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CIRCULATION.

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CONTENTS.

GOLD MINING ON THE RAND

The past few weeks have been marked by serious riots at Johannesburg. According to press reports several men have been killed in the streets by the government police and soldiers in an endeavour to maintain order. Gen. Botha, the ex-Premier, and Gen. Smuts, Minister of Mines, met representatives of the unions and arranged terms of settlement of the strike; but many of the miners have refused to return to work.

The government reports that 1,000 special police proved unable to check the riots and Viscount Gladstone, Governor-General of the Union of South Africa, sent 3,650 soldiers to Johannesburg at the request of the officials there.

What this labour disturbance means to the gold mining industry may be understood when it is known that the average number of rock drills in use at the Transvaal mines is over 6,000, the number having been doubled since 1908.

The Rand has long been the world's chief source of gold. The output has increased greatly in the last five years and in 1913 was £37,182,795, or about 40 per cent. of the world's output.

The South African Mining Journal in a recent issue computed the payable, fully exposed and fully valued tonnage of ore in reserve on December 31, 1912, in the chief producing mines at 87,387,462 tons. Adding ore partially developed or partially valued and tonnages in some smaller mines, a total reserve of 110,000,000 tons is arrived at. The estimated recoverable gold in this ore is estimated at $750,000,000. There is also standing developed in the mines a vast tonnage of low grade ore which may some time be profitably worked.

The enormous amount of work to be done in order to recover the values contained in the ore developed makes it specially unfortunate that labour disputes should intervene, and it is to be hoped that an early settlement of the strike will be made.

According to Canadian Press Despatches bearing date of July 7, a dispute is on over the actual terms of settlement which Gen. Botha and Gen. Smuts made with the unions. The unionists assert they insisted that the government provide for the miners whose places were taken by strike-breakers until new places should be found for them; that Generals Botha and Smuts agreed to this, but thought it inadvisable to put it into writing, and also that the leaders claimed amnesty for the rioters. Gen. Botha replying that that was a matter for the Department of Justice, but giving the impression that he favored amnesty.

The mine-owners say that the strike leaders are attempting to show that they concluded a better bargain than they did in order to strengthen themselves with the men.

PRECIPITATION OF SILVER FROM CYANIDE SOLUTION BY ALUMINUM

In 1906 S. F. Kirkpatrick, Professor of Metallurgy, School of Mining, Kingston, undertook some experiments, with the assistance of the Ontario Bureau of Mines, on the ores of the Cobalt district in order to develop a commercial process of treating them and saving the by products. It was found that the ores were fairly amenable to cyanidation even when they contained 2,000 to 4,000 oz. silver per ton; but the cyanide consumption was heavy, and zinc was not an ideal precipitant, tending to foul the solution and give a bullion below market requirements. Mr. Kirkpatrick found that aluminum could be used satisfactorily, the difficulties experienced by earlier experimenters being overcome by using the metal in the form of a dust. The process was introduced by the Deloro Mining & Reduction Co., in 1908, and has been in use ever since. It is also in use at the O'Brien cyanide plant.

In a recent issue, June 28, of the Engineering and Mining Journal, Mr. Kirkpatrick describes the process and gives the results obtained. In another article in the May 10 issue of the same journal, Mr. E. M. Hamilton discusses the use of aluminum as a precipitant of silver at the Nipissing plant at Cobalt. Mr. Hamilton states that the arsenic and zinc in solution interfered seriously with extraction and that this difficulty was overcome by substituting aluminum for zinc. Owing to the fact that aluminum does not form any compound with cyanogen, not only is the whole of the cyanide recovered which was combined with the precious metals, but also the additional loss of cyanide by direct combination with the zinc is avoided.

MAGMATIC WATER

Dr. A. P. Day at a recent meeting of the Geological Society of America exhibited a sealed glass tube about two feet long and an inch or more in diameter in which was about a pint of actual magmatic water. This was obtained by Dr. Day and Dr. E. D. Shepherd, of the Carnegie Geophysical Laboratory, from a little blister-cone a short distance from the main lake of lava at Kilauea. Through a pipe they exhausted from the immediate surface of a mass of molten rock the gases which were being given off and which above the tube became ignited as flames. From these gases the two investigators, at a safe distance, were able to condense in tubes unmistakable samples of water.

In view of the fact that some investigators have shown that the exhalations from volcanoes in some instances contain very little water and doubt has been thrown on theories based on the assumption that magmas contain water, the work of Dr. Day and Dr. Shepherd is of special interest. By Prof. Kemp, of Columbia University, that pint of water must have been viewed with loving eyes.

IRON ORE CONTINUES TO GREAT DEPTH ON THE MARQUETTE RANGE

It was feared in the early days of iron mining in Michigan that the ore would not persist to any great depth; but the development work in recent years has shown that the iron formations are in many places ore-bearing at considerable depth. R. C. Allen, Director of the Michigan Geological Survey, in a recent report states that there is more ore in sight now than ever before. The Marquette district has shipped nearly 100,000,000 tons of iron ore and the mines have in sight above the bottom levels about 50,000,000 tons. According to C. K. Leith recent deep drilling in bottom horizons of the Negaunee formation "suggests that the beds of this horizon at great depths may ultimately be found to carry a larger tonnage of ore than those of any of the other horizons." Mr. Allen states that in the Marquette as well as in the Gogebic district development at great depth has changed what was formerly a hope into a practical certainty. Deeply buried portions of the iron formation are ore-bearing and are likely to be fully as productive as the shallower parts.

THE TERRITORY OF NEW QUEBEC

The Mines Branch of the Department of Colonization, Mines and Fisheries has just sent out a volume containing extracts from reports on the District of Ungava, recently added to the Province of Quebec. The report was compiled from various sources and edited by Theo. C. Denis, Superintendent of Mines. It is accompanied by a large map, coloured geologically in parts where the necessary information was available. The chief source of such information has been the reports of explorations by A. P. Low and Robert Bell for the Geological Survey of Canada.

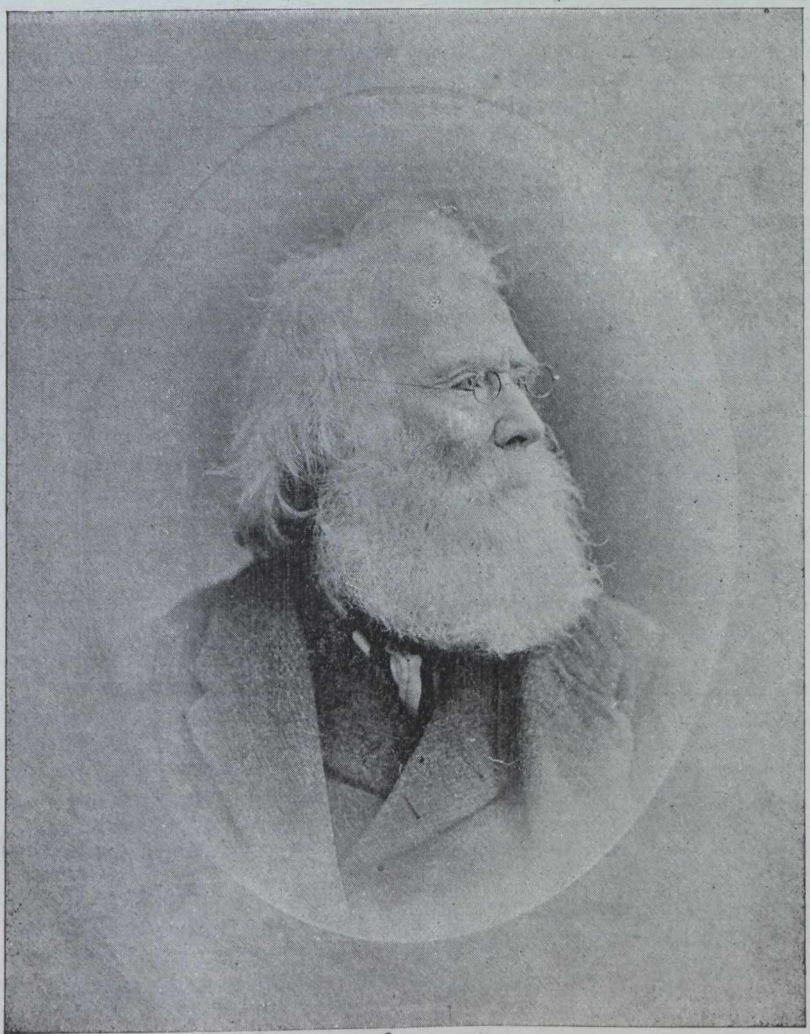
The report includes much useful information on water powers, physical geography, climate, soil, plants and fisheries. Detailed descriptions are given of the country along the main water routes.

While no originality is claimed for the contents of the report the work is a very useful one, as it makes the information on Ungava readily available.

THE TWELFTH INTERNATIONAL GEOLOGICAL CONGRESS

The Twelfth International Geological Congress, which is to be held in Canada this year, gives promise of being a marked success. The governments of twenty-five different countries have signified their intention of sending official delegates, and various scientific institutions in thirty-eight countries will be represented. The membership already is about 800, consisting of leading geologists and mining engineers of the whole civilized world.

The session of the Congress will be held in Toronto on August 7 to 14, inclusive, during which papers of great general geological interest will be read and discussed. The most attractive feature, however, is the opportunity that will be afforded to visit the leading mining districts and points of greatest geological interest in the country. To this end a great number of excursions have been arranged for.



The Late Sir W. E. Logan
First Director, Geological Survey of Canada.

Arrangements for the Session in Canada.

The Congress visits Canada this year on the invitation of the Government of Canada, transmitted through the foreign office and through the British Ambassador in Sweden. It was supported at the Stockholm session by Dr. W. G. Miller, for the Province of Ontario, and Dr. Frank Adams, who represented on this occasion the Government of Canada.

On December 2, 1910, an inaugural meeting was held in Toronto. It was called at the instance of the general secretary, R. W. Brock, acting for the government as the Director of the Geological Survey. At it were present representatives of the Institutions who had invited the Congress to be present in Canada and a small executive committee was appointed with instructions to appoint such other committees as might be required as and when they were required.

Committees dealing with the following subjects were appointed: Organization, coal resources, editorials, excursions, finance, leaders of discussions, official invitations, patronage, publications, qualifications for membership, Toronto local, transportation, and a committee to appoint an assistant secretary. Some of these committees have completed their work and have been dissolved, but most of these are still active and consist of one or two members of the Executive committee with in some cases other gentlemen but in each case they report direct to the executive committee which makes itself responsible for the financial arrangements.

Preparations were made for publication of a monograph on the Coal Resources of the World to consist of 1200 pages published in three volumes accompanied by an atlas of 70 maps. The work has been accomplished under the editorship of Messrs. William McInnes and D. B. Dowling, and is a credit to the country.

The excursions will, no doubt, be the leading feature of the Congress and every effort is being made to make them attractive both to geologists and mining engineers. The itineraries of the excursions are contained in circulars distributed by the secretary. The guide books consist of fifteen volumes comprising a total of more than 1,600 pages and 140 maps.

The preparation of guide books for use on excursions has proven to be one of the most useful features of the sessions. By this means a great deal of information concerning the structural geology and ore deposits of the countries visited has been made available. The set of guide books prepared for the Canadian meeting covers practically all through railway lines and steamboat routes from Sydney in Cape Breton to Dawson in Yukon. They consist in all of 1,600 pages, contain well arranged notes, are of convenient size, are accompanied by geologically coloured maps and sections and make a notable contribution to the literature treating of the geology of the country. Their attractive appearance, the fine quality of the material entering into their make up, and the excellent typography reflect great credit upon the Government Printing Bureau by whom the printing was done.

OBJECT AND WORK

Geology is defined as the science treating of the earth's history, and it includes the study of its mineral deposits and the floras and faunas which have successively clothed and peopled the earth's surface. The direct value of geological work is now fully recognized, especially by those connected with mining, civil and hydraulic engineering, it being daily applied not only to mining problems, but to many others, such as water supplies, foundations for bridges and large buildings, dams, road construction, etc. In fact, in the recognition of the commercial importance of geology there is danger that some branches of the science may be overlooked or slighted. It is well, therefore, to point out that in many cases the application of geology to engineering and commercial work has been made possible only by the study of problems which appear to be solely of scientific interest. The International Geological Congress takes care that all aspects of geology receive adequate consideration in its sessions.

The object of the International Geological Congress is, briefly, the advancement of knowledge concerning the earth both in the field of pure geological science and in its application to the arts and industries, through the association and co-operation of leading geologists and engineers of all nations.

The more important methods by which it endeavours to accomplish its aim are as follows:—

Meetings, publications, international committees, excursions and prizes.

Meetings.—The meetings are held every three years in different countries, and each session lasts from seven to ten days. The meetings are attended by members from every civilized country. The leading countries, societies and universities are represented by specially appointed delegates. Papers bearing on questions of general interest are read and discussed. As main topics for discussion subjects of scientific or economic importance are selected in advance so that every member who can contribute knowledge on the subject may be prepared to do so. In this way, the exact state of present knowledge on these topics is put forth and made known.

Publications.—The transactions of the Congress are published as soon after the session as possible. They contain the more important papers and discussions, and a general report on the business and work of the Congress. The transactions of the eleventh Congress form two volumes totaling 1,413 pages. In addition, a quarto volume of papers on "Changes of Climate since the Maximum of the Last Period of Glaciation," and two quarto volumes and a large atlas on "The Iron Ore Resources of the World" stand to the credit of the eleventh Congress.

International Committees.—Committees are formed to deal with questions requiring international or concerted action.

Such subjects as the standardization of geological colours and signs employed on maps, the standardization of geological nomenclature, and the planning of general geological maps covering an entire continent have been dealt with by these committees.

Excursions.—Excursions have become an outstanding feature of the sessions, special facilities being provided in the country in which the meeting is held to enable the delegates coming from every portion of the world to make, at small expense and under expert guidance, a personal study of its geological structure and mineral resources.

The value of the excursions is not confined to what is seen and learned. They afford the best opportunity for the members to fraternize and to become acquainted with each other and with each others' work and ideas. The informal discussions of the geological problems presented in the field and the information that is thus brought out concerning the methods employed in the various parts of the world in attacking and solving similar problems: and the use that has been found for neglected or little-known substances; these and similar discussions are perhaps the most instructive and valuable features of the Congress.

Prizes.—The Congress affords the necessary machinery for awarding prizes for special achievement in the science or application of geology. The Spendiarow prize, founded by a Mr. Spendiarow of St. Petersburg, Russia, in memory of his son, is awarded at each session for the most important work accomplished by an individual since the preceding session. Special prizes have been awarded at various sessions.

Value of the Congress.

From even such a brief recital of the object and work of the Congress, its importance is evident, but a few other points may be touched upon. It has secured the co-operation of the governments of various countries, as well as of men of science that has resulted in the magnificent geological map of Europe now approaching completion. A similar geological map of the whole world will be undertaken. As an example of valuable international studies may be mentioned the very careful investigation into the iron ore resources of the world, the results of which are embodied in a series of magnificent volumes, in which the extent, quality and mode of occurrence of the iron ore resources of every country of the world are set forth, and illustrated by means of maps and plans. A similar plan of study is now in progress to determine the coal resources of the world, a full report of which will be issued in 1913 before the meeting of the Congress in Canada. The Congress serves, in a sense, as an international clearing house for geology. These great gatherings of distinguished scholars of all nationalities have aroused greater interest in geology on the part of private individuals, corporations and

Governments, given it a higher standing as a science, and rendered possible its increased economic application.

The country entertaining the Congress is repaid in many ways. The excursions are participated in by the more eminent geologists and mining engineers of the world, giving them a knowledge of its resources and possibilities, which they spread abroad, for they are the advisers of capital; the writers of text books and authoritative articles; and the instructors in universities and schools. Their criticisms and suggestions based upon their experience with similar problems and conditions in other parts of the world are helpful and stimulating to the home geologists and mining engineers. After leaving any country they have learned where to obtain reliable information concerning it and they follow its developments and discoveries as announced in the press and technical papers.

Character of Attendance.

Geologists from every quarter of the globe attend the Congress. The word "International" in the title was well chosen and the character of the attendance at each Congress has been remarkable for the number of different nationalities represented. As to the personnel of the members, they may be broadly classed in three divisions.

1st. Professors and teachers from the leading colleges and universities as well as the technical mining schools.

2nd. Officers of Government geological surveys or equivalent organizations.

3rd. Geologists and mining engineers in private practice.

History.

The foundation of the Congress was inspired by the collections of geological maps and sections from various regions of North and South America, as well as from many countries of Europe which were shown at the International Exhibition in Philadelphia in 1876. The advantage of such comparative study so deeply impressed visiting geologists that at the annual meeting of the American Association for the Advancement of Science held in Buffalo, August, 1876, a committee was appointed to arrange for an international congress of geologists at the 1878 Paris Exhibition.

It is interesting to note that Dr. T. Sterry Hunt, who from 1847 to 1872 was chemist and mineralogist to the Geological Survey of Canada, was Secretary of this first committee—the Comite Fondateur of 1876, and at the first session of the Congress, held in Paris in 1878, Messrs. A. R. C. Selwyn, T. Sterry Hunt and Paul de Caze were the Canadian delegates, twenty-three countries being represented.

ORGANIZATION OF THE CONGRESS

The following paragraphs are from a circular sent out to geologists in the year 1876 by D. T. Sterry Hunt and associates. It presents the aims of the men who organized the Congress.

"The activity which has prevailed in the study of geology within the past generation has given to it a great importance both from a scientific and an economic point of view, and has resulted in a large accumulation of facts and materials. Workers in different countries have, however, pursued their labours to a great extent independently of each other, and have given their results in such ways that it is often difficult to co-ordinate them. Those geologists from Europe and America who have been at the International Exhibition at Philadelphia in 1876, have found there important collections of geological maps and sections, with rocks and organic remains from various regions of North and South America, as well as from many countries of Europe, and they have become deeply impressed with the great advantages to be gained by their comparative study. It was, moreover, evident that the bringing together of a still larger number of such collections in accordance with a previously arranged plan, could not fail to lead to important results for geological science. The International exhibition to be held at Paris in 1878 will furnish such an occasion, and it is proposed to invite to that end governmental geological surveys, learned societies and private individuals throughout the world, to send to Paris such collections as will make the geological department of that exhibition as complete as possible.

"In order to take advantage of the collections which may thus be brought together it is moreover proposed to convoke an International Geological Congress, to be held at Paris at some time during the Exhibition of 1878, and to make that Congress an occasion for considering many disputed problems in geology.

The Late Dr. T. Sterry Hunt
Secretary of the Committee of 1876

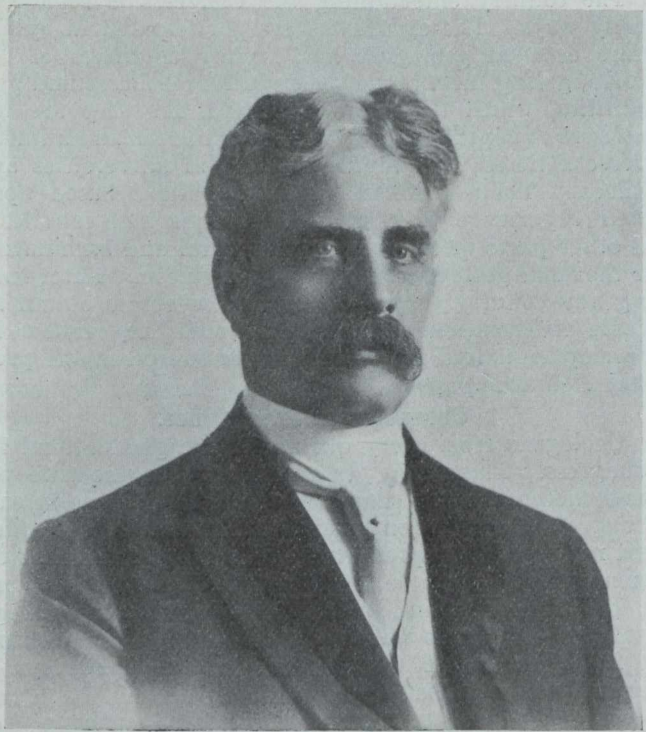
"In accordance with this plan it is proposed that the geological department of the International Exhibition of 1878 shall embrace:

"I. Collections of crystalline rocks, both crystalline schists and massive or eruptive rocks, including the so-called contact formations and the results of the local alteration of uncrystalline sediments by eruptive masses. In this connection are to be desired all examples of organic remains found in crystalline rocks, including Eozoon and related forms. These collections should moreover comprehend all rare and unusual rocks of special lithological, mineralogical and chemical interest, examples of ore-deposits and of veinstones of all kinds, with their encasing rocks. As far as possible these collections should be limited to specimens of

PATRONS

Honorary President:

His Royal Highness, the Duke of Connaught Governor-General of the Dominion of Canada,



Honorary Vice-President:

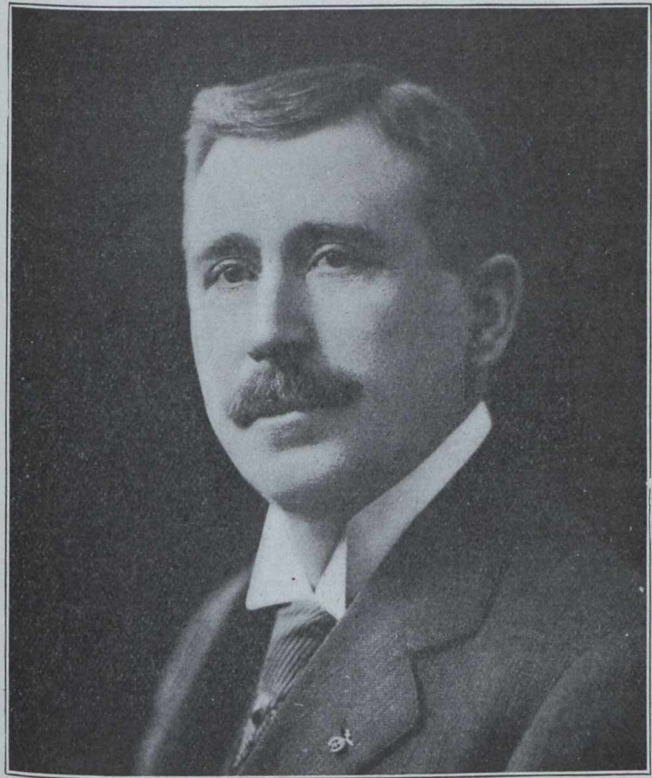
Prime Minister of the Dominion of Canada and Secretary of State for External Affairs

Honorary Vice-President:

Hon. L. Coderre, Minister of Mines, Ottawa

Honorary Vice-President:

Hon. Frank Cochrane, Minister of Railways and Canals, Canada



Honorary Vice-President:

Hon. W. H. Hearst, Minister of Lands, Forests and Mines of Ontario

a size convenient for examination, and be accompanied with sections prepared for microscopic study. In the arrangement of all these materials regard should be had to their natural associations rather than to theoretical notions or artificial classifications, so that they may be studied not only petrographically but geognostically.

"II. Collections illustrating the fauna and the flora of the paleozoic and more recent periods, particularly of such horizons as present a more critical interest to paleontologists from the first appearance or the disappearance of important groups of organic forms. It has appeared to the committee named below that the organic remains of the Cambrian, Taconic or so-called Primordial strata merit especial attention in this connection.

"These various collections should be explained as fully as possible by labels, catalogues, monographs and maps.

"III. Collections of geological maps, and also of sections and models, especially such as serve to illustrate the laws of mountain structure. In the geological maps regard should be had to various questions which deserve the special consideration of the Congress, such as the scales best adapted for different purposes, the colours and symbols to be used, and the proper mode of representing superficial deposits conjointly with the underlying formations. A discussion of these will prepare the way for improved general geological maps of the continents.

"In pursuance of the above plan the American Association for the Advancement of Science during its annual meeting at Buffalo, under the presidence of Prof. William B. Rogers, unanimously adopted the following resolution on the 25th of August, 1876:

"Resolved, That a Committee of the Association be appointed by the chair to consider the propriety of holding an International Congress of Geologists at Paris during the International Exhibition in 1878, for the purpose of getting together comparative collections, maps and sections, and for the settling of many obscure points relating to geological classification and nomenclature. And that to this committee be added our guests, Prof. T. H. Huxley, of England; Dr. Otto Torell, of Sweden, and Dr. E. H. von Baumhauer, of the Netherlands, who shall be requested to open negotiations in Europe looking to a full representation of European geologists at the proposed Congress. The said committee to consist of Prof. William B. Rogers, Messrs. James Hall, J. W. Dawson, J. S. Newberry, T. Sterry Hunt, C. H. Hitchcock and R. Pumpelly in behalf of the Association, with the addition of Prof. T. H. Huxley, Dr. Otto Torell and Dr. E. H. von Baumhauer.

"On the same day, at a meeting of the Committee, Prof. James Hall was elected chairman, and Dr. T. Sterry Hunt, secretary. It was then resolved to prepare the present circular, to be printed in English, French and German, and distributed to geologists throughout the world, asking their co-operation in this great work of an International Geological Exhibition and an International Geological Congress to be held at Paris in 1878; the precise date of the Congress to be subsequently fixed.

"All those interested in this project are invited to communicate with any one of the following members of the Committee: Prof. T. H. Huxley, London, Eng.; Dr. Otto Torell, Stockholm, Sweden; Dr. E. H. von Baumhauer, Harlem, Holland; Dr. T. Sterry Hunt, Boston, Mass., U. S. A."

Boston, Massachusetts, Sept., 1876.

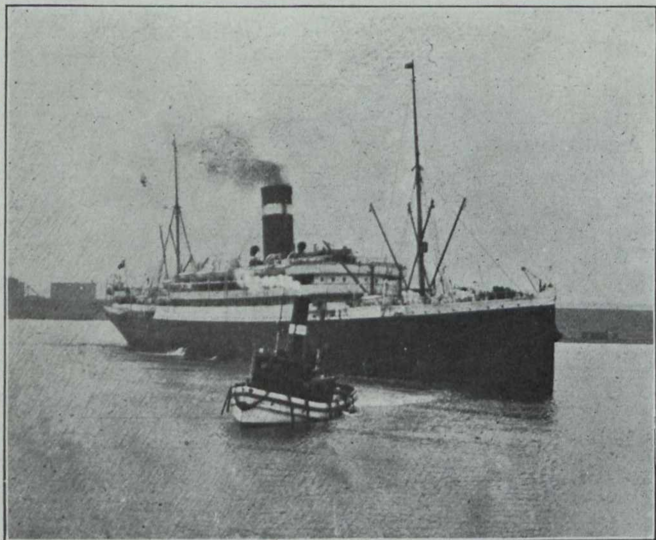
Honorary Vice-President:

Hon. E. H. Armstrong, Commissioner of Works and Mines of Nova Scotia

QUEBEC AND MARITIME PROVINCE EXCURSION

The A1 Excursion.

The first excursion in connection with the Twelfth Congress left Montreal at 1 o'clock Monday morning, July 14, for points in Quebec, New Brunswick, Nova Scotia and Cape Breton.



Str. Virginian with several geologists on board arriving at Montreal

Dr. G. A. Young, leader; E. R. Faribault, associate leader; R. Harvie, secretary, and A. Mailhiot, assistant secretary for this excursion, looked after the members as they arrived. Dr. F. Adams, president of the Congress; W. S. Lecky, secretary, and P. D. Quensel, who was secretary of the last Congress in Sweden, were on hand to make the final arrangements and see the excursion well started. Dr. Adams and Mr. Lecky went as far as Quebec and Dr. Quensel stayed with the party for several days.

