Nigeria, 403.

- Tin Ores, The Analysis of, 420.
Titanic, The, 298. E.
Titaniferous Ores and the Magnetic Sands on the North Shore of the St. Lawrence, The, by E. Dulieux, 450.
Titaniferous Ores, Electric Smelting of, by Alfred Stansfield, 448.
Topographical Division of the Geological Survey, The, by W. H. Boyd, 458.
Torbrook Iron Deposits, 637-641.*
To the Investor, 153.
Transportation to Mining in Cobalt, The Relation of, by A. A. Cole, 795.
Transvaal, Gold Mining in the, 509.
Tretthewey Silver-Cobalt Mine, Ltd., Annual Report of the, 203-6.*
Tretthewey Statement, The, 142. E.
Tube Mill Ratio, 22.
Tungsten, 557.
Tungsten Ore, World's Product of, 320.
Twentieth Annual Meeting of the Mining Society of Nova Scotia, The, 296. E.
Tyrrell, J.B., 313.*
Tyrrell, J.B.—
On Vein Formation in Cobalt, 171.
On Law of the Pay-Streak in Placer Deposits, 362.*
Ungava, 215. E.
Ungava, by Theo. C. Denis, 442.*
United States Duties on Lead and Zinc, 838.
United States—General Mining News—289.
United States, Graphite in the, 404.
University of Toronto, and the Mineral Industry, The, by H. E. T. Haultain, 394-399, 510-513.*
University of Toronto, The New Professor of Metallurgy at the, 91.*
Unprospected Areas in Quebec, 432.
Valuation of Mining Properties, The, 507. E.
Vein Formation in Cobalt, by J. B. Tyrrell, 171.
Venezuelan Ore Lands Venture—General Mining News—248.
Ventilation in Rand Mines, 539. E.
Ventilation in Pitching Seams, 594.
Vertical Versus Incline Shafts, 214. E.
Vertical Versus Incline Shafts in Precious Metal Mining, by J. M. Nicol, 281.
Wages in the Coal Mines of Alberta, 133.
Walker, C. R.—
On Basic Slag Works at Sydney, Nova Scotia, 608.
Warren, E. D.—
On Cobalt and Porcupine Shares During 1911, 59.
Warren, E. G.—Obituary, 509.
Wedge, Utley—
On The Sulphuric Acid Industry in the United States, 772.
Weedon (McDonald), Mine, Weedon, Quebec, The, 467.
Welcome, 141. E.
West Shining Tree Gold District, 587.
Western Branch Canadian Mining Institute, 206-9, 235, 527.
Western Meeting of the Canadian Mining Institute, The, 704.
Wettlaufer Lorrain Co., 321, 354.
Whipsaw Creek District, Similkameen, B. C., 850.
Whiskey Lake Area, by W. E. H. Carter, 483-5.*
White, James—Correspondence—
On Concerning Conservation, 42.
Willmott, A. B.—
On Opportunities in the Iron Industry in Canada, 148.
Wilkie, Wm.—
On Combination of the Contact Process With the Ordinary Lead Chambers, 703.
Winchell, Horace V.—
On The Mining Law—Its Faults and Suggested Changes, 266.
Winding Engines, Apparatus for Control of Over-Speeding and Over-Winding in, 734-742.*
Woolsey, W. J.—
On Asbestos History, 745.*
Work at the Gold Fields' Mines, 849.
Word of Appreciation, A, 37. E.
Work of the Geological Survey During the Year 1911, 44.
Work of the Mines Branch of the Department of Mines, Ottawa, 1911, 46.
World's Copper, The, 390. E.
World's Product of Tungsten Ore, 330.
World's Production of Iron, The, 60.
World's Production of Iron and Steel, The, 41. E.
Year 1911, The, 1. E.
Yukon—General Mining News—385.
Yukon Gold Mining Co., 249.
Yukon Mining Legislation, 331.
Yukon Rainy Hollow, B.C., and South-western, by E. Jacobs, 478-483.*
Yukon, The Ore and Coal-Bearing Formation of the, 407.
Zinc, 577.
Zinc and Lead in Quebec, 426.
Zinc, Rapid Estimation of, 379.
Zinc, United States Duties on Lead and, 838.

THE CANADIAN MINING JOURNAL

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CONTENTS.

Editorials	1
(a) The Year 1911, A Review	1
(b) The Natural Concentration of Gold	3
(c) In Praise of the Geologist	4
(d) McGill's Success	4
(e) Editorial Notes	4
Correspondence	4
Book Reviews	5
The French Process	6
British Columbia in 1911, by E. Jacobs	7
The Gypsum Deposits of Nova Scotia	10
The Rea Mine, Porcupine, by T. H. Rea	16
The High Duty Gravity Stamp Mill	18
Rhodesian Working Costs	19
The Lucky Cross Mines — Swastika	20
The Mineral Industry in the Province of Quebec During 1911, by Theo. C. Denis	23
Mine Rescue Service of the State of Illinois, by H. H. Stoek	24
The Coniagas Mines, Limited, Annual Report	26
Consolidated Mining & Smelting Co., of Canada, Limited	28
Personal and General	30
Special Correspondence, etc.	31

THE YEAR 1911.

A Review.

In even greater degree than its predecessor, the year 1911 has brought expansion, new growth, and stability to the varied branches of Canada's mining industry. Mining is attaining rapidly its proper national status. Since the total value of the mineral output for the year will probably exceed \$120,000,000, this is as it should be.

Nova Scotia.—Amongst the larger industries, coal mining in Nova Scotia and in the West has made large strides. The outputs in Nova Scotia are the largest on record. Had it not been for labour troubles, this would also have been the case in Alberta and British Columbia. Nevertheless, much advance has been made in opening new fields, and in the underground development of established mines, and the output of Vancouver Island collieries exceeds that of all past years.

Quebec.—Asbestos mining, the backbone of Quebec's mineral industry, has fallen on evil days. Saddled with extravagantly large capitalization, the Amalgamated Asbestos corporation has thrown up the sponge after about two years of strenuous effort. Re-organization and dehydration are soon to be effected. A multitude of small investors will suffer. But the enterprise, as such, should survive.

Ontario was the cynosure of all eyes during 1911. Cobalt, overshadowed in the public mind by Porcupine, attained a production of silver that is larger by some millions of ounces than was the yield of 1910. Porcupine will rank as a producer of gold before the snow disappears. Copper Cliff, maugre Dr. Day and his sinister vaticinations, is still earning lordly incomes for the International Nickel Company. Incidentally, its plant has been added to and partly reorganized, and its prosperity is not abated.

In the Michipicoten region, at the Magpie mine, The Lake Superior Corporation is opening up huge bodies of siderite, which, it is expected, after calcination, will supply a very large demand for Bessemer iron ore.

Half-hearted attempts have been begun to work several abandoned gold mines in the Lake of the Woods district, but the only profitable activity appears to be confined to the St. Anthony mine, near Sturgeon Lake.

Eastern Ontario has experienced a distinct revival. The erection of an iron ore concentrating plant at Trenton will give an impetus to Hastings County mining. The long-neglected gold mines of Hastings and Frontenac Counties are being looked into. The talc industry is flourishing. Corundum is holding its own.

The Bancroft marble quarries are producing acceptably. In fact the two counties have not for many years been the centre of so much attention.

As has been the case for some years, the production of petroleum has fallen off in southernmost Ontario, while the yield of natural gas has increased.

Manitoba, except for her clays, marls, and limestones, is practically a negligible factor in mining. Like New Brunswick, this province pays practically no attention to exploiting her mineral deposits.

Alberta's coal production will probably show a measurable decrease. For the past four years the annual output of coal has been climbing steadily and rapidly. The retrogression must be credited to the foreign labour agitator.

British Columbia's total mineral output, according to the estimate of our correspondent, Mr. E. Jacobs, than whom it would be hard to find a more reliable informant, will show a decided drop. Two causes are responsible for this: First and foremost, the coal miners' strike, which brought about a coke famine in southeastern British Columbia, and thereby curtailed smelting operations; and, second, the fact that the railway trestles and bridges on the line of the Kaslo and Slocan Railway, a line that taps the rich Slocan silver-lead and zinc district, have not been replaced since the destructive fires of last year. On the other hand, apart from these fortuitous circumstances, the province has not been standing still. The Consolidated Mining and Smelting Company has improved its position markedly, notably at the War Eagle mine, Rossland. The Sheep Creek gold mines have shown up well. The Hedley Gold Mining Company has produced heavily and has, moreover, developed considerable ore reserves.

Placer gold shows a decline. Both Barkerville and Atlin yielded less in 1911 than in 1910.

Work in other inland districts and on the coast was more than usually active. In a word, a year of industrial peace will make British Columbia a much closer second to Ontario than is now the case.

The yield of gold from Yukon Territory is slightly in excess of that recorded for last year. A larger output would have been won had not serious delays occurred in assembling the members of several large dredges that were to operate for the Yukon Gold Company.

GENERAL.

Technical Education.—The appointment of a Royal Commission to investigate questions pertaining to technical education was the salient feature of the year. After taking evidence all over the Dominion, the commissioners began their tour of Europe and the United States. Their final report will not be issued before two or three years shall have elapsed. Meanwhile throughout their Canadian itinerary they succeeded in creating a strong current of interest.

The three leading mining colleges, McGill, Kingston School of Mines, and Toronto, have done good work. McGill University, relieved of its burden of debt, will, doubtless, enlarge its boundaries. The university's mining department ranks easily among the most important of its faculties, and it is even more in need of financial aid. This it should receive without delay. The Kingston School of Mining, the pioneer in Canadian mining education, is equally deserving. Its academic requirements are now remarkably stringent, and it is turning out competent graduates. The mining department of the University of Toronto is aggressive, and is waxing strong. Though sadly in need of a larger staff, it is live and efficient.

Conservation of Natural Resources.—Much thought and effort have been devoted to the proper use of our natural resources. At its inception the commission, of which the Hon. Mr. Sifton is chairman, antagonized the mining fraternity by making certain wild statements in respect of waste in mining and smelting. After a series of more or less tropical incidents the situation was cleared.

The commission is now industriously minding its own business and will accomplish its ends unless it follows the example set by the quixotic Pinchot and his conferees. Already it has made a grave mistake, a mistake that argues absence of tact. At the very inception of the commission no sufficient steps were taken to work in sympathy with other departments. This is precisely what led to the contretemps referred to above. Yet, to its credit be it said, the commission's policy, impracticable as it may have been at first, is changing gradually for the better. It has much deadwood in its personnel. This should be lopped off. Live, keen, practical men are needed. In short, the commission requires to be popularized.

Legislation.—The committee of the Canadian Mining Institute that was authorized by the Dominion Government to codify the Federal mining laws has met frequently. Gradually the proposed statute is being moulded into shape. In due course it will be submitted to Parliament—the sooner the better.

The Province of Quebec has wrought radical changes in its Mines Act. These have been amply noticed in previous issues of the CANADIAN MINING JOURNAL.

The whole broad and intricate problem of workmen's compensation is being threshed out by various Ontario branches of the Canadian Mining Institute. This, probably, will be the most absorbing topic of discussion at this year's meetings.

The influx of foreign capital has brought home to Canadians the pressing need of housecleaning in matters relating to the administration of our heterogeneous mining laws, and in the character of the laws themselves.

We noted with regret a short time ago that the Hon. Mr. Borden had indicated that he had no intention of submitting to the House any bill dealing with the control of explosives. In regard to this we would urge that all possible pressure be brought upon the Dominion Government to take up this subject without delay. Neglect of this would be stupid and criminal to a degree. Nothing could exculpate the Government were more lives to be lost in catastrophies like those that have occurred in the last twenty-four months.

Departmental.—Full accounts of the field work of the mines branch and the geological survey branch of the Department of Mines will appear in our next issue. It suffices here to say that there is now noticeably less overlapping and duplication on the part of the two branches. Whilst the survey aims more and more to direct its efforts along economic lines, the mines branch is attempting to attain directly commercial results. It is fast becoming what it was intended to be, an essentially technologic departmental unit.

The Canadian Mining Institute.—No outward and visible ripple has disturbed the perfect peace that has brooded over the institute since last we wished our readers a Happy New Year. After an effervescent annual dinner, no more bubbles have risen to the surface. The president, the secretary, and members of the council have wisely encouraged the formation of branches. The Porcupine meeting, at which the Porcupine branch was formally organized, was an unqualified success. Other branches are needed at such places as Sudbury, Kenora, Sherbrooke, and Sydney. Amongst existing branches, Toronto possesses probably the most vigorous.

It may do no harm to compliment the secretary upon the quality of the last bulletin, which, typographically and otherwise, deserves appreciation.

The Profession.—Canada generally, and Toronto and Montreal in particular, have become popular hunting-grounds for many mining engineers from foreign parts. The number of consulting mining engineers, with headquarters in Canadian cities and towns, has doubled in the last year. Not all are making headway. But the majority are doing well. We doubt, however, if the Canadian public, many sad lessons notwithstanding, has a saving sense of its own needs. This will come in time.

Opportunities.—So often have we expatiated upon the chances that offer themselves to the mining investor in Canada that now we shall merely recapitulate a few. Our lists are confined to the more or less settled regions.

In Nova Scotia the best opportunities are available in mining and manufacturing gypsum, in mining and smelting auriferous antimony ore, in manganese mining, in tungsten mining, and (with qualifications) in gold mining.

New Brunswick proffers excellent openings in gypsum, iron ore, manganese ore, oil, natural gas, and, possibly, copper and gold.

Quebec, as mentioned above, holds out chances of rich copper ore in the Sherbrooke region. Placer gold promises well in the country drained by the Riviere du Loup. Magnesite should be the basis of a thriving industry; and mica, despite an erratic market, can be made to yield handsome profits.

Eastern Ontario contains a bewildering variety of commercially valuable mineral deposits. Pyrites, marble, actinolite, feldspar, sodalite, etc., etc., await cautious exploitation. Both here and in western Ontario the investor can have a good run for his money if he cares to investigate the best of the old gold mines. Fortunes will yet be made out of some of these.

The long-deserted silver mines of the Thunder Bay District will some day become fashionable again. A study of their history, as recorded in the records of the Geological Survey and of the Ontario Bureau of Mines, gives constructive evidence of their general intrinsic value.

In Albertan coal lands much German, Belgian, English, American, and Canadian capital has been and is being investigated. Some of these investments are unquestionably sane; many are worse than foolish. Investors of all kinds will never receive equal justice, and the better class will never feel any sense of security until the Province of Alberta controls her own natural resources.

British Columbia, blessed with equitable laws, should prove more and more attractive to the capitalist. Here, in our opinion, the outstanding opportunity lies in the development of an iron and steel industry on the coast, where Providence has placed all the necessary material, and where that material can be transported cheaply. To enumerate the promising openings in British Columbian metal mining would be a Herculean task. It must suffice to say that the range of choice is exceeded by no other country and is equalled by few.

* * * * *

That our country will continue to flourish, that Canadians will prove worthy of their high destiny, that the industry that we represent will, under the guidance of Canadians, form the foundation-stone of our national growth, is our most earnest hope. Here's to the New Year!

THE NATURAL CONCENTRATION OF GOLD.

In the Canadian Mining Journal for June 15, 1911, we gave a lengthy editorial notice of an article entitled "Certain Natural Associations of Gold." This article, written by Mr. F. C. Lincoln, appeared in the April-May number of *Economic Geology*. The October-November number of our excellent contemporary contains a letter by Mr. J. B. Tyrrell, commenting upon one of Mr. Lincoln's statements.

The statement commented upon is to the effect that the placer gold of Klondike represented an original gold content of about two cents per ton of rock eroded.

Quoting from a contribution of his own in Economic Geology, Mr. Tyrrell assumes that a thickness of 900 feet over an area of 800 square miles, equivalent to 1,600,000,000,000 tons of rock, was eroded and concentrated by natural agencies. The resulting placers yielded about 10,000,000 ounces of gold. This represents an original gold content, not of two cents per ton but of 0.013 cents per ton of original rock in place.

The opportunities offered in the Klondike district for approximate computations of this kind are exceptionally good. On the assumption that only one-third of the gold originally in the rock was collected in the placers of the present streams, Mr. Tyrrell points out that this would place the gold content of the rock at .04 cent. of gold per ton—a figure that he believes to be much nearer the average gold content of the igneous and metamorphic rocks of the earth's crust than Mr. Lincoln's estimate, which was three and a half cents per ton.

IN PRAISE OF THE GEOLOGIST.

Mr. Arnold Bennett, the most brilliant of a brilliant group of contemporary English novelists and essayists, has something good to say of the geologists in his Christmas book, "The Feast of St. Friend."

The decay of the old Christmas spirit he attributes to men of science. "It is due," says Bennett, "to the labours of a set of idealists—men who cared not for money, nor for glory, nor for anything except their ideal. Their ideal was to find out the truth concerning nature and concerning human history; and they sacrificed all—they sacrificed the peace of mind of whole generations—to the pleasure of slaking their ardour for truth. . . . They would leave naught alone; and they scorned consequences. . . . I mean the great philosophers and men of science—especially the geologists—of the nineteenth century. I mean such utterly pure-minded men as Lyell, Spencer, Darwin, and Huxley."

What higher eulogium could be bestowed? The geologist has profoundly influenced and modified every department of human thought. Religious dogma he has undermined. Superstition he has dissipated. The orderly sequence of his mental processes and the finality of his logic have left their mark upon all literature.

In fact, the geologist is at once the intellectual magistrate and the conservator of tradition.

McGILL'S SUCCESS.

Canadians will rejoice at the good fortune of McGill University. Adopting the modern cyclone method of collecting a large amount of money within a few days, the friends of the University announced that they would attempt to gather in \$1,000,000 within five days. On the evening of the last day of the campaign, Saturday, November 25th, the good news was made public that the sum of \$1,526,765 had been collected. The citizens of Montreal, the three large railway corporations, and the students themselves, had responded to the appeal in a manner that surpassed all expectations.

In this spectacularly successful incident it is well to remember that the devotion of the Principal and of his staff have roused the practical sentiments of the public. "McGill has found her friends" was the Principal's comment, when he heard the result.

McGill will have no difficulty in holding the friends that she has found. And these friends will bring more help than could be expected from any government.

EDITORIAL NOTES.

No industry lives unto itself. Mining is the mother of all industries. But even in mining regions the amenities of life cannot be overlooked, which is all a quite superfluous introduction to what we intend to say, namely, that there should be hotel inspection in Northern Ontario. Porcupine is well supplied with accommodation for the visitor. Cobalt, on the other hand, is unspeakably undesirable. Its hotels cumber the ground.

The necessity of low operating costs on the Rand is creating a demand for competent supervision. The conditions are unsuited to the employment of white labour. But white supervision is certainly required. The best informed authorities affirm that this is the only function of the white man on the Rand. Coloured labour will always be the staple.

"Lucky Jim," the B. C. zinc mine, is providing a harvest for the newspapers. The marketing of zinc concentrates presents more than enough difficulties and complications. The advertisements of the "Lucky Jim" flotation contain about one per cent. truth highly diluted with imagination, fabrication, and fiction.

CORRESPONDENCE

ORIGIN OF PETROLEUMS.

Editor, Canadian Mining Journal:

Sir,—In your issue of Nov. 1st a letter appeared from the pen of Mr. Eugene Coste, in which he somewhat elaborately discusses the origin of petroleum as non-organic.

While not claiming to have been as exhaustive a student of such phenomena as evidences, I am, never-

theless, not convinced of the soundness of the conclusion at which Mr. Coste arrived from facts and assertions (I say, assertions, because, in my opinion, some of his statements lack proof), on which he founds his deductions. He takes the position that petroleum had its origin in vulcanism. While it may be true that vulcanism developed petroleum, may it not have produced it by simply transferring it from a wide area of

pre-existing organic material to appreciable quantity in natural reservoirs, just as oils are often collected in properly arranged vessels by distillations.

The oils of commerce are, many of them, obtained by processes of pressure, distillation and absorption; and in the laboratory of nature it is reasonable to conclude that oil would be produced by similar operations from organic material. It is assuming too much to say that petroleum could not have travelled from remote sources through porous rock, because the rocks were already saturated with water, for we do not know that at the time of absorption and transmission the rocks were not deprived of most or all of their moisture by heat, and, further, we do not know that the rocks now saturated with petroleum were not characterized by greater porosity when saturated. It is a fact of general acceptance that the vast bodies of limestone found in all countries are of animal origin chiefly. These organisms must have existed in immense quantity to form, when consolidated, beds of rock hundreds of feet in thickness. Further, these beds have in many instances been changed by heat into granular limestone or marble, in which all traces of animal organisms have been obliterated.

During these processes of heat, evaporation, and solidification, it appears to me quite reasonable to infer that any petroliferous matter contained in the organisms constituting the main source of these rocks would, on expulsion by pressure and heat, percolate through the comparatively porous rocks previous to their final solidification; and accordingly we find

many limestone strata, most effected by heat, in which no trace of oil, or even of the organisms from which the oil is supposed to have been derived, is discernible. But this is not always the case. Previous to the discovery of oil deposits in Western Ontario, petroleum was produced by distillation of a layer of rock found between Owen Sound and Meaford. The product, a good illuminating oil, was sold at that time in Kincardine at \$1.25 per gallon. Shortly after the Petroleum oil came on the market, the distillation works burned down. Meanwhile the price of petroleum became so reduced that it was not considered advisable to rebuild. Some time after, the writer, on driving through that section, took occasion to examine the rock from which the oil had been produced, and found it to consist of a stratum of solid black rock composed almost wholly of fossil remains, chiefly trilobites, many of the markings of which were very distinct. This layer was horizontal and occurred between other strata of limestone, much lighter in colour, and in which the fossil tracings were much less prominent.

From the foregoing facts and observations, I came to the conclusion that, however true it may be that, in some instances petroleum may have seemed to have had its origin in petrological metamorphism, its true origin was either animal or vegetable organic matter, and chiefly animal.

Yours, etc.,

J. F. LATIMER.

Toronto, Ont., Dec. 21st.

BOOK REVIEWS.

MINING WITHOUT TIMBER—By Robert Bruce Brinsmade, B.S., E.M.—309 Pages—Profusely Illustrated—Price \$3 net—Published by McGraw-Hill Book Company, 239 West 39th Street, New York, 1911.

Mr. Brinsmade's object in compiling his very timely book was to supplement such works as Mayer's "Mining Methods in Europe," Storm's "Timbering and Mining," Ingalls' "Economics of Mining," Hoover's "Principles of Mining," and Finlay's "Cost of Mining." His attempt has been limited to describing generally accepted theories and leading examples of practice. Nothing more would be practicable, for the reason that timberless mining is yet in an early stage of development.

The first five chapters are general, taking up in succession the following subjects: Explosives and their use, principles of blasting ground, compressed air for mining, principles for controlling excavations, and principles of mine drainage. Nearly all the remaining chapters are made up of descriptions of actual practice in the United States and other countries. Surface shoveling, surface mining, underhand stoping, overhand stoping with shrinkage, in fact, all the standard stoping, caving, slicing, longwall, and pillar systems are set forth.

As mentioned above, the book opens with a discussion of the character and use of explosives. This chapter appears to the reviewer to be particularly meritorious. It is elementary; yet it is also instructively detailed. The composition, reactions, exploding temperatures, etc., of each class of explosives are explained, and the physical qualities of each are outlined. A few paragraphs on "misfires" are added.

Chapter II., containing clear diagrams, goes into the principles of blasting ground. Here are discussed the relations of geologic structure to the methods of drilling, loading, and firing.

Chapter III. describes the underlying principles of the use of compressed air. Control of excavations is the subject of Chapter IV. The control of the roof, and the control of sides and floor, and of the whole overlying formation, are considered separately.

Problems of mine drainage are considered in Chapter V. All of these chapters contain typical examples and practical working formulae.

Chapter VI., "Surface Shoveling in Open Cuts," opens with a description of the equipment of the Mayo and Mayari Mines, Cuba. Other examples from the Mesabi Range, from the Utah Copper Mine, from the Nevada Consolidated, and from the Eastern Pennsylvania and Illinois anthracite fields are given. In each instance all necessary commercial data are included.

The following fifteen chapters cover surface mining, underhand stoping, overhand stoping with shrinkage, overhand on waste in the United States, overhand on waste in Mexico and Australia, overhand with shrinkage and delayed filling, overhand with shrinkage and simultaneous pillar-caving, back-caving into chutes or chute-caving, block-caving system, slicing under mats of timber in barrels, slicing under ore with back-caving in rooms, principles of mining seams, advancing longwall systems for seams, pillar systems for seams, and flushing systems for filling seams and recovering pillars.

Chapter XXII. is a summary comparison of the various mining systems mentioned above. Principles of mine evaluation is the subject of Chapter XXIII.

A tabulated list of the chief magazine articles from which much of the subject-matter of the book was extracted, is appended immediately after Chapter XXIII. This is a great improvement upon the distracting foot-note.

While, incidentally, we regret that Mr. Brinsmade has overlooked many excellent examples of mining in Canada (not one Canadian mine is referred to), we cannot but commend both the form and the matter of the book. It is worthy the attention of both the coal-miner and the metal-miner. The horizons of both will be broadened by a close study of this volume.

We predict that in due process of time "Mining Without Timber" will go through several editions. It does not "fill a long-felt want," for the reason that it is strictly modern. It does, however, supply a present need. Author and publishers alike are to be congratulated.

THE FRENCH PROCESS

Mr. A. Gordon French, a metallurgical chemist, who had previously been making experiments in connection with the reduction of lead-zinc ores, has patented a process which is the outcome of his investigations and experiments. A well-known metallurgist thus describes and comments on this process:

"Mr. French's process aims at the extraction and recovery of the zinc contained in ores such as the silver-lead-zinc ores of the Slovan district of British Columbia, leaving as a residue the silver-lead, iron and gangue matter, which would be afterward smelted in the same manner as a lead ore free from zinc.

"The advantages claimed for such treatment would be:

"1. The recovery of the zinc in a metallic and marketable form.

"2. By the removal of the zinc from the original ore—(a) the residue would become a lead ore free from zinc and as such would obtain a lower smelting rate and avoid any 'zinc penalty' that would have been attached to the original ore; (b) the residue, carrying all the lead and silver of the original ore would be less in weight than such original ore, by the weight of zinc extracted. Consequently it would contain a higher percentage of lead and silver and there would be a proportionately lessened tonnage to smelt.

"3. The silver actually occurring in the blende would remain in the residue and so be recovered by smelting, whereas it would be lost if the zinc-blende were to be separated from the lead ore by any mechanical process.

"**Ores Experimented Upon.**—The ores experimented upon have been chiefly zinc concentrates containing galena, zinc-blende, iron pyrites, and iron carbonate together with the gangue matter, quartz and shale, and apparently a percentage of manganese in some form.

"**Treatment.**—The ore is crushed to pass through a 10-mesh screen. It is then roasted in an ordinary calcining furnace until the ore is nearly 'dead,' which reduces the original sulphides, theoretically, to oxides, although in practice there are probably sulphates and some sulphides left, depending in quantity upon the completeness of the roast.

"While the roasted ore is still in the calciner, at the hot end, a small percentage of nitro-cake*, in powdered form, is thrown in with the ore and thoroughly rumbled into it, making an intimate mixture. This mixture is thoroughly stirred (rumbled) under heat for a short

time. The effect of this is that the oxides in the ore are almost all converted into sulphates. When this action is considered complete the charge is removed from the furnace and allowed to cool.

"This roasted and treated ore, after having sufficiently cooled, is transformed to a wooden leaching tank, and water, in which a small quantity of nitro-cake has been placed, is added, and this dissolves out the sulphates of zinc and manganese, together with the sulphate of soda formed by splitting up of the nitro-cake.

"The sulphate of lead is not soluble and the silver can be rendered insoluble. These remain in the tank, as does all gangue.

"Mr. French claims that the sulphates of iron are not leached out until all the zinc is in solution, and if the leaching is stopped before the zinc is all out the iron will be left undissolved. Of this I am not certain and have not been able to try it, but the solutions in the works did not carry much iron, which seems to confirm his statement.

"The filtrate from the leaching tank, containing the sulphates of zinc, manganese and soda are run into a wooden box, in which are hung alternate sheets of zinc and lead, immersed in the filtrate or electrolyte. The zinc plates are connected to the positive pole and the lead sheets to the negative pole of a direct-current dynamo of low voltage.

"The action of the electric current is to plate the zinc sheet with metallic zinc, which accumulates in a dense hard mass over the entire side of the plate. When this deposit of zinc has attained the desired thickness it is lifted out and a new zinc sheet put in its place. The electrically deposited zinc is afterwards easily stripped from the zinc sheet, the latter to be used again and the former now ready for market after having been melted and run into bars.

"On the negative pole manganese is precipitated as a black oxide of manganese in a powder which is brushed off occasionally and collects in the bottom of the box. This black oxide of manganese has a commercial value.

"The filtrate from the leaching tank flows into the electrolytic precipitating box and out again, being pumped back to the leaching tank, this flow keeping the solution at a normal strength.

"The plant that Mr. French has at Nelson is only an experimental one, and is very crude, sufficient only to demonstrate the principle and is capable of treating only a batch of from 500 to 1,000 lbs. of ore at a time. The whole plant is home-made, and the process cannot be demonstrated in it.

"The plant consists of a small calcining furnace, with a hearth about 20 feet long by about 5 feet wide, built of concrete with a brick arch, heated by cordwood used in an ordinary firebox, working doors on one side only.

"The calcining hearth is inclined at an angle of about 10 degrees for the upper part of its length, but is level for the lower 5 feet. The ore is fed in at the upper end through the side door by shovel and is rumbled by hand.

"There is one leaching tank, also two wooden tanks for the storage of solutions."

*Nitro-cake is a bisulphate of soda with some free sulphuric acid in it and is a waste product of sulphuric acid works.

BRITISH COLUMBIA IN 1911

(By E. JACOBS.)

Statistics of mineral production in British Columbia during the calendar year 1911, when published, will be found to compare unfavourably with those of the five or six years immediately preceding. Two main reasons may be given for this seeming retrogression—one, the suspension of the production of coal and coke at the Crow's Nest Pass collieries consequent on a strike of the colliery employees, and the other, the continuance of a lack of ore concentration and railway transportation facilities for the several silver-lead and zinc mines of the Slocan district that were deprived of these essentials to production when, in the summer of 1910, forest fires destroyed surface buildings and plants at mines, and trestles and bridges along half a dozen miles of the Kaslo and Slocan Railway. However, the retarding effects of these temporary difficulties will not much longer be experienced, for production has been resumed at the coal mines and a branch railway is being built that will next summer afford suitable transportation conveniences for most of the mines that were without these throughout 1911.

But the progress or otherwise of the mining industry of the province during last year may not fairly be measured only by statistics of mineral production, for in other respects the position is entirely different, as a brief survey of some prominent features of the year will make manifest. For instance, the prospects for a larger production of lode gold were improved by several noteworthy developments. Among these are considerable improvement at the Consolidated Mining and Smelting Co.'s War Eagle mine, Rosslund, in which there has been partly opened below the 12th level a body of ore in greater quantity and containing value in gold quite beyond earlier expectations of the management. Then there is much encouragement from developments in Sheep Creek camp, Nelson mining division, where a decided change for the better has occurred at the Queen mine in the opening of a large body of gold-bearing ore of comparatively high average value, while the equipment of the Mother Lode mine, in the same camp, with a stamp mill (which, it is claimed, will be among the best in the world for efficiency in gold-saving), is added to the fact that the occurrence of ore of good gold value in this mine has been proved to a depth of 500 feet assures an ore supply, sufficient ore to keep the stamp mill running continuously for three years having been blocked out. Again, not only did the Hedley Gold Mining Co. mine and mill a much larger quantity of gold ore in 1911, with a proportionate increase in gold recovered, but it developed in the deeper part of its mines ore estimated to be worth at least \$1,000,000, and added this much to previously known ore reserves.

Silver and lead in much larger quantity than in recent years may be expected to be produced in the early future by Slocan district mines, for it has been most effectively demonstrated by deep-level development down to a depth of 1,200 feet that ore in considerable quantity and of high grade occurs to at least that depth, and there are indications that still deeper development will be similarly successful in revealing the presence of ore than can be mined with profit. In this connection, the initiation of the deep development of such well-known mines as the Slocan Star and Payne, both dividend-payers in former years,

is certainly gratifying to those concerned in the progress of mining in the Slocan district in particular, and of deep mining in general.

The outlook for copper mining is also encouraging, for during its last fiscal year the Granby Company added 290,000 tons more ore to its reserves "in sight" than the 957,000 tons it shipped from its Phoenix mines, while, as shown in the notes that follow, the same company's developments at its Hidden Creek mine and those of the Britannia Company at its mine in New Westminster mining division, were eminently satisfactory.

The activities of the Consolidated Mining and Smelting Co., the Granby Co., and the British Columbia Copper Co., in bonding and exploiting various undeveloped properties with a view to making them productive, were also progressive.

Just a word or two concerning the Provincial Government, before turning to notice in some detail of the different mining districts. Among other aids to mining rendered by the Government may be mentioned the passing of laws regulating coal mining that are acknowledged to be about the best in the world; the adjustment of matters at issue between the smelting companies and the company that supplies their works with electric power; and the substantial work done in mining districts in constructing and improving roads and trails to give access to parts in which mining and prospecting is being carried on. The encouragement given by the Government to railway building should also be acknowledged. Doubtless there are other things that should be noted, but the main purpose in view now is to direct attention to what has been done in the mining districts of the province, as shown in the notes that follow.

Cariboo and Cassiar.—Barkerville district and Quesnel division, Cariboo, and Atlin division, Cassiar, are the two important placer-gold districts of British Columbia. Both report a decreased production in 1911 as compared with 1910—about \$460,000 from the two districts as against \$522,000 in 1910. A shorter season for gravel washing is accountable for the decrease; the season opened late, and there were no fall rains to help out. In both districts there are beds of gravel available for hydraulicking. A feature in Cariboo last summer was the commencement of operations by the Quesnelle Hydraulic Gold Mining Co., which under the direction of Mr. Howard W. Dubois, of Philadelphia, has expended nearly \$1,000,000 in preliminary work and equipment, and the resumption of work near Quesnel Forks by Mr. John B. Hobson, the veteran hydraulic placer miner of Quesnel division.

East Kootenay.—Metal mining did not make much progress during the year. Exhaustion of the known ore bodies of the St. Eugene lead mine, from which an aggregate of about 1,100,000 tons of ore has been taken, is near at hand, production of concentrate having decreased yearly from 28,000 tons in 1905 to less than 6,000 tons in 1911. The Sullivan has in part taken the place of the St. Eugene, but its enormous ore reserves contain much ore in which the percentage of zinc is too high to allow of present profitable treatment in this province, so shipments are not large. Construction of the Kootenay Central Railway, now being carried out, will eventually give transportation to silver

and lead mines in parts of the district now without it.

Production of coal was practically stopped during the eight months the coal mine employees were on strike, but in that period the opening of coal seams at a level 500 feet above main entry to the Hosmer mine was proceeded with, several new seams were opened at the Crow's Nest Pass Coal Co.'s Coal Creek colliery, and others at Carbonado, while the Corbin Co. opened a phenomenal deposit of coal occurring 3,000 to 4,000 feet along the surface and 300 to 400 feet wide, which will be quarried in open workings.

Ainsworth.—This and the following named divisions in West Kootenay appear to have a brighter immediate future. Spokane men with money available for development work have secured and are opening several Ainsworth properties, and the Consolidated Mining and Smelting Co. has bonded others. Arrangements are being made to resume work and ore production at the Bluebell, which is a big lead mine situated across Kootenay Lake from Ainsworth. The Utica, 12 miles west of Kaslo, is shipping ore, and The Deep Mines, Ltd., is developing the deep of the Whitewater group properties, with the object of making tonnage available when concentrating and transportation facilities, destroyed by forest fires in 1910, shall have been replaced. Some 1,500 feet of underground work was done last year, including completion of a raise from the long cross-cut tunnel of The Deep mine, 540 feet to the old Whitewater Deep workings. A large fissure vein is being explored, and some ore has been found, but no great quantity has yet been blocked out. The outlook for this mine is encouraging.

Slocan.—Not having railway connection, production of zinc ore from the Lucky Jim was not practicable in 1911, so development work only was done; No. 6 level, 400 feet below No. 5, was driven 1,134 feet, entering the lime dike in which drifting in search of the zinc ore bodies is in progress. The Rambler-Cariboo opened shoots of silver-lead ore on each level at 900, 1,000, and 1,200-ft. depth, respectively, and is extending the 1,400-ft. level to find the same shoots; the concentrating plant is being removed down to a new mill site near the railway, which is in course of construction to provide transportation for this mine and the Lucky Jim. The development of much ore of good grade in the lower levels of the Rambler-Cariboo is considered to have a most important bearing on the future of the Slocan district. This having proved that ore continues to depth. The Washington was further developed; it has much lead-zinc ore in its workings. The Payne—which in earlier years yielded 50,000 tons of ore averaging 68 per cent. lead and 120 ozs. silver per ton, also containing 6,000 tons zinc blende—is having a cross-cut tunnel driven 3,300 feet to cut the vein at 675 feet below the lowest old level. Cody camp was active; shoots of silver-lead and zinc ore were found in the Noble Five, the Reco opened a new shoot of ore in virgin ground on No. 11 level, the Twilight also found ore in its No. 2 adit, the Sunset continued driving No. 8 level 1,600 feet to reach a long sheet of ore worked for 300 feet in length on higher levels, and the Surprise passed through good ore when raising from its adit level at 1,100-ft. depth to connect with the bottom of the old shaft 830 feet above. About Sandon, at the Ruth-Hope the upper levels have been extended, and a lower adit driven 800 feet, while more than 500 tons silver-lead ore has been shipped; the Richmond-Eureka has continued development and shipped about 2,300 tons; a new company has been organized to work the

Slocan Star, on which old workings have been reopened and a deep-level adit is being driven to cut the vein in 2,300 feet at 630 feet below No. 5 level. Four Mile Creek mines are flourishing; the Standard has cut good ore on No. 6 level, which is 190 feet vertically below the big galena showing on No. 5, has constructed an aerial tramway 8,000 feet from the mine to mill site near Slocan Lake, equipped a 100-ton concentrating mill, put in a water line and air compressor, and has commenced production on a larger scale; the Silverton Mines, Ltd., has opened much ore on levels down to No. 7, connected by raises up to No. 4, found rich ruby silver occurring freely in the ore, renovated the Wakefield concentrating mill, and been making experimental runs with one unit of the Elmore Vacuum Process plant on zinc middlings from jigs; the Van-Roi, which commenced concentrating at its new mill in March, put about 30,000 tons of ore through the mill and made two marketable products, namely, silver-lead and silver-zinc concentrates. The British Columbia Copper Co. bonded a gold property situated above Slocan Lake and commenced developing it. Many other mines in Slocan and Slocan City divisions were worked, as well as those above named. On the whole the outlook for the Slocan district is regarded as more promising than for years, with the deep of the mines being opened and ore of good grade and in considerable quantity being found at depth, already demonstrated down to 1,400 feet, and with expectation that it will go deeper.

Nelson.—In this division further development of the Molly Gibson has been favorable and the outlook for the mine much improved; it is owned by the Consolidated Company, which has put its mill in running order and increased the power available for mining purposes. No information has been received from the Granite-Poorman gold mine, in connection with which some sensations were sprung on the public in 1911 by a local newspaper. The Wilcox, Yankee Girl, and Dundee, all in Ymir camp, of this division, were worked; the Yankee Girl sent 1,350 tons of ore to the smeltery before it passed into the hands of a receiver; it has since been acquired by Spokane men. The Emerald, near Salmo, shipped nearly 2,000 tons of lead ore; in this district the Consolidated Co. bonded some claims on which there is a big surface showing of lead carbonate ore. The Queen opened its gold-bearing vein down to greater depth; the Nugget milled between 3,000 and 4,000 tons of gold ore having a gross value of \$20 per ton; the Mother Lode proved its veins down to 500 feet depth and put in a modern 10-stamp gold mill, and the Kootenay Belle and others were further developed. The Arlington and Second Relief, in Erie camp, were also producers of gold ore.

Rosslund.—The chief developments here were in the Centre Star group, owned by the Consolidated Co., and the mines of Le Roi No. 2, Ltd. The former found the high-grade ore opened in the bottom of the War Eagle develop into quite a large body and the average grade to keep up beyond expectations. Smaller ore bodies were opened in other parts of the Centre Star group. The Le Roi No. 2 discovered and developed the Holywell vein on the 300 and 500-ft. levels, and opened much ore in the Rodney vein on the 1,200-ft. level. The 1,300-ft. level was extended and preparations were made for going deeper, indications being in favor of finding more good ore in the deep. The Le Roi No. 2 shipped 27,000 tons of crude ore to the smeltery and concentrated 18,000 tons, producing 1,600 tons of gold-copper concentrate. The Le Roi was sold to the Consolidated

Co.; latterly it has been shipping 100 tons of ore a day, and an early increase in tonnage is looked for. The Bluebird and other small properties were also worked. At the Trail smeltery and lead refinery the Consolidated Co. put in two units of the Dwight-Lloyd sintering process plant, rearranged the Huntington-Heberlein plant, and made numerous changes to facilitate handling and sampling ore.

Other West Kootenay Divisions.—In Revelstoke division mining is largely restricted to development of mica deposits and hydraulicking for placer gold, both in Big Bend district. In the Lardeau, the Beatrice shipped 310 tons of ore, and in Trout Lake division the Silver Cup made an output of about 500 tons, also of silver-lead ore. Development was done on the Winslow, a gold claim, but there was little else worthy of note.

Boundary.—Tonnage of ore mined and smelted was the smallest in this district since 1907, due chiefly to the Crow's Nest miners' strike. The total was about 1,200,000 tons, as compared with 1,600,000 tons in 1910. The Granby Co.'s production was 583,000 tons as against 1,075,000 tons in 1910; the Snowshoe also produced less—31,000 tons as compared with 147,000 tons in 1910. On the other hand, the British Columbia Copper Co. increased its output 95,000 tons—533,000 as compared with 438,000 tons. Little development work was done in the Granby mines during the calendar year, for they were closed several months, but in the fiscal year, to June 30, last, estimated additional tonnage of ore blocked out was 1,248,000 tons, while only 957,000 tons were shipped, consequently ore in sight was increased 291,000 tons, making total ore "estimated in sight" 6,720,000 tons. Notwithstanding the reduced tonnage treated, smelting costs were three cents per ton lower. A new method for the disposal of slag, previously dumped molten, was arranged for while the furnaces were out of blast; this consists principally of granulation of the slag by water, sluicing of slag to central storage bins, where it will be de-watered, and conveyance of slag on conveyor belts up an incline to an elevation of 100 feet above the old dump and distribution there. Dump room for six to ten million tons of slag is thus provided. Most of the B. C. Copper Co.'s ore treated came from its Mother Lode mine, in which a different method of mining was adopted; the ore body was divided into a series of transverse stopes of a maximum width of 25 feet., thus making available a greater percentage of the ore and reducing costs of extracting it. Under this system more than 100,000 tons of ore was broken down at one time last autumn. In this connection 2,433 holes were drilled, averaging approximately 14 feet each in depth. These were charged with 425 boxes of 40 per cent. dynamite, equal to 10 $\frac{5}{8}$ tons; 2,525 electric detonators, low tension, No. 7, were used connected in series of 25; connection was finally made to 550-volt current, and the whole exploded, breaking down tonnage stated above. The year's tonnage from the Mother Lode was about 315,000 tons; while from the New Dominion Copper Co.'s Rawhide mine 172,000 tons was obtained, and 46,000 tons from three other Boundary mines owned by the company. In addition, 15,000 tons from two mines in the neighboring State of Washington, also owned by this company, was smelted. Three furnaces were kept in blast nearly all the year, using Pennsylvania coke, until November, when one was blown out to economize in coke consumption, until a supply should be obtainable from Alberta. Work was resumed in the Emma mine after a long shut-down, and about 1,500 tons of ore shipped monthly to the smeltery.

During the year several properties were bonded and exploration work done on them; among these was the Voigt group of 65 claims in Similkameen district, which it is hoped, will develop into big copper mine. The Greenwood-Phoenix Tramway Co. extended its adit to 3,000 feet from portal, and the Argo company also drove a long tunnel, but there was little else noteworthy.