A special train on the Intercolonial Railway carries the party of about 50 members. There are plenty of sleepers and two diners on the train. In the baggage cars a box is provided for each member to store specimens, etc., collected on the trip.

The train reached Levis early Monday morning. Here Dr. Percy Raymond, guide for the day, joined the party, and directly after breakfast a visit was made to points of interest about the town.

Splendid exposures of the Levis and Sillery formations were seen in the cliff back of the town. Dr. Raymond pointed out many of the most noteworthy features of the geological structure.

The rocks on either side of the St. Lawrence at this point are quite different. Between Levis and Quebec there are two major faults, known as the St. Lawrence and Champlain. On the Levis or hanging side the rocks exposed are much crumpled and folded, while on the Quebec or foot side the rocks have been less disturbed.

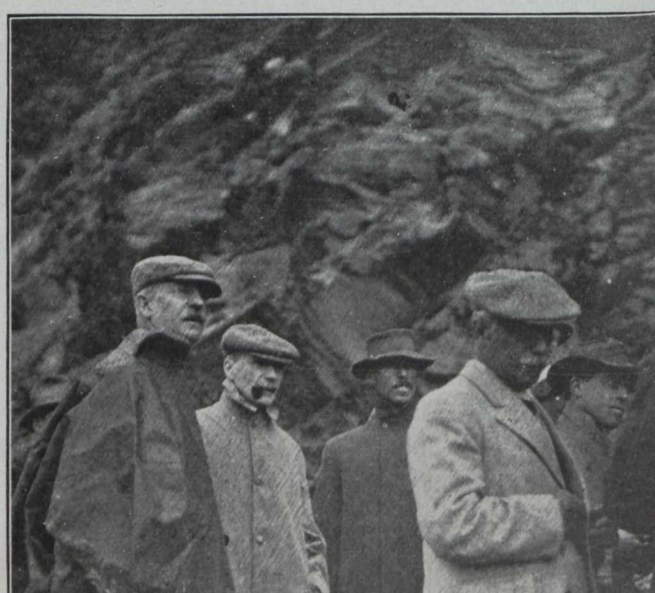
It is thought that forces acting from the southeast have forced the Levis and Sillery formations up and over so that they now appear, on casual examination, to be stratigraphically higher than what are in reality younger rocks on the Quebec or northern shore.

During the morning the party visited several good exposures at Levis, where the folded and faulted structure of the rocks could be studied. On Davidson Street a well-exposed sharp anticline was seen. At other points conglomerate beds among the shales were followed and found to pinch out. In several places fossil hunters were rewarded by interesting discoveries. Many expressed a desire to visit the locality again. Owing to poor exposures in some interesting places the actual contact between the Sillery and Levis formations could not be carefully studied. Dr. Raymond stated that the evidence indicates a fault between the formations in a little ravine visited by the party. Some of the members, from their brief examination, were led to express very diverse views; but an armistice was arranged until more careful examination has been made by the exponents of opposing views.

About noon the party crossed by ferry to the Quebec side of the St. Lawrence and went by electric cars to Montmorency Falls. Here lunch was served at Kent House. An address of welcome on behalf of the City of Quebec was delivered by Sir Georges Garneau. Dr. Frank Adams replied on behalf of the Congress, and extended Canada's welcome to the members from abroad. He then called on Dr. P. M. Termier, Director of the Geological Survey of France, Dr. B. Weigand of Strassburg, and Dr. A. Strahan, of the Geological Survey of Great Britain, who responded on behalf of France, Germany and Great Britain respectively.

After luncheon the exposures in the vicinity of Montmorency Falls were visited, and the structural features were explained by the guides. It was pointed out that a major fault exists here, that the rocks above the falls are older than those below, that above the falls the Trenton beds lie almost in their original position on the eroded surface of Archean gneiss, and that at the foot of the falls, the Paleozoic rocks have been brought down against the Archean by a normal fault. At the brink of the falls there are remarkably good exposures, showing the fossiliferous Trenton limestone lying on the Archean gneiss. According to Dr. Raymond the sponges and corals are standing practically in the position in which they grew on the Archean floor.

After examining the exposures above the falls the party went down below and saw good evidence of the



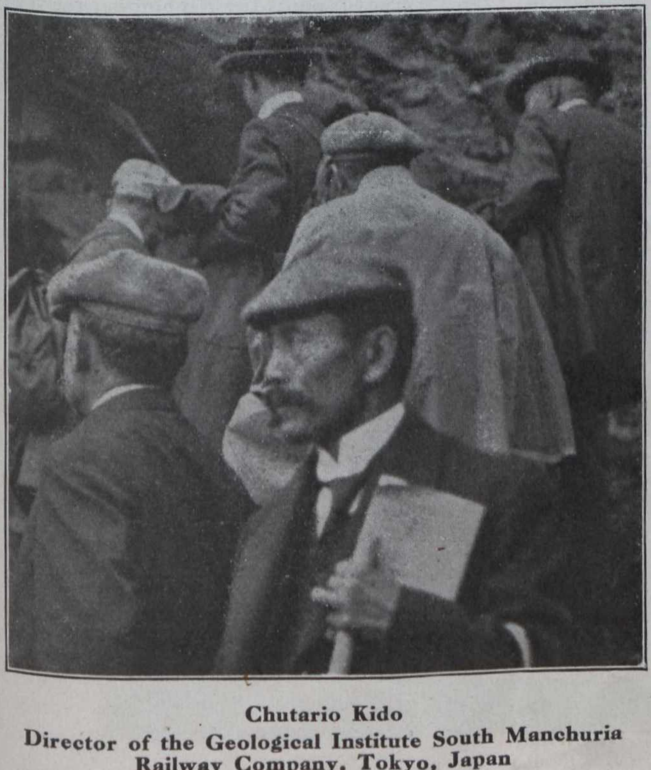
During a Shower at Levis

E. O. Ulrich, U.S.A.; L. M. Lambe, Canada; H. P. Cushing, U. S. A.; E. R. Faribault, Canada

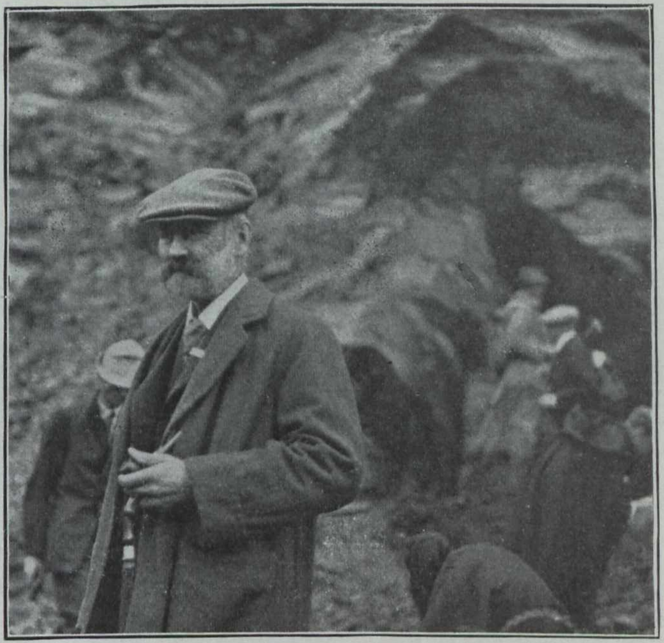
faulted structure . The fossiliferous beds were here industriously attacked by the European and American visitors. The German geologists were especially busy with their little hammers, as may be seen in some of the accompanying photographs.

Dr. B. Weigand, Germany

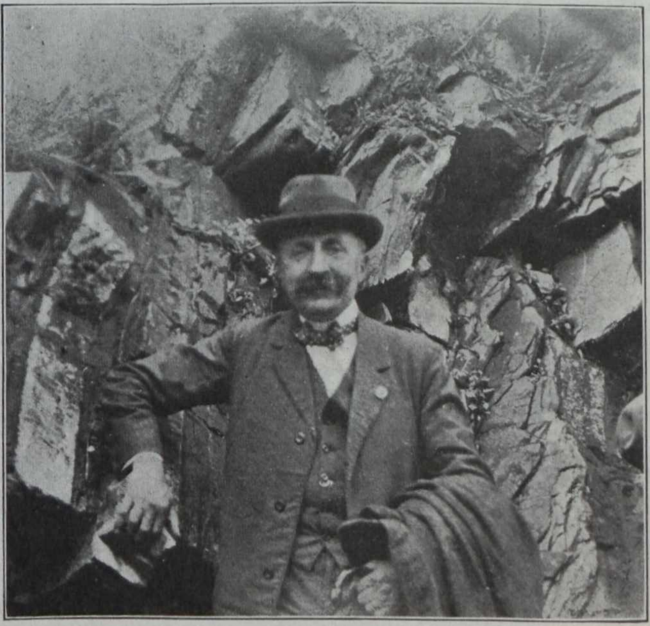
Professor B. Weigand, delegate of the Oberrheinischer Geologischer Verein, Stuttgart, is the eldest of the German visitors. He is an indefatigable traveller and is noted for his custom of choosing the longest excursions. In Sweden he was one of the few who made the trip to Spitzbergen. This year he intends to be a member of the party which will go to the Yukon. Dr. Weigand always has been much interested in the study of earthquakes and was the first to systematically record the shocks.



Chutario Kido
Director of the Geological Institute South Manchuria Railway Company, Tokyo, Japan

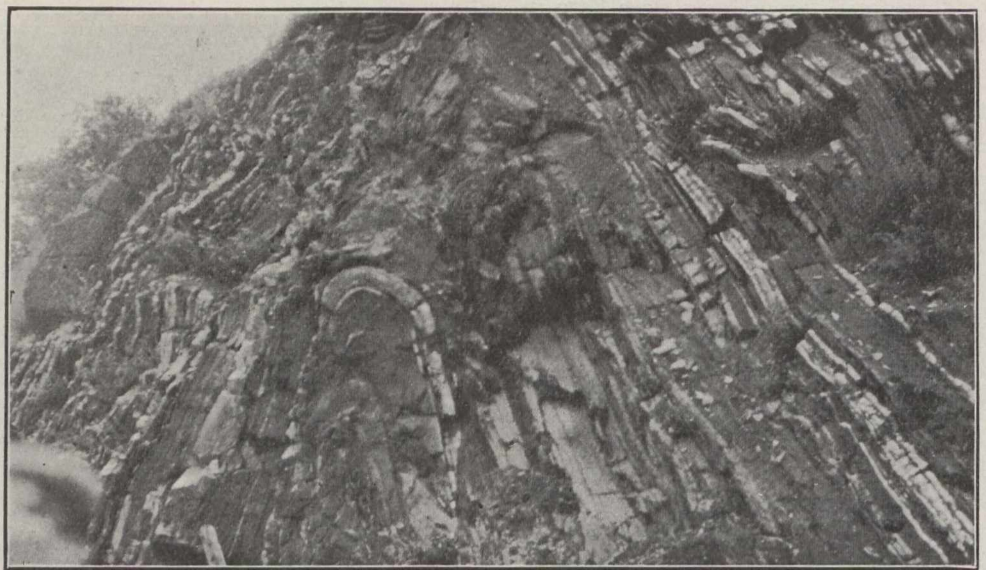


Aubrey Strahan, F.R.S.
Director Geological Survey of Great Britain



P. M. Termier
Director Geological Survey of France

P. M. Termier, Director of the Geological Survey of France, has made a special study of the changes in rocks brought about by mountain building forces and has done much towards making clear Alpine geology. He is a delegate of the Service de la Carte Geologique de la France, the Societe Francaise de Mineralogie, the Ecole Polytechnique, Paris, and of the Association Amicale des Eleves de l'Ecole Nationale Superieur des Mines, Paris.



Anticline in Levis formation, Levis, Quebec

By electric cars the party returned to Quebec. Here carriages furnished by the city were waiting for the members. A long drive through the historic town up the hill and out past the Plains of Abraham and back along the shore road to the ferry completed an interesting afternoon.

In the evening the members attended a reception by the city, held at Laval University. The buildings and equipment were shown to the guests and proved to be much more pretentious than had been thought by many. The equipment of the scientific laboratories is remarkably good and elicited much praise.

After listening in the University gardens to a programme rendered by the Guards band, and partaking of refreshments, the party returned to the train, much pleased with the splendid reception accorded them by the City of Quebec. Early next morning a start was made for Riviere du Loup and other points in Quebec and the Maritime Provinces.

The officers of A1 excursion are:—

Leader—G. A. Young.

Associate Leaders—J. M. Clarke, E. R. Faribault.

Secretary—R. Harvie.

Assistant Secretary—A. Mailhiot.

The following members have registered or will join the party en route:—

Andree, K., Dr., Privatdozent fur Geologie an der Universitat Marburg, Germany.

Arlt, Hans, Dr., Kgl. Bergassessor, Herzogparkstrasse 2, Munchen, Germany.

Bailey, L. W., Professor, University of New Brunswick, Fredericton, New Brunswick.

Bancroft, J. A., Dr., Associate Professor of Geology, McGill University, Montreal.

Barrows, W. L., M.A., 28 Brownell Avenue, Hartford, Conn., U.S.A.

Bell, W. A., St. Thomas, Ontario.

Boden, K., Dr., Privatdozent fur Geologie der Universitat, Geologisches Institut, Alte Akademie, Munchen, Germany.

Examining a conglomerate bed at Levis

Faulted conglomerate bed, Levis, Quebec

Burling, L. D., Geological Survey of Canada, Ottawa.

Cadell, H. M., Grange, Linlithgow, Scotland.

Caillebotte, Jean, Paris, France.

Carruthers, R. G., H. M. Geological Survey, 33 George Square, Edinburgh, Scotland.

Clarke, John M., Dr., New York State Geological Survey, Albany, New York, U.S.A.

Cole, L. H., Department of Mines, Ottawa.

Cushing, H. P., Dr., Professor of Geology, Western University, Cleveland, Ohio, U.S.A.

Faribault, E. R., Geological Survey of Canada, Ottawa.

Gardner, S. Mc., Mining Student, Mount Vernon Colliery Co., Ltd., Glasgow, Scotland.

Goldman, M. J., Dr., Johns Hopkins University, Baltimore, U.S.A.

Gurich, Georg, Dr., Professor, Lubeckertor 22, Hamburg, Germany.

Haniel, C. A., Dr., Venusbergweg 8, Bonn a. Rh., Germany.

Hartnagel, Chris., Education Building (State Museum), Albany, U.S.A.

Harvie, R., Dr., Geological Survey of Canada, Ottawa.

Hayes, A. O., 112 Mercer Street, Princeton, New Jersey, U.S.A.

Haycock, E., Professor of Geology, Acadia College, Wolfville, Nova Scotia.

Hobson, B., Thornton, Hallamgate Road, Sheffield, England.

Holbrook, E. A., Prof., Nova Scotia Technical College, Department of Mining Engineering, Halifax, N.S.

Holtedahl, Olaf, Dr., Maitre des conferences, Universitetets mineralogiske Institut, Kristiania, Norway.

Hore, R. E., Canadian Mining Journal.

Howley, J. P., Director of the Geological Survey of Newfoundland, St. John, Newfoundland.

Hudson, J. G. S., Mines Branch, Department of Mines, Ottawa.

Hyde, J. E., School of Mining, Kingston, Ontario.

Jehu, J. T., Dr., The University, St. Andrews, Scotland.

Viewing an Exposure of Levis formations

M. B. Baker, Kingston — E. M. Kindle, Ottawa — E. O. Ulrich, U.S.A. — H. P. Cushing, U.S.A. — A. C. Lawson, U.S.A.

At Levis Quebec

P. D. Quensel, Sweden ; W. Paulcke, Germany ; S. Powers, U. S. A.; Mlle. M. Termier and P. M. Termier, France ; R. Zuber, Austria ; Abbe R. Guimond, Quebec

Kido, Chutario, Dairen, Kantoshu, Manchuria.

Kindle, E. M., Dr., Geological Survey of Canada, Ottawa.

Lambe, Lawrence M., Geological Survey of Canada, Ottawa.

Lawson, A. C., Dr., Professor of Geology, University of California, Berkeley, California, U.S.A.

Lindeman, E., Mines Branch, Department of Mines, Ottawa.

Lory, P., 6, rue Fantin-Latour, Grenoble, France.

Mailhiot, A., Professor of Geology, Laval University, Montreal.

Martius, S. G., Dr., Assistant am mineralogish-petrographischen, Institut der Universitat Bonn, Poppelsdorfer Schloss, Bonn a. Rh., Germany.

Matthew, G. F., Dr., St. John, New Brunswick.

McIntosh, D., Professor of Geology, Dalhousie University, Halifax, Nova Scotia.

Michalon, Lucien, Ingenieur des Mines, 96 rue de l'Universite Paris, France.

At Levis, Quebec

H. P. Cushing, U.S.A; F. D. Adams, Canada; and W. Paulcke, Germany

At the Foot of Montmorency Falls

P. Zoude, Belgium and P. D. Quensel, Sweden

At Montmorency Falls

M. B. Baker, Kingston; Percy Raymond, Harvard, U.S.A.; P. Zoude, Belgium; Theo. Denis, Quebec

Mitscherlich, H. E., Bergingenieur, Parkstrasse 9, Karlsruhe, Germany.

Part, G. M., Trinity College, Cambridge, England.

Paulcke, W., Dr., Professor der Geologie an der Grossh, Badischen Technischen Hochschule Fridericiana, Karlsruhe, Baden, Germany.

Powers, S., Technology Chambers, Boston, Mass., U.S.A.

Pruvost, P., 159 rue Brule-Maison, Lille, France.

Quensel, Percy D., Dr., Lecturer in Petrography, University of Upsala, Upsala, Sweden.

Rathgen, Miss A., Argelanderstrasse 11, Bonn a. Rhein, Germany.

Raymond, Percy, Assistant Professor of Paleontology, Harvard University, Cambridge, Mass., U.S.A.

Riedel, A. J., Gausstrasse 25, Braunschweig, Germany.

Saint-Clivier, Hubert, Paris, France.

Fossil Hunters at Montmorency

Mlle M. Termier, France; W. Paulcke, Germany, H. E. Mitscherlich, Germany

Schuchert, C., Professor of Geology, Yale University, New Haven, Conn, U.S.A.

Strahan, A., Dr., 28 Jermyn Street, London, S. W., England.

Stolley, E., Dr., Professor, Technische Hochschule, Braunschweig, Germany.

Termier, Mlle M., 164 rue de Vaugirard, Paris XV., France.

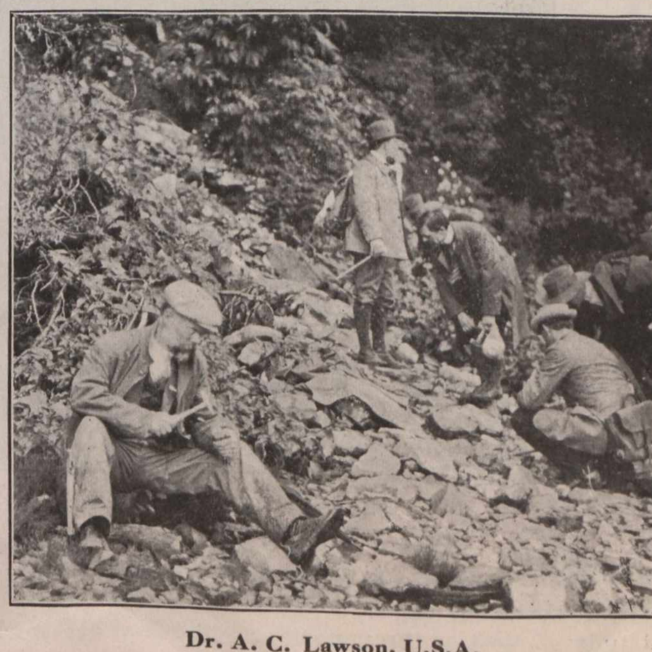
Termier, P. M., Directeur du Service de la Carte Geologique de France, 164 rue de Vaugirard, Paris XV., France.

Tillman, N., Dr., Lennestrasse 19, Bonn a. Rhein, Germany.

Tolmacev, I. P., Conservateur en Chef du Museee Geologipue Pierre le Grand de I,Academie Imperiale des Sciences, St. Petersbourg, Russia.

Twenhofel, W. H., Dr., Lawrence, Kansas, U. S. A.

Ulrich, E. O., 2421 First Street, Washington, D.C., U. S. A.



Dr. A. C. Lawson, U.S.A.

Trenton limestone lying on eroded surface of Archean gneiss, Montmorency Falls, Quebec

von Grote, F., Dr., Martiusstrasse 1, Munchen, Bayern, Germany.

Welter, O. A., Dr., Neringstr., 4, Bonn a Rh., Germany.

Weigand, B., Dr., Professor, Schiessrain 7, Strassburg i. Elsass, Germany.

Wigglesworth, E., Geological Museum, Cambridge, Mass., U. S. A.

Williams, H. S., Dr., Professor of Geology, Ithaca, N. Y., U. S. A.

Woodworth, J. B., Professor, Harvard University, Geological Museum, Cambridge, Mass., U. S. A.

Wordie, J. M., Professor, St. John's College, Cambridge, England.

Wright, W. J., Bear River, Nova Scotia.

Young, G. A., Dr., Geological Survey of Canada, Ottawa.

Zoude, P., Ingenieur civil des Mines, 109 Boulevard de Grande-Ceinture, Bruxelles, Belgium.

Zuber, R. Professor der Geologie, Universitat, Lemberg, Austria.

At Montmorency Falls

R. Zuber, Austria; P. D. Quensel, Sweden; Percy Raymond, U. S. A.; M. B. Baker, Canada; W. Paulcke, Germany
H. E. Mitscherlich, Germany; Chris. Hartnagel, U. S. A.; Theo. Denis, Canada.

Professor Dr. R. Zuber, delegate of the K. K. Franzens Universitat, Lemberg, is an oil specialist. He has made a study of most of the important oilfields of the world and is a prominent authority.

PROGRAMME FOR THE SESSION AT TORONTO

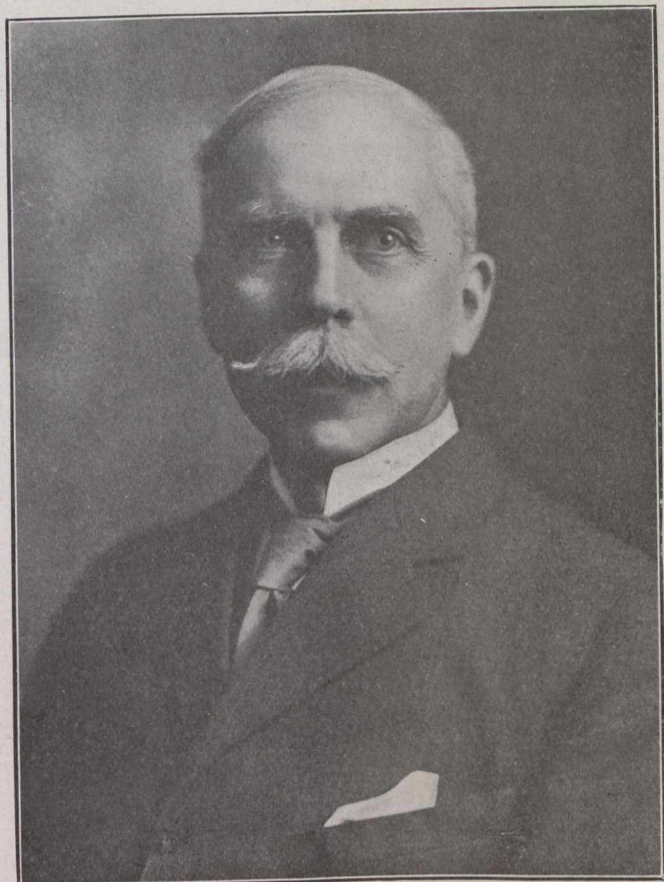
The following programme is provisional and subject to change. The Secretary will be glad to receive suggestions. If requested by the Presidents or Secretaries, special time will be alloted for meetings during the Session of any of the International Committees.

The following sections have been suggested:

Section 1—(a) Pre-Cambrian; (b) Economic; (c) Petrology, Mineralogy, etc.

Section 2—Paleontology and Stratigraphy.

Section 3—Glacial Geology and Physiography.



President, Twelfth Session

Frank D. Adams, F. R.S., Dean of the Faculty of Applied Science and Logan Professor of Geology, McGill University

Wednesday, August 6th.—8.00 p.m., Reunion and informal reception by the Toronto Local Committee. Costume de voyage. Convocation Hall, University of Toronto.

Thursday, August 7th.—10.00 a.m. Meeting of Council for organization and appointment of Bureau. 12.00 noon, Opening General Meeting, Convocation Hall. 3.00 p.m., General Meeting—Reports of International Committees of the Congress. 8.00 p.m., Popular lecture in Convocation Hall, University of Toronto.

Friday, August 8th.—9.00 a.m., Meeting of Council. 10.00 a.m., General Meeting: Topic No. 1. 2.30 p.m., Section 1: Topic No. 2; Section 2: Topic No. 6. 1.15 p.m., Ladies' Luncheon. All day, Excursion B-3, Hamilton.

Saturday, August 9th.—9 a.m. Meeting of Council. 10.00 a.m., General Meeting: Topic No. 7. 2.30-4 p.m., Section 1: Topic No. 3; Section 2: Topic No. 7 continued. 4.30 p.m., A Garden Party will be given to the members of the Congress by Mr. and Mrs. D. A. Dunlap. All day, Excursion B-5, Moraines north of Toronto. Evening, Excursions 8-6, Muskoka, and B-10, Madoc, leave.

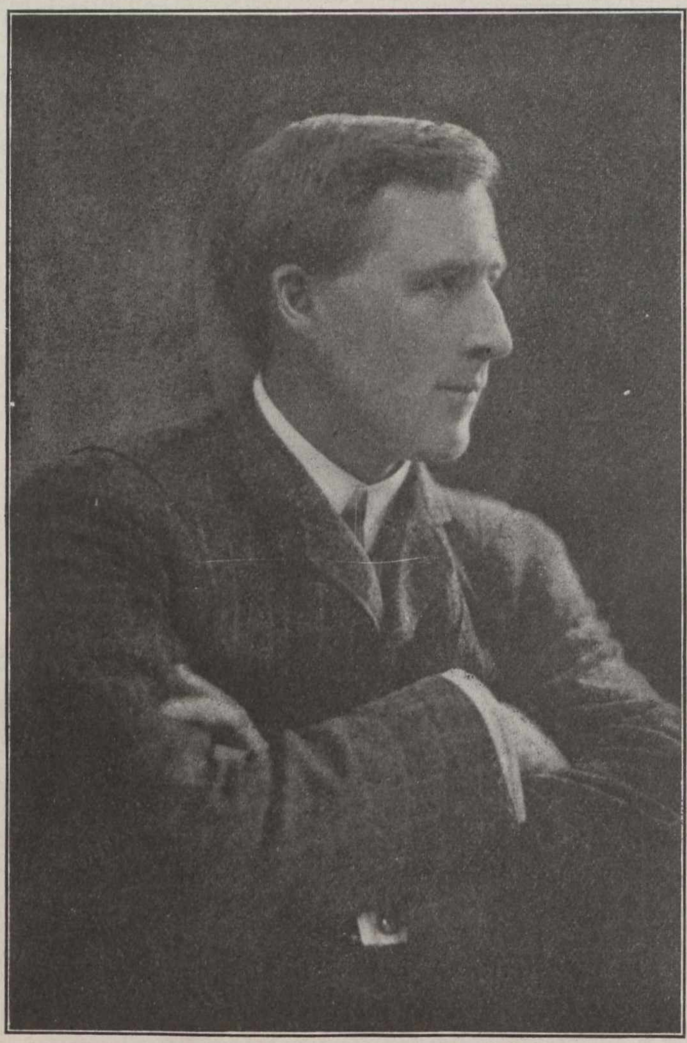
Monday, August 11th.—9.00 a.m., Meeting of Council. 10.00 a.m., General Meeting: Proposals and continuations of Reports of International Committees. 2.30 p.m., Section 1: Topic No. 5; Section 2: Miscellaneous; Section 3: Miscellaneous. Evening, Reception by His Worship the Mayor and Aldermen of the City of Toronto at the City Hall.

Tuesday, August 12th.—Excursions only.—All day, Excursion B-1, Niagara; B-2, Don and Scarboro; B-4, Credit River.

On application being made by ten or more members, excursions will be arranged to any accessible point and leaders provided.

Wednesday, August 13th.—9.00 a.m., Meeting of Council. 10.00 a.m., General Meeting: Topic No. 3. 2.30 p.m., General Meeting: Topic No. 4. All day, Excursion B-7, Streetsville; Excursion B-9, Orillia Afternoon, Excursion B-8, Clay Deposits. Evening, Banquet.

Thursday, August 14th.—9.00 a.m., Meeting of Council. 10.00 a.m., General Meeting: Miscellaneous Business, and close of the Twelfth Session. 3.00 p.m., Special Convocation of the University of Toronto at which honorary degrees will be conferred. 4.15 p.m., Garden Party. Evening, Excursions C-1 and C-2, leave.



General Secretary, Twelfth Session

R. W. Brock, F.R.S.C., Director of the Geological Survey of Canada

Topics for Discussion.

Topic No. 1.—Coal Resources of the World.—There are no separate papers, but the discussion on this subject will be based on the Monograph which has been in preparation for the last two and a half years under the direction of the Executive Committee of the Twelfth Session in Canada. Information has been supplied by Government Officials, Geological Surveys, Mining Bureaus and geological and mining engineers throughout the world. It has been edited by the members of the staff of the Geological Survey of Canada. The Monograph will be published in three volumes and one atlas, and the price for the set will be $25.00 net. The publishers are Messrs. Morang & Company, Limited, Toronto, Canada. The members of the Twelfth Session have the privilege of buying one set at the price of $20.00 net, provided their order reaches the publishers or the Secretary of the Congress on or before August 15th of this year, 1913.

Topic No. 2.—Differentiation in Igneous Magmas.—Messrs. F. Becke, Austria; R. A. Daly, U.S.A.; A. Harker, England; W. H. Hobbs, U.S.A.; J. P. Iddings, U.S.A.; F. J. Loewinson-Lessing, Russia; D. Platania, Italy; H. S. Washington, U.S.A.; and others have promised to take part in the discussion or to present papers.

Topic No. 3.—The Influence of Depth on the Character of Metalliferous Deposits.—Messrs. W. H. Emmons, U.S.A.; L. L. Fermor, India; J. F. Kemp, U.S.A.; P. Krusch, Germany; Louis de Launay, France; W. Lindgren, U.S.A.; Malcolm Maclaren, England; and others have promised to take part in this discussion or to present papers.

Topic No. 4.—The Origin and Extent of the Pre-Cambrian Sedimentaries.—Messrs. H. Baeckstroem, Sweden; J. Horne, Scotland; C. K. Leith, U.S.A.; J. J. Sederholm, Finland; and others have promised to take part in the discussion or to present papers.

Topic No. 5.—The Sub-divisions, Correlation and Terminology of the Pre-Cambrian.—Sir T. H. Holland, England; Messrs. A. C. Lawson, U.S.A.; T. Ogawa,

Three members in Sweden, 1910

Lady R. McRobert (Miss Workman), P. D. Quensel and W. G. Miller

Japan; J. J. Sederholm, Finland; A. Strahan, England; and others have promised to take part in the discussion or to present papers.

Topic No. 6.—To what extent was the Ice Age broken by Interglacial Periods?—Messrs. T. W. E. David, Australia; H. L. Fairchild, U.S.A.; G. W. Lamplugh, England; W. Lozinski, Austria; A. Penck, Germany; F. B. Taylor, U.S.A.; Warren Upham, U.S.A.; W. Wolff, Germany; and others have promised to take part in the discussion or to present papers.

Topic No. 7.—The Physical and Faunal Characteristics of the Paleozoic Seas, with Reference to the Value of the Recurrence of Seas in Establishing Geological Systems.—Messrs. Chas. Barrois, France; T. C. Chamberlain, U.S.A.; Chas. Schuchert, U.S.A.; C. D. Walcott, U.S.A.; and others have promised to take part in the discussion or to present papers.

Miscellaneous.—In addition to papers on the topics mentioned, contributions on other subjects of interest have been received from: Messrs. L. E. Gentil, France; C. N. Gould, U.S.A.; C. R. Keyes, U.S.A.; J. Samojloff, Russia; Bailey Willis, U.S.A.; and others.

Proposals.

The Phosphate Resources of the World.—A proposal has been received from Prof. J. Samojloff, of Moscow, Russia, suggesting the world's phosphate resources as a timely subject for the consideration of the Thirteenth International Geological Congress.

The Fractures of the Earth's Crust.—Regarding the proposal made at the Eleventh Session of the International Geological Congress by William H. Hobbs, and which was referred to the Executive Committee of the Twelfth Session, the Executive Committee will report to the Council of the Congress as follows:

"The Executive Committee regret that, owing to the demands made upon their time in connection with the preparation of the extended series of excursions arranged for the Twelfth International Geological Congress, as well as in the publication of the Monograph on the Coal Resources of the World, they have been unable to undertake the preparation of an additional Monograph dealing with the fractures of the Earth's Crust as suggested by the Eleventh Session of the International Geological Congress. The Committee would, therefore, respectfully request that this task be transmitted to the Executive Committee of the Thirteenth International Geological Congress."

Reports of Committees.

Reports will be presented at the Twelfth Session of the International Geological Congress from the following Committees:

1.—International Glacier Committee.—Elected in 1894 to encourage and advance studies of the size and variations of glaciers.

2.—Committee of the International Geological Map of Europe.—This committee since the Congress at Stockholm, has decided to publish a map of the world on a convenient scale, and to add to the number of the Committee by inviting representatives from non-European countries.

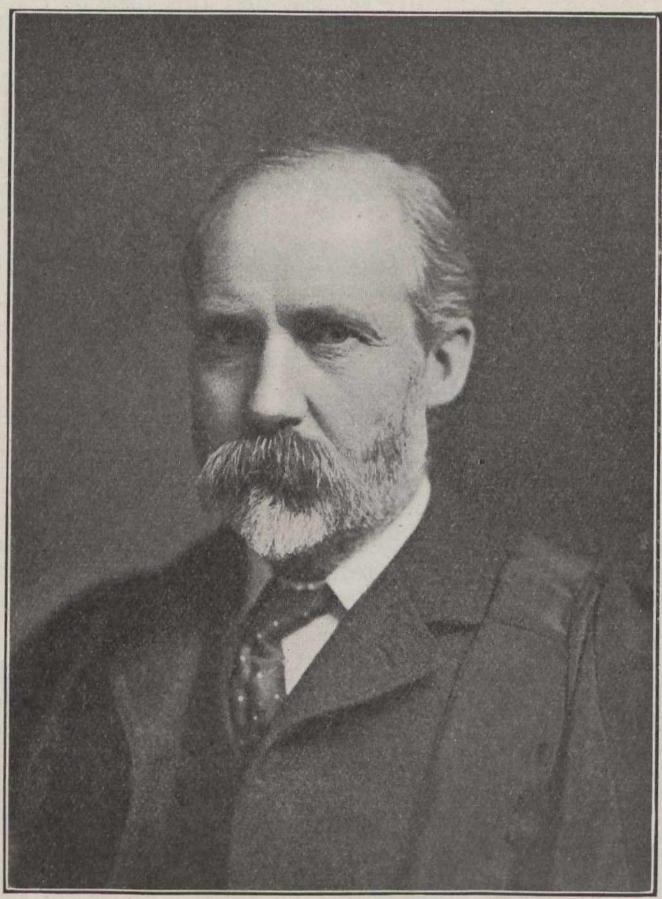
3.—Palaeontologia Universalis Committee.—An International Committee formed in 1900 to study the proposition of Mr. Oehlert regarding the reproduction by photographic processes of a series of type fossils.

4.—Spendiarow Prize Committee.—Charged with the award at each Session of the interest from a sum of 4,000 roubles donated in 1897 by Mr. Spendiarow, of Russia, for the most important geological work on a subject proposed by the Committee, that has been accomplished by an individual subsequent to the last Session.

5.—Stratigraphical Lexicon Committee.—Elected to carry out the proposal of Mr. Waagen regarding the publication of a stratigraphical lexicon.

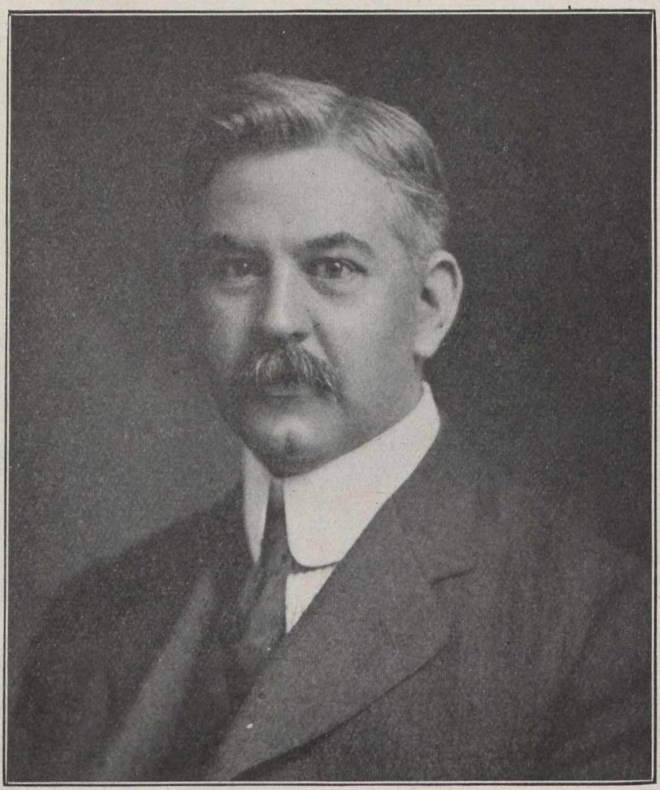
Chairman, Finance Committee

G. G. S. Lindsey, K.C.



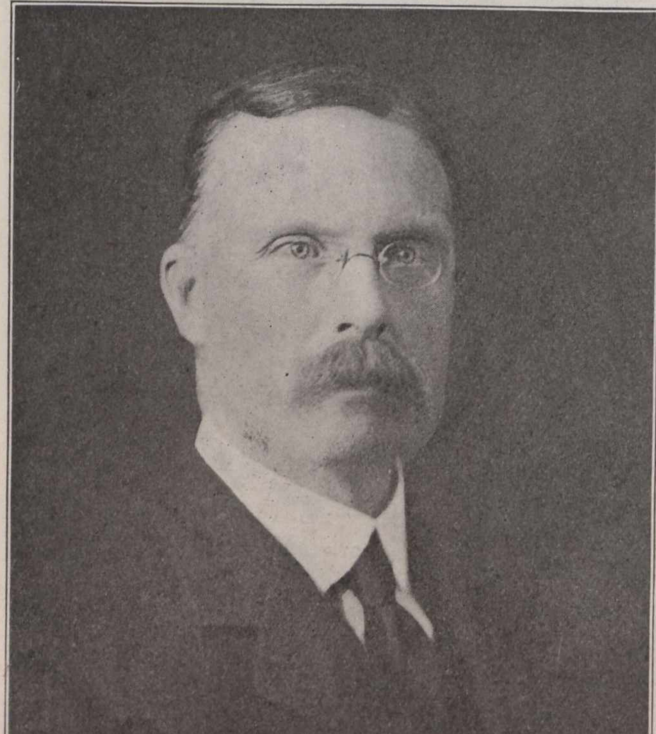
Chairman Toronto Local Committee

Dr. A. P. Coleman
Professor of Geology, University of Toronto

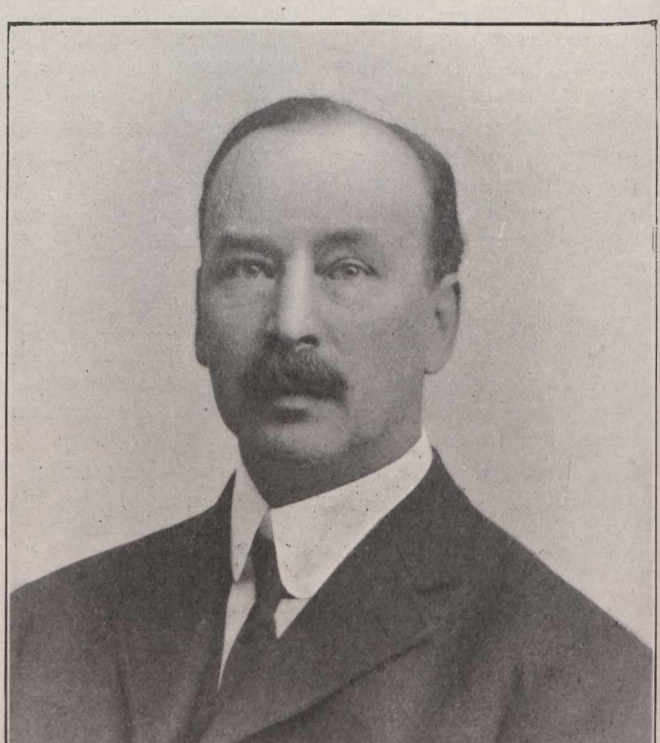


Secretary Toronto Local Committee

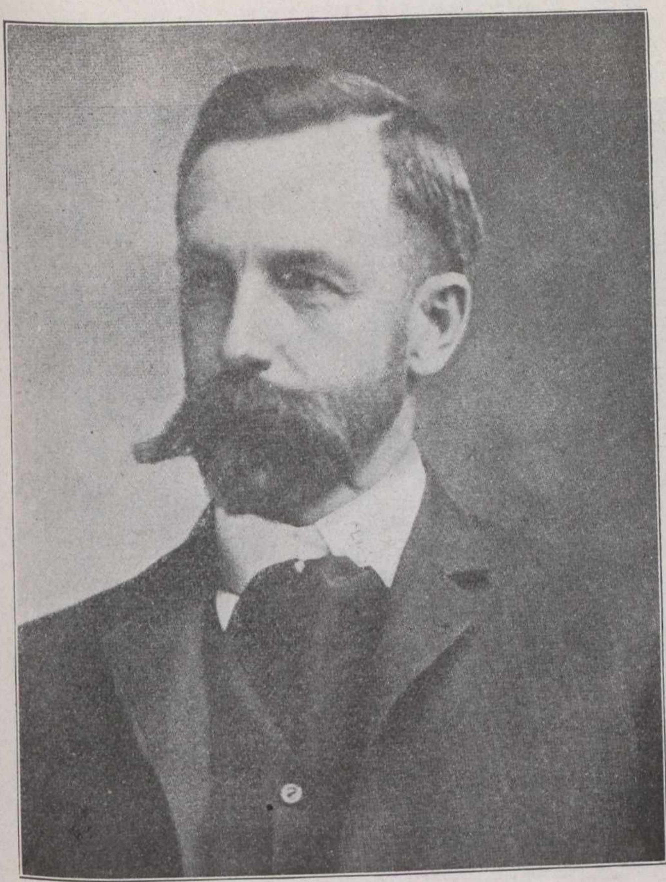
Dr. W. A. Parks
Professor of Geology, University of Toronto



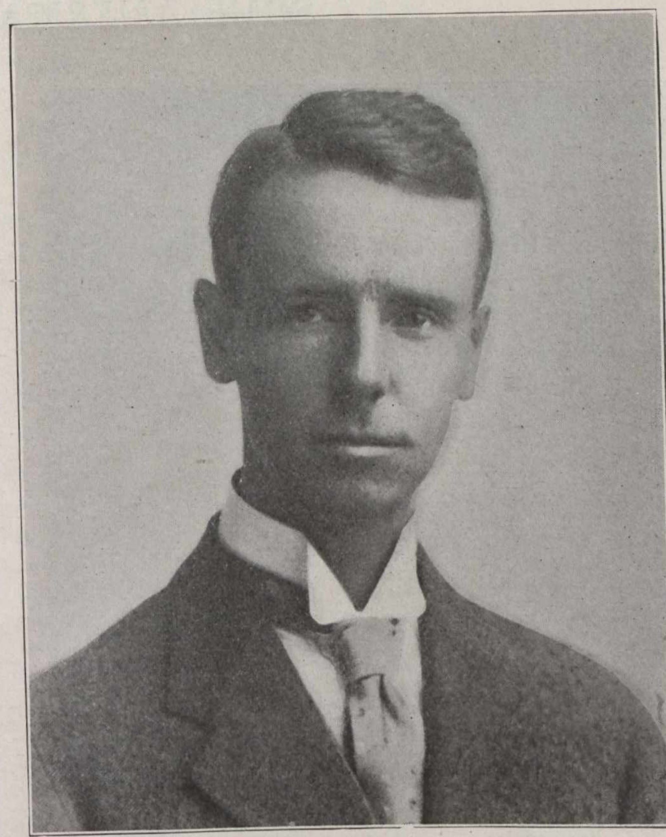
J. B. Tyrrell
Mining Engineer and Geologist, Toronto



Dr. T. L. Walker
Professor of Mineralogy and Petrography, University of Toronto



W. G. Miller,
Provincial Geologist of Ontario

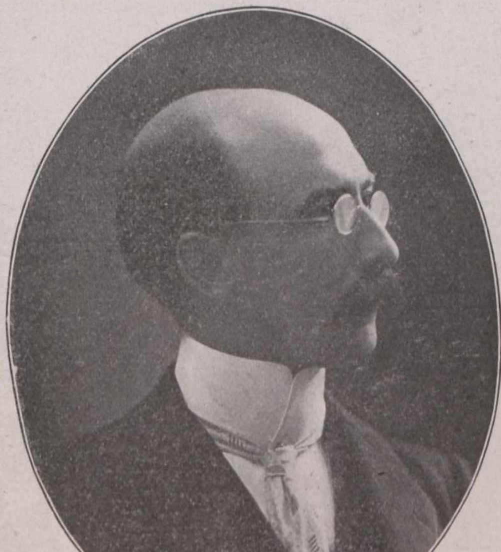


Cyril W. Knight
Assistant Provincial Geologist, Ontario

6.—Committee on Valuation of Iron Ore Resources. —To carry out and complete, according to a uniform method, the valuation of the world's iron ore resources, principally from an economic point of view.

7.—Committee on Institute for Study of Volcanoes. —Elected to consider the proposal of Mr. E. Friedlander, regarding the establishment of an Institute for the study of volcanoes.

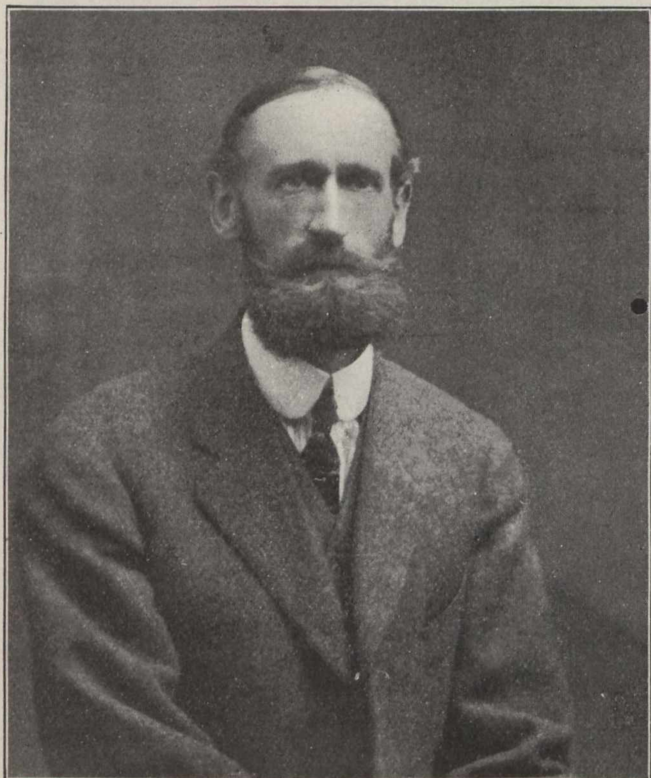
8.—Fossil Man Committee.—Elected to examine the proposal of Mr. N. O. Holst regarding the election of a Committee for the study of fossil man and for presenting a programme at the next Congress.



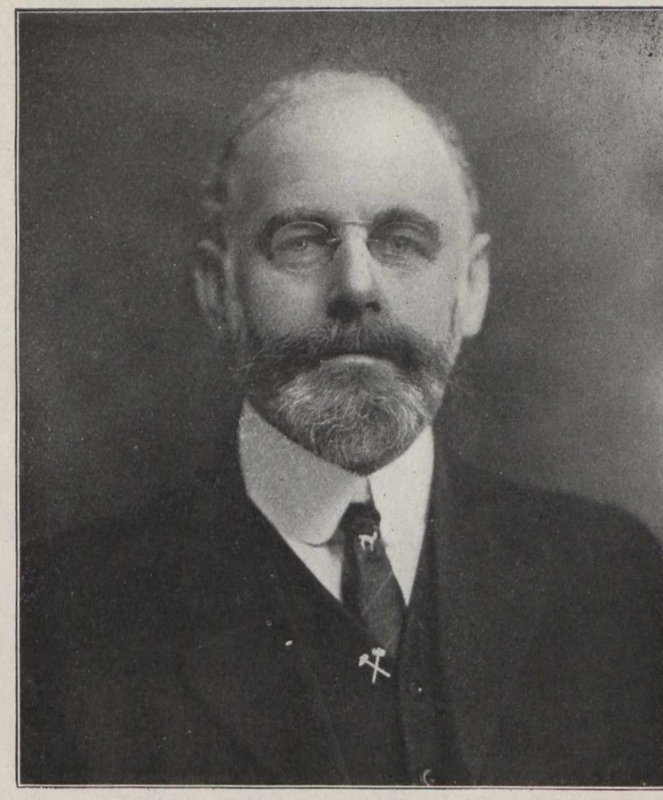
A. A. Cole,
Mining Engineer T. & N. O. Railway

A. G. Burrows
Geologist, Bureau of Mines, Ontario

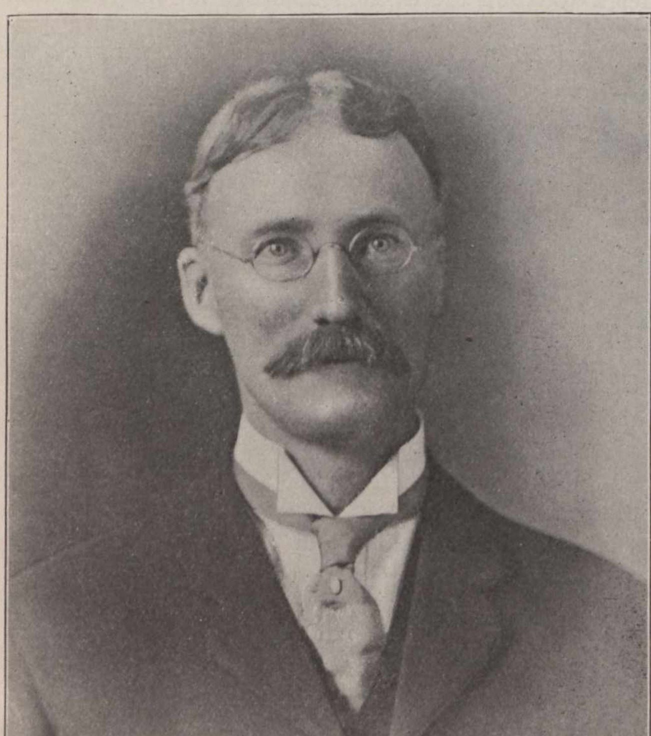
SOME AMERICAN DELEGATES



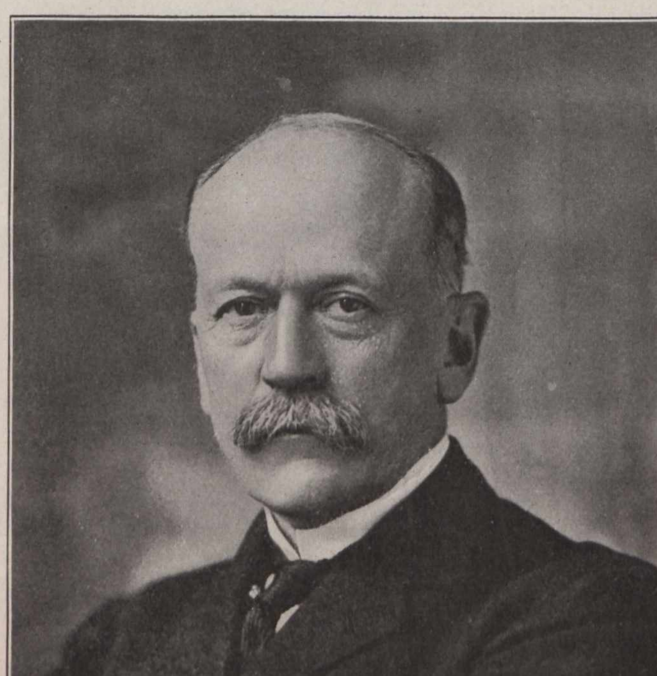
Wm. H. Hobbs
University of Michigan



James F. Kemp, Columbia University



Dr. F. L. Ransome
U. S. Geological Survey



Charles D. Walcott, Smithsonian Institution

PRODUCTION OF GOLD AND SILVER*

By Bedford McNeill.

The outstanding feature of progress for the last 33 years is, in my opinion, to be found in the enormous extension of mining, and the consequent corresponding increase in the production of the metals. Especially has the rate been accelerated during the past 10 years. I have prepared a table (see below) showing the World's production of the metals during the years 1889, 1891, 1901 and 1911.

Increase of World's Production of Metals.

	1899. Tons.	1891. Tons.	1901. Tons.	1911. Tons.	Pctge Inc. for ten years ending 1911.
Pig Iron ..	...	...	41,000,000	65,000,000	58
Copper ..	261,205	279,391	526,000	884,000	68
Zinc	329,600	356,200	500,000	900,000	80
Lead	540,200	589,000	850,000	1,100,000	29
Tin	55,400	59,500	88,000	116,000	32
Nickel ...	1,800	4,700	9,000	24,000	144
Aluminium.	70	328	7,500	46,000	513
Mercury .	3,700	3,700	3,000	4,000	33
Silver	4,100	4,700	5,300	7,500	41
Gold	...	...	380	680	79
Antimony .	...	...	10,000	23,000	130

It is particularly the comparison between 1901 and 1911, say only ten years, to which I would direct your attention.

In no instance for the latter year is the increased production less than 29 per cent., and that is lead; copper and zinc increase 68 per cent. and 80 per cent. respectively; antimony 130 per cent.; nickel 144 per cent.; and with aluminium the production is multiplied no less than five times.