Similkameen.—In metal mining the Hedley Gold Mining Co. was the only one that produced ore. The output from its Nickel Plate group of mines was approximately 57,000 tons, milled at its 40-stamp mill at Hedley, as compared with 46,800 tons in 1910. Average value per ton was \$12.10 and percentage of extraction 92 per cent. This shows a recovered value four cents per ton higher than in 1910. No gold is saved on amalgamation plates, but about 75 per cent. of value recovered is by concentration, and 25 per cent. by cyanidation. Treatment process includes crushing by stamps, tube-milling, cyaniding, and saving of gold in Merrill standard 36-in. frame presses with Oliver filter presses for slimes. Production of concentrates is about 300 tons per month; the concentrate, which runs high in gold, is reduced at Tacoma smeltery, Washington. Development work done during year added largely to known reserves of ore. Lower levels of mine look well and prospects for 1912 are bright. Coal was shipped from a small colliery at Princeton, and a promising new coal mine was opened above Granite Creek, Tulameen.

Nicola.—Chief development was at coal mines. The Nicola Valley Coal and Coke Co. erected and equipped a new tipple, making coal handling capacity 1,000 tons per day; put in new machinery and plant; extended railway trackage; much improved outlets from mines, and found by means of diamond drilling important extensions of coal deposits. Output tonnage was in excess of 209,000 tons, as compared with 141,000 tons in 1910. Development of several other properties was continued, but production was small. A gypsum deposit was opened and shipments made from it. There was little mining worthy of mention done in other parts of Yale district.

Coast.—Quite a transformation has been effected in the Britannia mine, Howe Sound. Two years ago the outlook for this property was discouraging; now there is in sight a large tonnage of ore running 4 to 5 per cent. copper, and it is believed the development work of the early future will greatly increase known good ore in sight. More than 100,000 tons of ore was extracted; most of this was passed through the graded crushing and concentrating mill. Extraction was good for chalcopyrite ore—about 80 per cent. A full-sized working unit of the Elmore Vacuum Process plant gave excellent recoveries, indicating that treatment of fines and slimes, following hand-sorting and jigging, will bring total extraction of value up to a high percentage.

Another important advance made was that of the Granby Co., at its Hidden Creek copper mine, Observatory Inlet. Reports of six engineers show an estimate tonnage—minimum 6,000,000, maximum 12,000,000 tons, averaging two per cent. copper for the smaller and 1.65 per cent. for the larger tonnage. Since their examinations of the mine, further development has given additional tonnage estimated to include at least 200,000 tons of 5 per cent. copper ore, beside that of lower grade also developed. Company has had up to 270 men preparing mine for stoping and production, and carrying out surface improvements. Establishment at Goose Bay, near the mine, of a copper smeltery, with

blast furnace capacity of 2,000 tons per diem, is planned. The year's results in Portland Canal camp have been disappointing. The only mine that made production on a commercial basis was that of the Portland Canal Mining Co., from which ore was extracted that when concentrated in the company's mill gave rather more than 2,000 tons of concentrates, the bulk of which was a product running 12 to 15 ozs. silver and 7 to 11 per cent. lead. The year's results demonstrated that, to be profitable, milling operations must be on a much larger scale. The Red Cliff was reported to have developed much copper ore of good grade, but bulk shipments to smeltery, frequently talked of, were not made. Other properties were stated to be looking well, but they are without transportation facilities. In Skeena River district numerous silver-lead claims were more or less prospected; in some cases development into shipping mines is confidently expected. Most of these are within a radius of 20 miles of Hazelton. Railway transportation will likely be available for some of them in 1912. More work was done on coal properties in the Telkwa and Morrice River district, while in the northern part of Skeena district much anthracite coal was found and some development work done on it. This coal field is described as promising to prove extensive and valuable. Prospecting for coal and oil on Graham Island, of the Queen Charlotte group, was done by various holdings; little progress appears to have been made in connection with metal mining on these islands.

The Marble Bay mine, Texada Island, continued to produce much bornite ore containing copper in good average quantity and an appreciable additional value in gold and silver. The Cornell mine did not ship much ore in 1911. Metal mining was practically non-existent on Vancouver Island, but substantial advance was made in coal mining during the year. The Western Fuel Company, Nanaimo, made the largest output in the history of its mines—about 586,000 long tons, as compared with nearly 512,000 tons in 1910. This company is opening a new shaft mine about 4 miles south of Nanaimo—main and air shafts are being sunk to a depth of about 1,000 feet, and it is expected coal will be reached next autumn. Thereafter the mine will be rapidly developed to a producing capacity of 1,200 to 1,500 tons a day. The company's mines are in excellent condition as regards equipment, development, and prospects, and it is expected 1912 will prove a record year. Distribution of coal produced was approximately as follows: Sold in British Columbia, 59 per cent., in California 32 per cent., elsewhere 9 per cent. The Canadian Collieries (Dunsmuir) Limited maintained

production at about same rate as in 1910, when the output was nearly 900,000 long tons, of which 122,000 tons was exported to the United States, and 26,000 tons to other countries. The distribution of the 1911 production was somewhat similar. The company has let contracts for construction work in connection with the development of a hydro-electric water power, initial capacity to be 11,000 h.p. Work let includes dam and a waterline about three miles long. Power will be used at the company's several Union Colliery mines in the vicinity of Cumberland, Comox district. A new shaft mine is to be opened, but as the shaft, the sinking of which has been commenced, will have to be sunk about 1,000 feet, no production from here will be made until 12 or 18 months hence. Many changes and improvements have been authorized, and these are being carried out as rapidly as practicable. Production is to be materially increased and more of the company's large deposits of coal utilized. The Pacific Coast Coal Mines, Ltd., has increased production at its Fiddick colliery to about 20,000 tons a month, and has active demand for all the coal it mines. At its Squash colliery, development is being continued to get the property in shape for shipping coal. The Vancouver-Nanaimo Coal Mining Co. is providing shipping facilities at tidewater for the coal it mines at its New East Wellington colliery. Reverting to metal mining—the Tye Copper Co.'s smeltery at Ladysmith, Vancouver Island, was operated intermittently during the year, but the available supply of ore was insufficient to keep its furnaces in blast continuously. The ore smelted came chiefly from British Columbia coastal mines, and others in southern Alaska.

Prospects for Future.—For metal mining the outlook is fairly encouraging. More gold and silver should be produced from Nelson, Rossland, Boundary, Similkameen, and Coast mines; silver and lead in larger quantity should be mined in Slocan district especially, and to a smaller degree in East Kootenay and Skeena district; coast mines promise a greater output of copper, but known inland mines will hardly make any increase; zinc production was so small in 1911 that it will not be difficult to make a considerable advance upon that. The utilization of iron ore deposits will likely be longer deferred. Coal promises to become increasingly important, and its production to soon reach a value in excess of that of all other mineral products of the province combined. Building materials and other non-metallic minerals will also make steady advance. Metallurgical methods are being improved, and conditions generally indicate progress for the mining industry.

The Gypsum Deposits of Nova Scotia

(Continued from last issue).

Sheet No. 42, Noel, Hants County.

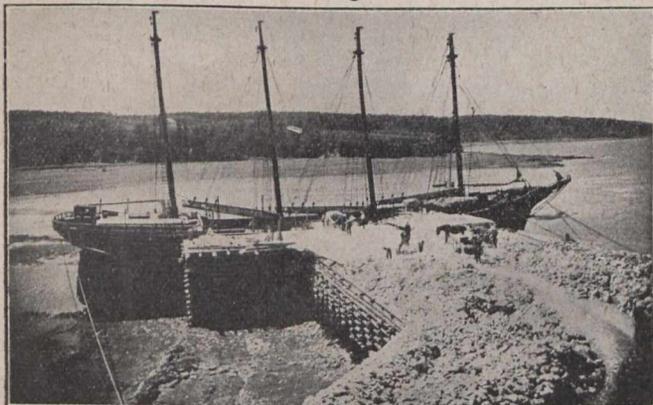
This sheet, besides showing the continuation of the deposits of the Kennetcook Valley, where there are several important exposures of gypsum similar in quality and texture to those that have been described in this valley, also shows a northerly gypsiferous area belonging to the Windsor series. This branches off from the Kennetcook valley near Burton's, and fol-

lows a westwardly course skirting the older Devonian rock, to the Avon River on the west, and forms the northern boundary of the lower Carboniferous basin of Hants county.

In this section important exposures of all varieties occur. Many of them, however, being so far away from transportation facilities, are not considered commercially valuable. Among these may be mentioned

the deposits on the Petite River, those on the West Branch of the Tennycapc River, on Robinson Brook, and those east of Northfield, together with those in an isolated area 1½ miles north of the Kennetcook River.

The first to be considered are those at Noel Lake. Here the gypsum outcrops on both sides of the lake and shows beneath the water in the lake. The greater part of the deposits appear as a white compact variety of excellent quality. In some places anhydrite occurs, in a form peculiar to this place, not in veins, masses, or beds, but in round spire-like pinnacles protruding through the gypsum.



Loading Gypsum at Walton Shipping pier.

On the west side of the lake the O'Brien Company has been operating for a few years, and exporting the crude rock to the United States. The quarry is situated in a hollow between 30 and 40 feet below the surrounding country, and has a height of face equal to that depth. It is drained by natural watercourses through the rock. The top of the rock is covered with blow or pipe holes. At the east of the lake, on the property of J. S. O'Brien, some development work has been done, which has proved the existence of large quantities of gypsum of excellent quality.

The present system of transporting this rock to the shipping pier (3½ miles distant) is by horses and wagons, which makes an excessive cost. A line of railway, over a very easy location, is proposed for future development, and, if constructed, will make this property one of the most desirable on the Minas Basin.

The next deposit of importance west of the above is one situated in the rear of Minasville, about 1½ miles from the shore. This property has an exposure averaging 50 feet in height, and over 1,500 feet in length. It is a good white compact variety of gypsum, showing but few irregularities. The topography of the country between the shore and the deposit is such that it would be difficult and expensive to construct a railway connecting the two points, but it has been proposed to make Tennycapc harbour the shipping port, and build a railway to that point, a distance of 3½ miles.

Sheet No. 43, Walton, Hants County.

Following westwardly from No. 42 the gypsum can be traced almost continuously, by outcrops and other characteristics, the whole length of the gypsiferous area, which in this sheet consists of 33.7 square miles. The most important deposit is that at Walton which is shown in Plate I. It is one of the largest deposits in the country, having a face 100 feet high, and may

be followed, with a constant exposure, for over 2,600 feet, and continues for miles with a series of extensive outcrops.

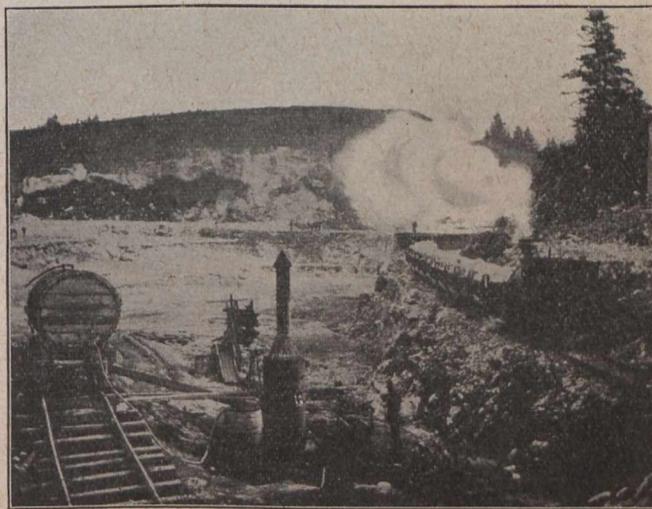
The Walton deposit, which has been operated intermittently for nearly a century, is now producing from 40,000 to 50,000 tons annually. The rock is a greyish white and blue compact variety, showing comparatively small quantities of anhydrite occurring in lenticular veins surrounded by gypsum, graduating with increasing or diminishing prominence into each other. At this point the pipe or blow holes are very characteristic, having a circular area, with perpendicular walls and rounded bottoms. The rock, where excavated, has no covering of clay, and everything, except foreign material, that will not pass through a coke fork, is shipped. The deposit is situated 1 mile from the shipping pier and the rock is hauled there with horses and carts. At present the whole output is taken by Messrs. J. B. King & Co., of New York, and transported by this firm in its own barges.

Sheet No. 44, Cheverie, Hants County.

Cheverie, consisting of an area of 4.3 square miles, is situated on the south side of Minas Basin, about 6 miles east from the mouth of the Avon, and has good water transportation facilities. Here operations have been carried on intermittently for many years. Outcrops occur at the shore, in high cliffs, associated with much anhydrite, and carbonate of lime in close contact. They also have prominence, and have been operated in the past, about a mile from the shore, where the rock appears to be freer from irregularities.

The present operations are carried on at the shore, at points known as the Cove quarry and the upper head. The Lower head occurs about one mile distant, on the north side of Cheverie Creek, in a small isolated area.

The Cove quarry is about 500 yards from the beach where the shipping pier is located. The gypsum is



Wentworth Gypsum Company's quarry; general view of quarry and transportation to pier.

covered with clay from 10 to 15 feet thick, and underlain with anhydrite. The gypsum and anhydrite graduate from one to the other without any particular line of demarcation.

On the right of this illustration is shown a tunnel, opened for underground mining and to develop deposits on the opposite side of the public highway, which runs near the face of the quarry. The Upper Head quarry is on the beach, a few hundred yards

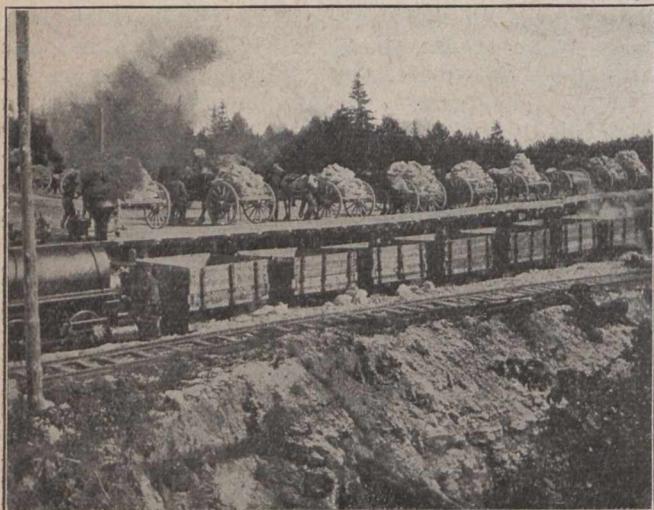
east of the shipping pier. The high tides of the Bay of Fundy do the work of cleaning the quarry, by washing the debris away from the rock. This rock is principally anhydrite with some gypsum inter-mixed.

Sheet No. 45, Avon River, Hants County.

Total gypsiferous area, 70.56 square miles.

On both sides of the estuary of the Avon River extensive deposits of gypsum have been known since the early discovery of the country, and some of them were operated over a century ago. Beginning at Summerville, on the east side, and Mount Denson on the west side, and continuing up the river for a distance of 8 to 10 miles, or until it meets with the irruptive rocks of the Ardoise hills, is the width here of the lower Carboniferous measures in which the gypsum deposits occur. These measures, which extend eastwardly, and are described in the opening of this chapter, carry, almost without interruption, gypsum deposits as far as the Shubenacadie River.

Many of the operations of the past in this section have been, for various reasons, abandoned. Few have made any attempt to operate below drainage level, and water has driven them out. Many of these deposits



Wentworth Gypsum Company's loading Stage for Cars.

have an overburden of clay, and owing to its increasing thickness, became too expensive to operate under existing circumstances; in others the prevalence of anhydrite has been discouraging, and concentration of trade has had much to do with closing out small operators; but not even in the quarries with the oldest history can it be said that the gypsum became exhausted.

Starting again at the northwest angle of this sheet, near Summerville, there is an area on the east side of the Avon, which by erosion of the river bank has been divided from the main body. It is known as Grant's quarry, and was operated for many years, but, although situated within a few hundred yards of the shipping pier, the rock dipping eastwardly under a heavy overburden of clay made operations too expensive, and the place has been abandoned. The rock here was a very fine white compact variety, showing a few streaks of black irregularly distributed through the white. The black was high in carbonate of magnesia, and carried some bitumen and iron pyrites.

A short distance above Summerville occurs the next outcrop, from which a small quantity has been taken. It has a small area, and is of little importance.

On the west side of the river, a few miles farther south, at Mount Denson, extensive cliffs 40 to 60 feet in height occur on the banks of the river and extend out on the beach to the river bottom. The greater part of the exposure here appears as anhydrite, but much of the concealed measures show evidence of a softer rock, and part of the rock on the beach is an excellent variety of gypsum, white, with a fine compact structure.

Prominent outcrops are also seen on the Scott estate and on the Hannah property, between the shore and the main road leading to Windsor. At the former place is one of the old quarries which was operated many years ago. It has a face exposed from 50 feet downwards, and much of it is white and blue gypsum, of a good variety, but associated with considerable anhydrite. On the Hannah property the principal outcrops are anhydrite. West of this property, about 1 mile from the shore, at the Duck pond, an extensive exposure is seen, from 40 to 60 feet in height. Much of the rock is harder than that allowed by the scale of hardness, yet in composition it is a true gypsum, white and compact. At Lower Falmouth there is a prominent exposure in the old quarry at Young's, and continuing on to Falmouth many outcrops occur. The most extensive is on the Glebe property, situated about 1½ miles from the western shores of the Avon River, opposite Windsor. Here the gypsum exposures have an average height above drainage level of 55 feet, and cover an area of several acres. Easy gradients could be secured from the deposit to the shipping point, and this, with a good white and grey compact rock showing but few irregularities, gives commercial value to the property. Continuing southwardly from the above, the outcrops are again met with on the Hanson property, but the gypsum, especially that occurring in lower ground, is irregular in colour and texture. This is another abandoned quarry.

Crossing the Avon River to Windsor on the east side we are on the historic ground of the gypsum industry of this Province. Here the gypsum beds lie almost parallel, having a strike east and west, the northern and southern boundaries converging slightly as they near the Kennetcook valley on the east. The greatest distance across the strike is about 6 miles. The most southern operations are those of the Wentworth Gypsum Company, at Meadow quarry, while the most northern are those of the Newport Plaster Mining and Development Co., Ltd., at Avondale.

One and a quarter miles south of Windsor there are what were known as the Wilkins and Redden quarries, long since closed, except for small quantities now being used for calcining purposes by the Windsor Plaster Company.

Beginning with the operations on the southern beds, the first is the Nova Scotia Gypsum Company quarry, at Threemile plains. This is situated about 3½ miles from Windsor, near the Dominion Atlantic Railway Company's line, on which the rock is transported to Windsor for export purposes. The rock is an excellent white, compact variety, having a working face 30 feet in height above drainage level; but it has a heavy overburden of clay, averaging 30 feet in thickness. This is considered the extreme limit of clay that can be moved profitably by the present methods of operating; that is, 1 foot of clay to 1 foot of face. An attempt was made to mine this rock, but sufficient height of face could not be secured without the use of pumps to make it an economic proposition.

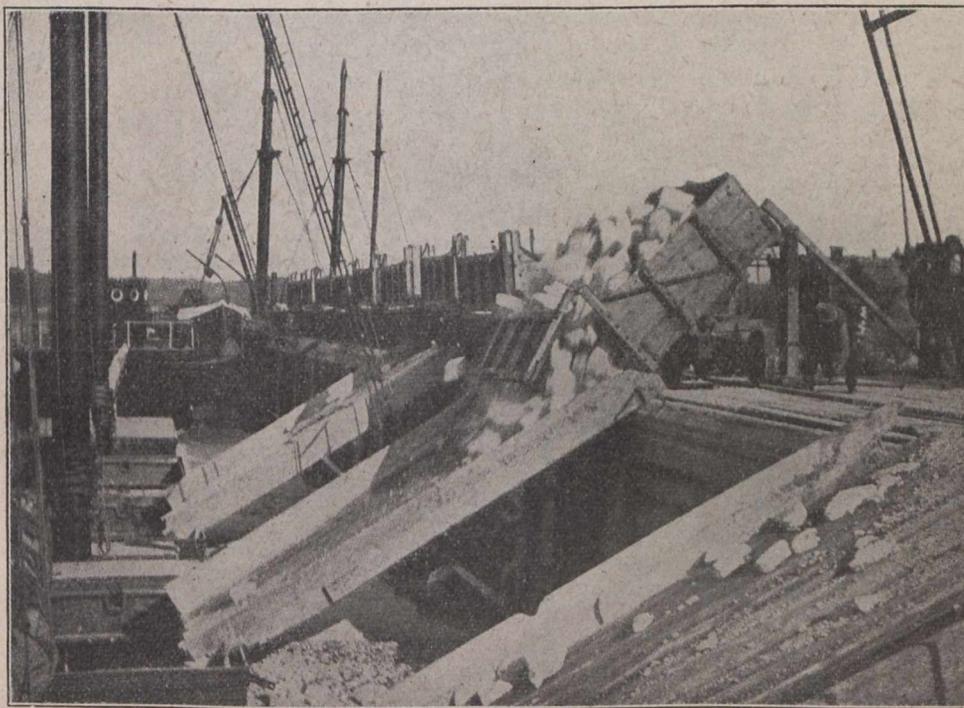
South of this, about half a mile, is the Meadow quarry, owned and operated by the Wentworth Gypsum Company. Here the rock has no covering of clay. The surface is very uneven, being covered with kettle, pipe, or blow holes, and as usual, where the gypsum is free from covering, the first few feet of the exposed surface is badly disintegrated by atmospheric action. On the eastern side of the quarry the face is 75 feet in height, extending westward and gradually diminishing in height; it also shows a natural water course or cave near the bottom. These beds are practically horizontal, and slightly stratified.

This quarry is connected with the Dominion Atlantic Railway by a branch road about one mile in length. Shipments are made over it to Windsor (4 miles) in summer, and occasionally to Halifax (41 miles) in the winter season.

The next property, $1\frac{1}{2}$ miles east of the above, is the quarry of the Windsor Gypsum Company at Newport. The occurrence and the conditions under which it is operated are very similar to those of the Nova Scotia Gypsum Company above described, except that

East of this, at Newport, there are a few other deposits which in the past have been operated and are now closed, but they are of no particular importance, and so similar in quality to those described that it is not necessary to give a detailed description of each outcrop.

North of the above described quarries, between 1 and 2 miles, occurs the second series of parallel gypsum beds. The principal operations are on the Wentworth deposit, owned and operated by the Wentworth Gypsum Company. From here the largest exporting business of the Province is carried on. This trade in 1868 amounted to 10,000 tons, while in 1909 it exceeded 175,000 tons. The deposits are very extensive, the Company owning about 1,200 acres, all underlaid with gypsum. The rock is principally a white compact variety, well suited for all manufacturing purposes. Anhydrite occurs irregularly, in some parts in prominent exposures, in others beneath the floor of the quarries. The greater part is covered by a heavy overburden of clay, in some places from 25 to 30 feet thick, but it has an advantage over the southern



Wentworth Gypsum Company. Loading gypsum into barges.

the operations are much more extensive. The superior quality of the rock in both these places is the only circumstance that makes it possible to operate under existing conditions. This property is also connected with the Dominion Atlantic Railway, over which the crude rock is hauled to Windsor for water transportation to the United States.