Some Points Concerning the Relationship Between Gold and Silver.

The production of silver in 1901 was 5,300 tons, in 1911 it was 7,500 tons, the increase being 41 per cent. In the case of gold, the production in 1901 was 380 tons; in 1911, 680 tons; an increase of 79 per cent. It may be mentioned incidentally, that at the Royal Mint, during the year 1911, the gold dealt with was no less a quantity than 442 1-10 tons (avoirdupois).

Gold.

Taking gold first, for the 108 years from 1493 to 1600, the average annual production was a little under a quarter of a million ounces. Taking the next 100 years, from 1601 to 1700, this figure approximated to a little less than one-third of a million ounces; for the next 60 years, 1701 to 1760, the output approximated to two-thirds of a million ounces. From the earliest date (1493) until 1840, there is only a gradual rise in production, but from 1841 onwards, the increase markedly sets in.

The discovery of gold in California was in 1848, and in Australia in 1851, and the effect of these two discoveries is shown in the output for next 40 years.

From 1851 to 1860 the average annual output was 6.4 million ounces.

From 1861 to 1870 the average annual output was 6.1 million ounces.

From 1871 to 1880 the average annual output was 5.6 million ounces.

From 1871 to 1880 the average annual output was 5.1 million ounces.

This latter date brings us to the starting of the Transvaal output in 1889, which owes so much to the simultaneous successful application of the cyanide process. We now get an enormous acceleration in output, and in 1911 the total output reported for the world was 22½ million ounces.

In other words, the world's present average production in one year is now equal to more than the total production for the 60 years preceding the year 1700.

Another way of bringing the gold production vividly before you is the statement that it is estimated that 653 millions sterling was added to the world's stock of gold for the 358 years from 1493 to 1850, whereas for the 11 years alone of this present century, that figure of 653 millions sterling has already been exceeded by the output of 867 millions sterling. Or again, there has been added to the world's stock of gold during the last 15 years a quantity greater than the total amount previously known to exist in the civilized world.

Before I leave the figures of the production of gold, I should like to allude to a remarkable feature, namely, its absorption and disappearance in India. Sir James Wilson, K.C.S.I., has recently published some interesting figures bearing upon this. For the ten years 1891 to 1900, the average annual absorption was 2.8 millions sterling. For the ten years 1901 to 1910 this figure became 8.2 millions sterling. In the year 1911 this absorption is given as 18½ millions sterling, and so recently as January last, Sir Edward H. Holden, Bart., estimated that during this present year, 1913, the probability is that the gold sent to India will be nearer 30 millions sterling.

In Egypt, too, there is a similar, though smaller, absorption of gold taking place. For the year 1910 this figure was given as six millions sterling. Lord Cromer, as far back at 1907, gave some Egyptian instances of hoarding gold. He says:

"A little while ago I heard of an Egyptian gentleman who died leaving a fortune of £80,000, the whole of which was in gold coin in his cellars. Then, again, I heard of a substantial yeoman who bought a property for £25,000. Half an hour after the contract was signed he appeared with a train of donkeys bearing on their backs the money, which had been buried in his garden. I hear that on the occasion of a fire in a provincial town no less than £5,000 was found hidden in earthen pots. I could multiply instances of this sort. There can be no doubt that the practice of hoarding is carried on to an excessive degree."

It is most extraordinary that the gold which is produced under circumstances demanding the highest technical skill, and in the obtaining of which the greatest care is lavished, and for which so many risk so much, should be destined ultimately to be buried and hidden out of sight, and, as far as we can judge, ruled out of any economic calculations, at any rate for the time being.

I need not remind you that the use of gold in a civilized community is not merely as it were for itself, but as serving the foundation for an enormous superstructure of credit; and unless, therefore, this absorption of

*Extracts from Presidential address, Institution of Mining and Metallurgy, March 13, 1913.

gold can be controlled or directed into channels in accordance with modern conditions, the embarrassment of the more civilized communities, as we regard ourselves, is going, I fear, to become more and more accentuated.

It is only fair to mention there are some who argue that this disappearance of gold is the least of several evils, and if it did not so disappear much greater troubles would ensue.

The question is, "Will the absorption of gold displace the absorption of silver in India?" which latter has been calculated by Sir James Wilson as totaling 423 millions sterling for the 70 years ending 1910. Will India continue to absorb silver? One can hardly think that it can absorb both gold and silver, and if India does not absorb silver, what is to be the result? What will be the outcome if the enormous population of India—who have already proved that they are unable to withstand the fascination of "hoarding"—be still further tempted.

Silver.

In connection with silver there are three aspects to consider:

Firstly—The weight of silver produced;

Secondly—The ratio of that weight to the weight of gold produced; and,

Thirdly—The value of the silver as compared with the value of the gold produced.

Now, firstly, as to the weight of silver produced.

Commencing with the ten years 1801 to 1810 we had an average annual production of 29 million ounces. This figure dropped to 15 million ounces 1821 to 1830. Then, the successive figures are:

Period of Time.	Average Annual Production.
1831 to 1840	19 million ounces.
1841 to 1850	25 million ounces.
1851 to 1860	29 million ounces.
1861 to 1870	39 million ounces.
1871 to 1880	71 million ounces.
1881 to 1890	100 million ounces.
1891 to 1900	162 million ounces.
1901 to 1910	182 million ounces.
1911	252 million ounces.

It is very remarkable that for a period of ten years (1901-1910) the weight of silver produced should have been maintained at a ratio as regards gold of 10 to 1, and this notwithstanding the great differences of locality and of the conditions under which the two metals were produced.

Secondly, as regards the ratio of the weight of silver produced as compared with the weight of gold produced.

Commencing with the period:

Period.	Times as much weight of silver produced as compared with weight of gold produced.
1801 to 1810	50.9
1811 to 1820	46.0
1821 to 1830	32.6
1831 to 1840	29.2
1841 to 1850	14.0
1851 to 1860	4.5
1861 to 1870	6.4
1871 to 1880	12.7
1881 to 1890	19.8
1891 to 1900	15.9
1901 to 1910	10.0
1911	11.2

Example—From 1801 to 1810 the production of silver was 50.9 times that, by weight, of gold.

In the ten years. 1851 to 1860, the discoveries of gold in California and Australia, as I have already pointed out, added to the gold production without any corresponding increase in silver, which for 1851-1860 fell to 4½ times the weight of gold. As between 1861 and 1911 the silver production varied by weight from 6.4 to 19.8. The production of silver for the year 1911 being by weight 11.2 times as much as gold.

Thirdly, as to the value of the silver produced as compared with the value of the gold produced, and for the same periods.

I have endeavored to discover as to how and when the ratio of value between gold and silver commenced, and as to what was its origin. Since the year 1884, I have been closely in touch with silver, and have watched its fluctuations daily. Silver to-day is enormously depreciated in value when compared with gold, but it was not always so. At one time there is a great probability that silver was the more valuable of the two.

Starting A.D. 1250, when 10.9 ounces of silver were exchangeable for 1 ounce of gold, we come down to 1911, when 38 ounces were required, and silver was 2s. 0½d. per ounce; the ratio for 1912 has slightly diminished, 1 ounce of gold requiring 33.3 ounces of silver to purchase it, the price being, say 2s. 4d. per ounce.

To about the year 1840, the gold produced in the world would only have purchased one-half of the amount of silver produced. In 1841 an increase of gold production commenced three times that of the previous ten years, and for the first time silver is more than balanced by gold. For the next period, 1851 to 1860, the gold production makes another leap of three times the previous production, the ratio of gold to silver being 15 to 1. The production of silver rises, until for the period 1881 to 1890 the silver was practically equal to the amount represented by the gold production multiplied by the existing value ratio.

This will be clear to you if we take for example, the ten years, 1881-1890, during which period the production of gold was 5.1 million ounces. The production of silver was 100 million ounces, that is to say, 20 times the amount by weight. The ratio of value for the same period was 19.8 (nearly 20), so that the 5.1 million ounces of gold were just balanced by the 100 million ounces of silver. Once, however, we leave the period ending 1890, we never again get the same conditions. As you already know, the production of gold has been unprecedented, and similarly so has that of silver. For the ten years ending 1900, the gold produced was equivalent to 309 million ounces of silver; for the ten years ending 1910, it would have purchased 657 million ounces of silver. For 1911, at the ratio of 38 to 1, the gold produced would have purchased no less than 855 million ounces of silver.

Stocks of Metal.

In considering the foregoing figures, we have to take care that we do not lose sight of the cumulative effect of the world's stocks of the two metals, and it is to this aspect of stocks of metal I want to direct your attention for a few minutes.

A fact that has always to be remembered when we are considering gold, is the excessive care taken on every hand to prevent loss. The result is that gold stands pre-eminent as regards its increasing stock, and, although a part is utilized in the Arts (estimated by Dr. Soetbeer at 4,000,000 ounces per annum), this remains generally in such a shape that it can be re-melted and quickly put into the form of bullion again.

The Relative Production of Gold and Silver.

Period.	Number of Years.	Gold: Millions of oz.	Gold: Value in millions. £	Silver: Millions of oz.	Silver: Value in millions. £
1493-1660	168	41	173	1,490	514
1661-1850	190	113	480	3,320	952
1851-1900	50	334	1,400	4,010	750
1901-1911	11	205½	867	2,062	226
	419	693½	2,920	10,882	2,442

The total figures are not very dissimilar, namely, gold 2,920 millions sterling and silver 2,442 millions sterling, but this is explained when we remember the measurement of value, by the fixed value of gold. The total world's production of silver from the discovery of America, say—400 years ago, is estimated roundly to have been nearly 11,000 million ounces, and there was, of course, a large quantity of silver in the world before then. Taking the present world's stock, therefore, as being 12,000 million ounces, we have a value at its present price of, say, 1,200 millions sterling, more than one-half of which has been added to the world's stock of silver during the last 60 years.

The Future.

We should all like to know whether the present output of gold and silver will be maintained.

As regards the present, the large producers of gold are: The Transvaal, United States of America, Australasia, Mexico, Russia.

The large producers of silver are: Mexico, United States of America, Canada, Australasia.

Taking the world's total production as 100, I have worked out the annual percentage production of each of the above countries for the ten years ending 1911 (see following table). No accurate figures are yet available, but it is estimated that so far as gold is concerned the total production exceeded 25 million ounces, which is an increase over 1911. With regard to silver, the only estimate that I have seen is that the production for 1912 could be considered as equal to 1911.

It will be seen that the Transvaal has maintained its gold production, and in a lesser degree Mexico, but the United States and Russia are barely holding their own, whilst Australasia shows a falling off which has been continuous for the last ten years.

The question is: Will the ratio of production ruling for 1911 be maintained? The answer is to be found in giving a positive value to the following factors.

Against—We have the rise of cost of materials and labor acting as an automatic check on any further increase of production.

For—We have (1) the possible discovery of new gold fields; (2) new processes giving increased extraction, but for which new processes there is less and less scope; (3) diminished cost owing to improved mechanical means of handling tonnage. South Africa has shown us what can be done by the employment of huge amounts of capital, combined with competent technical and thorough business management.

As regards silver, which is also based upon the foregoing table, interest centres mainly in Canada.

Percentage Output of Gold and Silver Produced 1902-1911

Country	1902		1903		1904		1905		1906		1907		1908		1909		1910		1911	
	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver
Transvaal	11.8	—	18.6	0.3	22.4	0.3	26.6	0.3	29.8	0.3	32.0	0.4	32.8	0.6	32.8	0.5	34.3	0.4	36.5	0.4
United States	27.1	33.8	22.3	31.4	23.1	31.7	23.2	31.0	23.4	30.6	21.7	30.8	21.4	24.7	21.7	24.1	21.2	24.0	20.6	22.9
Australasia	27.1	5.9	27.0	6.9	25.0	8.1	22.6	7.9	20.5	7.4	18.2	9.5	16.5	8.1	15.5	7.0	14.4	6.6	13.0	6.8
Mexico	3.5	35.2	3.5	39.2	3.7	36.8	4.3	35.9	4.2	37.0	4.5	33.3	4.7	34.2	4.9	32.0	5.0	32.6	6.3	34.6
Russia	8.3	—	7.6	—	7.1	—	5.8	—	5.6	—	6.4	—	6.9	—	7.0	—	8.0	0.1	5.3	0.1
Rhodesia	1.4	—	1.3	—	1.4	—	1.9	—	2.4	—	2.6	—	2.8	—	2.8	—	2.8	—	2.8	—
India	3.4	—	3.4	—	3.3	—	3.2	—	2.7	—	2.5	—	2.4	—	2.6	—	2.4	—	2.3	—
Canada	7.0	2.7	5.7	1.8	4.7	2.0	3.8	3.3	2.8	4.7	2.0	7.0	2.2	10.4	2.0	12.1	2.2	13.6	2.1	13.3
	89.6	77.6	89.4	79.6	90.7	78.9	91.4	78.4	91.4	80.0	89.9	81.0	89.7	78.0	89.3	75.7	90.3	77.3	88.9	78.1
Other countries	10.4	22.4	10.6	20.4	9.3	21.1	8.6	21.6	8.6	20.0	10.1	19.0	10.3	22.0	10.7	24.3	9.7	22.7	11.1	21.9
World's Total Production	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.00	100.0	100.0	100.0	100.0	100.0

U. S. MINE RESCUE CAR IN LAKE SUPERIOR DISTRICT

By P. B. McDonald.

Two years ago a mine fire occurred in the Hartford mine of the Republic Iron and Steel Co, at Negaunee, Mich., and seven miners were suffocated. It was realized that had oxygen helmets and pulmotors been available the men might have been saved, and mining companies, both in the copper and iron regions became aroused over first aid and mine rescue work. Previously the Lake Superior mines had been considered reasonably safe, as comparisons had been made with the coal mines, where so many fatal accidents occur. The Cleveland-Cliffs Iron Co. led the way in rescue work, by purchasing oxygen helmets and pulmotors, and training first aid and rescue crews at each of its mines; the company later held contests and exhibitions at its headquarters in Ishpeming, where prizes were distributed to the teams showing greatest proficiency. Other companies have followed the lead of the Cleveland-Cliff Co., even to the creation of a safety inspector, whose sole duty is to visit his company's mines and report machinery and working places liable to be dangerous.

A petition was then circulated in the mining towns and the signatures of thousands of miners obtained, asking the Government that one of the Rescue cars of the Bureau of Mines be stationed in the Lake Superior district. This request was complied with, and U. S. Rescue Car No. 8, the only one assigned to a metal mining region, was sent to Ironwood, Mich., as a headquarters. The car is fully equipped with all necessary apparatus for use in mine fires, accidents, etc., including oxygen helmets and pulmotors, and is manned by three Government experts. The car is ready at any minute to be taken to the scene of a mine catastrophe, where the crew will co-operate with the company in saving life. In addition the car travels around the different iron and copper districts, and the crew gives instructions and lectures to the miners and mine officials, spending several weeks in each place.

The car was recently at Ishpeming, on the Marquette range. At this place the Oliver Iron Mining Co. gave the use of an old building for experimental purposes; a smudge was built in the stove, and the building filled with smoke, so that a man could see only a few feet ahead. Then men were sent in fitted with oxygen helmets, and remained for an hour, during which they climbed ladders, sawed timbers, and operated a rock drill on a piece of diorite taken in for the purpose.

The pulmotors are used to resuscitate persons overcome by smoke, gases, electricity, or water; pure air is forced into the lungs and breathing automatically stimulated. The results obtained with the pulmotor on persons apparently dead are remarkable. In first aid demonstrations, the miners are instructed how to tie up an artery to stop the flow of blood, place splints on a broken arm or leg, make a stretcher out of such materials as a pair of overalls and two long drill-steels, etc.

Following the visits of the Rescue Car in nearly every district, the mine officials of the different companies have co-operated to form a Miners' Safety Club, which meets at intervals to discuss safety and rescue work.

METHODS OF MINING AT COBALT

By Reginald E. Hore.

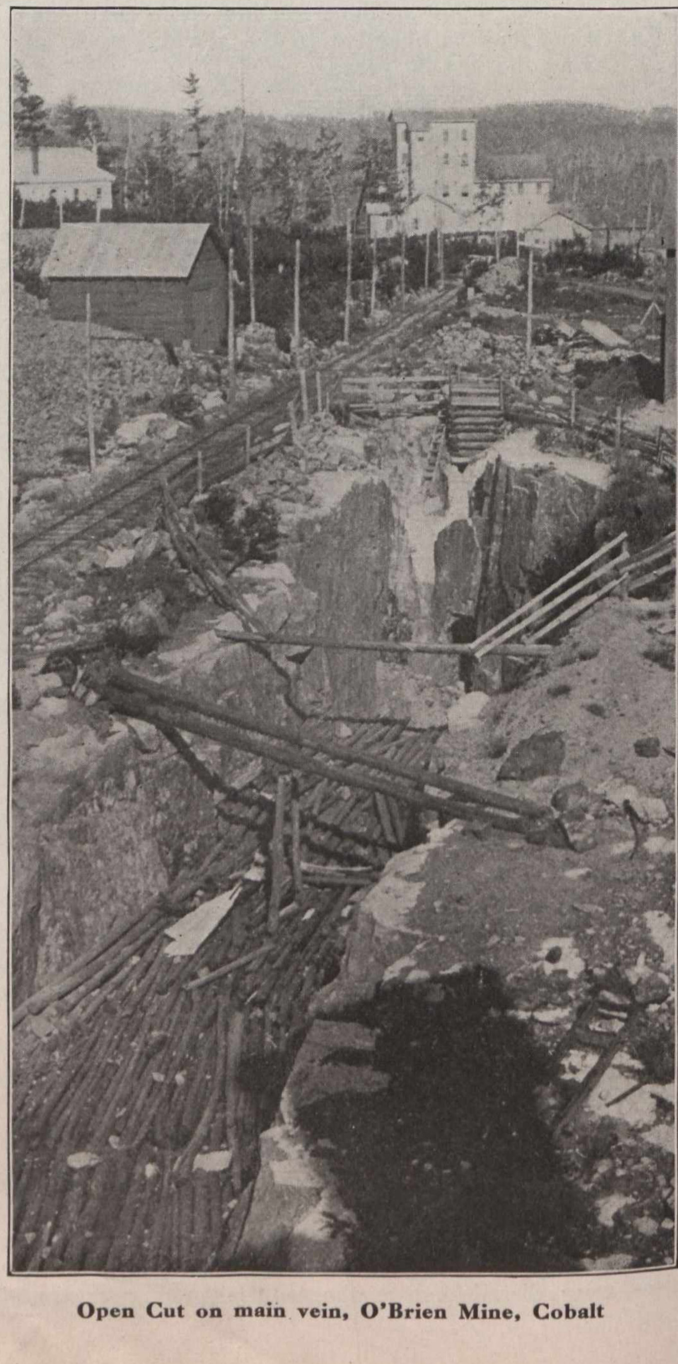
The general method of mining high grade ore in the early days was by open cuts. Rock on one side of the vein was broken and removed, and then the vein matter was picked off the wall and bagged. From open cuts 50 or 100 feet deep, several million ounces of silver was taken in this way before more systematic mining was undertaken.

The deposits having proven to be of great value it might have been expected that ordinary development shafts and drifts would have been started, but at many mines this was not done for some time. When such work was finally done and overhand stoping commenced, it was still common practice to leave the vein on one wall and bag only the ore taken off after removing the broken rock. Much fine ore became mixed with the rock which was piled on the dumps. Later more attention was given to this lower grade material, and when numerous concentrators had been built for its treatment, the method of mining and handling ore was naturally improved.

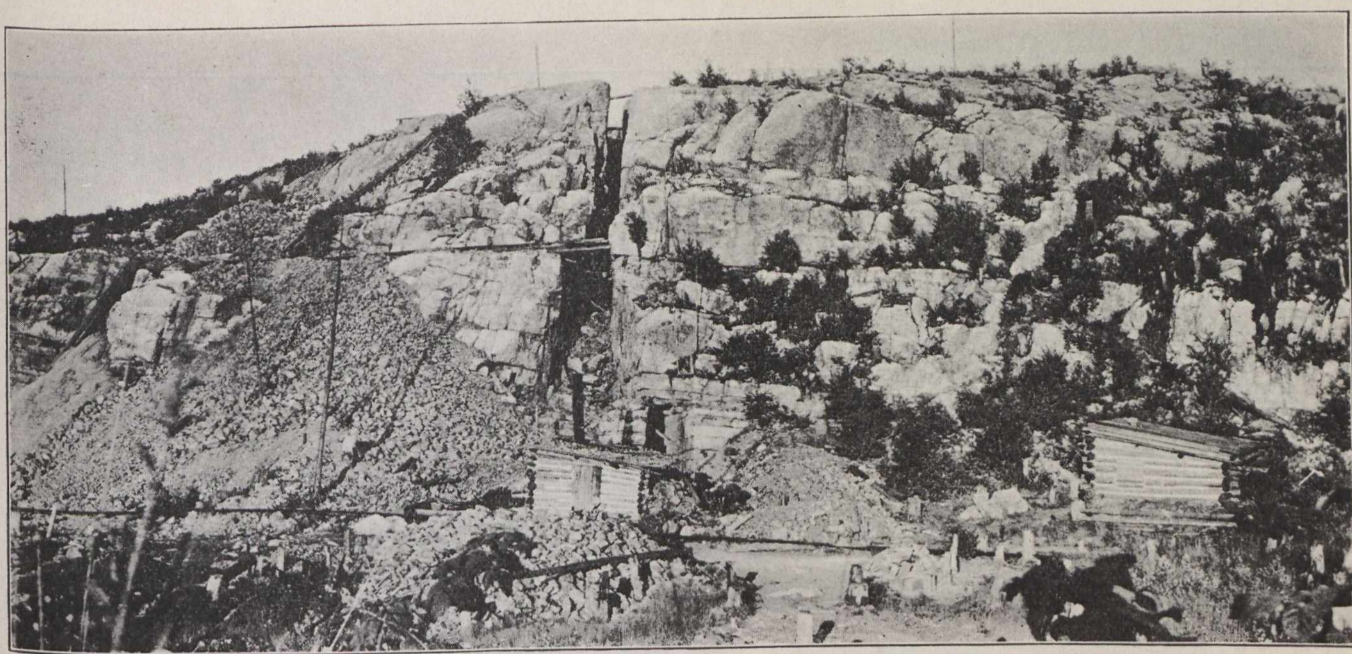
In almost all cases the present practice in developing ore is to sink vertical shafts on the vein and drive drifts at short intervals, 50 or 75 feet in many mines, and usually less than 100 feet. Other veins are reached by cross-cuts and developed by winzes and drifts in a similar manner. At most mines there is a central hoisting shaft where all the ore from several veins is raised to the surface.

Instead of leaving the vein on the wall, it is in most mines now the practice to keep the vein well within the working face. The rock on each side for a few feet, and in many cases for several feet, usually contains enough silver to pay for milling. In some mines care is taken to keep the high grade vein matter from mixing with the broken rock. It is picked out and bagged in the mine. In other mines the practice is to do no sorting whatever underground. All is allowed to mix and is raised to surface, where it is washed, screened and hand picked. The undersize is jigged or shipped direct to the smelter.

In stoping the ore some mines use a shrinkage system. The ore is broken down onto the lagging and just enough drawn off to give room for the miners. In this way a block of ore is stoped from one level to another, and there is, consequently, in a stope just finished about 60 per cent. of the broken ore still underground.



Open Cut on main vein, O'Brien Mine, Cobalt



Early workings on Little Silver vein, Nipissing Mine

Silver vein, O'Brien Mine

In other mines the practice is to put in stulls and lagging at short intervals in the stope, and then there is often a comparatively small amount of broken ore necessarily present in a stope at any one time. This is done in mines where the practice is to raise the ore as soon as possible after it is broken.

In one mine, the Crown Reserve, square sets are used, but so far as I am aware, this method of timbering is not used in any other. Good examples of the shrinkage system are the Nipissing and Coniagas mines. The practice of the Nipissing is briefly as follows:

Method of Mining at Nipissing Mine.

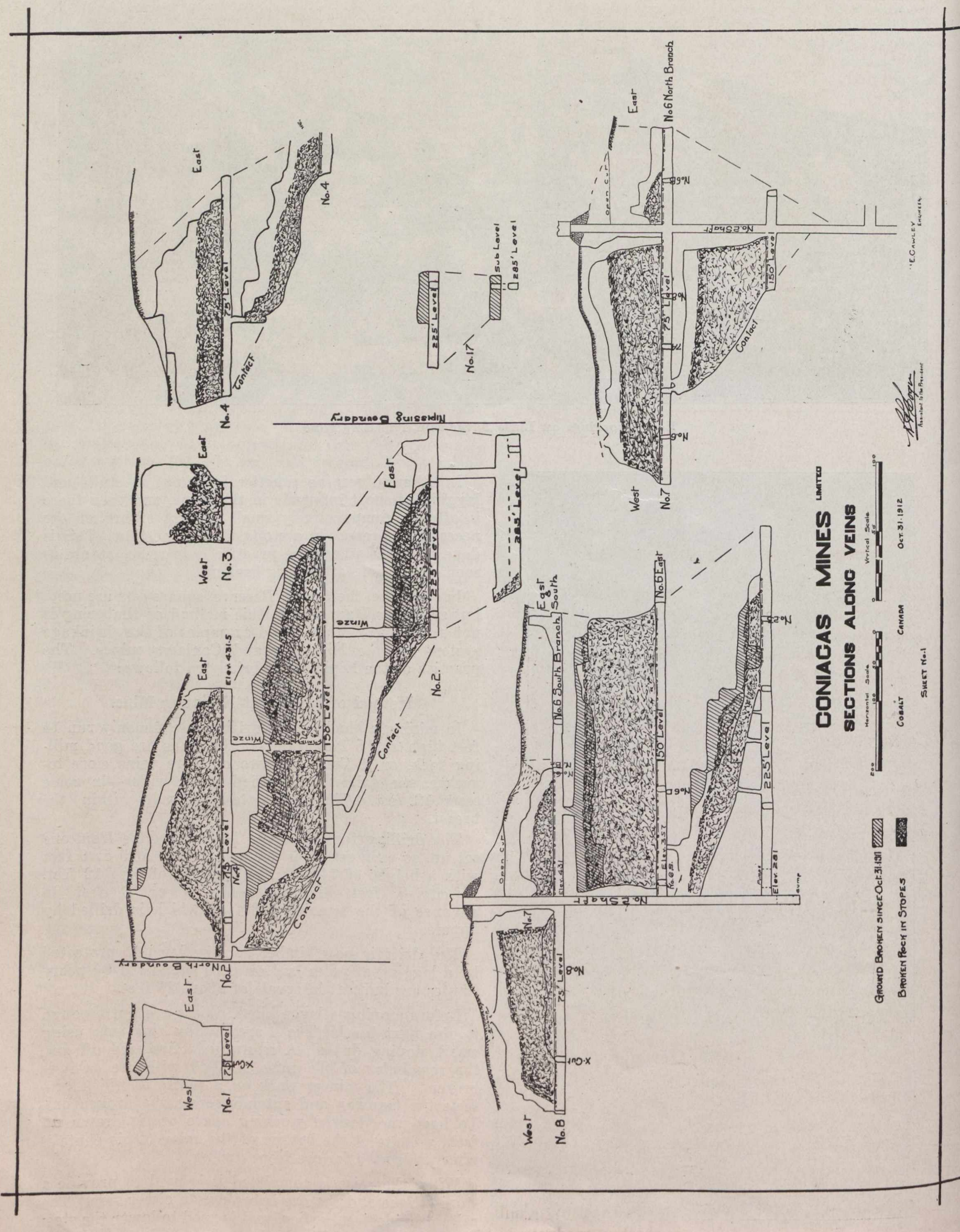
In mining a block of ore drifts are commonly run 14 feet high and 5 feet wide. If the walls are good milling rock, or if there are two or more veins close together, the drifts are carried much wider—in some cases 12 feet. The veins are kept well within the breast.

The drilling for the whole 14 feet is done from one set up, so each set up is for an advance of 5 or 6 feet with a height of 14 feet and a width of 5 to 12 feet. A cut 8 feet high is taken 5 or 6 feet in advance of the remaining 6 feet, which is drilled by uppers.

The drift is now timbered. The level is protected by a lagging of poles laid on caps supported by posts. Chutes are built at intervals of about 25 feet.

Before stoping a large block, raises are put through to the next level. These are cut by two men using small stoping drills. A manway is timbered off and the remainder of the raise is filled with ore as it is broken. The miners work on a platform which protects the manway and extends across the broken ore. To keep the desired working space ore is drawn off from a chute at the bottom of the raise. This chute is afterwards used for ore from stoping.

When the raise is completed it is used to provide a stoping face and the ore is broken on either side. The raise provides ventilation, and is used to lower the steel and as manway. The high grade and low grade ore



Section showing method of developing and mining veins at Coniagas Mine.

Rich silver vein and glaciated country rock, Lawson Mine, La Rose Mines, Cobalt

are not kept separate, but all is allowed to lie as it falls when broken. Enough is drawn off to provide space for the miners. The cars are taken to surface on a cage, taken, and mine fines are treated together with fines from the crusher.

The Coniagas uses two man drills in stoping as well as in sinking and drifting. The drill used is the Redington, designed by Mr. John Redington and manufactured on the property.

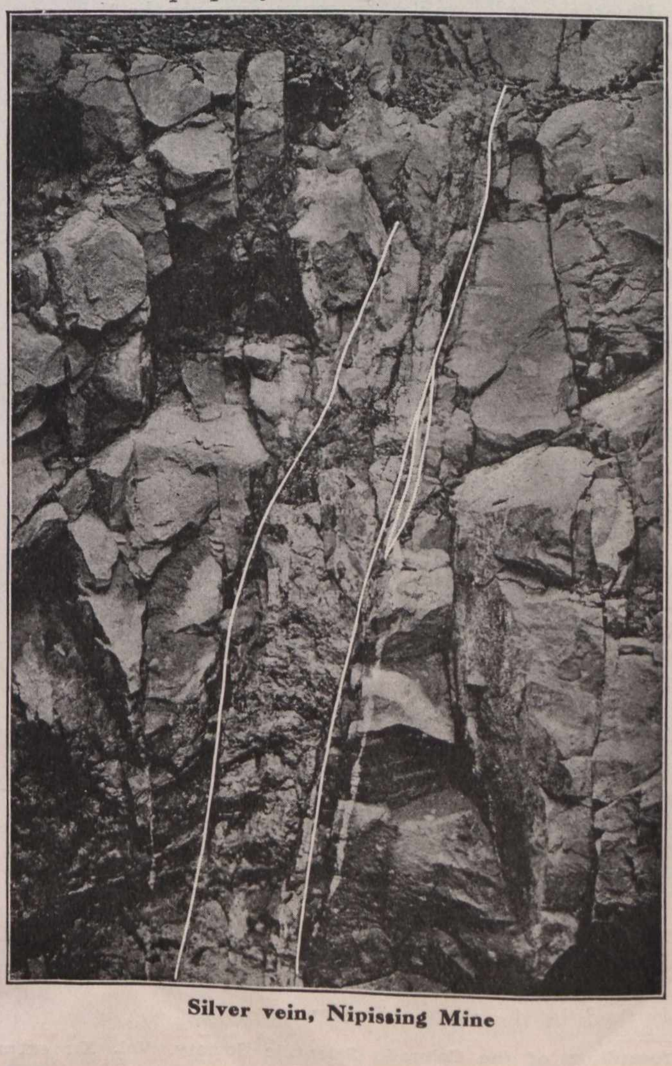
Method of Mining at Coniagas Mine.

The methods of developing and mining at the Coniagas are similar to those at Nipissing, but some variations may be noted. Drifts are run 8 feet high and later enlarged by a cutting-out drift, giving 8 feet additional height. The lagging is supported by stulls set in hitches. Where the drift is wide posts are used to support stulls in the middle. Chutes are built at intervals of about 25 feet.

When the timber is ready, stoping is begun by breaking some ore carefully onto the lagging, and then continued by the shrinkage system. To avoid pot-holing and sledging of large chunks of rock, care is taken to break the rock comparatively small. Heavy charges are not used.

Considerable high grade ore is picked out by sorters underground. In the drift-stopes a sorter looks over the ore as it is loaded into cars and bags the high grade. In the stopes there are no sorters, but the miners, without making very careful examination, pick out considerable high grade. While at the Nipissing all the ore is sorted at the surface, a very considerable percentage of the Coniagas high grade ore is bagged underground, and is brought to the surface ready for shipment to the smelter.

The Coniagas does not use a cage in hoisting. The ore is trammed to the shaft and emptied into pockets. Thence it is drawn off by chutes to a specially designed skip. The skip dumps automatically at surface over a grizzly to a chute down which the ore runs to the mill bin. The ore is crushed before another product is



Silver vein, Nipissing Mine

APPLICATION OF GENETIC THEORIES TO THE SEARCH FOR ORE†

By George E. Collins.

The science of economic geology advances in bounds only to overreach itself and fall back; but it never recedes quite to the starting place. In each of the fashionable theories which from time to time spring up, there is a kernel of solid truth, which remains as a permanent addition to the stock of human knowledge, after the husks have been blown away by the searching blast of criticism.

The reasons for the failure, in practice, of so many deductions based upon generally accepted theories of ore deposition and local enrichment, have been clearly and fairly stated by R. A. F. Penrose in a recent paper entitled "Some Causes of Ore Shoots," published in Economic Geology. I quote from the paper the following paragraphs:

Page 100. The great difficulty in classifying ore shoots is that many totally different causes have often combined to produce any one shoot, and the evidence of some of these may have been much obscured or even obliterated since that time, so that the determination of just what cause has been uppermost in influence is often impossible.

Page 131. The influences that may produce ore shoots do not necessarily do so. An ore shoot is the exception and not the rule, and even when apparently the most favourable combination of influences exists, there may be no ore shoots. Moreover, the causes that have produced a shoot in one region may have no such effect in another region, or in another deposit in the same region, or perhaps in another place in the same ore deposit.

As a matter of fact, most of these influences seem to be practically without effect in far more cases than they have effect, and in some cases they have actually been injurious to the quantity, or quality, or both, of the ore.

Many of us used to criticize the geologists, and in particular those of the United States Geological Survey, for publishing obituaries; and to suggest t' they were to blame for not being ready with an exhaustive study of a mining district until its deposits were worked out. Yet, if we cast aside the temptation to indulge in cheap sarcasm, how is the geologist to furnish a complete explanation of the facts, before the facts themselves have been laid bare? On reflection, we should admit that no final and convincing description of any mining district can ever be written, excepting as an obituary. The object of such work is to arrive at general truths which may ultimately be applied elsewhere; and in our hurry for something which the geologist cannot supply—reliable deductions as to the nature and form of ore bodies that the miner has not yet found—we rush him into furnishing descriptions of phenomena which we cannot recognize when we look for them, and hazarding opinions which too often prove unfounded. Yet the fault is not so much his as ours, who expect the impossible. The result is to confuse the popular mind; to discredit science herself, instead of the fallacies and half truths which are delivered in the name of science.

We must learn to ask at once less, and more, of the geologist. In new and partially opened districts, he can give us a useful and indeed essential aid—a study of the structural geology. He can read for us the relative ages of veins and rock formations; can assist us by collecting and correlating the data, many of which are unknown to or overlooked by the technical man who is most familiar with any given district; and can inform us what is known of ore occurrences elsewhere, where the conditions are sufficiently similar to suggest possible analogies in the deposits which result from the conditions. The less he ventures into the realm of concrete prediction, the better for his peace of mind, and for the progressive unfolding of correct scientific conceptions.

This groundwork or outline furnished, it remains for the miner to fill in the details. It is here that the role of intelligent hypothesis, based on sound scientific conceptions, and on detailed observations drawn from practice in comparable localities, comes in. There are only two ways of conducting mining exploration. The one is essentially empirical, prospecting by shafts and levels at regular distances on a plan adopted with a view to subsequent convenience in working; or by bore holes spaced at more or less regular intervals. This method, in its multitudinous ramifications ,is eminently suitable for regular veins or simple deposits. But just as we must be prepared in metallurgy to deal with increasingly complex and difficult ores, the simpler ones having been already taken care of by our predecessors, so in mining, the future belongs to the man who can find and extract the more irregular deposits; who can unravel the puzzling and intricate cases of complex faulting, and of devious ore channels. The mere mechanical problems incident to mining are so much child's play compared with these, and I cannot but think that eventually the honor, and remuneration, attending professional work will in greater measure be regulated by its difficulties, and the quality of the faculties which are necessary to cope with and overcome them.

It has long been a favourite doctrine of mine that the problems which require to be solved are often more difficult and intricate in a small mine than in a large one, and success is often due more directly to the degree of ability applied. In each case we have to proportion our means to the attainable ends. The successful solution in the large mine is frequently only the application of a simple method on a large scale, by multiplying units. As with smelting, the inherent difficulties are often removed by merely enlarging the scale of operation. From this reflection, which I believe is indisputable, I sometimes pass to the paradox that the remuneration for the work of mine management should be fixed in inverse proportion to the size of the mine.

But to return from this digression. In the development of irregular ore bodies, we must either adopt the same geometrical basis of exploration, which soon leads to bankruptcy, or else direct our exploration according to some working hypothesis. To "follow

*Proceedings of the Colorado Scientific Society, Vol. X.; extract from presidential address, published in Mining Science.

your ore" is an excellent maxim, when you have it; but it does not help very much when your ore is yet to be found. Hitherto, the work of hunting for ore has been left, as a rule, to the so-called "practical man." He also plans his work along the lines suggested by some hypothesis. The trouble is that, as has been pointed out by others, there is no theorist so wild or so inveterate as your "practical man;" none that rides his hobbies so hard or so far. What is needed is the trained mind, acquainted with the literature of ore deposits in various districts; able to observe from day to day all the facts that suggest similar conditions and possibly parallel results in his own, and familiar with all the various theories of ore deposition which are applicable to those conditions. Thus equipped, he is able to form rational hypotheses on which to base exploration, and to realize when the time has come to discard them and adopt others. In other words, the scientific miner of the future will proceed along much the same inductive lines as those which have laid the foundations and built the superstructure of all modern scientific progress; the only difference being that he cannot artificially create the conditions of each experiment, for which reason his progress must inevitably be far slower.

The detailed study of ore deposits, with reference to their origin and distribution, requires four qualifications: First, a thorough grasp of the fundamentals of physics and chemistry; second, a wide first-hand acquaintance with other occurrences elsewhere, for the purpose of comparison; third, a close and continuous study of the deposits under consideration, for the reason that much of the evidence bearing on the genesis of the deposit is removed as rapidly as it is exposed; fourth, and most important of all, imagination, by which alone the mind can conceive tentative hypotheses of origin, to be tested by the observed facts. I have said above that I believe the complete history of any mine cannot be adequately written until the mine has been worked out. To this I would add that it cannot be done without a dependable record of its characteristics as they unfold themselves.

An ore deposit is a palimpsest on which, throughout successive ages, various chemical and physical processes have traced their records. The most legible inscription on its surface may represent only the latest of the many influences which have contributed to the final result. By careful scrutiny we can sometimes discern, hidden perhaps in an obscure corner, traces of the half-obliterated hieroglyphics which record the earlier stages of its development.

In an examination of any such deposit, we can merely see what happens to be exposed in drifts, raises and so forth, at that particular moment. Even of these, only a small proportion, in most mines, is open for examination at any one time; and the openings themselves form only part of the total area. The visiting geologist or engineer therefore sees only a small fraction of the entire deposit, and it is natural enough that in many cases the really significant pieces of evidence escape him. The man who has the best opportunity, to study the deposit is he who is familiar with it throughout the entire period when it is being worked; who sees the freshly broken face of each drift, and the developments from day to day in every working place. A relatively less degree of ability so applied may be expected to yield greater results than an occasional brief visit from an eminent scientific authority. The greatest progress in the study of ore deposits may be looked for when these men become conversant with the fundamentals of economic geology; when the mine superintendent and the mine surveyor have been trained in the methods of the field geologist, to observe accurately and to record their observations.

Even now I do not believe for one moment that the men who do the actual work of underground mining are as unobservant or as incapable as one might suppose, judging from the comparative absence of mention of their observations in the modern literature of ore deposits. I prefer to conjecture that their work has somehow failed to become adequately recognized in the publications; and that many of the luminous observations recorded are really due to the careful study of some unnamed foreman or mine superintendent who conducted the distinguished visitor through the mine.

In the future scientific dealing with the origin of ore deposits, and particularly the localization of their richer portions, I believe that the work of the chronicler will be of equal dignity and importance with that of the official historian. I go further, and express the opinion that when more of our economic geologists take up the actual work of directing and planning underground mining operations, their opportunities for original observation will be improved, and the results will be careers of increased usefulness, and increased scientific progress.

Certainly there is no royal road to the discovery of ore bodies which do not crop out at surface. Yet the study of the subject is not without practical utility. It enables us to substitute intelligent underground prospecting for purely geometrical or empirical prospecting. Our ore bodies are not found, as a rule, where we look for them the first time, or the second; for, as Lindgren says, the shoots "often fail to materialize where in accordance with supposition they should do so." But as the result of a great deal of hard-earned experience I do not hesitate to assert that prospecting based on intelligent hypotheses succeeds far oftener than prospecting which is blind or based on unintelligent hypotheses. Further, the trained engineer, familiar with what is known already of the causes of the localization of ore, and its occurrence under widely different conditions in many districts, has a great advantage in finding ore over the ordinary uneducated tributer.

It has frequently occurred to me that, in discussing the origin of ore localizations containing the precious metals, and also compounds of the base metals, there has been some confusion of thought owing to failure to distinguish sufficiently between the causes which produced enrichments of gold, and those which produced ore bodies of the base metals. The same causes which produced the one by no means necessarily produced the other. In the case of the base metals, we are dealing with appreciable quantities which can be expressed in percentages; and their ores, if sufficiently plentiful to be considered ores at all, are at once visible. With the precious metals, on the other hand, and gold in particular, we have to deal with minute proportions, one two hundred and fortieth of 1 per cent. being a high grade ore—or quantities which, excepting for the relatively simple metallurgy of gold, could not be detected, much less worked. It is probable that other rare elements exist in common ores to at least an equal extent, the presence of which, owing to the absence of equally effective methods of assay, is never suspected. The gold in most ores, in fact, may from the standpoint of the chemist or the physicist be regarded as an insignificant and accidental impurity in the very ore bodies which derive their economic value from its presence.

The geologist who studies this subject has usually no personal knowledge or equipment for investigating at first-hand this most important factor in the distribution of ore values. He is dependent on the engineer or mine superintendent for information of this kind, which all engineers know is most difficult to ascertain precisely, even with close and prolonged study. How frequently it happens that, even after years of familiarity with the ores of a particular mine, with all the assistance afforded by thousands of assays, the engineer still knows little or nothing positive as to the conditions under which his precious metals occur, or the specific minerals with which they are associated. Indeed, we frequently know more, or rather imagine we know more, after the first week, than after the first year. Now, the unfortunate geologist is usually in the same position as we are after the first week: That is, he has absorbed a great many observations which have every merit, except that of being in accordance with the facts. He is necessarily dependent on the information he gets from the local operator, and the stream is no purer than its source. It is by no means true that even a man who is very familiar with a mine, necessarily knows the valuable ore by its appearance. The ore of some mines can be quite accurately graded by a person who is really familiar with them; in other cases it can never be accomplished.

As an aid to the discovery of ore shoots, nothing is so important as persistent sampling. By that I do not mean the systematic sampling employed to delimit and ascertain the value of ore bodies, the methods employed in which have been thoroughly worked out and described for several years past. I mean rather the kind of sampling which is employed—only not nearly so thoroughly as it should be—by the tributer in search of a "pitch." This kind of sampling is directed more to find where values are, than what they are; it tests every separate stringer, regardless of size and every novel vein material, however small in quantity. Its use reminds one of the children's game of "hide and seek," in that directly you get a good assay you may be "warm," for it proves that solutions carrying high values have been at work in that vicinity, and it is time to hunt for their channels. More and more, experience teaches me that this is the essential factor in prospecting. The mineralization being of the right character, there is always a fair chance of finding some place where its effects have been concentrated sufficiently to create commercial ore bodies. On the other hand, I have learnt to distrust the veins, however large or "well defined," which show no evidence somewhere or other of mineralization by solutions which were capable of depositing a workable grade of ore. Nearly every mining district contains plenty of such, which have every requisite for making good mines, excepting pay ore. There was a time when a fine appearing vein appealed to me in itself; and I recollect that at one time I used to suppose that in choosing a place to prospect, it was necessary to select "a fine, large, generous vein," so that if an ore body occurred in it, there would be plenty of space for a large one. I have grown out of all that. Granted the right kind of mineralizing solution, and a fissure, however small, the elements are there already. At some point shattering or faulting will have made spaces enough in which to deposit ore; or, if not, the mineralizers can usually eat out their own receptacle.

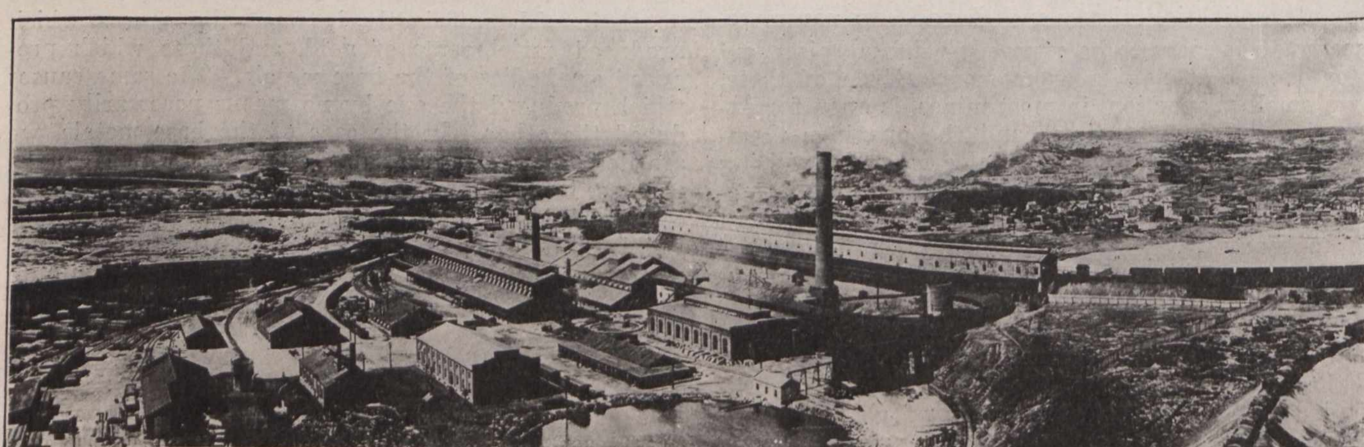
SORTING, ROASTING AND SMELTING NICKEL-COPPER ORE, CANADIAN COPPER COMPANY

The Canadian Copper Company is at the present time mining ore at the Creighton, the Crean Hill and No. 2 mines. In 1912 the ore production was as follows:

Creighton	518,417 tons.
No. 2	66,371 tons.
Crean Hill	33,506 tons.

The hoisting, crushing and picking methods are the same at all the mines, and a description of the process at Creighton Mine will suffice for all.

The ore is hoisted in $2\frac{1}{2}$ ton skips by motor-driven hoisting engines. At the top of the rock house the skip dumps over a "grizzly" or screen, formed of rails spaced five inches apart. The fine ore is thus separated



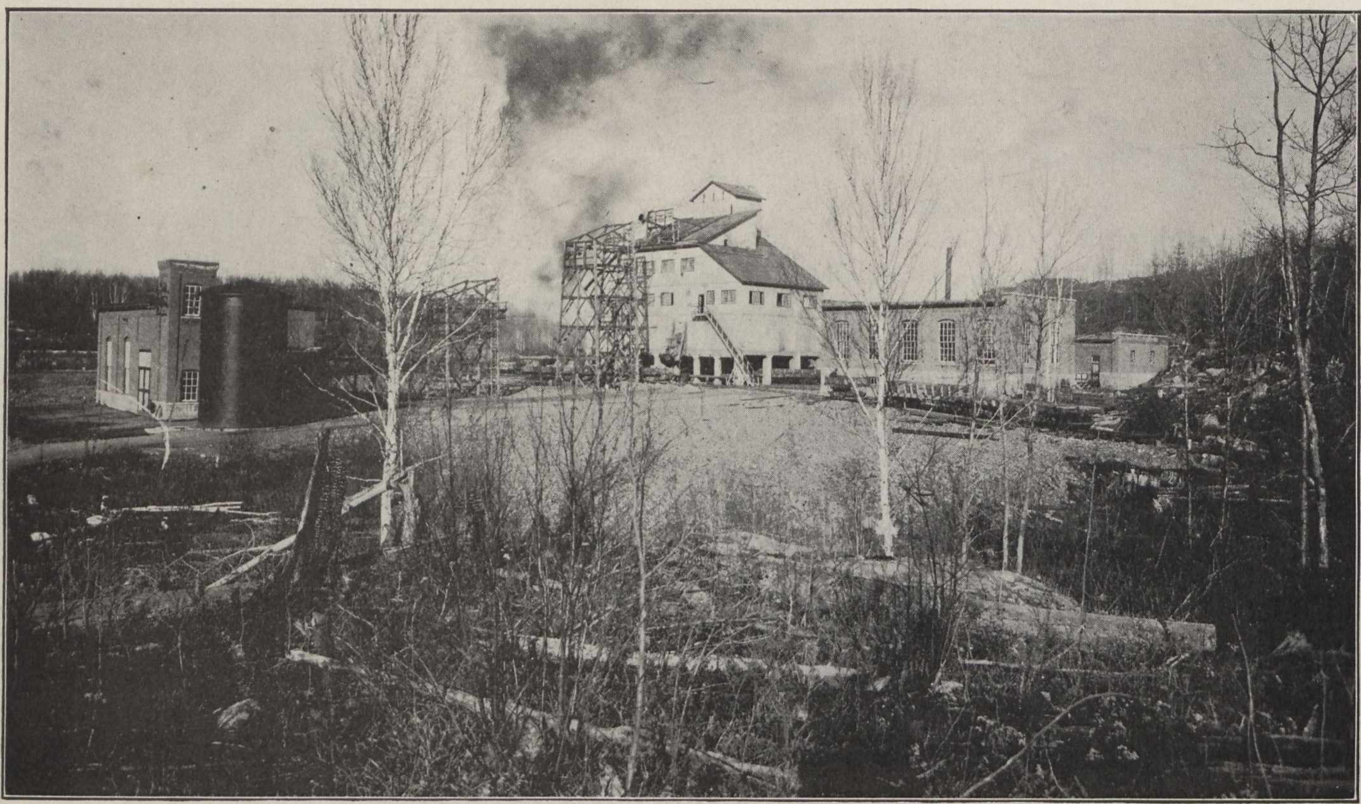
General View of Smelter, Canadian Copper Co.

Creighton Mine Buildings, Canadian Copper Co.

from the coarse and falls into the fine ore bin. The coarse ore is fed into two crushers of the Blake type, 18 x 30, which break it into pieces approximately 2½ inches cube. The crushed ore passes through trommels pierced with ⅞ inch openings, which remove the fine ore. The coarse ore passes over picking belts, where any visible rock is sorted out by hand. Of 100 parts material hoisted, about 10 parts are removed on the belts as rock.

Roasting.—The coarse and fine ore are taken from the rock house on flat cars and removed to the roast yard at Copper Cliff. Here the ore is roasted in open heaps. A bed of cordwood is prepared, and on this the ore is placed in piles of about 2,000 tons, about six feet high. Fine ore, which is separated from the coarse at the rock houses, and which amounts to about 15 per cent. of the total ore, is used to cover the beds. The wood is fired and the piles allowed to burn under normal conditions for about three months. The sulphur, which in the green ore is 25 per cent., is thus

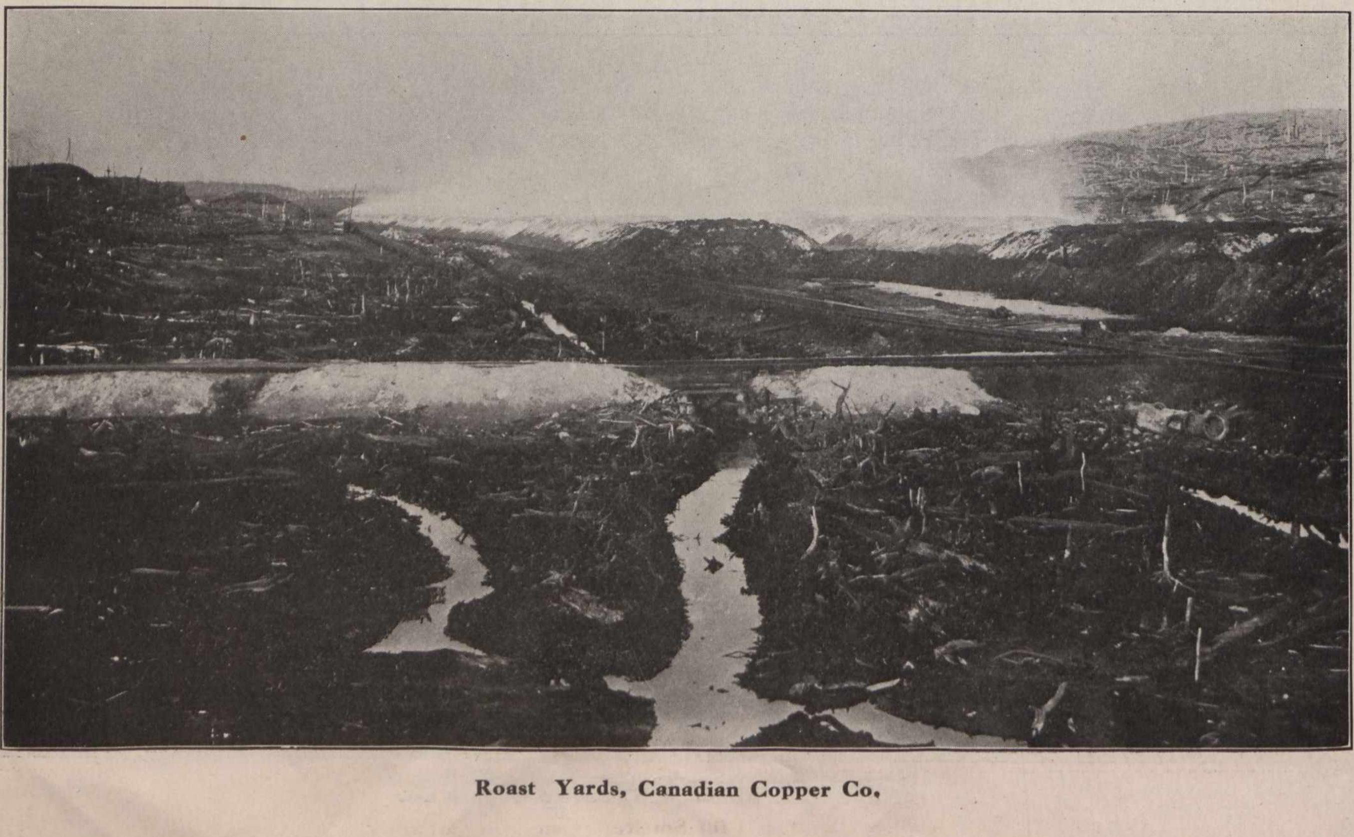
No. 3 Mine Buildings, Canadian Copper Co.