A feature of considerable geological interest occurs here, which would warrant more complete investigation if time permitted. Within a distance of 2 miles, on the same strike and having a similar elevation above the sea-level, three exposures are seen. Two of these, one on either end, have been planed off by glacial action to practically an even surface, and covered with a heavy overburden of boulder clay, while the centre one is quite free from clay, and does not show the same glacial action, nor any overburden of clay.

deposits in having a higher working face beneath the clay.

In the past all this clay was brought down with the gypsum and removed by horses and carts to the waste dump. At present the steam shovel is being used in some places to remove the clay from the top, before the rock is blasted.

These quarries are connected by a standard gauge steam railway with the shipping piers, $2\frac{1}{2}$ miles distant, on the St. Croix River, which is a tributary of the Avon.

After the rock is blasted and broken to one man size (meaning the size one man can conveniently handle), it is put in carts and hauled to a loading stage sufficiently high to dump directly into cars. It is then taken by train to the shipping pier and loaded into barges which are dismantled schooners of about 2,000 to 2,500 tons capacity, and towed to New York.



NO 6. 6

generally three in a tow. These barges are usually taken out singly, at high tide on the Avon, and anchored in head water of the Minas Basin, where the whole tow is made up and taken by an ocean going tug. The whole product of these quarries is taken exclusively by Messrs. J. B. King and Company, who have extensive mills on Staten Island. This firm is also a large holder in the Wentworth Gypsum Company.

East of the Wentworth Gypsum Company property, and adjoining it, is the Phillips farm. It has an area of 75 acres, and an average elevation above drainage level of 60 feet. It was tested in 1909 by a series of trenches and pits, and showed an excellent variety of white and snow-white gypsum of fine compact structure, the greater part being covered with clay; showing in the pits and trenches from 2 to 15 feet deep.

The proposed shipping point for this deposit is on the St. Croix River, above the railway bridge. This bridge is fitted with a draw having a width of 32 feet.

Above the St. Croix public bridge and east of the last described property, high prominent cliffs of gypsum and anhydrite are seen, and from here back to Newport station occurs an almost continuous series of outcrops, but the greater part of them show anhydrite in abundance. Above the St. Croix bridge, 30 or 40 years ago, gypsum was quarried and scowed down the river for export purposes.

Again, farther east on the Meander River, gypsum was quarried on the Woolaver property, and on the Chambers property. On the latter, prominent exposures are now seen of white and blue gypsum, of both granular and compact texture. The operations were carried on here many years ago, when the transportation was done in small vessels which loaded near the old shipyard.

Going north from the Wentworth quarries to the third range of gypsum beds, the principal operations are carried on at Avondale by the Newport Plaster Mining and Development Company, Ltd. (Messrs. J. B. King & Co., of New York, being the principal holders). This company controls about 4,000 acres of gypsum land in this vicinity, and is preparing for extensive operations. The old quarry, which was operated here some years ago, has been reopened at a lower level, by driving a tunnel large enough for drainage and railway track. This will lower the floor of the quarry from 10 to 20 feet. They also extended their operations west about 2½ miles, where they are opening up a new quarry, and connecting it with their shipping pier by a standard gauge railway, now under construction.

The rock is principally white in colour, with some little grey and black. Portions of it show an excess of carbonate of lime.

On the eastern extremity of this Company's property are the old quarries at Miller Creek, which were abandoned many years ago, but likely to be reopened by this company.

Continuing eastwardly, prominent exposures occur on the west side of River Hebert, near the railway, and on the Chambers property on the east side. Here considerable anhydrite is in evidence, but some very superior snow-white gypsum is seen on the Chambers properties.

The exposures at this latter point are low, but the rising ground going east gives evidence of large quantities covered with clay.

GYPSUM DISTRICT "F."

Sheet No. 32, Malagash, Cumberland County.

Near the eastern extremity of the Clairmont anticline is a gypsiferous area of 2.19 square miles. In this several important outcrops of gypsum occur. On the shore of Plaster Cove, East Wallace, on the road leading to Wallace and eastwardly to North Shore, Malagash, the beds can be followed almost continuously, associated with greenish yellow marls, clay, and limestone. The rock is white, with compact crystallization. The location of these deposits, so easily accessible to water transportation by the Gulf of St. Lawrence, and having the Pietou coal fields on the east, and the Cumberland coal field, 35 miles distant by rail, on the west, makes it one of the most desirable in the district for supplying the Canadian markets, either with the crude or manufactured article.

Sheet No. 33, Pugwash, Cumberland County.

Following the Clairmont anticline westwardly we again have important outcrops of gypsum near Hartford, associated with the limestones; at Canfield Creek, a tributary to the Pugwash River, and 4 miles from its mouth; and also—principally in concealed measures—on the east and west side of the Pugwash River basin, and on Victoria Island in the basin. This whole basin evidently was at one time a calcareous formation.

The most interesting part of this section is that of Canfield Creek. Here the grey, greyish white, and white gypsum outcrop in extensive beds. They are within 2½ miles of railway, and if connected, it would place them within 5 miles of deep water shipping.

At the northern base of the gypsum outcrops, in a shallow basin of water, at the water's edge, the largest and purest deposit of selenite known has been discovered.

Analyses of the samples taken from Canfield creek show the following results:—

	Per cent.
Lime	33.25
Ferrie oxide and alumina	0.74
Sulphuric anhydride	42.76
Carbonic anhydride	3.11
Water, loss on ignition	19.30
Insoluble mineral matter	1.72
	100.88

No. I. Sample from old quarry, greyish white in colour and slaty structure. This rock is being used in the manufacture of fertilizer at Pugwash.

Sheet No. 36, Nappan, Cumberland County.

About 1 mile north of Nappan station, and extending westwardly to Cumberland Basin, occur outcrops of importance, in a gypsiferous area traceable over 800 acres. The topography of the country is low, consisting principally of marsh or dike lands, which makes it difficult to trace boundaries. The exposures are known as the Newcombe, the Fowler, and those operated by the Maritime Gypsum Company, Limited, which cover an area of 12 acres. This company has been operating for several years, shipping an average of 4,000 tons per year. Their operations have been carried on below the drainage level, in an open pit to a depth of 50 feet below the fractured surface, and they have tested the ground by bore holes to a depth of 100 feet. During the summer of 1909 they installed a Ledgerwood cable system, and are prepared to sink to a further depth. This property is connected with the Intercolonial railway by a branch line, which also

connects with their shipping pier, at tidewater, on the Cumberland Basin, 2½ miles from the quarry.

The rock at the surface is considerably fractured,

and is mixed somewhat with clay and thin seams of dark carbonaceous material, but at depth it is white, compact, and very pure.

THE REA MINE, PORCUPINE

Written for the Canadian Mining Journal by
T. H. REA.

[Editor's Note:—There are two ways in which stock jobbers may injure the mining industry. Undue inflation is the usual method. Another, more insidious, and often quite as damaging, is the circulation of anonymous newspaper items that are designed to discredit any given mine. The object of such rumours is too obvious to require any explanation.]

Just after a representative of the Canadian Mining Journal had paid a visit to the Rea mine in Porcupine, an incident occurred that led him to request Mr. T. H. Rea, a director of the Rea Consolidated Gold mines, Limited, to write the following article. The Journal has first-hand knowledge of the Rea mine and has no

was discovered. It was not until Mr. F. M. Connell, of Kingston, Ont., had acquired the property in May, 1910, that the main, or No. 1, vein was discovered. Mr. Connell uncovered this vein over a distance of 205 feet. Native gold was observable along the vein for a distance of 150 feet, showing along the northwest wall in the quartz from one to five feet from that wall. The wall itself shows gold in places where it is vertically grooved.

Measurements of the width of the vein, made by Mr. Louis Webb and myself, gave an average width of six feet. Sampled every five feet, for a stopping width of 42 inches, it gave an average assay of \$23.05 per ton.



General View of the Rea Mine.

hesitation in describing Mr. Rea's statements as substantially correct. As stated above, this article was written at the specific request of The Canadian Mining Journal, and is intended to clear up misapprehensions as to the standing of the property.]

This property consists of 321 acres, comprising the north half of lots 6 and 7, concession No. 3, Tisdale township.

A patent from the Ontario Government for the north half of lot 6 was issued to one Homer on September 25th, 1907, and a patent to one Martin for lot 7 was issued on January 9th, 1908.

Mr. Cavanagh, of Orillia, Ont., purchased these veteran lots from Homer and Martin before Porcupine

On August 18th, 1910, I bought the property from Mr. Connell, and on September 22nd, 1910, I commenced sinking two prospect shafts on the northwest wall, 150 feet apart. On October 25th, 1910, these shafts had reached a depth of 27 feet. Meanwhile I gave Mr. H. H. Webb, consulting mining engineer and attorney-in-fact for the Consolidated Gold Fields of South Africa, an option on a three-fifths interest. After he had examined the property in the latter part of October he sent Mr. Louis Webb, his assistant, to sample it thoroughly. At the same time he engaged Mr. Harold Kingsmill and instructed him to order machinery and to sink the east, or Kingsmill, shaft 200 feet. Mr. Kingsmill was also instructed to commence sinking No. 2 shaft on the No. 3 vein on the

east lot to the distance of 100 feet, and also to commence diamond drilling. Mr. Louis Webb sampled both shafts on Vein No. 1, allowing a stoping width of 42 inches. The average in the Kingsmill shaft was \$47.50 per ton, and on the west, or Eakins shaft, \$26 per ton.

A shot-drill was used to prove the vertical continuity of the vein. At a point 70 feet northwest of the Kingsmill shaft a hole was put down at an angle of 78 degrees, cutting the vein at 228 feet, vertical depth, and cross-cutting 11 feet of quartz, making a total depth of 239 feet. Four and one-half feet of quartz on the footwall side of the vein at this point gave an average of \$19.20 per ton. This did not include about 8 inches of the core containing visible gold.

The Kingsmill shaft had reached a depth of 70 feet at the time this vein was cut. Mr. Webb now gave orders for a complete plant, which consisted of one six-drill compressor, two 60-h.p. boilers, hoisting engine, and eight months' supplies. Suitable camp buildings were to be erected, etc.

After the machinery had been installed and supplies delivered, and about 50 per cent. of the payments

tors which consisted mainly of the underwriting syndicate, made a contract with the Bewick-Moreing Company to manage the property for three years. After the organization of the company they elected the present board of directors, and promptly withdrew their support from the market.

After Mr. Louis Webb's offer of his services as consulting engineer had been declined, and the contract made with the Bewick-Moreing Company, the Gold Fields and Mr. Lockhart sold a large portion of their shares. At this time the vein had been cross-cut on the 200-foot level, showing a width of 3 feet at the point of cross-cutting. Drifts northwest and southeast exposed the pay-shoot over a distance of 200 feet, and samples taken across the vein, every 5 feet, over a section 110 feet long, gave an average of \$23.12. The entire length of the vein gave an average of over \$18. Over one separate section of 50 feet the average assays were \$37.83 per ton. This figure does not include a rich portion of the vein, about 15 feet, which swung to the south and left the footwall. This portion, in my opinion, if sampled, would bring the average up very considerably.



General View of the Rea Mine

made on the option, a disagreement arose between the parties interested in the option. This would have resulted in closing down the development work and the option would have been forfeited. However, I succeeded in arranging matters by taking back the option and reimbursing the Gold Fields and others their payments and expenditure on the property.

I then negotiated a deal with Mr. Henry Lockhart, president and general manager of the Mines Finance Co., New York, who incorporated the Rea Consolidated Gold Mines, Ltd., with a capital of \$1,000,000, divided into 200,000 shares of \$5 each. \$70,000, which sum had been expended on the property, was paid; \$100,000 capital stock was reserved; and \$100,000 cash placed in the treasury.

Mr. Lockhart then sold to a Canadian underwriting syndicate a large block of stock, which was placed on the market by the syndicate. The first board of direc-

The Kingsmill shaft has now reached a depth of 330 feet, including the sump. Thirty-five feet north of the 300-foot level the vein was intersected by a cross-cut. The vein on this level shows a width of 38 feet. A few samples were taken and assayed before Mr. O. H. Bergstrom, the present manager, was appointed. These showed low values. The values at this point are, no doubt, scattered, owing to the enlargement of the vein. The sampling done, however, was too meagre to show anything except that the samples themselves were low grade.

Mr. Bergstrom's first recommendation was to instal an assay office and testing plant, and, next, to drift northwest and southeast on the vein to permit of thorough sampling. This is being done.

Mr. Bergstrom is re-sampling the whole mine and both assaying and testing the ore to determine the method of milling.

The new vein recently discovered west of the powerhouse, showing visible gold, has been stripped at different points for 700 or 800 feet, and shaft-sinking has commenced. No. 3 vein, where the Gold Fields Company commenced prospecting with a core drill, and stopped on account of a break in the drill, will be sampled and sunk on. Surface stripping on this vein has uncovered at least two rich shoots.

Owing to the hoisting engine at the Kingsmill shaft being too small for work below the 300-foot level, Mr.

Bergstrom has ordered a larger hoist, and will continue sinking to the 400-foot level.

The company has supplies on the property for six months in advance, a cash balance in hand of between \$30,000 and \$40,000, 100,000 shares in the treasury, and, on short notice, sufficient cash will be provided to meet the cost of erecting and equipping a mill. In fact, the position of the company for all future development is strong. The company's policy is to develop ore reserves and not to manipulate its stock.

THE HIGH DUTY GRAVITY STAMP MILL

(Abstract compiled for the Canadian Mining Journal.)

The Chemical, Metallurgical and Mining Society of South Africa is a body that displays exemplary care in adding to its membership, and a praiseworthy liberality in the scope of the papers that it accepts. At the October meeting of the society a paper was read by Mr. Peter N. Nissen, whom our readers will remember as the inventor of the Nissen stamp-mill. It is creditable to the spirit of the Society that an inventor should be permitted to present fully the claims and special merits of his invention.

As Mr. Nissen's paper is essentially an outline of the principles of high-duty gravity stamping, we shall glance over the leading features of his thesis.

Stating first that the gravity stamp has been found, within prescribed limits, to be the best device for crushing gold ores, Mr. Nissen points out that the function of the stamp is to crush the greatest quantity of ore for a given expenditure of power. He then alludes to his belief that all the stamps in a multiple stamp mortar cannot do the same amount of useful work. The lack of control of feed lessens efficiency and increases breakages and wear. The rectangular mortar is not logical, as only the material adjacent to the screen can be discharged. Double-discharge mortars do not improve this condition since they introduce fresh difficulties in feeding.

It is commercially impossible to make the multiple stamp mortar of sufficient weight to secure the necessary inertia for effective crushing. Therefore it must be attached rigidly to a foundation of great weight and stability. The greater the length of the mortar the more difficult is it to hold securely.

Stamps weighing above 1,250 lbs. carry in all cases shoes and dies of the same diameter, so that the length of the mortar need not be increased. This implies that any increase of weight must be obtained by using longer heads and heavier tappets. This has the evil effect of raising the centre of gravity and increasing the distance between the face of the die another lower guide. The more rational method of increasing the diameter of the head involves a longer and heavier mortar, and a greater distance between cam-shaft bearings, both of which factors are closely limited by practical considerations.

Now the heavy stamp, other things being equal, is more to be desired than the light stamp. It is claimed for the Nissen stamp that great crushing capacity has been secured with due regard for sound mechanical principles. Without signifying our own opinion, it will be instructive to follow Mr. Nissen's reasoning. In a later issue we shall summarize the criticisms volunteered by his fellow members, many of whom

rank among the highest authorities on milling.

The Nissen stamp-mill has been developed on the unit principle. A circular mortar is provided for each stamp. The height of discharge does not differ materially from that obtaining in ordinary practice; but, since the mortar is circular, the screen can be extended more than half way round, always at the same distance from the stamp. Thus a maximum screen area per stamp is secured and the screen is always at right angles to the splash of the pulp, instead of having the pulp impinge at all angles. Hence all particles that are sufficiently reduced are discharged rapidly. The circular design of the mortar, moreover, induces the return of all uncrushed material to the die when the stamp is raised.

Each stamp controls automatically the feed into its own mortar. Certain mechanical advantages, also, inhere in the circular design, such as the easy removal of shoes and dies, the reduction of the height of the battery structure, etc.

Although light, the Nissen mortar is very rigid, as it receives the blow of the stamp always in its vertical axis. Rocking strains are done away with, and there is much less danger from shrinkage strains in the mortar casting. More continuous operations, slighter loss of time in repairs, greater strength of design, lower centre of gravity, are some of the other advantages claimed. With large installations of Nissen stamps it has been found feasible to obtain an actual operation of more than 95 per cent. of the total time.

An important feature in actual working is the even, flat wear of the dies, which permits of discarding only a minimum of metal. The head, which is a most important member, can, in the Nissen stamp, be made very large in diameter, and, consequently, short. This is beneficial in more than one respect. The combined weight of the shoe and head is $57\frac{1}{2}$ per cent of the total weight of a 2,000-lb. stamp. Thus the greater part of the weight is concentrated in the head, and not in the stem. A stem 5 inches in diameter by 10 feet in length, of double fagotted iron, is used. This can be made heavier without evil effect. Stem breakages are thus practically eliminated. The tappet is made light, broad faced, and short. The cam shaft is $6\frac{1}{2}$ inches in diameter. The cams are arranged right and left alternately on each pair of stamps, thus bringing them close to the bearings. The shaft in lifting four Nissen stamps transmits only about half the power necessary for the ten stamps in multiple mortar construction. As it is subject, moreover, to only 40 per cent. of the shocks, it has a much longer life.

The Nissen stamp for the same tonnage requires about 30 per cent. less power than the ordinary stamp,

therefore smaller motors, shafting, pulleys, and belting are used. The greater capacity obtained reduces the total weight of the battery for a given tonnage of ore by possibly as much as 40 per cent. The dropping weight of the Nissen has gradually been increased to a maximum of 2,250 lbs., and may be further added to.

Exhaustive simultaneous tests carried out at the works of the City Deep, Limited, with a view to comparing the performance of four Nissens with that of ten City Deep stamps resulted most favourably for the Nissens. The running weights of the Nissen stamps varied from 1,927 lb. in test No. 2, to 2,245 lb. in test No. 3. The weights of the City Deep stamps ranged from 1,775 lb. to 1,863 each. The number of drops for the Nissen was 103 per minute; for the City Deep, 100. The height of the Nissen drop was 8½ inches, except in No. 3 test, when it was 8¾ inches. The City Deep drop was the same. The height of discharge varied from 2 inches to 2⅝ inches for the Nissen, and from 2¼ inches to 2½ inches for the City Deep. The screens used by both were equivalent to nine holes per square inch, except in tests No. 3 and No. 6, when ⅜-*inch* apertures were used.

The following table compares the performance of both:—

	Nissen. Tons.	City Deep. Tons.
Stamp duty per day (9-mesh screen)	24.47 to 30.85	18.26 to 20.95
Stamp duty per day (⅜- <i>inch</i> screen)	36.69 to 37.74	22.72 to 24.34
	H.P. hours	H.P. hours.
Power consumption per ton of ore crushed	2.7 to 4 Lbs.	4.45 to 5.5 Lbs.
Ore crushed per lb. falling wt.	25.35 to 37.91	19.6 to 27.65

The wear and tear of shoes and dies is slightly in favour of the Nissen stamp. While the grade of the discharge was approximately the same in both cases, the feed to the Nissen was, with the exception of one experiment, always the coarser. The mechanical efficiency was 35 per cent. in favour of the Nissen.

Here follows a long comparative hypothetical statement of the cost, capacity, power demand, and wear for Nissen and ordinary stamps, which is again in favour of the Nissen.

It is worthy of note that six tests carried on at the City Deep were supervised by Messrs. F. L. Bosqui and J. H. Rider.

RHODESIAN WORKING COSTS

[Editor's Note.—We reprint hereunder an article called from the Financial Times, London, England. As it is a study of working costs in a very progressive gold mining country, it will prove interesting to Canadian operators. The mines referred to have not the benefit of cheap electric power, and have to pay high prices for coal. The cost figures given are, naturally, shillings and pence.]

(From a Correspondent.)

“Ajax,” in contrasting the market valuations of the Cam and Motor and Eileen Alannah in a letter which appeared in The Financial Times on Saturday last, mentions that the working costs estimated for these mines (Cam and Motor, 23s per ton; Eileen Alannah, 19s per ton) “both seem low as compared with other Rhodesian costs.” In taking this view, I fancy he is expressing an opinion very generally held in the Stock Exchange amongst those who follow the doings of Rhodesian mines. It is clear from Mr. Gerald Browne’s report on the Cam and Motor, and Mr. Ackerman’s report on the Eileen Alannah, that the ore bodies are identical, being—a short distance from the surface—refractory and “heavily mineralized with arsenical pyrites.” This, Mr. Ackerman agrees with other engineers, will necessitate roasting the whole of the ore, a more complicated and expensive process than the usual milling and cyaniding treatment. The operations are set out by Mr. Gerald Browne as consisting of (1) rock-breaking (two steps), (2) rotary drying, (3) ball milling, (4) roasting, (5) tube milling, (6) slimes filtering, and (7) precipitation and smelting. The working costs for the Cam and Motor Mr. Gerald Browne places at 30s per ton, which agrees with Mr. V. S. Allen’s estimate in his report published with the prospectus. This figure was adopted in all profit calculations for the Cam and Motor until the directors’ annual report appeared last month, when the profit in sight was

revised on the basis of 23s per ton costs—a new estimate, given by Mr. G. F. Dickson on behalf of the London and Rhodesian Mining and Land Company, Limited, which acts as “the consulting engineers,” and, as is known, was one of the promoters. No reason was given for thus suddenly lopping 7s per ton, or 30 per cent., off the estimated working costs arrived at by two independent engineers. It is certainly a matter that seems to call for explanation. Such a reduction, of course, makes a great difference in the theoretical “profit in sight,” increasing it on the 700,000 tons reported to be exposed by no less than £245,000.