Crean Hill Mine Buildings, Canadian Copper Co.

reduced to 12 or 13 per cent., a corresponding oxidation of iron takes place, so that the roasted ore consists of a mixture of iron oxide with the sulphite minerals.

The roast ore is loaded into steel drop bottom cars, holding 50 tons, by a steam shovel. The roast ore is now taken to the smelter and dropped into bins behind the blast furnaces. These bins contain beside the roast ore, all the ore from Crean Hill, which is used as it comes from the mine, without roasting, together with quartz, limestone, coke, converter slag and other materials used in the smelting process. Quartz is used as a flux in the blast furnaces, to combine with the oxide of iron, produced both in the roasting and the blast furnace treatment of the ore. This quartz comes from the Company's quarry in the township of Dill, about twenty miles south-west of Sudbury. It is a

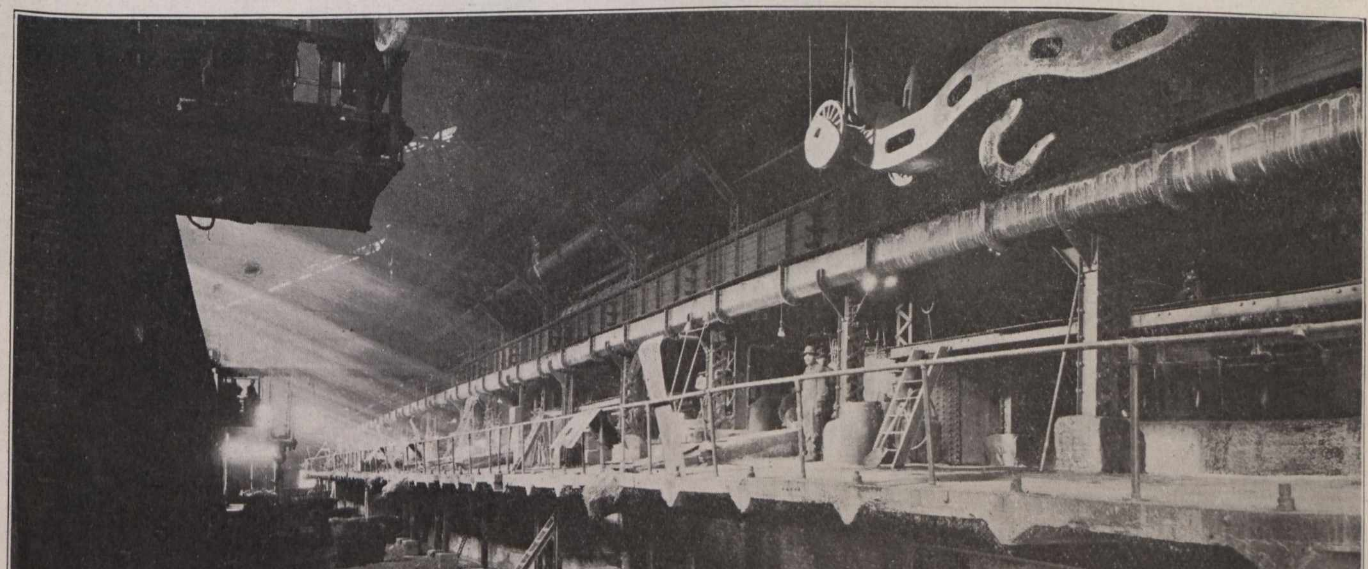


Roast Yards, Canadian Copper Co.

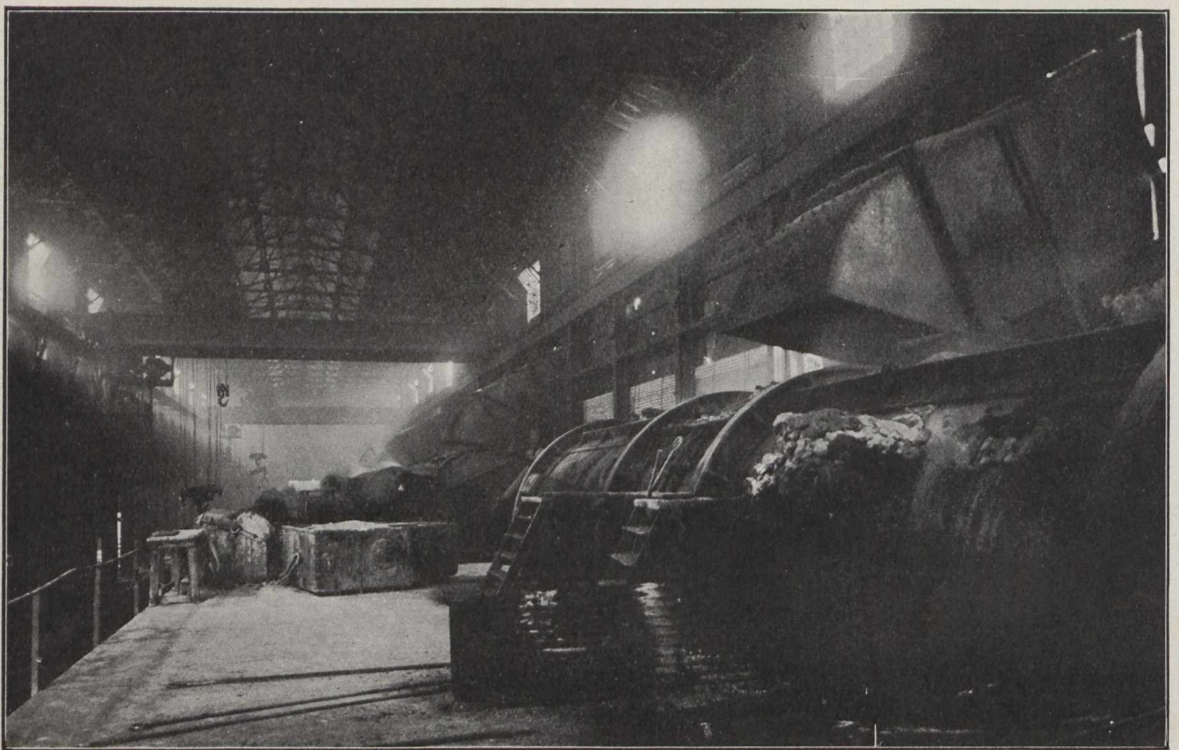
Blast Furnace Charging Floor, Copper Cliff Smelter

remarkably clean, massive quartzite, containing about 92 to 94 per cent. silica.

Smelting.—To understand the smelting operations, it must be premised that copper and nickel matte smelting is entirely opposite in its principle to the blast furnace treatment of iron ores. In the iron furnaces, the operation is conducted in a reducing atmosphere, with the intention of reducing all the iron present to metallic form, and preventing its passage into the slag. In copper and nickel smelting, on the other hand, the operation is conducted in a strongly oxidizing atmosphere, with the intention of driving as much as possible of the iron into the slag, and saving only the copper and nickel with sufficient sulphur to pre-

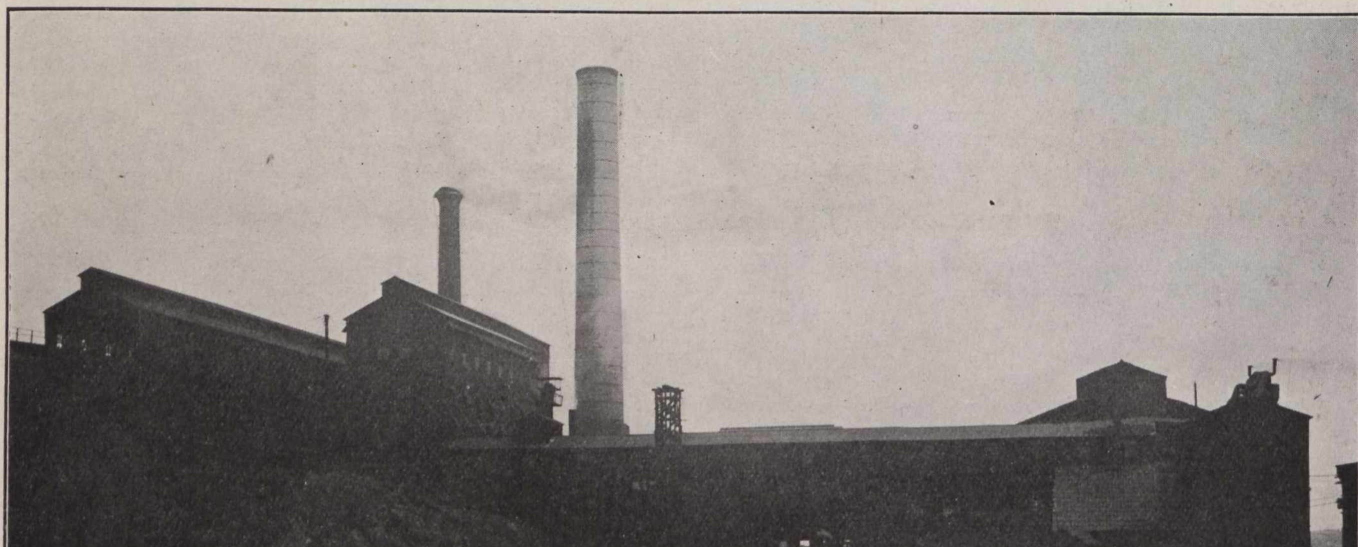


Tapping Floor, Copper Cliff Smelter, Canadian Copper Co.



Basic Converter Plant, Canadian Copper Co.

vent their oxidation. Copper and nickel combine with sulphur in the blast furnace to form what is known as matte. This matte contains iron in amounts which vary inversely with the amount of oxidation attained on the roast yard and in the blast furnace. If the ore is roasted to 10 per cent. sulphur, the furnace matte may contain 30 to 40 per cent. copper nickel, and from 40 to 30 per cent. of iron, while if the ore is roasted to about 14 per cent. sulphur, the furnace matte may contain only 10 to 20 per cent. copper nickel, with about 50 per cent. iron. It is evident that if the ore is poorly roasted, the oxidation attained in the blast furnace must be relatively greater than is necessary with well roasted ore. This furnace oxidation is attained by the addition of quartz in the blast furnace. This quartz prevents the rapid smelting of the ore, and by holding it in the blast furnace, under the influence of a powerful blast of air, allows the oxidation of about 50 per cent. of the sulphur and iron, contained in the roasted ore. The iron oxide formed on the roast yard and in the blast furnace, combines with the quartz to form a slag which contains about 55 per cent. iron



Reverberatory Department, Copper Cliff Smelter

oxide, in the form of silicate of iron. This silicate of iron can often be found in crystalline form on the slag dump.

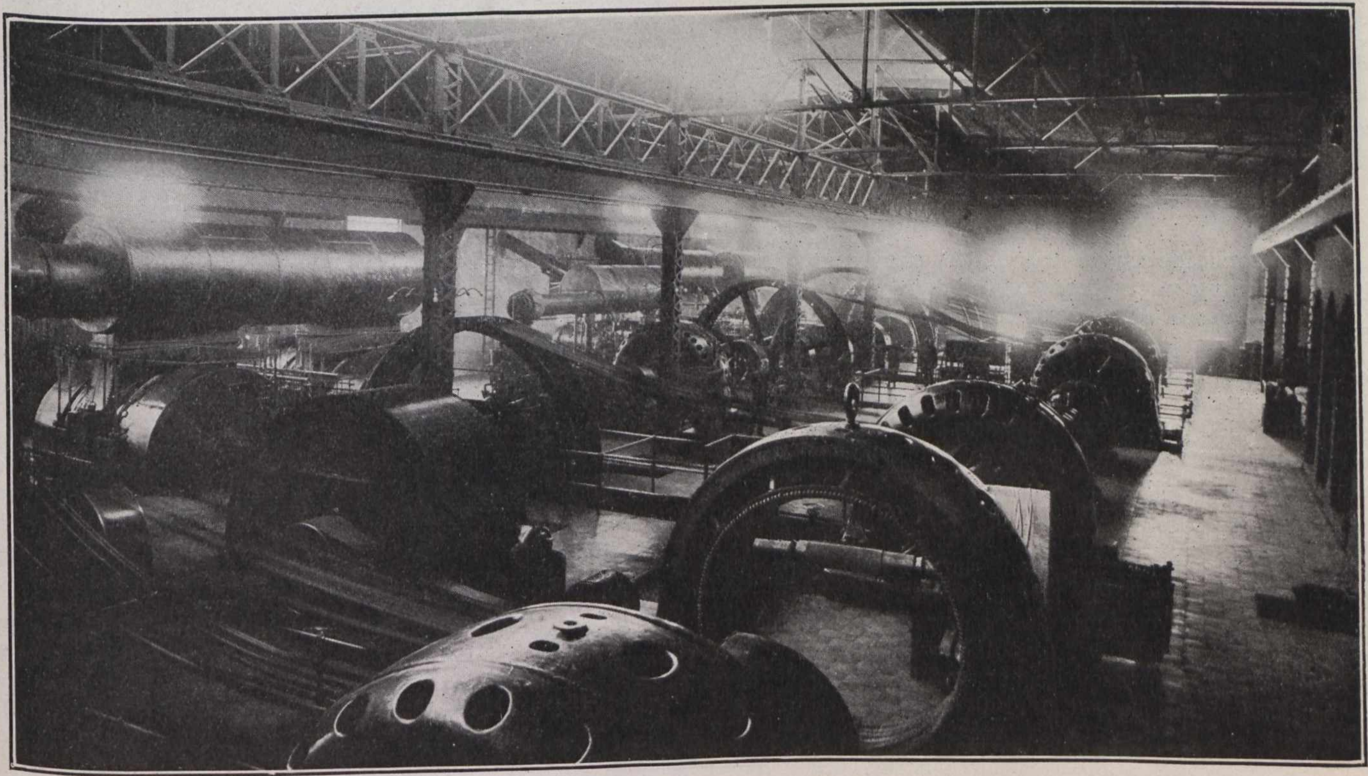
Limestone is used as a flux only when the furnaces are in poor condition. The addition of a lime base to the slags lowers their melting point, and thus allows the cleaning of accretions from the sides of the blast furnace. In certain cases, when the ores are very rocky and particularly if much aluminium is present, the addition of a small amount of limestone to the charge is indicated.

The furnace charge is taken from the bins in trains of nine cars hauled by electric locomotives. These cars hold about two tons of ore. The first three cars contain coke, about 11 per cent. of the weight of the charge. This is dumped into the furnace by rolling the cars on their base, so that the coke is spilled over the side of each car into the furnace. The next car contains quartz, which is spread on top of the coke by moving the train along while the quartz is being dumped. In this way the quartz is placed next to the coke, and being thus strongly heated is in a position to combine with the iron which flows down over it from the melting ore.

The ore charge of three or four cars is dumped next above the quartz. The last car or cars may contain converter slag, scrap, or other smelter cleanings, and are dumped last.

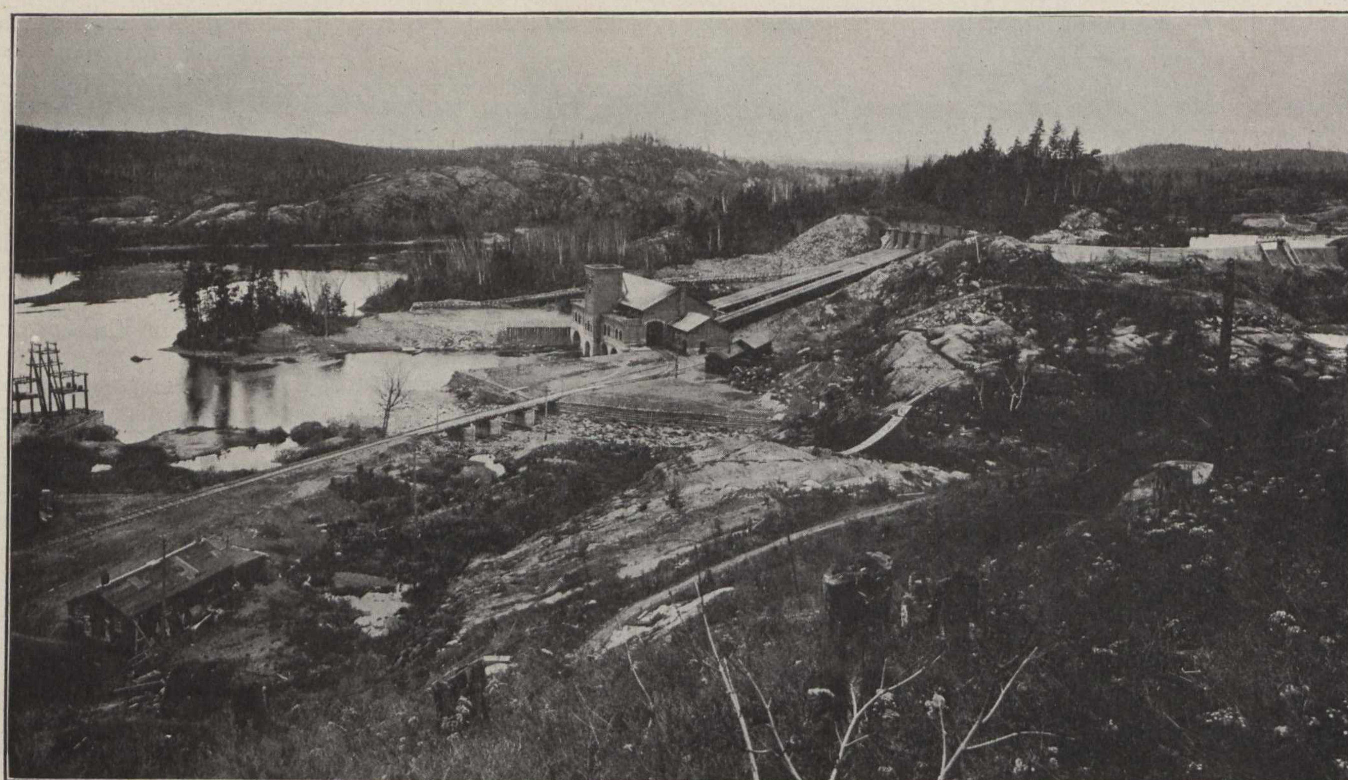
The blast, which is introduced through 32 tuyeres near the bottom of the furnace, furnishes oxygen, not only for the combustion of the coke, but also for the combination with the sulphur and iron in the ore. The amount of air blown into each furnace is about 24,000 cubic feet per minute. Each furnace smelts about 300 tons of ore, or 400 tons charge in 24 hours. During this time it receives about 1,300 tons of air, so that the air blown into the furnace is about three times as much in weight as the solid charge.

There are five furnaces 17 feet long, and one furnace 21 feet long, having a total capacity of over 2,000 tons ore in 24 hours. The melted products flow continuously from the furnace into an oval brick-lined settler, 19 ft. 6 in. x 16 ft. x 5 ft. 6 in. In this settler the matte, which has specific gravity about 4.6 to 4.8, separates from the slag, which has specific gravity about 3.7. The slag runs continuously from the settler into 25 ton pots, which are taken to the dump. This slag contains about 33 per cent. silica and about 55 per cent. iron oxide. It carries off about 0.4 per cent. copper nickel. The matte is tapped from the bottom of the settler into eight ton pots and transferred to the converter building. This furnace matte contains about 6 per cent. copper, 16 per cent. nickel, 47 per cent. iron and 27 per cent sulphur. It is treated in the converter department by blowing air through it to convert the iron into iron oxide, which iron oxide, as fast as formed, unites with quartz or mine rock, which is placed in the converters as a flux. The continuous blowing of air through the matte, and the continuous removal of the iron in the shape of converter slag, removes the iron from the matte and leaves a final product containing about 80 per cent. copper nickel, with about 0.5 per cent. iron and 19 per cent. sulphur, which is known as Bessemer matte.



Interior of Sub-Station, Copper Cliff Smelter, Canadian Copper Co.

The converters, five of which are installed, are cylindrical iron vessels, 37 feet long by 10 feet diameter, lined with magnesia brick and capable of rotation on a horizontal axis. At the back of these converters is a row of tuyeres, 44 in number, and 1½ inches in diameter, through which air is blown into the molten matte at about ten pounds pressure. Each converter requires about 6,500 cubic feet of free air per minute. This air rapidly oxidizes the iron and sulphur in the matte, burning about 120 pounds iron per minute from iron sulphide to iron oxide, with a corresponding liberation of sulphur dioxide. The hot gases escape through



Hydro-Electric Plant, High Falls, Canadian Copper Co.

a six foot opening in the top of the converter. A slot shaped opening in the front of the converter allows the slag to be poured off as desired.

The conduct of the operation is as follows: The converter, being empty and heated by a previous charge, about 70 to 80 tons of matte is poured in with 5,000 or 6,000 pounds of dry crushed quartz. The converter is turned back and air blown in through the tuyeres. After an hour's blowing, the converter is turned down and slag poured off. From this time on, every forty minutes one pot of matte is added to the charge in the converter, with about 5,000 pounds of a mixture of quartz and waste mine rock. Air is blown through this for forty minutes. Slag is poured off and matte and flux added. In this way 400 to 500 tons matte may be put into the converter before the iron is eliminated, and a cast of 100 tons Bessemer matte obtained. This "blow," as one complete operation is termed, will last about 70 or 80 hours. The time depends on the grade of the matte put in the converter. Each ton of matte containing 22 per cent. copper nickel will produce about a ton of converter slag. The converter slag contains 28 per cent. silica and 62 per cent. iron oxide, with 2½ to 3 per cent. nickel. This slag is poured on a bed in the yard and sent back to the blast furnace, where its high percentage of iron oxide makes it useful as a flux. In passing through the blast furnace the copper nickel contents are very largely recovered.

The finished matte, which contains 25 per cent. copper, 55 per cent. nickel, 0.5 per cent. iron and 19 per cent. sulphur, is cast into slabs, broken by hand, loaded into box cars and shipped to the refineries in Bayonne, N.J.

NEW PLANT OF THE STEEL COMPANY OF CANADA AT HAMILTON, ONT.*

At Hamilton, Ont., the Steel Company of Canada, Ltd., recently has placed a new plant in operation consisting of a blooming mill, continuous billet mill and continuous rod and merchant bar mill, which combines all of the latest improvements in rolling mill design and operation. As a unit, it is claimed to reach the highest development of more recent steel rooling practice. The features of these works are summarized as follows:

Electrically-driven throughout.

Power is purchased from a hydro-electric plant, the current being transmitted a distance of nearly 40 miles.

The reversing blooming mill is motor-driven.

The motor-driven continuous billet mill consists of four stands, necessitating larger reduction for the four passes than is customary in mills of six and eight stands of rolls.

The combination continuous rod and merchant bar mill is the first of its type to be installed on the North American continent.

Equipment for cooling rods, whereby they are annealed and the formation of scale is reduced to the minimum.

Steel for this new plant is produced in six open-hearth furnaces, two of 80 tons, two of 35 tons and two of 25 tons capacity, the monthly output averaging approximately 15,000 tons. The two 80 ton furnaces have been added recently to meet the requirements of the new rolling mill and have been installed in an addition

*Extracts from an article published in Iron Trade Review, July 3, 1913.

to the existing open-hearth building. Hot metal is supplied by two blast furnaces, the open-hearth charges consisting of 55 per cent. of scrap and 45 per cent. of molten pig. Prior to the operation of the new plant, 6x6 inch ingots were cast, approximately 5 feet long, which were broken down in a roughing mill, this practice and the employment of small ingots, which were the size of large billets or small blooms, having entirely eliminated the blooming operation. The ingots for the new mill are 15x17 inches in section and weigh approximately 4,200 pounds.

The blooming and billet mills and the combined continuous rod and merchant bar mill are located in separate buildings, paralleling each other, and divided by a crane runway, extending at right angles to these structures, which commands the billet cooling bed, loading truck and the large conveyor for the continuous billet heating furnace for the rod and merchant bar mill. Both buildings are of steel construction, the one containing the blooming and billet mills being 60x475 feet and the rod and merchant mill 85x550 feet.

After casting, the ingots are conveyed from the open-hearth department over a standard gage track to one end of the blooming mill building, where the molds are stripped by a 75-ton, 63-foot span stripping crane, installed by the Alliance Machine Co., of Alliance, O. From the ingot mould cars the ingots are transferred to the soaking pits by a 10 ton soaking pit crane, installed by the Morgan Engineering Co., Alliance, O. The two soaking pit furnaces each have four holes, 5 feet x 8 feet 6 inches, which have a capacity of eight ingots each. These furnaces are built almost entirely above the floor level, permitting easy access for repairs. Producer gas is used for heating, this fuel being generated by four Morgan producers located in a separate building contiguous to the blooming and continuous billet mills. The covers of the soaking pit are hydraulically operated from a platform on a level with the tops of the furnace.

From the soaking pits the ingots are delivered by a crane to the approach table of the two-high, 34-inch, reversing, motor-driven blooming mill, which was designed by the Morgan Construction Co., and built at the Lloyd-Booth plant of the United Engineering and Foundry Co., Pittsburg. When breaking down ingots into blooms for the billet mill the steel is given 18 passes, but when breaking down for 6x6 inch blooms, the number of passes is reduced to 15. The blooming mill approach table is operated by a 30 horse power, direct current motor, and the two blooming mill tables are driven by 100 horse power motors. The side guards of the mill are hydraulically operated. In line with the blooming mill is the electrically operated 18 inch continuous billet mill, which consists of four stands of rolls. The blooms are cut by a 10x10 inch vertical bloom shear, which is electrically-driven, but has hydraulic movements. If the blooms are intended for the billet mill, they are conveyed by the electrically operated approach table to the first stand of billet mill rolls. Blooms to be rolled into billets are $3\frac{1}{2}$x$3\frac{7}{8}$ inches in section. However, when larger blooms are being rolled for one of the company's other works or for outside consumption, a section of the billet mill approach table is tilted, and the blooms are discharged onto buggies from which they are loaded into freight cars in the yard. The crop ends of the blooms are discharged into a bucket in a concrete pit, from which the bucket is lifted by the mill crane. A standard gage track at right angles to the length of the building extends the width of the plant between the bloom shear and the continuous billet mill. Supplies, spare parts, etc., are received over this track, and to permit the ingress and egress of cars, as well as loading the blooms intended for the billet mill onto buggies, a section of the billet mill approach table is so constructed that it can be tilted through an arc of 90 degrees.

The billet mill is of the Morgan continuous type, and consists only of four stands of rolls, which marks a radical departure in continuous billet mill construction, as the majority of mills of this type contain six and eight stands of rolls. The amount of reduction in the mill of the four-stand type over that of the six or eight-stand type is considerably increased per pass. When the bloom enters the first stand of rolls, the amount of reduction is 35.5 per cent.; second stand, 28.5 per cent.; third stand, 34.5 per cent., and fourth stand, 25 per cent. This reduction is considerably larger than that of continuous billet mills now generally in operation, which rarely exceed 27 or 28 per cent. during the earlier passes. The billets are rolled into $1\frac{3}{4}$, 2 and $2\frac{1}{2}$ inch sections, according to the size of the finished product, for which they are intended. The mill also is equipped to roll 2x8 inch flats. When intended for finishing by the combined continuous rod and merchant bar mill, the billets are cut to 30 foot lengths, and for the 10 inch hand mill to 15 foot lengths by an Edwards flying shear located at the end of the billet mill runout table. From the shear table the billets are delivered to a skew table, operated by a 75 horse power motor and onto the cooling bed. The cooling bed straightening device and the push-off each are operated by 50 horse power, direct current motors.

THE COBALT SERIES*

By Morley E. Wilson.

The Cobalt series consist of an assemblage of clastic sediments, conglomerate, greywacke, argillite, arkose, and quartzite. These rocks are not sharply defined members, for they not only pass gradationally into one another, both horizontally and vertically, but conglomerate commonly occurs in the midst of greywacke or greywacke in the midst of conglomerate, and a similar relationship may exist between all the members of the series. Nevertheless, in a general way, there is a succession in most localities, from a basal conglomerate through greywacke and argillite to arkose, which in turn is overlain by an upper conglomerate.

A compilation of all the published observations of the succession and thickness of the various rocks comprising the series throughout the Timiskaming region shows that there is generally an upper and lower conglomerate with greywacke and argillite, quartzite, and arkose as intermediate members.

Basal Conglomerate—Wherever the Cobalt series is seen in contact with the rocks of the older complex, the basal member of the series is usually a conglomerate. The outstanding feature of this basal conglomerate is its heterogenity, not only in the size and angularity of the included fragments, but in the variability of the rock, both in texture and composition from point to

*Extracts from a paper published in Journal of Geology, Feb., 1913.

point. In some places it is largely composed of coarse fragmental material with little matrix and, in other places, consists largely of matrix with few fragments. As a rule it is unstratified, but locally a partial alignment of the pebbles can be seen.

The matrix of the conglomerate varies greatly in texture and composition and may be either coarse and feldspathic or exceedingly fine grained and slate-like in appearance; the coarser types are, however, by far the most common. Examined under the microscope the matrix is seen to be composed of angular, subangular, and round fragments of quartz, feldspar, quartz porphyry, mica schist, rhyolite, andesite, basalt, and other rocks inclosed in a cement consisting chiefly of chlorite, but usually accompanied by small quantities of carbonate, epidote and pyrite.

The pebbles and boulders of the conglomerate include, even in a single rock exposure, nearly every variety of rock occurring in the older complex. Fragments of granite occur everywhere, and are commonly many miles from the nearest occurrence of this rock in the underlying basement from which the Cobalt series was evidently derived. As is generally characteristic of coarsely clastic sediments of this character, the pebbles and boulders are commonly subangular or angular in shape though round fragments are also present.

Greywacke and Argillite.—The basal conglomerate of the Cobalt series commonly passes gradually upward by the loss of its pebbles and boulders into greywacke and argillite. This greywacke was originally a ferromagnesian sand and the argillite a ferromagnesian mud, both of which are now, however, very firmly cemented, the argillite resembling a slate but differing from a slate in possessing no slaty cleavage. The greywacke and argillite, like the other members of the Cobalt series, vary greatly, and here and there contain beds of arkose, masses of conglomerate, and in some places, single isolated boulders. In a few places the greywacke is unstratified, but as a rule both it and the argillite are uniformly bedded. The microscopic examination of the greywacke shows it to consist of fragments of quartz, feldspar, basalt, andesite, and other ferromagnesian rocks along with an abundance of chlorite. The argillite is much finer grained than the greywacke, consisting of exceedingly minute fragments of quartz and feldspar imbedded in a chloritic cement. Small quantities of sericite, epidote, and carbonate are also commonly present in all of these rocks.

Arkose and Quartzite.—The greywacke and argillite are usually replaced on passing upward by arkose or quartzite, the transition taking place by a gradual increase in the feldspar and quartz content or by an alteration of beds of the two rocks. The arkose and quartzite are firmly cemented sands which, when examined under the microscope, are found to consist of round, angular, or subangular fragments of quartz, or of quartz and feldspar along with small quantities of calcite, sericite, epidote, pyrite, and other minerals. They are generally stratified, may show ripple marks, are locally cross-bedded, and in places contain well-rounded pebbles of quartz and jasper in lenticular aggregations.

Upper Conglomerate.—Wherever the Cobalt series has a considerable vertical thickness, the arkose and quartzite are overlain conformably by an upper conglomerate which differs in no respect from the lower member of the series and cannot be distinguished from it except where the stratigraphical succession is known.

THE PROBLEMS OF GOLD AT DEPTH*

By Hugh F. Marriot.

Much has been said from time to time during the life of the Rand about the present and prospective decrease of value in depth, and it is now desirable that the line of argument as regards these fields should be put on a definite and rational basis.

The relations between the earlier mining records and those now being produced have been fully set forth in the contributions to discussion from Mr. H. S. Denny and myself on Mr. Schmitt's paper (Transactions I.M.M., London, Chemical, Metallurgical and Mining Society, South Africa), and need no further elaboration here. The present contribution deals rather with the wider geological point at issue.

In dealing with ore deposits as they were chiefly known previous to the discovery of the Rand, it was only natural for the theorists to come to the conclusion that veins and fissures would be found to be poorer the deeper they were opened up, because, until the comparatively recent intense search for valuable minerals throughout the world, the majority of the deposits which had been worked were, by reason of the greater ease of their selection, in that particular class which affords the evidence in support of the formation of a theory on these lines.

All mineral deposits have limits to their extent both laterally and vertically, and, in the cases where the valuable mineral has been introduced upwards from below, the vertical length of each lens naturally tends to be greater than the lateral extension. I use the word "lens" advisedly, for in the succeeding argument all deposits which have defined limits and defined thickness may be considered as variations of lens-formation when spoken of broadly as regards their mass. In the natural process of denudation of the surface, these lenses are weathered down together with the surrounding country, and it is when their greatest thickness—and therefore their most important horizon—is reached that they offer more resistance to the denuding influences than does the country rock, and so stand up above the normal surface, thereby offering easy evidence to the prospector. This evidence is often supplemented by a large amount of surrounding detritus, being the product of denudation. If it happens that the thickest portion of the mass has not yet been brought to the surface horizon, subsequent mining operations will, in time, pass through it, and will thereafter continue down into the narrower portion of the lens until that particular deposit pans out.

*From South African Mining Journal, Sept., 1912.

That is the type of mineral deposit which, till recent years, has formed the subject of the mining operations in the majority of vertical and inclined veins and lenses of the world. Other deposits there are on which denudation has done its entire work, and, when the rich material on the surface which still remains in concrete form in large blocks has been cleared up, the underlying country has been found to contain the merest stringers of what was, in the higher levels, a magnificent deposit. A vast field yet remains for future generations, who will be equipped with appliances for detection, the nature of which are only now dimly indicated by embryonic investigations in the science. Further developments will provide the means to find those lenses, which either give no indication of their contents on the surface at all or present so insignificant an outcrop in size and value, that they are to-day left untouched. This may be taken to apply to the type of ore deposits that have until recent times formed the chief sources of production. The field is now so vastly widened that it is necessary to review the position afresh and to be prepared to discard many of the theories which have of necessity only been formed on one section alone of the mineral wealth of the world.

I have pointed out that the majority of the evidence of decrease of value in depth has been taken from those deposits in which the measurement has been greater in their vertical than in their horizontal axis. Let us now take a broad view of the Rand deposit as seen from the standpoint of nature, regardless of the many small readings with which it has been burdened, based on the comparatively small and haphazard disclosures made by human agency.

Between the extremities of Randfontein and Modderfontein there are about fifty miles of banket, which can be considered from a natural standpoint as one continuous and systematic gold-bearing deposit. Take the present developed depth of the Rand, say five thousand feet vertical or ten thousand feet on the dip, and study the formation diagrammatically by drawing a rectangle with the horizontal side to represent fifty miles in length and the vertical side to represent five, ten, or, if you wish to look far into the future, twenty thousand feet on the incline. In each one of these cases you will obtain a representation that will show far less depth in proportion to the length than is the case between any two levels in any average mine in the normal type of ore deposit. From the point of view of nature, this is one great gold deposit, and it is altogether unreasonable to suppose that the purely fortuitous position of the outcrop horizon, embracing a strip of ground almost of length without breadth, was selected by the various agencies responsible for the deposition of the gold in direct opposition to all the observed procedure in other mineral deposits of the world. Whether the gold came in with the pebbles from above downwards, or from below along the plane of least resistance upwards, or whether it filtered in from the great mass of the surrounding country and found a final resting place in concentrated form in the conglomerate, one thing is certain, that there is no argument that can support the theory that nature has chosen a strip fifty miles horizontal by two miles on the incline, to the exclusion of the remainder of the great stretches of the banket deposit throughout the Witwatersrand series, or, to bring it within practical limits, to the exclusion of the next two miles southwards on the incline. That the weathering away of the surface from unknown heights to the level of the present outcrop has taken place is evidenced by the rich deposits of gold which occurred in the oxidized zone in the vicinity of the surface in the higher grade sections and has been worked out in the early days of the more notable mines. The gold so deposited can have been but a small portion of that which was originally contained in the subsequently denuded banket, but the amount found redeposited in sub-outcrops of the reefs in situ shows that the formation must have been subjected to denudation to the extent of thousands of feet.

As regards the variability of gold content in detail, it is not possible to give any rule for the mode of accertion of what is locally termed the "payable" as against the "unpayable" portion of the deposits. The most that can be said is that the consistently richer portions lie in series of irregularly-shaped areas of which the units can be observed as measuring roughly up to five thousand feet by two thousand five hundred feet on their major and minor axes. There is an indication that evidence will be forthcoming, as the development of the country progresses, that these richer areas form links in a series of huge zone formations, which wind about without limitation of horizon through the great mass of the Witwatersrand beds. The mine development to-day is the greatest where these zones have been bisected by the line of outcrop.

To revert for a moment to the comparison usually made between present results and those of former years and to show how fallacious as a means of argument is the hitherto commonly accepted basis of yield, I will quote one instance where I have made a comparison on a comprehensive scale between the records of the old workings near the surface and those now being prosecuted at the greater depths. The assay values of the tonnage measured over the stope widths stand in the records of the old workings in the upper levels over the various sections of country as 9.7 dwts. over five feet, 17.3 dwts. over four feet six inches, and 10.9 dwts. over four feet six inches. When removed from their richly endowed home in the narrower stoping width that used to be considered sufficient for the moderate ideas and small mills of the early days and translated into figures distributed over the actual stoping widths from which the ore is extracted by the present methods, the above records taken in their due proportion are represented as 8.8 dwts. over six feet six inches, and when compared on a common basis, there is only the difference of a fifth of a pennyweight between the two periods.

There is yet much ore rich in gold-content to be found in the unprobed depths of the Witwatersrand, but to be a profit producer it must, when found, be treated as nature has made it, and be extracted by methods of mining which will enable it to give the full force of its value in the mills in which it is treated. In the meantime, judging the Rand from a comprehensive standpoint, the deepest level work is merely prospecting, and it will not be until the now opened up deeper developments of to-day have been extended throughout their horizon so as to form connecting links in the chain of evidence at the depth of the present deepest line of shafts that we shall be able to select with some degree of accuracy those sections of the Main Reef series which will be, in the depths yet unexplored, the successors to the rich producers at the outcrop.

PERSONAL AND GENERAL

F. C. Alsdorf has returned to Boston from a trip to Cobalt and Kirkland Lake.

Charles M. Henrotin has returned from a visit to Kirkland Lake properties.

J. B. Tyrrell has returned from Harricanaw district, where he has been investigating reported gold discoveries, and will join the Sudbury Cobalt-Porcupine excursion of the Geological Congress.

The Northern Customs Concentrator has been sold to the owners of Cobalt Townsite and other mines at Cobalt. The contracts have not been sold, however, and a new mill will be built near La Rose mine to treat ore from La Rose and Cobalt Comet mines.

The annual meeting of the American Institute of Mining Engineers will be held in Butte, Montana, on August 18th. Members attending this meeting can, if they wish, join either excursion C-1 or C-2 of the Geological Congress at Vancouver and take part in the return portion of it. They also have time before the meeting to take part in the Session at Toronto.

Mr. Jos. Trethewey, of Cobalt, has been investigating the mineral resources of a part of the Hazelton district, in the Skeena River country, British Columbia, from which district a commencement has been made to send out silver-lead ore, ten cars having lately been shipped from the Silver Standard mine to the Consolidated Mining and Smelting Co.'s smeltery at Trail.

Mr. J. M. Turnbull, of Trail, B.C., has been preparing to do development work on a group of mineral claims near Howe Sound, Vancouver mining division, which property the Consolidated Mining and Smelting Co. will explore under option of purchase.

Mr. J. L. Warner has returned to Rossland and has lately been busy in connection with the installation of some power plant on one of the claims held by the Richmond Consolidated Mining Co., situated in the South Belt of the camp.

Mr. E. R. Wolfe, of Spokane, Washington, is manager for the Florence Mining Co., which is doing work on the Hope property in Ainsworth mining division, British Columbia.

Mr. Geo. W. Wooster, of Grand Forks, B.C., treasurer and director of the Granby Consolidated Mining, Smelting and Power Co., was lately on a visit to the company's property at Granby Bay, Observatory Inlet, where a smeltery is being erected and equipped to treat ore from the company's Hidden Creek copper mines.

Wm. H. Green, formerly of the Toronto University staff in mineralogy, is now at Ironwood on the Gogebic Iron Range, Michigan.

Robert B. Stewart is at Saskatoon preparing for an exploration trip in Northern Alberta.

Mr. W. M. Archibald, of the Consolidated Mining and Smelting Co.'s mining engineering staff, has made Nelson, B. C., his headquarters of late.

Mr. E. Berryman has for more than a year superintended the work of exploring various mineral claims on Copper mountain, Similkameen district, B. C., held by the British Columbia Copper Co., under option of purchase. Mr. F. R. Weekes is resident engineer at these properties.

Mr. James Buchanan, superintendent of the Consolidated Mining and Smelting Co.'s lead and copper smeltery at Trail, B. C., is on a visit to Scotland. Mr. M. H. Sullivan, assistant superintendent, is in charge at those works.

Mr. J. C. Edwards, superintendent for the Treasure Mountain Silver-Lead Mining Co., of Spokane, Washington, which has for nearly two years been developing mineral claims situated in Summit camp, near the headquarters of Tulameen River, B. C., has returned to Treasure mountain from a business visit to Spokane.

Mr. James Humes, for several years connected with mining properties on Vancouver Island, B. C., is now superintendent for the Silver King Consolidated, at Park City, Utah, U. S. A. His son has succeeded him in charge of the King Solomon property on Koksilah mountain, Vancouver Island.

Mr. R. H. Ley, formerly practising assaying at Nelson, B. C., is now visiting various mining districts of that province in the interest of the Giant Powder Co., Inc.

Mr. O. E. Leroy, of the Geological Survey of Canada, is on an official visit to British Columbia.

Sir Richard McBride, Premier and Minister of Mines for British Columbia, will shortly pay another visit to England, whence he will go on important official business.

Mr. Frank E. Pearce, formerly of Baker City, Oregon, but now manager for the company owning the Inland Empire gold mine and stamp mill in Trail Creek mining division, British Columbia, has been on a visit to the coast cities, Victoria and Vancouver.

Mr. Wm. Springer, one of the pioneers of the Slocan, British Columbia, and for the past year in charge of development work on the Idaho-Alamo group of mineral claims for the Finch syndicate, has gone on a prospecting trip to the North Thompson River, B. C.

The capitalization of Canadian Boving Company, hydraulic and general power engineers, has been increased to $1,000,000, and the company is now being operated under the title of Boving & Co., of Canada, Ltd. The company recently purchased the works of the Madison Williams Manufacturing Company of Lindsay, Ontario, and will manufacture water turbines, centrifugal pumps, etc.

In a recent decision in the U. S. Court at Pittsburg, Pa., in the case between Duplex Metals Company, complainant, and Standard Underground Cable Company, defendant, regarding copper clad wire, the case in so far as it is based on alleged infringement of patent, was dismissed on the ground that defendants have not infringed said patent.

It has been announced in a press despatch that Hon. T. W. Crothers, Dominion Minister of Labour, plans to make a flying trip to the Pacific coast in July for the purpose of personally investigating matters in connection with the labour troubles that have caused a suspension of work at some of the coal mines on Vancouver Island, B.C.

Mr. Clarence Cunningham, of Seattle, Washington, whose name has been prominently before the public in connection with coal lands in Alaska, was in the Similkameen district of British Columbia in the latter part of June, examining mineral claims in camps along the Similkameen and Tulameen Rivers. In the same party was Mr. E. F. Fields, of Spokane, Washington, a mining engineer well known in that state.

Mr. J. C. Edwards, who for more than a year has been engaged in directing the developmnt of the Treasure Mountain Silver-Lead Co.'s mineral claims in Summit camp, Tulameen district, B.C., was a recent visitor to Spokane, Washington, in which city his company has its head office.

SPECIAL CORRESPONDENCE

COBALT, GOWGANDA AND SOUTH LORRAIN

Nipissing Finds Branch Vein at No. 73.—For the month of June the Nipissing shipped $388,883 net, and produced net value $215,418. The shipment included bullion from ore taken as customs at the high grade mill.

The most important development of the month was the cutting of a branch vein at the third level of shaft 73. When first encountered, the vein assayed 3,000 ounces over a width of three to four inches. Twenty feet of drifting has already been done on this branch, and although somewhat smaller the grade remains the same.

The cross-cut at the 650 ft. level of the 64 shaft is in 60 feet. One hundred and twenty feet will be necessary to cut the vein. A calcite seam, several inches in width was encountered at 40 feet, but it is of low assay, and probably is the same vein cut across the shaft at a depth of 500 feet. This is all dead work.

Hydraulic prospecting between the high and low grade mill was completed. A large number of small seams were encountered, most of them showing some cobalt. Two have a width of two to four inches, but have only fair assays. Another one has a width of one inch over a width of 75 feet, and at one point shows high grade ore. All of these veins will be worked this summer. The hydraulic line has been changed and ground is now being prospected between Little Silver Hill and veins No. 19 and 27. Nearly all of the ground to be washed is conglomerate. The high grade mill treated 147 tons and shipped 570,703 ounces of silver. The low grade mill treated 6,291 tons.

Bailey Mine Opens High Grade Shoot.—A good shoot of high grade ore has recently been opened up at the west end of the first level of the Bailey mine. The vein is from an inch and a half to two inches wide and at the point where the strike was made is about 150 feet below the top of the cliff. The ore is a heavy niccolite and exceptionally high grade. It has been opened up for about 16 or 20 feet. This is not a continuous shoot of ore, since for several rounds the ore is merely cobalt, with low silver values. The vein on the fourth level has been opened up for 140 feet. All this is high grade ore of an average value of 1,200 ounces per ton, the vein being from two to three inches wide. On the third level the main vein is three to four inches wide, and has been drifted upon for 86 feet. Of this possibly two-thirds is high grade, while the rest will make milling ore.

McKinley-Darragh-Savage Finds New Ore Body.—The production for the McKinley-Darragh-Savage mines for the month of June was 185,182 ounces, of which 56,191 ounces came from the Savage and 128,271 ounces from the McKinley. The feature of the month was the discovery of an entirely new ore body on the Savage in virgin territory. This was discovered at the 140 foot level. There is only about 25 feet of ore on this level, where it averaged two to three inches of 5,000 ounces. It has all the appearance of being the apex of an ore shoot, and a cross-cut is being run at the 190 foot level to pick it up. The No. 2 vein on the Savage at the 190 level has been yielding surprisingly well, though for some time it contained nothing but cobalt with low silver values. This was found when raising in the stope near the Provincial line. The new ore shoot at the McKinley-Darragh is on the No. 40 vein, at the 100 foot level. For a hundred feet this vein is in good milling ore, but with no high grade to sweeten it. At this point there is now three inches of 5,000 ounce ore.

Good Ore From Low Levels at Timiskaming Mine.—At the bottom of the winze, 40 feet below the 575 foot level at the Timiskaming mine, some remarkable high grade is coming through the ore house. The vein in diabase is at this point fully six inches of bonanza silver ore. Below the contact in the diabase there has been opened up for 112 feet a shoot of high grade. This only goes up to the contact, and has for the most part been stoped out. It is remarkable that while extensions of profitable veins in the Keewatin rocks have been discovered, none of them carry any silver values. The "Diabase" vein is an entirely new ore body, though it is running parallel to those on the upper levels. At the 650 foot level there is good milling ore in another vein, with occasional shoots of high grade.

The Seneca-Superior Mining Company declared a dividend of 10 cents on the dollar. The Seneca-Superior, with this disbursement, will have paid 40 per cent. on a capitalization of a half a million dollars, and as the mining of ore only commenced on Oct. 21, 1912, this is a remarkable performance. It was decided to put the company on a bi-monthly dividend basis of 10 per cent., meaning 60 per cent. a year. The mine will also go on a regular production basis of 100,000 ounces per month. Between the main shaft at the 200 foot level and the No. 2 on the opposite side of Peterson Lake, there is an ore shoot over 400 feet in length, which will run between 4,200 and 4,500 ounces to the ton.

SWASTIKA, KIRKLAND LAKE AND PORCUPINE

Hollinger Made Good Progress in June.—With the power trouble over and the strike disappearing on the horizon, the Hollinger profits for June were back to normal, and the costs are rapidly being cut down. Mr. P. A. Robbins, in his June report, says: "Upon June 17 the winze which is being sunk on No. 1 vein has reached a depth of 74 feet below the 300 foot level. There has been no change in the character or value of the ore. Work upon the 300 foot level continues to demonstrate values consistent with those encountered upon the upper levels. The work of sinking upon the No. 7 vein has been commenced, and at a depth of 12 feet the vein is two and a half feet wide and carries $16.50 a ton. This vein is classed under miscellaneous in the last annual report. Working costs have been reduced to $5.47 per ton, and further reductions are hoped for."

The mill ran 94 per cent. of the possible running time, treating a total of 11,867 tons. The average value of ore treated was $16.50 per ton, and the approximate extraction was 95 per cent. Milling costs were $1.398 per ton milled.

The McIntyre is now sinking its Nos. 4 and 5 shafts. It is probable that these shafts will be carried down with all expedition to 700 or 800 feet, opening up levels at each 100 feet.

Ernhous Claims Being Developed.—Capitalists associated with the Nipissing Mining Company are developing the Ernhous claims in the Kirkland Lake section on a working option basis. These claims adjoin the Hunton, upon which a rich discovery was made some weeks ago. The work consists entirely in stripping.

Burnside Discovery.—The discovery on the Burnside claim at Kirkland Lake has aroused more excitement than anything since the Tough-Oakes began to develop. A vein paralleling several others, which had been discovered previously, has now been opened up for 100 feet. It does not appear very rich on the surface, and shots were put in at various places along the fissure, with the result that ore very similar in character to the Tough-Oakes was uncovered. This high grade streak is from 17 to 21 inches wide, and is in places remarkably rich in free gold, and tellurides are plainly visible. Shaft sinking has been abandoned for the present in favour of prospecting. The property is under option to a Haileybury syndicate, consisting of Messrs. C. A. Foster, A. A. Ferland, R. T. Shillington, Fred Shillington, Charles A. Richardson and others. This is the principal discovery in the new gold area, but there have been several of minor importance. A very narrow vein exhibiting gold and tellurides has been stripped on the Robbins claims, and some free gold has been discovered in a wide vein on the Wright property.

On the Tough-Oakes Claims, which will be thrown into a stock company known as the Tough-Oakes Mines, Ltd., the shaft is down 180 feet on the incline. The vein is still good at the bottom, though the high grade is broken up into several stringers. A head frame is being erected. Experience at the small five stamp mill has shown that straight amalgamation will not save much more than 70 per cent. of the values, and a larger plant will have to be installed. This will be financed by the new issue of stock in the company.

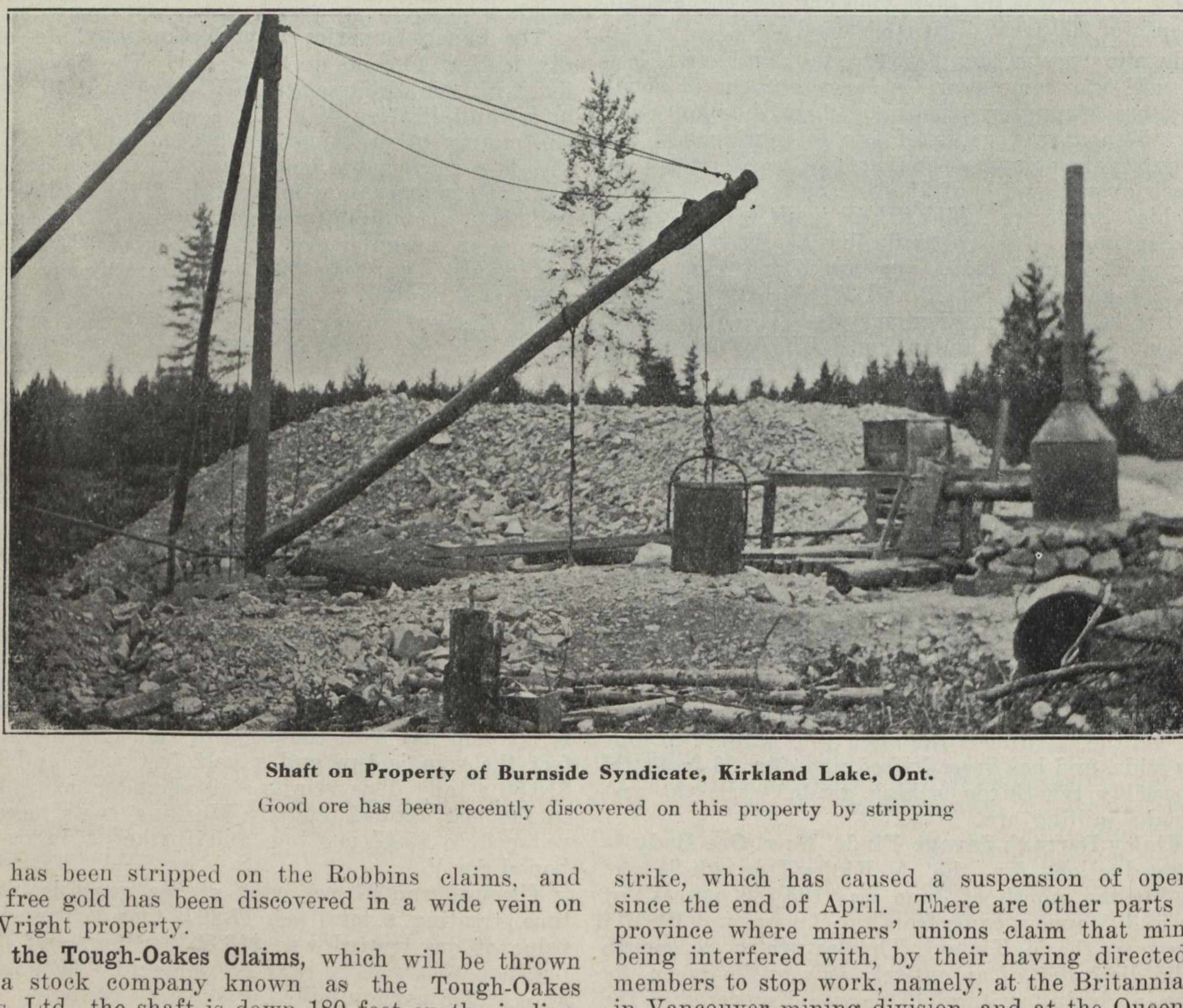
The Government Road to Kirkland Lake is being rapidly constructed. With a little care taken to fix up the bad spots in the road, it will soon be available for traffic.