Mr. Ackerman, in his report on the Eileen Alannah, however, believes that the costs will be still lower. He puts them at 17s 6d per ton on the basis of 6,000 tons treated per month, with an additional 2s per ton for roasting the whole of the ore, or a total of 19s 6d per ton. In his final calculations of profit he assumes 19s per ton. Whether this includes the royalty of about 1s 6d per ton payable to the Chartered Company on the expected recovery of 49s per ton is not clear; presumably it does not.

At present there is no mine in Rhodesia roasting the whole of its ore, although it is expected by experts that several of the new properties being developed will be compelled to do so. The Globe and Phoenix is today merely roasting its rich concentrates, which are separated at an early stage from the crushed product. For the six months ended the 30th June last it thus treated 1,718 tons of concentrates—the current concentrates representing less than 5 per cent. of the total ore crushed the final result—with which shareholders equivalent to 1s 2d per ton on the total tonnage crushed. The alternative plan of roasting the whole of the ore treated, instead of only 5 per cent., will, of course, be more expensive. The roasting process, when dealing with large quantities, before the extrac-

tion of the concentrates, will naturally take less time and give a lower cost per ton of product roasted; on the other hand, in the aggregate more fuel and handling will be required, so that on the basis of the total ore crushed the final result—with which shareholders are concerned—will be that the working costs per ton will be higher. A point to be borne in mind is that coal, so essential for roasting, unless wood is cheap, is very expensive in Rhodesia, the price being three times as much as it is on the Rand.

Having regard to the estimated costs, roasting all the ore, of 23s per ton for the Cam and Motor and 19s per ton for the Eileen Alannah, it is interesting to observe that the mine working expenses of the Globe and Phoenix for the six months ended 30th June, 1911, roasting only 5 per cent. of its ore, were as high as 33s 3d per ton. The last annual report shows that the London charges amount to another 6s 10d, thus giving total costs of about 40s per ton, leaving such items as depreciation, income tax, etc., entirely out of account.

The Globe and Phoenix, the premier mine of Rhodesia, besides being a rich concern with years of experience behind its back, is recognized to be capably managed. Judging by Rhodesian standards, its plant is by no means a small one, capable of treating, as it is, over 6,000 tons per month. Consequently it will be extraordinary—making every allowance for differences in mining conditions—if the Eileen Alannah or Cam and Motor can work at a figure so much below the costs prevailing at the Globe and Phoenix. Either there is undue optimism on one side or bad management on the other—which latter I, for one, am not prepared to believe.

Neither must it be lost sight of that, owing to the shortage of supply, coupled with increasing demand, native wages in Rhodesia are steadily rising, the minimum recruiting wage for certain classes of work having recently been advanced as much as 33 per cent. This must tend to increase rather than reduce the operating expenses of new mines, and must be allowed for in making estimates for the future.

Judged also by the standard of working costs of other crushing mines in Rhodesia—none of which, as far as I am aware, roast their ore—the Cam and Motor and Eileen Alannah estimates appear to be very low.

To arrive at the total of Rhodesian mining costs, it is necessary to add to the mine figures declared monthly or quarterly an estimate for London charges (including directors' fees) and other items, to be found only in the last annual reports and accounts. Here is an interesting table giving roughly the average mine costs for the last six months, plus an estimate of the "other charges" as they appear in the last published annual reports. Under the heading of other charges are also included depreciation and interest (variable quantities) when they appear in the reports, as these items have to be deducted from the mine profits before dividends can be paid:—

Company.	Monthly tonnage about.	Mine costs per ton.	London and other charges per ton.	Total costs per ton.
Bucks Reef	900	46/6	3/2	48/8
Charterland & G (Old Nic)	1,400	25/2	..	..
Eldorado	7,400	22/	3/10	25/10
Gaika	3,000	22/7	4/7	27/2
Giant	11,600	13/6	3/4	16/10
Globe	6,000	33/3	6/10	40/1
Jumbo	3,500	26/	8/6	34/6
Lonely	3,300	..	..	32/8
Rezendo	3,600	21/3	4/1	25/9
Pénbalonga	5,800	20/8	3/9	24/5
Selukwe Col.	3,000	33/	3/6	36/6
Thistle Etna	3,000	26/9	3/9	29/6

The Lonely costs, being in respect of a new plant, will no doubt be reduced. The Giant works an enormously wide reef.

An important item in Rhodesian mining costs, which is apt to "hide its light under a bushel," is the royalty payable to the Chartered Company, where such has not been compounded. It is reckoned on the gold won, not on the profit earned. Last year with the Bucks reef it was 8s per ton, the Lonely is allowing 4s per ton and the Eileen Alannah will have to pay 3 per cent. of the gold extracted if the recovery is less than 85s per ton and 5 per cent. if above 85s. The Cam and Motor, presumably, will have to pay a royalty on an equivalent basis.

THE LUCKY CROSS MINES—SWASTIKA

Written for the Canadian Mining Journal.

About 60 miles north of Cobalt, on the T. and N. O. Railway, is the station of Swastika, the centre of the Swastika mining district. Three of the claims of the Lucky Cross Company are traversed by the railway. A fourth claim is situated partly on the banks of the Blanche River. The claim numbers are T.C. 57, 58, 59, and 61. The station of Swastika is placed on claim 61. The general elevation of the country is 1,000 feet above sea level. An idea of the topographical features is conveyed by the accompanying photographs.

Veins.

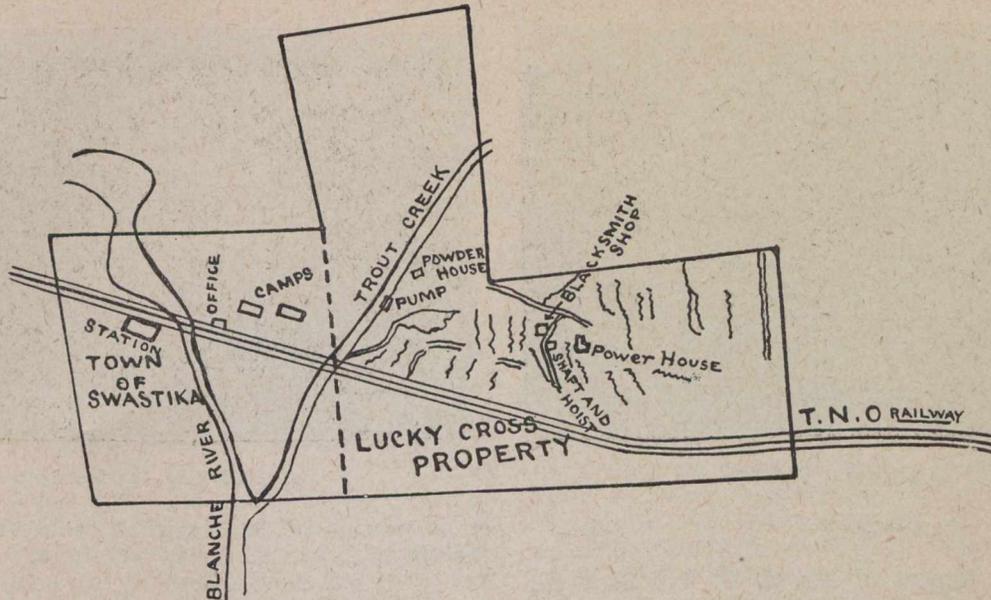
Prospecting commenced in June, 1911. Two and one-half miles of trenching exposed no less than 41 distinct veins, 9 of which show visible gold. Several others give encouraging assays. Most of these veins

occur in the middle claim. The results of work done are as follows:—

Vein No. 16, on which a shaft has lately been sunk to a depth of 111 feet, gave on the surface, for a length of 100 feet, \$112 to the ton. The width on the surface averaged about 2 feet. At a depth of 55 feet the vein dipped out of the shaft. At this point it was five feet in width. It has been stripped for fully 300 feet.

Vein No. 4. The first discovery of gold was made on this vein at a point about 100 feet from the railroad. The vein here is four feet wide. A few samples taken here showed about \$37 to the ton. Only 30 feet of the vein outcrops.

Vein No. 18. About 120 feet from the shaft this vein is 23 feet wide. A test pit sunk to a depth of 6



feet across the full width gave an assay average of \$11.16 to the ton. The vein has been exposed for 100 feet. It is heavily overburdened. The lowest assay obtained was \$8 to the ton.

Vein No. 21 has an average width of 3 feet, and shows visible gold. It is stripped for 30 feet. Assays ran \$6 to the ton.

Vein No. 19 is about one foot wide. It is stripped for 150 feet and shows considerable amounts of visible gold. It has not been sampled.

Vein No. 7 is stripped for 100 feet. It is about 4½ feet wide. Assays average \$4.50 to the ton.

Vein No. 29 is situated on the eastern claim. It is 30 feet wide. Assays taken over its entire width gave \$4 to the ton. No gold is visible.

Equipment.

The equipment consists of one 100-h.p. boiler, return tubular, brick set; one 6-drill duplex Blaisdell air compressor; one 6x8 Jenckes hoist, and three No. 43 Rand drills.

Two large frame buildings accommodate 50 men. An office building, blacksmith's shop, stable, pump-house, magazine, and thawing house complete the list of buildings.

Mining.

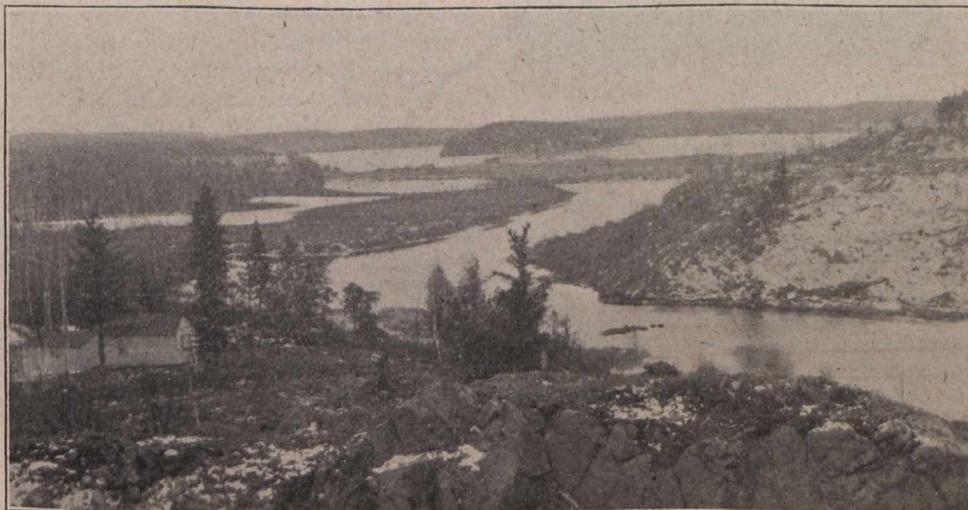
Work on the shaft was commenced on November 17. On December 18 a depth of 111 feet had been reached. When this has been timbered a station will be cut. A cross-cut of a few feet will catch No. 16 vein. No. 4 vein, the original discovery, will also be cut underground.

A siding will be laid at once quite close to the shaft to facilitate the handling of coal and other supplies. The siding will be not more than a few hundred yards long.

Much of the quartz is slightly impregnated with copper sulphide and iron pyrites. In places there are occurrences of masses of iron pyrite. Associated with the copper sulphide fine powdery gold is often found.

The location is exceptionally favorable for economic mining. The railway was completed before the company commenced to work. Hence the buildings and working are situated most advantageously.

Two large streams, the Blanche River and Trout Creek, both of which flow into Lake Otto, flow through the property.



View near Swastika



Location Shaft No. 1, Vein No. 16.

Geology.

Extracts from Report of Mr. J. B. Tyrrell: The rocks of the Huronian formation underlie about two-thirds of the northwest portion of claim 61, and almost all of that portion of claim 59, which lies northwest of Trout Creek. The rocks consist of green conglomerates, graywackes, and slates, which are everywhere distinctly of a fragmental character. . . . They are now on these particular claims tilted to a high angle and have been much altered and metamorphosed until the finer varieties have been changed to a hard green slate or to a soft, silvery schist. The presence of pebbles or grains of jasper is a characteristic feature of these conglomerates and slates, and even in the finer grained schists the minute red particles of jasper can usually be detected with a lens, thus affording an easy and reliable method of distinguishing them from other similar rocks.



Camps and Office

The Keewatin and intrusive rocks include greenstone, diorite-prophyry, felsite, minette, diabase, granite, and vein quartz. . . . A line of profound fracture runs northeast through claims 61, 58, and 57. A number of quartz veins have been formed in this disturbed and fractured zone, and gold was distinctly seen to occur with the quartz in some of these veins. The fractured zone will almost certainly extend to a considerable depth and it is reasonable to expect that the gold-bearing quartz veins will extend downwards to very considerable depths in it.

Extract from later report made by Mr. J. B. Tyrrell as Company's Consulting Engineer: The veins, where the shaft left it, was still strong and well defined, and from the surface downward it had everywhere been liberally sprinkled with gold, as can be readily seen by



No. 18 Vein—23 feet wide

an inspection of the dump of ore near the mouth of the shaft.

Mr. J. W. Vandergrift is the company's local mine manager. His experience, gained in Nova Scotia and in the Western States, is proving of definite value to the company. His work at the Lucky Cross has been a record for rapid development. The claims were first staked in 1906, and were later owned by the Crawford Gold Mines Company. No discoveries were, however, made by Crawford, who did considerable work on two barren veins. They were acquired by Geo. M. Hurd & Co., of Philadelphia, in the spring of 1911. The Lucky Cross Company was then organized under the laws of Ontario, with a capitalization of \$1,500,000, \$500,000 in the treasury, \$200,000 of which are being sold to develop the property. To date about \$26,000 has been expended on the property.

TUBE MILL RATIO.

At the annual meeting of the Johannesburg Consolidated Investment Company Mr. Charles Marx stated that the new mill of the Consolidated Langlaagte would be 100 stamps and 10 tube mills, which is at the rate of one in ten, a considerably higher ratio than generally employed in Rand practice. However, the tendency is to increase the ratio of tubes to stamps, not on this field only, but throughout the world. The greatest ratio is on the Waihi Grand Junction mine, where 10 tube mills are employed with 40 stamps. With the assistance of its tube mills the 100 stamps at Langlaagte Consolidated should crush 45,000 tons monthly. The East Rand Proprietary only employs 25 tube mills to its 820 stamps; Bantjes 3 to 60 stamps; Brakpan 6 to 100 stamps; Cinderella 3 to 80 stamps; City Deep 5 to 110; Crown Mines 19 to 620; Durban Roodepoort Deep 3 to 100; Ferreira 3 to 100; Ferreira Deep 3 to 100; Geldenhais Deep 8 to 420; Jupiter 6 to 70; Knight Central 3 to 120; Knights Deep 6 to 270; Langlaagte Estate 5 to 200; Modders 5 to 180; Nourse Mines 7 to 260; Randfontein Central 22 to 775; Robinson 6 to 250; Robinson Deep 5 to 210; Rose Deep 7 to 300; Simmer and Jack 7 to 320; Simmer Deep, 9 to 105; Van Ryn 6 to 135; Village Deep 5 to 180; West Rand Consolidated 4 to 100; Wit Deep 4 to 245; and Wolhuter 4 to 120 stamps. The New Kleinfontein is the largest mine in the Rand which does not employ tube mills. It has 220 stamps. Other instances where no tube mill auxiliaries are employed are New Primrose,

Princess Estate, and City and Suburban. There are other mines, such as Glencairn, May Consolidated, Salisbury, and Jumpers, which are getting too near finality to run to the expense of tube mills. The Lang-

laagte Consolidated will have the largest ratio of tube mills to any mine on the Rand, followed closely by the Simmer Deep and Jupiter. At the El Oro mine in Mexico one tube mill is installed for each nine stamps.

THE MINERAL INDUSTRY IN THE PROVINCE OF QUEBEC DURING 1911

(Written for the Canadian Mining Journal by Theo C. Denis).*

During the year which has just closed the mineral industry in the Province of Quebec has been characterized by several features of importance. Foremost among these is the fact that the asbestos industry, which is the most important, laboured during the greater part of the year under abnormal and unfavourable conditions. During the preceding year, the production of all grades of asbestos had been pushed to its maximum, and as a result the asbestos market became congested; stocks increased to the extent that on January 1st, 1911, the stocks on hand had reached a value of nearly \$2,000,000. As a result the prices dropped, to the extent that several mills are now shut down for an indefinite period. This applies specially to those asbestos properties which do not produce the long, crude fibre, and at present none of the Broughton mines are working.

There is no doubt that the high capitalization of some of the companies operating in the Thetford-Black Lake district has been one of the factors which caused this crisis. As mentioned in last year's review, the total capitalization of the asbestos companies sending in returns of production to the Mines Branch, and therefore on an operating and producing basis, was over \$35,000,000, whereas the total value of the asbestos disposed of was \$2,667,829.

Had the market for asbestos been unlimited; had the consumption been able to absorb all that could be produced the high capitalizations may have had some justification. But the above figure of production represents the maximum of absorption for the year 1910 at approximately remunerative operating prices, and although it is probable that the uses of asbestos will develop, it would be unwise to count on a yearly increase greater than 8 to 10 per cent. for some years to come. It is probable that financial reorganization of some asbestos companies will have to be effected in the near future, and it would be wise to keep these figures in mind. In all likelihood the shipments of asbestos for 1911 will fall below those of 1910.

To use a colloquialism, "the goods are in the mines." As we remarked last year, there is no sign of decrease in the contents of asbestos of the rock as depth is reached. That the faith of asbestos men in the value of the deposits is quite unimpaired was clearly demonstrated in the early part of 1911, when an asbestos property at Thetford, which had lain idle for some fifteen years owing to litigation, was put up at sheriff's sale, and, after lively bidding, knocked down for \$710,000 to a syndicate made up of practical asbestos operators. A large mill is now in course of construction and will be in operation shortly.

*Superintendent of Mines, Mines Branch, Quebec.

Copper. Only two mines working on the cuprififerous-sulphur ores of the Southeastern townships were on a shipping basis in 1911. These were the Eustis mine, at Eustis, a few miles south of Sherbrooke, and the McDonald mine, operated by the East Canada Smelting Company, situated at Weedon, some 35 miles north of Sherbrooke.

The figures of shipments will probably show a substantial increase, as the McDonald mine is now producing and shipping regularly at the rate of about 2,000 tons per month. This ore is mainly shipped to the sulphuric acid works of the Nichols Chemical Company at Capelton; the cinders are subsequently smelted for the recovery of the copper contents, the average of which is over 4 per cent. in the ore.

The deposit at the Weedon mine has been proved by drifts to be over 600 feet in length at the 100-foot level. It is lenticular in shape, and at its greatest width is 49 feet. A diamond drill hole, which was put down from the 100-foot level along the dip of the lens, went down 200 feet in ore, and is said to have stopped in ore.

Shipments from the Eustis mine were not as active as in 1910, and a certain quantity of ore went to the stock piles. Advantage was taken of this lull to push on the development work, and there is now ore in the mine blocked out for the next two years.

This progressive policy greatly adds to the value of the mine, which is now in very good shape. A great deal of the development work was done at the lowest levels, and the main slope, which is inclined at an angle of about 40 degrees, is about 3,000 feet long. The management is at present looking into the advisability of installing the Elmore oil concentration process.

A great deal of prospecting was carried on to the northeast of the MacDonald mine on the continuation of the same mineralized belt, which extends for several miles in that direction. Diamond drilling was resorted to, but so far the results have not come up to the expectations entertained.

Work of a prospecting nature was also done on the old Ives mine, at Eastman, by Mr. N. S. Parker. He has uncovered a very promising vein of chalcopyrite, and it is proposed to amalgamate several mines and prospects of that region to thoroughly test their possibilities.

Lead and Zinc.—A considerable amount of prospecting was done on a galena and zinc blende deposit, near Notre Dame des Anges, Portneuf County. The deposit consists of pockets of these sulphides in what appears to be a pyroxenite rock. The mass of rock is quite extensive and, besides the pockets, it contains impregnations and disseminations of crystals of galena, blende, pyrite, and copper sulphides. An average

of ten men have been working on this deposit for several months and a concentrator is spoken of.

Precious Metals.—After a long period of rest, the placer gold industry of the Province of Quebec has been very earnestly and, it is hoped, successfully revived. In the latter part of 1909, the Dominion Gold Fields Company (whose name was changed subsequently into the more characteristic title of *Le Compagnie des Champs d'Or de Rigaud-Vaudreuil*), acquired the mining rights for gold and silver of the Rigaud-Vaudreuil Seigniory, comprising 70,000 acres. After spending the greater part of the year 1910 in prospecting their large holdings, hydraulic mining was begun in the summer of 1911. Owing to a shortage of water and delays in the installation, the monitors were at work for a period of five weeks only. Dispositions were taken afterwards to greatly increase the storage of water to tide over periods of droughts.

As it was, the results were very satisfactory. The washed gravel gave an average yield of slightly under 50 cents per cubic yard, and with the improvements on the plant which are now being completed, next season should be a very profitable one.

Iron.—The Canada Furnace Company operated their charcoal furnace at Radnor Forges, where they use a mixture of bog iron ore produced locally and of Ontario magnetite. The supply of local bog iron ore is diminishing year by year, and by far the greater proportion of ore used at Radnor is now Ontario ore.

Mica.—The mica industry which centres in the region north of Ottawa, was more active in 1911 than during the previous year, and the figures of shipments will show a substantial increase as compared with the previous year. The prices which ruled this year were more satisfactory, and the greater part of the stocks which had accumulated during the two preceding years were disposed of.

Peat.—An earnest resumption of work in the peat industry of the Province of Quebec took place during the year 1911. A company "Peat Industries Limited," with offices in the Imperial Bank Chambers, Montreal,

installed an improved peat machine on the extensive Farnham bogs, and the results are said to be satisfactory.

Building Materials.—Limestone, granite, marble, and various kinds of trap rocks are actively worked in the Province of Quebec, and three large cement factories, with a combined annual capacity of two and a quarter million barrels of cement are steadily producing. In 1910, the quantity of cement manufactured was over one and one-half million barrels, and the figures for 1911 will probably show a substantial increase. The increased activity in the building materials industry is a natural sequence of the growth and development of the country.

Mining Law.—As to legislation, it may be mentioned that during the session of 1910-11, of the Quebec Legislature, a measure was passed and assented to on March 14th, 1911. This enacts that in the future the mining licenses shall be granted at a yearly rental of 50 cents an acre, instead of \$1 as it was previously. Moreover, working conditions are now imposed. Therefore as it is now in force, the Quebec Mining Law provides for: Issuance of miners' certificates, which entitle the holder to stake out claims, to a maximum of 200 acres, on lands the mineral rights of which belong to the Crown. After staking and registering a claim, this can be held for six months without any disbursement. At the expiration of six months, a mining license is taken out at the rate of 50c. an acre per year. During the first six months after staking, work must be done on the claim to the amount of 25 days of the labour of one man. After the mining license is taken out, work to the extent of 25 days a year for each 40 acres is exacted. This mining license is renewable yearly, on proof that the working conditions have been fulfilled. If preferred, a patent can be obtained by buying the claim outright at the rate of \$20 or \$10 an acre, according to its distance from a railway, and in this case all the money paid as rental for mining licenses is deducted from the purchase price.

MINE RESCUE SERVICE OF THE STATE OF ILLINOIS

By H. H. STOEK, Urbana, Ill.

[Article reprinted from December Bulletin of the American Institute of Mining Engineers.]

The origin of the Mine-Rescue Service of the State of Illinois can be traced to two distinct sources, the work of the Rescue Station at Urbana and the Cherry disaster.

During the early part of the year 1909, the Technologic Branch of the U. S. Geological Survey, now the Bureau of Mines, in connection with the Illinois Geological Survey and the College of Engineering of the University of Illinois, established at the University of Illinois, in Urbana, a branch rescue-station to supplement the work of the Pittsburgh station of the Geological Survey. As a result of the work of training at the station in Urbana by R. Y. Williams, mining engineer, and James Webb, foreman of the Bureau of Mines, and the use of the helmets at several mine-accidents in the State of Illinois, the people of the State were some-

what familiar with oxygen-helmets when the Cherry disaster occurred, in November, 1910. The oxygen-helmets were successfully used in connection with that disaster, and upon the recommendation of the Illinois Mining Investigation Commission, the Legislature of the State, assembled in special session during the winter of 1910, passed a bill appropriating \$75,000 for the erection and maintenance of three rescue-stations, stipulating that they should be located in the northern, central, and southern parts of the State. The Act also provided that the stations should be in charge of a Commission of seven, two representing the United Mine Workers of Illinois, two the mine-operators, one the Federal Bureau of Mines, one the State mine-inspectors, and one the Department of Mining Engineering of the University of Illinois.

This Commission was called together by the Governor of the State, Aug. 2, 1910, and since that time three stations have been located, built, and equipped: at La Salle for the northern part of the State, at Springfield for the central, and at Benton for the southern part of the State. Men are now being trained at these stations in the use of oxygen rescue-apparatus, and in rendering first aid to the injured.

Description of Buildings.—The station buildings were designed and built under the direction of the State Architect, after sketches furnished by the Commission. As the three stations were built from the same plans, a description of one building will suffice.

The foundations are of solid concrete. The walls of the building are of timber covered on the outside with metal lath coated with two coats of plaster throughout. The extreme dimensions are 61.5 by 87 ft. The height to the peak of the roof is 29.5 feet.

The front part of the building has two floors and contains the living apartments, office, and workshop. The rear portion contains the training chamber, which is one story in height.

The basement contains a store-room, coal-room, and furnace-room, and has a concrete floor and finished concrete walls throughout.

On the first floor, at the left of the entrance, is the office of the superintendent, in which there is a large closet for the storage of maps. Back of the office is a hallway leading to the dining-room, which also serves as a general living-room. Off of this hall is a closet and toilet. Back of the dining-room is the kitchen, off which is a commodious pantry and a rear entrance. From the front entrance a hallway leads to the training-chamber, and on the right of this hallway is a large room used for the storage of the helmet-equipment, oxygen-tanks, potash-cartridges, and other supplies. One end of the room is fitted up as a work-shop for the repairing of apparatus, and in this part are the appliances for the charging of the electric lamps used in connection with the helmets.

The second floor includes a dormitory, containing 12 white enameled iron beds. Adjoining the dormitory is a commodious toilet fitted with lockers, shower-baths, wash-bowls, and other toilet facilities. There is also a bath-room on the second floor. Three rooms are available as bedrooms for the family of the superintendent or for other purposes. A commodious linen-closet, an attic over the front part of the building and over the training-chamber and the cellar give ample storage space.

The building is well lighted with electricity and thoroughly ventilated by means of numerous well-placed windows. It is finished throughout in natural wood stained a dark color, and presents an excellent appearance.

The rescue training chamber and lecture hall occupy the rear of the first floor. The lecture or observation hall is a room 30 by 57 ft., lighted from above by skylights, but it can be darkened, when desired, by curtains over the skylights. The sides of the lecture hall are of glass, thus giving a full view of the training gallery which surrounds the lecture hall on three sides. The lecture hall seats about 100 persons, is well lighted, and is provided with a special lighting switch, so that a stereopticon can be used for lecture demonstration purposes.

The training gallery is an air-tight chamber in which sulphur can be burned, and in which training with the helmets and other rescue apparatus is carried on. The right side of the gallery is 8 ft. wide and 10 ft. 4 in.

high, and in this part there are placed a mine track and a mine car. The left side of the gallery is 6 ft. wide, and is divided horizontally into two parts, the lower part being 5 ft. 2 in. high and the upper 4 ft. 7 in. high. This division allows work to be carried on in restricted quarters, and the upper part also serves as an over-cast. In the lower part a pile of rock has been placed to represent a fall, and at one end is a toilet. The mine track from the right side extends across the end, and there is also a tunnel through which men wearing the helmets crawl as part of the training.

Cost.—The entire cost of each building was approximately \$10,000, exclusive of ground, which was donated in each city by the citizens. About each building is a commodious lot which contains a side-track for the rescue car, and also affords space for a garden for the superintendent of the station.

Rescue Cars.—At each of the stations there is a rescue car for use in transporting appliances to the scene of an accident. It is also fitted up so that a rescue party may have a comfortable place in which to stay at the scene of the accident. Two of these cars, completely equipped, were donated to the State, one by the Chicago, Milwaukee & St. Paul railroad, the other by the Chicago & Northwestern railway. The third car was purchased from the Pullman Co., and was refitted at the shops of the Toledo, Peoria & Western railroad in Peoria, Ill.

The cars are Pullmans, and as the arrangement of the three cars is practically the same, the accompanying description of Car No. 3 will serve also for the other two cars.

One end of the car is occupied by the heater, coal-box, and the locker for linen, and on the opposite side of the aisle is the toilet.

Three double-compartment berths on each side of the car will accommodate 12 persons, sleeping singly. The kitchen is fitted with stove, sink, and pantry, and an ice-box is beneath the car. The state-room, intended as an office for the manager or whoever is in charge of the rescue-work at the mine, contains a double berth, a desk, and a small toilet.

The end of the car used for storing the rescue apparatus may also be used for demonstration purposes, but the space is small, and it is preferable to demonstrate the use of the apparatus outside the car, or in a suitable room. In one corner are three oxygen tanks, connected to a pump. On the opposite side is a storage rack for seven additional oxygen tanks. In one corner is a coal box and in the other a locker for the pulmotor, first aid supplies, and other small articles, and for the storage of potash cartridges. The helmets are hung by hooks from the ceiling of the car, and, to prevent them from swinging, there is a strap that goes to the floor and is caught into a ring by a snap hook when not in use. The helmets are covered by a canvas cover to protect them from dirt.

Helmet Equipment.—Each station now has ten helmets of the Draeger, Westphalia, and Fleuss types, and at least five more will be added in the near future. Whether or not any one form will be adopted as a standard cannot be stated at this time; probably not; but even if this should be done, examples of other types that are in common use will be maintained at each station for purposes of demonstration.

A systematic account is being kept of the cost of operation and maintenance of the different types of apparatus used at each of the stations, but sufficient time has not yet elapsed so that reliable cost figures are available. Since in training large numbers of men the

cost of maintaining and operating a helmet is a much more serious item than the original cost of the helmet outfit, the type of apparatus ultimately adopted for training will no doubt depend largely upon the cost of operation as determined by experiments now being made.

Each station has an adequate equipment of ordinary and electric safety lamps, two pulmotors for resuscitation, 20 oxygen tanks, each of 100 cubic feet capacity, and two oxygen pumps, one being kept at the station and one in the rescue car, so that there is always a spare pump.

Each station is equipped with a small library of mining books, the leading mining magazines, and with a stereopticon. By co-operation with the mining department of the University of Illinois, lantern slides have been furnished illustrating rescue and first aid work, the dangers of mining, and various other topics.

Each station has a complete equipment of supplies, charts, etc., as furnished by the First Aid Department of the National Red Cross Society, and in the training of men first aid is of equal importance with helmet work.

Station Staff.—According to the law establishing the Commission, the three stations are in direct charge of a manager appointed by the Mine Rescue Station Commission. Each station is in charge of a superintendent and an assistant. The salaries provided by law are as follows:

Manager, \$3,000 per year.

Superintendent, \$125 per month.

Assistant, \$75 per month.

An amendment appropriating money for the maintenance of the stations during the two years ending June 30, 1913, gives the Commission authority to employ such additional occasional assistants as may be needed for the operation of the cars, and for the payment of lecturers on first aid and other technical subjects.

The superintendents and assistants were selected after a preliminary competitive test and examination held at Springfield. Those who passed the preliminary examination spent several months at the Urbana station receiving training in rescue work and taking lectures in general mining subjects, the lectures being furnished by the staff of the Department of Mining Engineering, the State Geological Survey, and the members of the Federal Bureau of Mines located in Urbana. The men finally selected as superintendents and assistants were also given a period of training at the Pittsburg station of the Federal Bureau of Mines.

Training.—Any men, who apply to the station individually or who are sent there by their employers, are given a course of training with oxygen helmets, in the use of oxygen reviving apparatus, such as the pulmotor, and in first aid. When they show that they are familiar with the operation of the apparatus and can perform within a period of two hours the following tasks, they are granted certificates as members of the Illinois Mine Rescue Corps. A distinctive button is also awarded.

The tasks included in the two-hour test are:

1. Eight complete trips around gallery on ground floor.
2. Ten trips over over-cast.
3. Each man carries 25 bricks over over-cast.
4. Crawl through tunnel three times.
5. Carry four props over over-cast.
6. Saw two props.
7. Set five props and knock them out.

8. Hang canvas, take down and fold up.

9. Pull weight 60 times.

10. Two men carry dummy once around gallery, lifting dummy over car.

11. Two men push car once around gallery.

12. Eight complete trips around gallery on ground floor.

The time of training varies from one to two weeks, depending upon whether the men devote all their time to the training and live in the station during the period of training, or come to the station from adjacent mines, and devote only such time as they have from their regular duties. No charge is made for the training, and, if they desire, 12 men at a time can be lodged in the dormitory free of charge. The superintendent has the privilege of running a boarding table for which those in training pay, or they can board outside the station if they prefer.

The mining law passed by the Legislature just recently adjourned provides that a map of each mine in the State shall be filed with the Manager of the Rescue Stations, and these will be kept at each station for the mines in the territory contiguous to the station, so that in case of an accident the rescue party going from the station can study the map while en route.

The same law provides that candidates for the positions of mine inspectors and mine managers must pass an examination in rescue and first aid methods.

Although the stations have been equipped and in operation only a few months, both the operators and the miners of the State have shown their willingness to co-operate in every possible way with the Rescue Commission, and the work promises to be a potent factor not only in case of accident, but as an educational feature in combating the daily dangers of mining.

THE CONIAGAS MINES, LIMITED, ANNUAL REPORT.

The President's Address.

To the Shareholders of the Coniagas Mines, Limited:

Gentlemen:—The past year has been a very prosperous one for your mine, which has paid, in four dividends and bonuses, a total of 36 per cent. on its capital, making 71 per cent. of the capital stock returned to shareholders to date in dividends and bonuses.

Our statements show value of Ore in Transit and at Smelter, on which payment is not due, of . \$440,454.20
Cash on Hand and in Bank 479,547.94

Total \$920,002.14

The mine and its equipment is in most excellent condition, working without any serious delays during the year except the holidays provided by law. The mill has crushed during the year 52,320 tons, or an average of 169 tons per day, and shipped 1,643,616 ozs. of silver, contained in 1,418.4 tons of concentrates. The extraction in the mill was nearly 87 per cent.

The total ounces of silver mined and shipped during the year were 3,789,274 ozs. at the remarkably low cost of 8.8c. per ounce, including mining, concentrating, freight to smelter, sampling, assaying, and treatment charges, and all head office expenses and royalties, as compared with a corresponding cost for the previous year of 13.285c.

The average price received per ounce of silver was 53.175c. as compared with 53.55c. for the previous year.

The smelter charge for treatment (smelting, refining

and marketing the silver), amounted to 3.49c. per ounce, including treatment and refining costs of 0.49c., also included in cost of mining above.

The underground workings now cover about 25 acres of the 40 owned by your company, and since the end of the fiscal year we have started sinking a winze in good ore below the third, or 225-ft. level. The engineer's reports, based on careful surveys and sampling, show ore in sight containing 12,516,000 ozs. of silver, enough to keep the mine working on past year's rate of production for over three years.

The report of the assistant to the president, to the directors, on the year's operation of the mine, and the financial reports of the secretary-treasurer, are included in the report of the directors to the shareholders, and form a part thereof. The report of the directors of the Coniagas Reduction Company, and of the president of the Redington Rock Drill Company, Limited, to the shareholders of the Coniagas Mines, Limited, are also included.

The Redington Rock Drill Company, controlled by your company, has confined its operations to the manufacture in your own machine shop of repair parts for drills for your Mine, and a few extra machine drills for renewals or sale when completed.

The 15 machines operated during the year double shift show a cost for repairs of \$5.02 per drill per month, which is a very satisfactory showing for the quality of the drills, which is reflected in the cost of operation of the mine.

Owing to deficiency in the water supply for milling purposes your directors entered into negotiation with the directors of other mines obtaining their supply from the same source, to the end that the Mines Water Supply Co. is being formed for the purpose of augmenting the supply by pumping from Mud Lake. The work is about completed, and the proportion of cost for construction which your company will be asked to provide will be about \$5,000. It is proposed to submit a by-law of the directors authorizing a stock subscription in the Water Company for the approval of the shareholders as soon as the amount required is definitely ascertained.

It is a pleasure to have this opportunity of acknowledging one of the most important factors in the successful working of your properties, which is the loyal, enthusiastic service of the staff and employees, the great majority of whom have been in your service for several years.

I take pleasure in moving the adoption of the report.

R. W. LEONARD,
President.

St. Catharines, Ont., Dec. 18th, 1911.

Report of the Directors.

Report of the Assistant to the President:

To the President and Directors of the Coniagas Mines, Limited.

Gentlemen:—Herewith report of the operations of the company at Cobalt for the year ending October 31st, 1911.

During the year the mine has operated continuously, excepting holidays with an average force of 158 men, distributed as follows:—

Mines' Office and Supervision	9
Camps	4
Mining	103
Drills	4

Mining Maintenance	11
Milling	16
Milling Maintenance	9
Loading Ore	1
Lands and Roads	1
	158

The wooden foundations under battery posts in old part of mill, "30 stamps," were replaced by concrete. This work was carried on from January 10th to May 11th, and caused a loss of 20,558 stamp hours, or a total of 28 days for 30 stamps.

The operation of the mill has been most satisfactory, and the tonnage treated since the above alterations were made, has averaged 186 tons per day of 24 hours.

A canvas table plant has been installed and operating since January 1st, which enables us to recover a low grade concentrate which was previously going to waste.

The total amount milled during the year was 52,320 tons, averaging 36.3 ozs. per ton. The average value of tailings from the mill was 4.75 ozs. per ton.

Development work during the year has been mostly confined to the district between No. 2 vein and north boundary; and by a cross-cut from No. 9 vein on the second level towards the south-west corner of the property.

Veins Nos. 12, 18, 24 and 25 were discovered in first area, all producing high grade ore, and in second area veins 15 and 16 were cross-cut on second level. No. 15 is producing high grade ore, but No. 16 as yet has not produced as well as in No. 6 shaft, sunk from surface.

Preparations have been made to sink winze from third level on No. 2 vein as developments on adjoining property have shown good values below this.

During the year new veins Nos. 17 to 27 inclusive, have been discovered underground, all shown on accompanying plans.

No surface prospecting has been done.

All work, both in stopes and drifts, for the past year is shown on accompanying plans and sections.

Development of new ore bodies during the year has about equalled the value of silver taken out of the mine. This is estimated at 3,720,000 ozs., as against an actual shipment of 3,789,274 ozs.

Ore reserves in sight, October 31st, 1911, are estimated as follows:—

No. 1 Ore, Vein matter	4,100 tons at 3,000 ozs.=	12,390,000 ozs.
Milling Rock	89,000 tons at 20 ozs.=	1,780,000 ozs.
Broken Rock on Stulls in Mine	29,000 tons at 40 ozs.=	1,160,000 ozs.
Mill Rock on Surface		
Dump	10,500 tons at 30 ozs.=	315,000 ozs.
Total		15,645,000 ozs.

Allowing 20 per cent. for possible over-estimation would leave an ore reserve on the 31st of October, 1911, of 12,516,000 ounces, which figure I consider conservative to base estimates on for the ensuing year.

This gives an ore reserve of about the same as on the 31st of October, 1909, after shipping in two years 5,718,804.91 ounces of silver.

The estimates are based on careful surveys made by Little & Baker, mining engineers.

The following was the quarterly output of the mine for the fiscal year, in ounces of silver.

All ore shipped went to the Coniagas Reduction Company, Limited, at Thorold, with the exception of one car of low grade.

	Mine Ore.	Concen- trates.	Total oz. Sil- ver shipped.	Total oz. Sil- ver paid for
1st Quarter...	639,782.71	584,546.21	1,224,328.92	1,156,579.02
2nd Quarter...	430,174.35	337,566.76	767,741.11	720,641.15
3rd Quarter...	475,055.01	308,053.61	783,108.62	736,606.40
4th Quarter...	597,949.64	416,145.62	1,014,095.26	956,996.99
	1,646,312.20	2,142,961.71	3,789,273.91	3,570,823.56

Totals of Shipments

Year	Mine ore	Concentrates	Total
1st Nov. 31st Oct.	Tons	Ozs.	Ozs.
1905-06	289	657,513	657,513
1906-07	2,655	1,341,372	1,341,372
1907-08			
1908-09	350	807,253	807,253
1909-10	330.1	979,630	979,630
1910-11	619.1	2,142,536	2,142,536
Total to Oct. 31, 1911	4,243.2	5,928,304	5,928,304

This includes 466.8 tons of Canvas Table Concentrates, and original slimes from mine, which averaged 115 ozs. per ton.

Coniagas Mines, Limited, incorporated November, 1906.

Concentration of Ore began September 24th, 1907.

Mine Ore and Concentrates shipped and treated together during 1907-08.

Work done to date and work done during the year ending October 31st, 1911:

	Total to Oct. 31, 1911	Total to Oct. 31, 1910	Work done during 1910-11
Shaft Sinking, feet.....	597	539	71
Drifting feet.....	10,006	6,649	3,335
Cross cutting, feet.....	2,843	2,032	811
Winzes, feet.....	252	232	20
Raises, feet.....	276	233	184

	Tons removed Since beginning of operations to Oct. 31, 1911.	Tons removed to Oct. 31, 1910.	Tons removed during 1910-11
Crosscutting and Waste	17,798	11,053	6,745 Barren Rock
Drifting	32,359	22,359	10,000 Pay Rock
Stoping	99,872	59,568	40,304 Pay Rock
Open Cutting	4,680	4,680	
Shaft Sinking	2,265	1,910	355 Pay Rock
Winzes and Raises..	1,281	1,000	281 Pay Rock
	158,255	100,570	57,685

Ore Milled in Tons, to Oct. 31st, 1911.

Total to Oct. 31st, 1911.	Total to Oct. 31st, 1910.	Milled during 1910-11.
119,088		52,320

Surface Dumps.

Remaining Oct. 31st, 1911.	Remaining Oct. 31st, 1910.	Removed during 1910-11.
12,020	14,020	2,000

Note.—The 2,000 tons removed from surface dump were jig tailings, which were run through mill to make room for sand storage.

Milling Ore and Rock Hoisted, Tons.

	Total to Oct. 31, 1911.	Total to Oct. 31, 1910.	During 1910-11.
Milling Ore	119,088	66,768	52,320
Waste Rock	18,431	11,686	6,745

The Power Companies who supply compressed air were unable to keep up pressure during part of winter 1910-11. Our compressor was started and run during this period, which enabled the mine to run to its full capacity.

Thirty married employees are living on the property from the Mine.

Year	Mine ore	Concentrates	Total
1st Nov. 31st Oct.	Tons	Ozs.	Ozs.
1905-06	289	657,513	657,513
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1910-11	619.1	2,142,536	2,142,536
Total to Oct. 31, 1911	4,243.2	5,928,304	5,928,304

in houses owned by the company, and 50 per cent. of the balance in company's boarding house.

I cannot speak too highly of the services rendered by F. D. Reid, mill superintendent, who is responsible for bringing the mill to its present efficiency, nor of the services of Arthur Martin, mine captain, who has charge of all work underground.

There have been no serious accidents during the year. Ten cases of typhoid developed during August, and resulted in one death.

Respectfully yours,

R. P. ROGERS,
Assistant to the President.

CONSOLIDATED MINING AND SMELTING COMPANY OF CANADA, LIMITED.

Including estimated production for December, which was expected to be higher than that made in November, the total value of the production of metals at the smeltery of the Consolidated Mining and Smelting Company of Canada, Limited, at Trail, British Columbia, during the calendar year 1911, was approximately \$4,750,000, in the following proportions:

Gold	\$2,745,000
Silver	715,000
Lead	770,000
Copper	520,000

Total\$4,750,000

As compared with the production during the company's fiscal year ended June 30, 1911, this shows an increase in total value of about \$312,000, or a little more than 7 per cent. This result is the more noteworthy since the tonnage received and smelted during the fiscal year was greater by approximately 60,000 tons, than that in the calendar year.

The decrease in tonnage was due chiefly to the cessation of operations at the Snowshoe mine, Boundary district, which mine had been for several years worked by the company, and from which a comparatively large quantity of ore had been extracted and shipped to Trail. During the fiscal year to June 30, 1910, the Snowshoe shipped 182,000 tons to Trail, but in the last fiscal year the output from the mine was only 86,000 tons, while the total for the calendar year now under notice was but 31,000 tons. Moreover, the several lead and silver-lead mines operated by the company,

with the exception of the Molly Gibson which increased its output, each shipped less to Trail in 1911 than in the fiscal year to June 30 of that year. On the other hand, the Le Roi, which the company acquired by purchase early last summer, shipped as much ore during the six months it was worked by the Consolidated Co. as it did during the whole of 1910, when its output was included in the custom ore receipts at Trail.

Reviewing the company's mining operations in 1911, the following notes will serve to show what the most important of these were:

Centre Star Group, Rossland.—Tonnage of ore produced, approximately 195,000 tons. Metal contents: gold, 86,512 oz., silver 57,670 oz., copper 2,182,676 lb. Development work done: Drifting 7,300 ft., cross-cutting 2,812 ft., sinking 209 ft., raising 1,617 ft., total narrow work 11,938 ft.; diamond drilling, 19,861 ft.

Development has been along the usual lines of maintaining the ore reserves. A number of new ore bodies have been opened, particularly in the lower levels of the War Eagle mine. Development and stoping are so regulated as to maintain a practically constant average output of 16,000 tons of ore per month. It is probable the production of 1912 will equal, if it do not exceed, that of 1911.

Beyond the replacement of two low-pressure boilers by a 150 h.p. high-pressure h.r.t. boiler, there was little addition made to plant other than that connected with development work as this was done. Neither was there any change of importance in connection with surface works generally, buildings, etc.

Le Roi.—During the five months of the year this mine was operated under the direction of the liquidator of the Le Roi Mining Company, Limited, its production was 5,502 tons, containing 2,853 oz. gold, 4,183 oz. silver, and 141,667 lb. copper. Since then, after it passed into the possession of the Consolidated Company, production was as follows: Ore produced, about 12,900 tons; containing 4,017 oz. gold, 5,542 oz. silver, and 263,369 lb. copper. Preparations are being made to considerably enlarge the output in 1912.

Development work has consisted largely in making connections with the Centre Star mine at various levels. The motor haulage system has been extended from the Centre Star into the Le Roi on the levels that have been connected, so as to allow of ore from the Le Roi being hoisted through the Centre Star shaft and passed over the sorting tables of the latter mine. The big boiler plant of the Le Roi has not been used latterly, but instead air from the Centre Star compressor has served to operate the hoist in the Le Roi main shaft.

St. Eugene. — Production of ore was only about 34,600 tons, as against 47,700 tons in the last fiscal year; concentrate produced was 5,136 and 7,708 tons, respectively, for the two periods. The falling off for the calendar year was therefore considerable. The metal contents of the concentrate shipped to Trail in 1911 were: Lead, 5,882,000 lb.; silver, 136,150 oz. For the first time in its history while being worked the St. Eugene had to take second place as a producer of lead in Canada. Its tonnage output was larger than that of the Sullivan by about 11,000 tons, but the lead content of the ore was much smaller. Leaving the Sullivan out of consideration, the St. Eugene continues to produce more than the combined output of all other mines in the Province. More than 2,000 ft. of development work and 1,000 ft. of diamond-drilling was done. The ore testing plant at the St. Eugene

was operated intermittently as required, and results were of much interest.

Sullivan.—This mine, also in Port Steele mining division of the East Kootenay, produced rather more than 25,000 tons of ore during the year, which output was nearly 9,000 tons less than during the last fiscal year. Metal contents of the 1911 output were nearly 11,000,000 lb. of lead and 187,500 oz. of silver. About 1,900 ft. of narrow work was done in further development of the mine, and approximately 7,500 ft. of diamond-drilling. This work showed the existence of large reserves of ore.

A new power system and an ore-sorting addition are being put in. The former includes a concrete dam 20 ft. high and 50 ft. wide, on Mark Creek, and a 30-in. continuous wooden stave pipe line, 4,380 ft. in length, to a compressor building 80 by 40 ft. Of three 6-ft. Pelton wheels, two are connected by a rope-drive to a compressor having a capacity of 3,000 ft. of free air per min., and one to a 120 kw. 2200-volt generator. Compressed air will be conveyed to the mine through an 8-in. pipe-line about 5,100 ft. long.

The sorting house contains a 15 by 24-in. Farrel crusher, bins, trommels, and a 36-in. sorting belt 60 ft. long. The ore-sorting house is so arranged that ore can be picked out of the waste where the latter predominates, or vice versa. It is the intention to also make a second-class product to consist of ore high in zinc and low in lead. The terminal of the tramway has been removed to the storage bin below the sorting house. A tunnel has been opened from the 100-ft. level of the mine out to the sorting house; electric motors will be used for haulage on this level.

Other additions are to be made to surface plant, buildings, etc. and generally the policy being followed here is with the object of permitting for a gradually increasing production of ore, of which there is known to be in the mine a very large tonnage.

Richmond-Eureka.—The quantity of ore produced at this Slocan property was less in 1911 than 1910, only about 2,300 tons as compared with 4,000 tons. Not many men were worked throughout the year, and those chiefly in further development, the expense of which was covered by the proceeds of ore extracted. Metal contents of ore shipped were 428,000 lb. of lead and 78,400 oz. of silver.

Molly Gibson.—This mine is in Nelson mining division, about 20 miles northeast of Nelson City. During 1911 an aerial tramway, from the mine towards the west arm of Kootenay Lake, was completed; its total length is 4½ miles and it has reduced the distance over which ore must be hauled in wagons from 10 to less than 5 miles. A cross-cut tunnel is being driven 200 feet below No. 6 level of the mine; the face of this is now about 500 ft. from the portal, and the vein is 300 ft. ahead. A raise will be made in the vein to No. 6 level. The new level will be the main ore-outlet from the mine, and in preparation for this a site for the upper terminal of the aerial tramway is being excavated in solid rock in the side of the mountain so as to be out of the way of snowslides, which have been a yearly surface danger at this mine.

Development work has resulted favourably, so that the prospects for this property are now better than at any previous time since it was acquired by the Consolidated Co.

The concentrating mill has been put in working order; among the changes made in its equipment was the substitution of a Huntington mill for the 5-stamp

battery previously in use. Minor alterations and repairs were numerous, and the plant has been thoroughly overhauled. More water power has been developed on Kokanee Creek; a second flume 3,000 feet long has been constructed and 900 feet of 20-in. pipe put in, giving a head of 150 ft. The power derived operates a compressor having a capacity of 500 ft. of free air per min., and this has been connected to the old air lines by 3,200 ft. of 4-in. pipe. A dynamo, for electric power and lighting purposes, has been installed.

Construction work will be completed and development of the mine so advanced that ore production in 1912 may be expected to be on a considerably increased scale as compared with present capacity of mine.

No. 7 Mine.—No ore production has been made from this mine since last March, but prior to the close of that month 775 tons was received at Trail from it. Much development work was done, and the ore-sorting plant was completed and ore bins built at the lower terminal of the aerial tramway.

Other Properties.—Little or nothing was done at the company's Phoenix Amalgamated property, in Boundary district. The company took under bond the Hudson Bay group and the Silver Dollar, both in the vicinity of Salmo, Nelson River mining division, and the No. 1 and Tiger, both in Ainsworth camp. Work is being done on all these properties with the object of proving their value. The indications are that a

large body of lead ore may be developed at Salmo. The ore of the other mines mentioned contains silver and lead.

Smeltery and Refinery.—Other than the installation of two units of the Dwight-Lloyd sintering process plant, for roasting ores, there were not any important additions to the plant at the Trail works. Many changes were made, though, to facilitate the handling and sampling of ores; included in these is a rearrangement of the Huntington-Heberlein roasting plant, which when completed, will be so placed as to make for greater convenience and effectiveness in the future.

Both copper and lead sides of the big reduction works at Trail have been, and are being maintained in a condition and on a scale demonstrating progressiveness and general adaptability to the varied ore reduction needs of the Kootenay and other districts whence the ore supply is drawn. The official staff at mines and reduction works was little altered during the year, the most important change having been the resignation of Mr. A. J. McNab from the position of superintendent of the smeltery, and the promotion of Mr. James Buchanan to fill the vacancy thus occasioned. Mr. M. H. Sullivan succeeded Mr. Buchanan as metallurgist, and Mr. B. A. Stimmel moved up to take Mr. Sullivan's place as chief chemist. Mr. R. H. Stewart remains general manager, Mr. S. G. Blaylock, assistant general manager, and Mr. T. A. Bingay, comptroller.

PERSONAL AND GENERAL

Through inadvertence the address of Mr. A. D. Miles, who has taken offices in Toronto as representative of the International Nickel and the Canadian Copper Company, was given as the Standard Bank Building in our last issue. This is incorrect. Mr. Miles' address is Room 801, Traders Bank Building.

Mr. Harry Hanson, of the Dome Mine, Porcupine, is spending his Christmas holidays in California.

Mr. R. Anson-Cartwright is in Toronto, at 34 Donald Street.

Dr. W. L. Goodwin, director of the School of Mines, Kingston, Ont., visited Toronto on December 21st and 22nd on business connected with the Department of Education.

Mr. John L. Retallack, manager of the Whitewater group of mines and the Washington, both in Slovan district, has returned to Kaslo from a visit to the Coast district of British Columbia.

Mr. Charles Dempster, manager of the Fife mine, situated in the eastern part of Boundary district, B.C., is again in Rossland, after an absence of about three months in New York and other eastern cities.

Mr. Charles F. Caldwell, manager of the Utica mine, in Ainsworth division, British Columbia, has been in Victoria, urging upon the Government the necessity for a wagon road being constructed to facilitate getting ore from his mine to the Kaslo and Slovan Railway.

Mr. T. D. Pickard, of Vancouver, B.C., was in Hedley camp, Similkameen, last month, in connection with the prospecting work being done on the Apex property, situated in the vicinity of the Nickel Plate group, and on which he and associates have a working bond.

Mr. Thomas Graham, for several years general superintendent for the Western Fuel Company, owning and operating the No. 1 Shaft, Protection Island, and Brechin coal mines, near Nanaimo, Vancouver Island, B.C., has been appointed chief inspector of mines for British Columbia, in succession to Mr. F. H. Shepherd, who resigned to become the representative of Nanaimo district in the Dominion House of Commons.

Mr. Thomas Kiddie has returned to British Columbia from Morenci, Arizona, where he was visiting his elder son, John, who is in charge of the Arizona Copper Company's engineering department, and is also geologist for that company. Mr. Kiddie, Sr., hastened his return to British Columbia in order to investigate for principals a new zinc reduction process now attracting attention in that province.

The three directors of the Tye Copper Company, who were in British Columbia last month, have left on their return to England. Mr. W. J. Watson, for several years the company's smeltery manager at Ladysmith, Vancouver Island, and who was appointed acting manager on the retirement recently of Mr. W. H. Trewartha-James, remains in charge of the company's affairs in British Columbia. It is understood that the company purposes extending its operations and enlarging its smelting works.

Mr. W. E. Zwicky, manager of the Rambler-Cariboo mine, Slovan, B.C., and who is directing the development work recently undertaken on the Payne mine, in the same district, has been reported by the Spokesman-Review, of Spokane, Washington, as having said in that city, when there recently: "American lead

miners need not be worried about competition from Canada, because we now have a Government which believes in the protection and development of home

industries, and we propose to close our markets to lead and lead products from the United States, Mexico, and all other countries in the world."

SPECIAL CORRESPONDENCE

ONTARIO.

Cobalt, Gowganda and South Lorrain.

The announcement of railroad facilities for Elk Lake and Gowganda has already caused a considerable awakening of interest in that somewhat neglected field. At Elk Lake there was a rush of prospectors to restake, and the Hitchcock and the Beacon Consolidated companies have announced their intention to commence operations again. At Gowganda the Millerett and the Miller Lake O'Brien have been steadily producing all the year, and development work has been so successful that ore reserves have been little, if at all, depleted. The diabase section of the Millerett at the 150 and the 200-foot levels is showing up remarkably well, and is yielding the bulk of the mill ore to the concentrator, which is treating 35 tons per day, while a considerable amount of high grade is handpicked from both the conglomerate and the diabase. On the other side of the lake the Miller Lake O'Brien has now extensive stopes of high grade ore on the 150 and the 250-foot levels, and so far the veins have shown no indication of petering out either in width or values. Shipments have been steady. At Gowganda itself the Mann property has commenced work again and is mining ore, the Powerful Mining Company at Calcite Lake, has cut its vein and is sacking ore, and so is the Canadian Gowganda, midway between Gowganda and Calcite Lake. With the railroad facilities, many prospects will certainly be opened directly supplies can be taken in and ore taken out at less ruinous rates than at present. The wagon road built into Gowganda by the Government is so bad that with some snow on the ground it takes fifteen hours for a passenger rig to travel.

The Beaver Consolidated position for the quarter ending November 30th was as follows: Cash on hand, \$107,286. In addition, payments to be received from the smelters amount to \$51,000. The fifty ton mill is making good progress and should be ready the second or third month of the new year.

The November production of the McKinley-Darragh Savage mine totalled 220,000 ounces, of which 85,000 ounces came from the Savage property. This brings the total production for the year to 2,434,000 ounces, or only 200,000 ounces short of last year's total, with a month to run. The mill has been running an average tonnage of 40-ounce ore per day, and practically all the shipments from this property have been concentrates.

Despite predictions to the contrary, the La Rose Consolidated paid its regular quarterly dividend of two per cent., requiring a disbursement of \$150,000. The company has now paid back 37 per cent., or \$2,579,185. The Nipissing, too, will pay their old rate of seven and a half per cent. on January 20, bringing total disbursements to 129 per cent., or \$7,740,000. The regular quarterly dividend calls for \$450,000, and an average of about \$226,000 net is being produced each month. The surplus of the Nipissing on Dec. 9th was \$1,421,480, while the La Rose on or about the same date had a surplus of \$1,516,042.

The first aerial tramway of any considerable length is now in operation between the Crown Reserve, the Kerr Lake mine, and the Nova Scotia mill, a distance of nearly a mile. The contract with the Crown Reserve calls for 85 tons per day, and the Kerr Lake 75 tons, while it is very probable that the Drummond will be sending 35 tons per day as soon as the tramway can be extended to them.

Porcupine, Swastika, and Other Gold Sections.

The event of the month in the Porcupine camp was undoubtedly the visit of the Canadian Mining Institute to inaugurate officially the gold camps branch. Though called at somewhat short notice, there was an excellent assemblage, and an exceedingly interesting meeting ensued. One hundred and six members attended the first meeting of the branch in the King George Hotel, and the papers read and the discussion were most interesting. Dr. Adams briefly defined the objects of the Institute and pointed out its growing importance in the world of mining. Dr. A. E. Barlow dealt with a letter that had been received from the Toronto Branch, stating the resolution arrived at in connection with the amendment of the Employers' Liability Act. Outlined it proposed the adoption of the English Act, which threw the burden of the proof of carelessness in the case of accident on the employer, this being the only impediment to the miner's obtaining compensation; it provided that the compensation should be provided from a fund jointly contributed by the employer and the employee, and it fixed the amount for fatal accident at \$1,500, or three years' wages. Mr. W. F. Ferrier explained the position taken by the Toronto Branch. Mr. G. C. Bateman, who occupied the chair, read a very interesting paper on the sampling of Porcupine veins, and a brisk discussion followed. Mr. Hy. Hanson, who is in charge of the construction work of the Dome mill, read an interesting paper on fine grinding, in which he emphasized the increasing importance of tube mills, not to replace, but in conjunction with, stamps.

Mr. A. E. Burrows opened a discussion on various geological characteristics of the Porcupine camp. He had found scheelite rock on the Jupiter, and hessite on the Powell, in Deloro. He thought that if telluride were to be found in paying quantities it would have been discovered before now, but scheelite containing tungsten might easily have been mistaken for other minerals, and it might be of economic importance to the camp. Mr. Carl Reinhardt, of Cobalt, expounded a theory of the classification of the Northern Ontario rocks, and the origin of the Cobalt ores.

On Sunday the visitors separated into three parties, and visited the Dome, Hollinger, McIntyre, Vipond, and Rea in succession.

A local committee of the Porcupine branch was formed of C. H. Pourrier, manager of the Vipond; C. E. Watson, manager of the Plenaureum; A. H. Smith, of the consulting firm of Carter and Smith; A. P. Globe, superintendent of the Hollinger; R. Rattray, manager of the Jupiter, and H. C. Meek, superintendent of the Dome.

Just previous to the visit of the Mining Institute, three important discoveries had been made at the properties on or near Pearl Lake. Drifting towards Pearl Lake on the 200-foot level from the No. 4 shaft the McIntyre struck into a good body of ore sixty feet from the shaft. While assays were lean in the first shots, they gradually increased until an average of about \$14 was obtained over four feet after careful sampling, and the hanging wall of the vein had not been reached at the date of writing. From the same No. 4 shaft, too, No. 4 vein has been cut. At the point of intersection the company show 26 feet of vein matter, going \$19.50 to the ton. Forty feet of this vein has been drifted upon, and good average values have been obtained. On the other side of the lake the

Jupiter opened up another nice bunch of ore in a crosscut to connect two workings. The vein is about four feet wide, and the average values are high for properties of this section of the camp.

At the Plenaurum, at the east end of the lake, an unexpected body of quartz, showing visible gold, was struck in the shaft at 120 feet. As neither of the veins between which the shaft was sunk show any tendency to dip towards the shaft, this is presumed to be another vein.

On the Hollinger the rumour of a strike on the 200-foot level synchronized with a sudden rise in the stock. Though it was not generally known, the main vein, after it had been drifted upon for about 300 feet, was lost, and a considerable amount of crosscutting had to be undertaken before it was picked up the other day. Though there is no official information available it is stated that this continuation of the main ore body is four feet wide and shows very rich ore at the point of intersection.

Satisfactory progress is now being made with the Hollinger Extension of the T. & N. O. While it was in the contractors' hands the work seemed to lag badly, but since the railroad itself took it over there has been a great improvement. The steel is now laid right into the Aura Lake settlement, and a yard is laid out, so that machinery can be unloaded here. The trestle bridge over Pearl Lake will cause a little more delay, but the big rock cut beyond is finished and it should be possible to run freight into Timmins townsite by the middle of January or the first of February, or five months after the scheduled time when the work was first undertaken.

Two shafts are being sunk on veins on the Porcupine Reserve property. One of these is down fifty feet, and the shaft is almost entirely in quartz, the other is down 30 feet, and both will be taken to the hundred foot level before exploration work is commenced.

The Rea is now installing a larger hoisting plant, as it has been determined to sink to the 400-foot level without delay. Drifting is also in progress at the 300-foot level.

It is now admitted that delay in the steel work of the Dome mill will prevent the stamps dropping before the first of March. It will even then, in all probability, be the first mill to crush ore on any scale in camp.

W. R. Bauder, who has been manager of the McIntyre for a month or six weeks, has resigned, and Mr. William Cooper, formerly with the Bewick-Moreing Co., has been appointed to the position in his place.

At a depth of 1,140 feet in No. 3 drill hole on Pearl Lake mine, visible gold is seen in the core. Values run all the way from a trace to \$20. The drill hole has been put down 1,250 feet and, according to the dip of the drill and the distance in which the cores were in values, it is computed that the ore body penetrated was about fifty feet thick.

The Gold Pyramid Company, of Munro Township, has ordered ten more stamps for its battery, which at present consists of five stamps. At present two other mines in the vicinity of the Gold Pyramid have small stamp mills running.

It is reported that the Murphy Mitchell claim in Carscallen township, has been optioned by a French syndicate for \$200,000. The option takers will go to work at once, and probably instal a small plant.

BRITISH COLUMBIA.

Comprehensive information relative to mining in the province is contained in 33 pages of the "Year Book of British Columbia," by Mr. R. E. Gosnell, the "Coronation Edition," of which has been issued, having been published by authority of the Legislative Assembly of British Columbia. The chapter on Mines and Minerals deals first briefly with the great latent possibilities of the mining industry in western Canada, and then directs attention to the Cordilleran region, recognized as one of the greatest mining regions in the world, of which the

part in Canada has a length of 1,300 and a width of 400 miles. The total area of the Canadian portion of this great region is placed at, approximately, 600,000 square miles. The following excerpt should prove suggestive to those interested in the mining industry of British Columbia: "A faint idea of the possibilities of this great region may be obtained from consideration of the fact that 'Pennsylvania, which is probably the best developed Appalachian state, now has an annual production of domestic minerals approximately equal to \$9,340 per square mile of territory, or to \$67 per capita.' Another illustration is that of Nova Scotia, which has an annual production of about \$1,000 per square mile, or \$4 per capita. At even \$1,000 per square mile of mineralized territory, British Columbia's annual mineral production would, under like conditions of utilization of its minerals, amount to an immense sum, so that there is in the development of its mineral resources a great future awaiting the enterprise and energy of this Province and its people. Except in the far north, the 'Cordilleran region is largely a forested country. In the southern interior, however, are wide stretches of open grass-covered hills and valleys, noted for their fertility. Various districts have long been known to be rich in mineral wealth, and new ones are, from time to time, engaging attention. The mines of the region, which is pre-eminently a mining district, already yield virtually all the lead mined in Canada, more than half the gold, nearly three-quarters of the copper, fully one-quarter of the coal, about one-tenth of the silver, and a share of some other minerals. This high rank has been reached notwithstanding that prospecting of even the most desultory character has been carried out only over a very small, almost insignificant, part of the area, and this chiefly in districts lying south of the main line of the Canadian Pacific Railway. This comparatively limited amount of prospecting, though, has, in the districts covered, marked out various regions as being characterized by the occurrence of certain classes of mineral deposits. The Rocky Mountains, and the flanking foothills on the east, contain vast quantities of coal, but apparently are not otherwise rich in mineral wealth. Coal also occurs over other districts—in central-southern British Columbia, on Vancouver Island, on Graham Island of the Queen Charlotte group, in the Skeena River country, and elsewhere. Rich silver-lead deposits are characteristic of the country south of the Canadian Pacific main line railway, between the Rocky Mountains and the Arrow Lakes of the Columbia River; zinc in workable quantity also occurs in this part of the province. To the west and south of this, almost to the Fraser Valley—in Rossland and the Boundary camps, and in the Similkameen and Nicola country—are many deposits of ores containing copper and gold. Along the Pacific coast, on both the mainland and the islands, are numerous copper-gold deposits, with others in the Skeena country and also farther north. The chief placer-gold fields of the province are in Cariboo and Atlin districts, respectively. Iron ore is found in several places in the interior of the province, and on Texada, Vancouver, and other islands. Miscellaneous minerals include platinum, chiefly in the Tulameen district; cinnabar (mercury), in Kamloops district and on the west coast of Vancouver Island; pyrites, in the lower Skeena country; scheelite, in Cariboo; tungsten, at Sheep Creek, Nelson mining division; molybdenum, in Nicola district and various other parts; mica at Tete Jaune Cache, upper Fraser River; hydro-magnesite, at Atlin; gypsum in Ashcroft and Nicola mining divisions; and clays, building, and other stones, cement materials, sand, etc., all of more or less commercial value, and available for utilization and to contribute to the total of value of the mineral products of British Columbia."

To comment in detail on the whole of the information given on the mines and minerals of the province would require far more space than is here available, so a short summary of the

greater part of the particulars given in the Year Book must suffice for the present. The history of mining gives interesting information. Accompanying the review of mineral production are statistical tables showing comparative views of production over various periods; the lode mines come next, followed by an outline of the great potentialities of the province in placer-gold and coal. Mining and metallurgical facilities are stated, and then, under the heading of "What May be Expected," an interesting forecast is given. One of the most valuable features of the mining section is the review of the question of whether the economic conditions on the British Columbia coast are favourable to the development of an iron and steel industry. The chapter is concluded by a notice of the mining laws of the province.

In conclusion, the comments under the heading, "A Striking Comparison," are here quoted: "It is of interest to note that British Columbia continues to maintain its average proportion of the mineral production of the whole of Canada. Placing the aggregate value of the production of the Dominion for the 25 years, 1886-1910, included in the official records, at \$1,130,000, it would appear that this province may fairly claim to have produced between 27 and 28 per cent. of this large sum. The aggregate value of the mineral production of the province for all years to 1910, inclusive, is \$374,000,000. Deducting the total value of the minerals—chiefly for coal and placer-gold—produced prior to 1886, which was nearly \$64,000,000, British Columbia's approximate aggregate for the 25 years is left at \$310,000,000, which is between 27 and 28 per cent. of that of the whole of Canada. It is a striking fact, as indicating the substantial increase in the value of the mineral production of the province in recent years as compared with that prior to 1906, that fully 40 per cent. of this large value is the production of the last five years, 1906-1910, while more than half—nearly 54 per cent.—is that of seven years, 1904-1910."

Fuel Prices in Coast Cities.

Three ladies, who were appointed by the mayor of the city

of Victoria to investigate and prepare a report on the high cost of living, have prepared a report which has been submitted to the city council. The committee which undertook the inquiry states that it has endeavoured to secure a careful and accurate comparison between the cost of living in Victoria and in neighbouring cities. The inquiry, therefore, by way of comparison, was limited to four cities, namely: Victoria, Vancouver, Nanaimo, Seattle (Washington). Included in the report, which is lengthy, is the following regarding the prices of fuel:

"In fuel, one of the most costly necessities, there is but slight variation in the prices in the three cities mentioned below. Wood is selling in Victoria at an advance of 50 cents per cord above that in the other places. Coal sells at the same price in Vancouver as in Victoria—\$7.50 per ton. The same coal retails in Seattle at \$6.50 per ton, the Vancouver Island coal, because of its superior quality, being considered as cheap at that price as the local product at \$6.50 per ton. Vancouver Island coal unscreened is delivered to the miner at \$2.50 per ton, the estimated loss by screening being 35 per cent. Screened coal is sold to the public at the pit's mouth at \$4.50 per ton; delivered at \$5.50.

"A practical expert miner quotes the cost of production of coal in the Vancouver Island collieries at the outside \$5.40 per ton f.o.b. It would seem that the coal merchants of Victoria are not responsible for the high prices paid by the consumer, as the mine companies evidently establish a price in common. It would appear in regard to this commodity, a case of utilizing one of the natural resources of the province for the making of wealth for the individual at the expense of the public, through selling at excessive profits one of the necessary articles of living."

It may be added that the question of the price of coal has been brought up in the Legislative Assembly of British Columbia in two successive sessions, but the situation is one that appears to be outside the sphere of the provincial legislators to take action upon.

GENERAL MINING NEWS.

NOVA SCOTIA.

Halifax, Dec. 14.—The North Atlantic collieries, Cape Breton, were to-day sold at foreclosure, and were purchased by Stone and Webster, Boston, for \$70,500.

Halifax.—The Dominion Coal Company's new charter boat Lingan, which was launched at Middlesborough, England, on October 10, last, is due at Sydney. The Lingan was built by Sir Raylton Dixon & Co., Ltd., for the Furness, Withy & Co., of West Hartlepool, and is said to be of the latest improved type of patent cantilever construction, with topside water ballast tanks, and is being constructed to receive the highest class with British Corporation, single-deck type with poop, bridge, and forecastle. She is 388 feet 3 inches by 52 feet by 29 feet 9 inches moulded, and will have a d.w. carrying capacity of 7,600 tons. She has 11 hatchways and 4 holds free from all obstructions, such as beams, or web frames, and perfectly self-trimming owing to the sloping sides of the top-side tanks at each side of the ship. Of the total amount of about 2,400 tons of water ballast which she can carry, about half will be in the topside tanks. She has 12 derrick posts and 20 derricks, 4 boats, hand and steam steering gear. She is fitted with triple extension engines having cylinders 26, 44, and 73 by 48 inch stroke, supplied with steam by three boilers, working 180 lbs. pressure.

The Lingan is commanded by Capt. Paterson, formerly of the S.S. Rosanno, and left for Sydney early in December.

Halifax.—A syndicate of British capitalists, headed by Sir Thomas Lipton, has acquired extensive mineral leases in the southeastern portion of Conception Bay, Nfld., and propose

tunnelling from the main land to strike the iron ore deposits which outcrop on Bell Island.

The point where the British holdings have been taken up is about eight miles from the Wabana mines, but any slopes driven from the main land to strike the Wabana beds have to be much longer than those which "Scotia" drove out to its 26 miles of submarine areas there.

QUEBEC.

Montreal.—A circular is being sent out to the Amalgamated Asbestos bondholders officially notifying them of the fact that the bondholders have obtained the consent of Sir Hugh Graham, Mr. W. G. Ross, and Mr. Henry J. Fuller, to act as a protective committee to protect the interests of the Canadian bondholders, and more especially to obtain representation of the depositing bondholders on any reorganization of the central advisory committee that may be appointed.

Similar protective committees have already been formed in England and the United States, and these will co-operate with the Canadian Committee.

The circular is signed by the following large bondholders: Hon. Robert Mackay, William MacMaster, Rodolphe Forget, M.P.; Burnett & Co., C. Meredith & Co., Thornton Davidson & Co., McDougall & Cowans, F. Orr-Lewis, Estate John MacIntosh, Preble MacIntosh, George Hyde, and William Frew Robertson.

No scheme of reorganization of the company can be voted upon by the Canadian Protective Committee until it has been submitted to and approved of in writing by the depositors of a clear majority in value of all bonds deposited with the

Committee, and as soon as a scheme of reorganization has been agreed upon by the Central Advisory Committee, such scheme will be submitted to the bondholders for approval.

Bondholders are requested to deposit their bonds with the National Trust Co., Montreal and Toronto, and in exchange they will receive a receipt.

Montreal.—Mr. A. J. Brown, K.C., has been elected to the Canadian Amalgamated Asbestos Bondholders' Committee, which is now composed of four members.

The Committee is anxious to have all the Canadian holders deposit their bonds with the National Trust Company, as the Canadian interests should be represented as largely as possible in the reorganization discussed.

ONTARIO.

Cobalt, Dec. 18.—Drifts to the east and west are being pushed on the big No. 4 vein from the 154-foot level of the Cobalt Lake mine, in an endeavour to pick up another ore shoot of a similar nature to the one which Manager Gordon found shortly after he took charge of the property this year.

BRITISH COLUMBIA.

Vancouver.—Thomas Kiddie, the well known metallurgist, former superintendent of the Le Roi smelter of Northport and the Ladysmith smelter, has returned from Arizona.

He will leave for Nelson to conduct on behalf of private parties a series of experimental tests of a new process for treating zinc ores. The process is known as the French system, after the name of the discoverer, A. G. French.

Important developments may result in the event of the tests proving successful.

Nelson.—Delegates from all over district No. 6 of the Western Federation of Miners met at Ymir, B.C., on December 19 to arrange matters of special interest to the miners' membership. They took action relative to the affiliation with the British Columbia Provincial Federation of Labour, deciding whether the locals of the district board will send the delegates; while the court decision pertaining to the "foreign dependents" in connection with the Workmen's Compensation Act, and jurisdiction are to be brought before the convention.

COMPANY NOTES

ASBESTOS MEETING.

The Royal Trust Company has made official announcement that a meeting of Amalgamated Asbestos bondholders will be held January 25.

PASSED ITS DIVIDEND.

The Temiskaming Mining Company has passed its quarterly dividend of 3 per cent.

DOMINION STEEL DIVIDEND.

A dividend at the rate of one per cent. upon the stock of the Dominion Steel Corporation, Limited, has been declared payable 2nd January, 1912, to shareholders of record 16th December instant.

NIPISSING STATEMENT.

The financial statement of the Nipissing Mines Company, as of December 9, shows: Cash on hand, \$872,661; ore in transit, \$144,934; ore at mine and ready for shipment, \$403,885; total, \$1,421,480.

TILT COVE COPPER.

The committee of management of the Tilt Cove Copper Company, Ltd., has declared an interim dividend of 6d. per share, free of income tax. The committee desires to point out that this dividend is based upon the profits for eight months—namely, from 31st December, 1910, to 31st August, 1911.

DOM. COAL & N. S. STEEL OUTPUTS.

The Dominion Coal Company's shipments for the eleven months are 413,386 tons ahead of a year ago, while the N. S. Steel Company's coal shipments, due to the fire, are 79,011 tons behind. The figures for September and the eleven months follow:

Dominion Coal Co.	
Shipments, November, 1911	297,131
Shipments, November, 1910	306,041
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Decrease, November, 1911	8,910
Shipments, 11 months, 1911	3,385,127
Shipments, 11 months, 1910	2,971,741
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Increase, 11 months, 1911	413,386
Nova Scotia Steel & Coal Co.	
Shipments, November, 1911	74,310
Shipments, November, 1910	77,728
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Decrease, November, 1911	3,418
Shipments, 11 months, 1911	686,623
Shipments, 11 months, 1910	765,634
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Decrease, 11 months, 1911	79,011

STATISTICS AND RETURNS

COBALT ORE SHIPMENTS.

Following are the shipments from the Cobalt camp for the week ending December 15th, and those from January 1, 1911, to date:

	Dec. 15.	Since Jan. 1.
	Ore in lbs.	Ore in lbs.
Badger		55,200
Bailey		40,000
Beaver	65,080	1,585,297
Buffalo	58,961	2,508,267
Casey Cobalt		261,265
Chambers-Ferland		1,300,900
City of Cobalt		727,980
Cobalt Lake	64,800	4,036,320
Cobalt Townsite	128,835	1,273,802
Colonial		227,910
Coniagas	63,254	291,164

Crown Reserve	2,049,829
Drummond	1,380,000
Green-Meehan	145,800
Hargraves	43,780
Hudson Bay	64,120
Kerr Lake	2,456,610
King Edward	40,000
La Rose	128,473
McKinley-Darragh	65,372
Nipissing	5,901,317
O'Brien	1,388,788
Little Nip.	58,430
Powerful	2,010
Provincial	202,050
Right of Way	1,336,025
Silver Cliff	106,680
Standard	102,813

Temiskaming	1,622,841
Trethewey	1,219,393
Wettlaufer	851,860

The shipments for the week were 742,675 pounds, or 371 tons, against 491 tons the previous week.

The shipments from Jan. 1 to Dec. 15 were 49,735,300 lbs., or 24,867 tons.

B. C. ORE SHIPMENTS.

The total for the week ended Dec. 2nd was 16,115 tons, making the total for the 11 months 1,407,139. The smelter receipts for the same periods were respectively 13,979 tons and 1,294,435 tons. The figures in detail are:

Slocan-Kootenay Shipments.

Richmond-Eureka	26	2,087
Ruth	35	525
Rambler-Cariboo	61	1,533
Molly Hughes	9	62
Knob Hill	185	4,906
Molly Gibson	28	1,046
St. Eugene, milled	420	24,816
Queen, milled	420	19,850
Granite-Poorman, milled	250	12,010
Nugget, milled	110	5,280
Van Roi, milled	800	36,249
Other mines		33,982

Total 2,344 142,346

Rossland Shipments.

Centre Star	3,727	182,798
Le Roi No. 2	389	26,749
Le Roi	399	16,730
Le Roi No. 2, milled	300	14,400
I. X. L.	8	97
Other mines		405

Total 4,823 241,179

Boundary Shipments.

Mother Lode	7,590	289,235
Jack Pot	273	23,727
Athelstan	178	17,537
Unnamed	907	12,166

Other mines 680,949
Total 8,948 1,023,614

**B. C. Copper Co.'s Receipts.
Greenwood, B.C.**

Mother Lode	7,590	289,235
Jack Pot	273	23,727
Athelstan	178	17,537
Unnamed	907	12,166
Other mines		61,111

Totals 8,948 403,776

**Consolidated Co.'s Receipts.
Trail, B.C.**

Centre Star	3,727	182,798
Le Roi No. 2	389	26,749
Le Roi	399	16,730
Richmond-Eureka	26	2,087
St. Eugene, concentrates	32	6,415
Ruth	35	525
Rambler-Cariboo	61	1,533
I. X. L.	8	97
Queen	38	660
Molly Hughes	9	62
Knob Hill	185	4,906
Molly Gibson	28	1,046
Van Roi	94	1,528
Other mines		55,110

Totals 5,031 300,246

The total shipments from the Kootenay and Boundary districts for the week ended Dec. 9th, and year respectively to date, were 13,525 tons and 1,424,167 tons. The smelter receipts for the week were 14,424 tons, and for the year 1,309,957 tons. The figures in detail are:

Boundary Shipments.

Mother Lode	7,222	296,457
Jack Pot	247	23,974
Athelstan	115	17,652
Unnamed	1,514	13,680
Other mines		681,251

Total 9,298 1,033,014

Rossland Shipments.

Centre Star	3,623	186,421
Le Roi No. 2	226	27,075
Le Roi No. 2, milled	300	14,700
Le Roi	525	17,255
Other mines		502

Totals 4,674 245,953

Slocan-Kootenay Shipments.

Sullivan	323	16,203
Richmond-Eureka	76	2,163
St. Eugene, milled	420	25,236
Silver Cup	30	472
Ruth	35	560
Emerald	39	1,842
Rambler-Cariboo	61	1,594
Queen, milled	420	20,270
Granite-Poorman, milled	250	12,260
Nugget, milled	110	5,390
Standard	138	529
Society Girl	34	554
Hope	26	642
Knob Hill	56	4,962
Van Roi, milled	800	37,049
Ethel	2	7
Sunset	12	20
Whitewater	21	21
Other mines		15,426

Totals 2,853 145,200

**B. C. Copper Co.'s Receipts.
Greenwood, B.C.**

Mother Lode	7,222	296,457
Jack Pot	247	23,974
Athelstan	115	17,652
Unnamed	1,514	13,680
Other mines		61,111

Totals 9,098 412,874

**Consolidated Co.'s Receipts.
Trail, B.C.**

Centre Star	3,623	186,421
Sullivan	323	16,203
Le Roi No. 2	226	27,075
Le Roi	525	17,255
Richmond-Eureka	76	2,163
St. Eugene	31	6,446
Silver Cup	30	472
Ruth	35	560
Rambler-Cariboo	61	1,594
Emerald	39	1,842
Standard	138	529
Society Girl	34	554
Hope	26	642
Queen	37	697
Knob Hill	56	4,962
Van Roi	31	1,550
Ethel	2	7

Sunset	12	20
Whitewater	21	21
Other mines		36,657
Totals	7,326	305,670

SILVER PRICES.

	New York.	London.
	cents.	pence.
Dec. 6	55	25 ³ / ₈
" 7	55 ³ / ₈	25 ¹ / ₈
" 8	55 ¹ / ₂	25 ⁵ / ₈
" 9	55 ¹ / ₄	25 ¹ / ₂
" 11	55	25 ³ / ₈
" 12	55 ¹ / ₄	25 ¹ / ₂
" 13	55	25 ³ / ₈
" 14	55	25 ³ / ₈
" 15	55 ³ / ₈	25 ¹ / ₈
" 16	55 ¹ / ₄	25 ¹ / ₂
" 18	54 ⁷ / ₈	25 ⁵ / ₈
" 19	55 ³ / ₈	25 ³ / ₈
" 20	54 ¹ / ₂	25 ¹ / ₈
" 21	54 ⁵ / ₈	25 ³ / ₈
" 22	54 ¹ / ₂	25 ¹ / ₈

TORONTO MARKETS.

Dec. 26.—(Quotations from Canada Metal Co., Toronto).

- Spelter, 6.75 cents per pound.
- Lead, 4.50 cents per pound.
- Antimony, 7 to 9 cents per pound.
- Tin, 45 cents per pound.
- Copper, casting, 14.50 cents per pound.
- Electrolytic, 14.50 cents per pound.
- Ingot brass, 7 to 12 cents per pound.

Dec. 26.—Pig Iron.—(Quotations from Drummond, McCall & Co., Toronto):

- Summerlee No. 1, \$23.00 (f.o.b. Toronto).
- Summerlee No. 2, \$22.50 (f.o.b. Toronto).
- Midland No. 1, \$18.50 (f.o.b. Toronto).
- Midland No. 2, \$18.00 (f.o.b. Toronto).

GENERAL MARKETS.

- Coal, anthracite, \$5.50 to \$6.75.
- Coal, bituminous, \$3.50 to \$4.50 for 1¹/₄-inch lump.
- Coke.

Dec. 22.—Connellsville Coke (f.o.b. ovens).

- Furnace coke, prompt, \$1.75 per ton.
- Foundry coke, prompt, \$1.90 to \$2.00 per ton.

Dec. 22.—Tin, Straits, 44.85 cents.

- Copper, Prime Lake, 14.12¹/₂ to 14.25 cents.
- Electrolytic copper, 14.10 to 14.20 cents.
- Copper wire, 15.25 cents.
- Lead, 4.45 to 4.50 cents.
- Spelter, 6.40 cents.
- Sheet zinc (f.o.b. smelter), 8.25 cents.
- Antimony, Cookson's, 7.87¹/₂ cents.
- Aluminium, 18.50 to 19.00 cents.
- Nickel, 40.00 to 45.00 cents.
- Platinum, ordinary, \$46.00 per ounce.
- Platinum, hard, \$48.50 per ounce.

SHARE MARKET.

(Courtesy of E. D. Warren & Co.)

NEW YORK CURB.

December 20th, 1911.

	Bid.	Asked.
Braden.....	5 ³ / ₄	5 ⁷ / ₈
B. C. Copper	4 ¹ / ₄	4 ¹ / ₂
Butte Coal	22	22 ¹ / ₈
Ely Central .....	.03	.05
Ely Cons.	⁵ / ₈	⁷ / ₈
First National	1 ³ / ₄	1 ⁷ / ₈
Giroux	4 ³ / ₈	4 ¹ / ₂
Greene-Canadian	8	8 ¹ / ₄
Inspiration	10	10 ¹ / ₈

Nevada Hills	2 ⁵ / ₈	2 ³ / ₈
Ohio Copper	1	1 ¹ / ₈
Ray Central	1 ⁷ / ₈	1 ¹ / ₈
Yukon Gold	3 ³ / ₈	3 ¹ / ₂
Union Mines .....	..	..
Goldfields Cons.	4 ⁷ / ₈	5
Nevada Cons.	19 ¹ / ₈	19 ¹ / ₄
Miami	23 ³ / ₈	23 ¹ / ₂
Granby	28	60
Cons. Mining & Smelting ..	43	46
Davis-Daly	1 ¹ / ₈	1 ¹ / ₈
Cons. Arizona	¹ / ₂	¹ / ₈
Rawhide Coal .....	..	..
Ray Cons.	17 ⁷ / ₈	18
Chino	25 ³ / ₈	25 ¹ / ₂
New Baltic .....	..	..
United Copper	1 ⁵ / ₈	1 ⁷ / ₈

COBALT STOCKS.

Bailey .....	.02	.02 ¹ / ₄
Beaver Consolidated .....	.40 ¹ / ₂	.41
Buffalo .....	..	..
Chambers-Ferland .....	.10	.12
City of Cobalt .....	..	..
Cobalt Lake .....	.24 ¹ / ₂	.30
Coniagas .....	..	..
Crown Reserve	2.93	3.00
Great Northern .....	.09 ¹ / ₂	.11
Hargraves .....	..	..
Hudson Bay .....	..	..
Kerr Lake	2.75	3.00
La Rose	3.97	4.02
McKinley	1.67	1.70
Nipissing	7.00	7.12 ¹ / ₂
Nova Scotia .....	..	..
Peterson Lake .....	.05 ⁷ / ₈	.06 ³ / ₄
Right of Way	off	.07 ¹ / ₄
Temiskaming .....	.30	.31
Trethewey .....	.63	.70
Wettlaufer .....	.83 bid	..
Little Nip. ....	.01 ¹ / ₂	.02
Green Meehan .....	.01 ¹ / ₄	.02 ¹ / ₈
Rochester .....	.02	.02 ¹ / ₂
Silver Leaf .....	.03	.03 ¹ / ₄

PORCUPINE STOCKS.

American Gold	1.08	1.08 ¹ / ₂
Apex	off	.10
Coronation .....	..	..
Nor. Exploration .....	..	..
Dobie .....	.75	1.05
Dome Ex. ....	.60	.61
Foley-O'Brien .....	.46	.52
Rea	1.50	1.53
Hollinger	13.70	13.75
Monita .....	.10	.14
Pearl Lake .....	.37	.44
Central	3.25	3.30
Imperial .....	.05 ¹ / ₂	.06 ¹ / ₂
Northern .....	.62	.63
Tisdale .....	.02 ¹ / ₂	.04
Preston East Dome .....	.11 ¹ / ₂	.11 ³ / ₄
Standard .....	.11 ¹ / ₂	.12
Swastika .....	.20	.20 ¹ / ₂
United .....	.02 ¹ / ₂	.02 ⁷ / ₈
Porcupine Gold .....	.57 ³ / ₄	.59
West Dome .....	..	..
Crown Chartered .....	.51	.52
Eldorado .....	.09 ¹ / ₂	.10 ¹ / ₂
Gold Reef	off	.18
Porcupine Canada .....	.85	1.00
Jupiter .....	.49 ¹ / ₂ bid	..
Achilles .....	.33 bid	..
Porc. South .....	.61	.62