The Extension of Time allowed under the amendment in the Mining Act for assessment work on claims expired on July 15th. The first year's work on a very large number of claims has been sworn in; but as there is no inspection, there is no doubt whatever that far less than the statutory amount has been done in many cases. This has been demonstrated in the Mining Commissioner's court, recently where Mr. Gordson has threatened to bring several witnesses in mining disputes to the attention of the Attorney-General for perjury.

BRITISH COLUMBIA

As the second half of the year is entered upon, the prospects for continued activity in the chief mining districts of the province are generally favourable, with the single exception of Nanaimo district of Vancouver Island, where the coal mines are idle, owing to the United Mine Workers of America having called a strike, which has caused a suspension of operations since the end of April. There are other parts of the province where miners' unions claim that mining is being interfered with, by their having directed their members to stop work, namely, at the Britannia mine, in Vancouver mining division, and at the Queen mine, in Nelson division, but outside of having reduced the number of workers at the latter by about a score, there is no effective prevention of production.

While no information has been received from the placer gold mining districts, reports from various other parts of the province tell of an unusually cool, and in many places wet, summer, so it is hoped Atlin and Cariboo are experiencing similar weather, for, if so, the effect will be a prolongation of the season during which their gravel washing operations can be continued. Lode mining is being carried on and ore pro-



Shaft on Property of Burnside Syndicate, Kirkland Lake, Ont.

Good ore has been recently discovered on this property by stripping duction records show that the output is being maintained on about a similar scale to that of last year. With the exception above mentioned, coal mining, too, is fully up to its customary condition of productiveness.

Rossland.

Ore production figures show the output of mines in Trail Creek mining division during six months to July 1 to have been approximately 121,000 tons, this amount including about 1,000 tons treated at the 10 stamp mill at the Inland Empire mine, which is situated some miles away from Rossland, and the whole of the remainder from mines in the immediate vicinity of that city. The Consolidated Company's mines produced 101,000 tons (Centre Star group nearly 72,000 tons and Le Roi 29,000 tons), and those of the Le Roi No. 2, Ltd., 18,500 tons. Several small shippers made up the remaining few hundred tons. Of this total about 112,000 tons was shipped to the Consolidated Company's smeltery at Trail, this including between 800 and 900 tons of gold-copper concentrate from the Le Roi No. 2 concentrator at Rossland. Incidentally, it may be mentioned that the total of ore and concentrates received at the Trail works during the six months was between 160,000 and 170,000 tons, and of this aggregate Rossland mines contributed fully two-thirds.

No particulars relative to operations at the Consolidated Company's mines at Rossland are available just now. It is generally understood though that there has been opened in them an abundance of ore, and some of it containing comparatively high value in gold, so that the prevailing feeling in the Rossland community is one of confidence that the mines on Red Mountain will continue to be productive and profitable for many years. An indication that this confidence is well founded is found in a recent announcement that the C.P.R. intends to substitute electric power for steam on its railway to Rossland.

Mining operations this year at the Josie mine of the Le Roi No. 2, Ltd., have been chiefly on the 300, 500, 700 and 900 foot levels. The ratification of the agreement between this company and the Consolidated Mining and Smelting Company of Canada, Ltd., information relative to which has already been published, has had this result—the former company has since been able to do underground work which cannot now be questioned on the grounds of extra-lateral rights of the Consolidated Company. Several new ore bodies have been discovered and worked. The rate of development work and production has been much the same as during the company's last fiscal year, when development was at the rate of rather more than 500 ft. a month, diamond drilling nearly 1,200 ft., and production about 3,000 tons of ore, of which rather more than one-half was sorted out for shipment crude direct to the smeltery, and the remainder concentrated into 140 tons of gold-copper concentrate monthly. Some work has been done on the 1,500 foot level, which corresponds in depth with that of the 1,650 level of the adjoining Le Roi mine, and ore found here of a value of \$14 to \$15 in gold a ton and 0.33 per cent. copper. Permission has been obtained to use the Le Roi 1,650 foot level from which to open the Josie mine at this depth, and this will for the time being do away with the necessity of sinking the Josie shaft 200 ft. deeper and cross-cutting about 900 ft. A new centrifugal electrically operated pump has been obtained to replace the pumps now in use on the 500 foot level of the Josie mine. This additional pumping power has been provided to admit of the company's neighbouring No. 1 mine being unwatered, as well as of pumping from the Josie, at the one station. Water from No. 1 will be drained along the Josie 500 foot level, the workings of the two mines being separated by only 70 ft. of rock, through which diamond drill holes will give an outlet for water from No. 1 mine. Diamond drilling into the northern ground of the Le Roi No. 2 group has been done, with the permission of the Consolidated Company, from the ninth level of the War Eagle mine, the depth of which about corresponds with the 900 foot level of the Josie. Altogether, the outlook for the Le Roi No. 2, Ltd., is regarded as satisfactory, which is also the condition in respect of other productive mines on Red Mountain, this comprising the main productive area of Rossland camp.

For a while there was no mining, nor preparation for any, in the South Belt of the camp, operations having been suspended at different times during the last twelve months on the Blue Bird, Richmond Consolidated group and Phoenix, all three of which were being worked last summer. Now a power plant, including a hoist and a 12 drill compressor, is being put in at the Lily May, one of the Richmond-Consolidated Company's properties. The Rossland Miner on July 9 gave the following information relative to this property: "At the properties of the Richmond Consolidated there is great activity and 25 men have been employed during the past week in the construction of buildings. All concrete work is finished and the bedplates laid ready for the compressor, as soon as the compressor building shall be covered in. The assay office—a four-room building—is completed, and the compressor building will be this week. The gallows frame is being constructed, and the blacksmith and machine shops will be erected this week. Timbering the double compartment shaft down to 55 ft. from the surface has been completed. Mining will be commenced as soon as all the construction work shall be done. The present outlet from the mine is by wagon road, one mile to the Canadian Pacific Railway from Rossland to Trail, but eventually an aerial tramway will be constructed from the mine to the railway."

Osoyoos.

The Dividend-Lakeview Consolidated Gold Mining Company is developing its Dividend mineral claim, situated on Kruger Mountain, near Osoyoos Lake. The group includes the Dividend, Lakeview and Gold Dust claims, but at present work is being done only on the Dividend. Ore is being hauled in a 5 ton motor truck to Oroville, nearly seven miles distant, and is taken thence by railway to the Granby Company's smeltery at Grand Forks, Boundary district. Value is in gold and silver, and, owing to the high freight cost, only ore running \$25 a ton or higher is shipped. The property is situated within a short distance of the International Boundary line, just across which, in the State of Washington, the Golden Chariot and other claims in the vicinity are also being developed.

Hedley.

There is little mining work being done in Hedley camp, Similkameen, other than that on the Hedley Gold Mining Company's property. One exception is the New York No. 2 Syndicate, which is operationg two diamond drills, capable of drilling to a depth of 2,500 ft. Both water and compressed-air are conveyed from the Hedley Gold Mining Company's mine, the pipe lines being each about 5,000 ft. long. The claims on which the drilling is being done are held by the syndicate under option of purchase. The object of the work is to prove whether or not the Nickel Plate ore bodies extend into the ground being drilled.

At the Hedley Gold Mining Company's Nickel Plate mine, the greater part of the work is being done from No. 4 adit level, and to facilitate operations buildings are being erected near the portal of this tunnel. A new blacksmith and machine shop—a wood frame building, dimensions 95 by 35 ft., roofed with corrugated galvanized iron—has been erected, and this is being equipped with all necessary power-tools and other mechanical appliances and plant. Another building includes store and warehouse, the former 50 by 35 ft., and two storeys high, and the latter a single storey compartment, 90 by 35 ft. Ground is being graded for a building to comprise cookhouse, dining-room, wash-rooms for men, recreation-room, etc., to be of similar construction to above-mentioned buildings and to provide accommodation for about 1500 men.

Last year's development and diamond drill work having warranted the estimate that the minimum quantity of reserve ore available in the company's Nickel Plate and Iron Duke claims was 413,000 tons, of an average value of at least \$11.35 per ton, another incline shaft, known as the Dickson incline, is being sunk to mine the new ore bodies then developed, and others also below the level of No. 4 adit of the Nickel Plate mine. This incline is being sunk to the north-west on the pitch of the lowest known ore body in the mine. The intention is to sink it to a depth of 3,000 ft. It is so situated as to be under all the ore bodies, and will have pay ore above it continuously for 1,100 ft.

No. 5 incline has been sunk, in the same direction as the Dickson, to a depth of 420 ft., and four levels have been opened from it. There are in this part of the mine three known ore bodies, lying directly one above the other, and this incline has been sunk in the middle one. Drifting and sinking have proved the ore to be about 16 ft. between walls, and its average value is \$14 a ton. At the collar of the incline the length of the ore shoot is 130 ft.; at the 100 ft. level it has been drifted on 180 ft., and on the third level 120 ft. These drifts are in good ore all the way and, their faces, as well as the bottom of the incline, are in ore. This incline is in favourable condition for ore shipping, with ore pockets on each level and plenty of good ground for stoping.

No work is being done in the company's Sunnyside mine, owing to lack of power, nearly all available being used in connection with operations in the Nickel Plate mine. Some time since the company made application for water rights on Similkameen River, but it has not yet been able to secure the water it requires for additional power purposes, owing to other applicants, stated to be only speculators and not bona fide operators, having forestalled it, and so prevented it this year carrying out its plans for important extensions of its mining and milling operations.

The quantity of ore crushed during five months of 1913, to June 1, was 29,180 tons and the value of the recovered gold \$377,483.14. This gives an average recovery of \$12.936 a ton, as compared with \$10.18 a ton for 27,936 tons crushed during the corresponding period of 1912, and with \$10.62 a ton for 70,455 tons crushed during the whole of 1912. Assuming that the total costs were not higher than for 1912, when they averaged \$5.14 a ton, it would appear as if the net profit for the five expired months of 1913 has been at an average rate of approximately \$7.80 a ton.

Granite Creek.

Messrs. J. A. Anderson and Andrew Gordon have been working for several years on ground situated about half a mile higher up the creek than Lambert & Stewart's dam. Lately they have been drifting with the object of finding an old channel at a higher level than that of the present creek. Other work done last year on the same bench gave varied results, the best having been a pocket of about 5 oz. of gold recovered in one place. At the present time water is causing the workers much trouble, the seepage from the hill above the drift amounting to quite a stream of water. In order to try to keep the drift dry, an Edison wrecking pump was lately obtained. There are indications that the drift is entering an old channel, and Messrs. Anderson and Gordon, who have been most persistent with their operations, are feeling hopeful accordingly.

Now that the high water season has passed and Messrs. Lambert & Stewart's dam across the creek, just above the mouth of the north fork, has stood the summer freshets preparations are being made to carry out the intended method of working the creek for about 1,000 feet below the dam. As soon as the water shall be low enough for the flume, that has been constructed for the purpose, to carry the stream the water will be diverted, and then a bed-rock flume will be taken up the creek bed and the pay dirt, from the top of which some six feet of overburden has been removed, will be sluiced. Commencing at zero at the lower end of the canyon, the gravel gradually increases in depth to about 15 feet just below the dam. The dirt has been prospected and it is confidently expected to yield good pay in both gold and platinum, in the proportion of about two of the former to one of the latter. Much interest is taken locally in this enterprise, for, if successful, it is expected it will lead to the working of some 12 to 14 miles of Granite creek above Lambert & Stewart's ground.

Coalmont, the new town dependent largely upon the operations of the Columbia Coal and Coke Co., of Winnipeg, Manitoba, is feeling the effect of the suspension of work on that company's coal property. After a long cross-cut adit had been driven and much other work done in connection with it, it was found necessary to abandon it and do work from the Collins Gulch side of the mountain. It is stated some good coal has been opened in the latter workings, but owing to exhaustion of funds all work has been stopped pending making new arrangements for financing the undertaking.

Salmo.

In a report of meetings of the Labor Commission, which has been holding meetings in various parts of British Columbia, and taking evidence concerning labor conditions, the following reference to the position at the Queen Gold mine, in Nelson mining division, is made: "Queen mine has a labour dispute which is a hopeless tangle. Up to a little while ago there were 45 men employed at the mine; now there are 24. The men who have quit say there is a strike; the men who have remained at or returned to work say there is no strike at all, and that they are good unionists, who are satisfied with their condition. They say, further, that the men who have quit were induced to do so by misrepresentation. To an outsider the whole thing looks like an illustration of the pernicious activity by which a certain type of labour agitator often makes himself a public nuisance. In this particular instance, as in many others, the men who have stirred up the row are reported to have come from the United States."

Nanaimo.

The Vancouver Board of Trade having offered to arbitrate the differences between the coal-mine owners and mine workers on Vancouver Island, replies were received from the respective general managers of the two larger companies, from which the following are excerpts: W. L. Coulson, general manager of the Canadian Collieries (Dunsmuir), Limited, operating the Cumberland and Extension collieries, each having several working coal mines, replied in part: "We appreciate very much the spirit in which your kind offer of arbitration for the settlement of the strike in the coal trade on Vancouver Island is made. As all our mines are now and have been for some time in satisfactory operation, we have no differences with our employees to arbitrate." Part of the reply of Mr. Thos. R. Stockett, manager of the Western Fuel Co., Nanaimo, follows: "So far as this company is concerned, there is nothing to arbitrate, the issue being solely—shall it turn its property over to the control and dictation of a foreign organization, which is without status in Canada, and not even amenable to its laws, and whose interests are inimical to the best interests of the workmen, the community, and the company? This the company is not willing to do, nor does it consider the question one for arbitration. For the information of your council and board, I may say that under this company's policy of dealing with its workmen as employees, there has prevailed in this community an era of nearly eight years of industrial peace and prosperity that has worked for the good of all, and but for the presence of foreign agitators, who caused the breaking of a working agreement between employer and employees (and without permitting the employees to have a voice in the matter), there is every reason to believe that industrial peace would have continued for many years."

The Pacific Coast Coal Mines, Ltd., has decided to try to operate its mines at South Wellington, three or four miles from Nanaimo, with non-union labour. A commencement has been made to resume getting out coal, but production as yet is on only a small scale. The miners on strike have been ordered to vacate the company's houses, which will be occupied by non-union men as soon as available for them.

NOVA SCOTIA.

Dominion Coal Outputs.—Outputs in July showed a considerable improvement on June. To the fifteenth the production totalled 194,000 tons, and for the month it should reach 420,000 tons. Presuming this output for July the aggregate tonnage from the Glace Bay mines for the seven months ending 31st July, will be 2,715,000 tons, comparing with 2,533,000 tons for the same period of 1912, being an increase of 182,000 tons.

Albion Mine Fire.—The fire in the Albion mine has been extinguished. The fire was constantly fought for over a fortnight, in the face of most difficult circumstances and under dangerous conditions. Oxygen breathing apparatus and electric lamps were used, and the flames were combated at close quarters by helmet-men using hose and nozzle. It was finally found possible to isolate the fire area, and to completely submerge the burning material. Your correspondent has the best reasons for stating that it would have been well-nigh impossible to have extinguished the fire in the manner in which it was actually accomplished, had not breathing apparatus been available. In saying this, there is no wish to minimize in any way the heroism and skill with which the staff and men of the Acadia Coal Company fought the fire under almost intolerable conditions. Modern breathing apparatus, accompanied by electric hand lamps, will, however, enable men to breathe and see where, without these devices, life could not exist.

The fire at the Albion mine has given oxygen breathing apparatus probably the severest and longest testing as yet received in Nova Scotia, and when it is considered that these devices were used for nearly a fortnight, under the most strenuous conditions, without any accident, there can hardly be room for doubt as to their usefulness. Oxygen apparatus have been used in fighting mine fires at Sydney mines, at Springhill mines and at the Albion mine, and in every case they have proved invaluable.

The word "rescue" in connection with oxygen breathing apparatus has been consistently objected to by your correspondent, as obscuring the true usefulness of these devices. It is true that many lives have been saved which would otherwise have been lost, had not breathing apparatus been used, but the occasions on which these devices have been of use after mine explosions are but very few compared with the times they have been used successfully in fighting underground fires.

The possibilities of oxygen breathing apparatus are not limited to usefulness in mines, but are now being extended to the needs of the aviator and the submarine boat. The Draegerwerk, of Lubeck, will supply apparatus that will enable the aviator to live at an altitude impossible to the human being unprovided with such apparatus, and they will also supply an apparatus to enable the diver to walk along the sea-floor entirely independently of the surface air, and unhampered by the life-line that the old-style diver must take with him.

The crews of all German submarine boats are provided with breathing apparatus that will enable them to escape from a sunken submarine if the depth is not too great. It must, therefore, be obvious that the uses of breathing apparatus intended for use in mines is a reliable device, but that it will develop further improvements and usefulness may be confidently expected.

The International Geological Congress.—The members of the Congress, who will participate in the Nova Scotian excursion, are expected to spend the 23rd, 24th and 25th of July in the neighbourhood of Sydney, Glace Bay and Sydney Mines. Extensive preparations are being made for the visit by the large coal and steel companies in this vicinity, and if the weather is propitious the occasion will no doubt be a very enjoyable one. There is a great deal to see in Cape Breton to interest both the purely scientific geologist and those interested in industrial enterprise in other parts of the world.

Shipping Coal from Sydney.—The following extract is clipped from the "Iron and Coal Trades Review" of 20th June:

"There have been several instances of exceptional coaling at Immingham, but last week every record was eclipsed. The s.s. 'Gretchen Muller' commenced at 10.45 a.m. and finished at 4.30 p.m., which, after deducting meal hours and shifts, gives a net time of 3 hrs. 20 minutes, during which time 1,586 tons of coal, constituting a full cargo, were shipped, an approximate average of 476 tons per hour."

The Immingham docks of the Hull & Barnsley Railway are the latest word in coal shipping in England, and serve as the main outlet of the South Yorkshire coal field for Baltic and other ports. The record of performance quoted will not, however, strike Cape Breton readers as constituting anything remarkable. It is a usual matter at the Sydney piers of the Dominion Coal Company to ship 7,000 tons of coal in five hours, and the same cargo can be discharged at the Montreal end in seven hours. On the occasion previously referred to in this correspondence when 18,130 tons was raised from the Glace Bay collieries in one day, there was also lifted from the storage banks 6,400 tons of coal, meaning that the Coal Company's railway and piers disposed of the enormous quantity of 24,500 tons of coal in one day. In the six days ending the 28th June the Coal Company's shipments totalled 123,000 tons, or well over 20,000 tons per day.

A notable incident in this connection was the coaling of H.M.S. "Cumberland" at Sydney on the 18th. This large cruiser of 22,000 tons laid alongside the loading pier of the Dominion Coal Company at Sydney, and took bunkers direct from the pier loading-chutes. The officers of the ship expressed themselves as surprised and pleased at the quick dispatch given. Coal was taken on board at the rate of 250 tons an hour, the loading occupying from 5 a.m. to about the same time in the evening. The rapidity of loading was of course limited by the stowing of the bunkers as the piers could have handled a great deal more. Other war vessels in Sydney have usually coaled from lighters in the stream. The commandant of the "Cumberland" is said to have expressed his opinion that Sydney Harbour was ideally suited for a naval coaling station, and that the harbour, railways and collieries should be protected by fortifications. Your correspondent has pointed out the value of Sydney and the coal mines adjacent in case of war on more than one occasion. The whole of Eastern Canada and the railway communication of half the Dominion depends for its motive power on the mines of Cape Breton. At the present time the mines and all means of transportation are entirely unprotected from attack by sea or land. All the mines are visible from sea, and make excellent targets.

COMPANY NOTES

DIVIDENDS PAID BY NIPISSING MINING CO.

The Cobalt Nugget prints the following statement of dividends paid by the Nipissing holding and operating companies to the end of June, 1913:

Nipissing Mines Company (Holding Co.)

1906	3			$ 480,000
1907	14			840,000
1908	12			720,000
1909	22½			1,350,000
1910	35			2,100,000
1911—Jan. 20	7½	450,000		
April 20	7½	450,000		
July 20	7½	450,000		
Oct. 20	7½	450,000		
	—	——	30%	1,800,000
1912—Jan. 20	7½	450,000		
April 20	7½	450,000		
July 20	7½	450,000		
Oct. 20	7½	450,000		
	—	——	30%	1,800,000
Total				$9,090,000
1913—Jan. 20	7½	450,000		
April 21	7½	450,000		
July 21	7½	450,000		
	—	——		1,350,000

Nipissing Mining Company (Operating Co.)

1905—To Syndicate	$ 300,000 00
1906—To Syndicate	100,000 00
1906—To Nipissing Mines Co.	500,000 00
1907—To Nipissing Mines Co.	880,000 00
1908—To Nipissing Mines Co.	740,000 00
1909—To Nipissing Mines Co.	1,370,000 00
1910—To Nipissing Mines Co.	2,122,500 00
1911—To Nipissing Mines Co.	1,853,430 49
1912—To Nipissing Mines Co.	1,842,366 76
Total	$9,708,297 25

Nipissing Mines Co.

The following is a brief financial statement of the affairs of the Nipissing Mining Company, Ltd., (the Operating Company), as of July 1st, 1913:

Cash in bank	$1,090,558.59
Ore and bullion in transit	224,936.00
Ore on hand and in process and bullion ready for shipment	147,907.00
	$1,463,401.59

The Seneca-Superior Silver Mines, Ltd., at a director's meeting on July 14 declared a bi-monthly dividend of ten cents a share payable on August 15th to shareholders of record at the close of business on the 10th of August, 1913. The company have cash in banks $127,249.00, and have ore in transit to the approximate value of $65,000, and are in the unique position of having shipped since the 11th of November last year, over 975,000 oz. of silver ore. The company have already paid three dividends of ten cents a share on February 15, April 15, and June 15, 1913.

STATISTICS AND RETURNS

COBALT ORE SHIPMENTS.

The shipments for the week ending June 25th, were:

Mine.	High.	Low.	Pounds
La Rose	1	..	105,780
Crown Reserve	1	..	45,000
Cobalt Comet	1	..	78,500
Dom. Reduction	1	..	89,200
Townsite	1	..	46,400
Cobalt Lake	2	..	126,590
	7	..	491,390

The shipments from the Cobalt mines to date are:

Mine.	High.	Low.	Tons.
Bailey	4	1	130.35
Beaver	8	..	237.43
Chambers-Ferland	3	4	223.77
City of Cobalt	4	..	105.14
Cobalt Townsite	36	..	1,308.70
Cobalt Lake	18	..	141.52
Buffalo	2	..	66.13
Coniagas	27	..	863.17
Crown Reserve	14	..	643.44

Cobalt Comet	13	..	341.10
Green-Meehan	..	1	12.96
Hudson Bay	10	..	369.81
Kerr Lake	16	1	440.60
La Rose	35	3	1,585.53
McKinley-Darragh	42	..	1,467.29
Nipissing	2	35	1,070.35
O'Brien	7	..	262.63
Seneca-Superior	5	3	249.44
Silver Cliff	1	..	20.00
Trethewey	7	7	362.63
Timiskaming	10	1	331.98
Casey Cobalt	4	..	264.72
Colonial	1	..	21.56
General Mines	..	1	8.80
Silver Queen	..	..	169.89
Wettlaufer	..	..	122.26
Miller L. O'Brien	2	..	47.19
Right of Way	1	1	62.71
Penn-Canadian	4	..	126.13
Silver Bar	..	1	20.00
Mann	1	..	20.00
York Ontario	1	..	20.00
Miscellaneous	1	..	88.05
	280	60	11,705.88

The bullion shipments for the past week are:

Mine.	Ounces.	Value.
Nipissing	3,231,500.01	$1,859,880.62
Penn-Can.	7,219.30	4,351.08
Buffalo	823,582.90	523,042.19
Cr. Reserve	234,566.00	146,768.25
Dom. Red	314,860.40	181,256.58
Townsite	10,909.00	6,647.00
Miscel.	3,920.00	1,623.00
Timiskaming	9,469.20	5,443.72
O'Brien	93,184.77	47,603.88
Wettlaufer	4,715.00	2,925.00
Miller Lake	3,710.20	2,053.01
Colonial	635.00	374.00
Trethewey	11,178.83	6,886.04
Casey Cobalt	2,394.00	1,520.00
Kerr Lake	14,278.98	9,047.98
Bailey	1,839.00	1,103.40
Wettlaufer	4,391.00	2,634.60
City of Cobalt	1,755.45	1,053.00
Preston E. D.	3,452.60	2.002.50
Cobalt Lake	1,717.80	996.36
Cobalt Comet	998.50	579.13
	4,780,268.94	$2,807,791.34

B. C. ORE SHIPMENTS.

Shipments for week ending June 21 and for year to that date were:

Slocan and Ainsworth.		
Standard, mld.	1,000	27,000
Van Roi, milled	700	15,207
Rambler-Cariboo, milled	300	7.000
Bluebell, mld.	1,400	40,323
Richmond-Eureka	30	445
Standard	216	7,986
Bluebell	224	4,169
Ruth	36	296
Rambler-Cariboo	76	1,792
Van-Roi	35	526
Silver Hoard	125	461
No. 1	86	1,684
Whitewater	35	100
Other mines	..	2,592
Total	4,263	109,581
Rossland.		
Inland Empire, milled	275	1,925
Le Roi No. 2, milled	325	9,348
Centre Star	3,144	80,150
Le Roi	929	32,086
Le Roi No. 2	334	11,985
Other mines	...	199
Total	5,007	135,693
East Kootenay.		
Sullivan	414	19,881
Other mines	...	858
Total	414	20,739
Nelson.		
Queen, mld	350	7,525
Mother Lode, mld	500	10,000
Second Relief, mld.	150	3,700
Yankee Girl	72	2,774
Queen Victoria	103	14,180
Other mines	...	6,314
Total	1,175	44,493
Lardeau.		
Other mines	...	266
Boundary.		
Nickle Plate, mld.	1,500	43,500
Jewel, mld.	300	2,300
Knob Hill	49	1,506
Ben Hur	163	7,176
No. 7	148	4,136
Granby	24,124	686,555
Mother Lode	4,997	176,762
Rawhide	5,450	144,778
Napoleon	570	18,882
Unnamed	243	4,681
Other mines	...	4,442
Total	37,544	1,094,718

B. C. Copper Company's Receipts.
Greenwood, B. C.

Motherlode	4,997	176,762
Rawhide	5,450	144,778
Napoleon	570	18,882
Queen Victoria	103	14,180
Unnamed	243	4,681
Total	11,363	359,283

Granby Smelter Receipts.
Grand Forks, B. C.

Granby	24,124	686,555

Consolidated Company's Receipts,
Trail, B. C.

Knob Hill	49	1,506
Ben Hur	163	7,176
No. 7	148	4,136
Silver Standard	286	314
Richmond-Eureka	30	445
Standard	216	7,986
Bluebell	224	4,169
Ruth	36	296
Rambler-Cariboo	76	1,792
Van-Roi	35	526
Silver Hoard	125	461
No. 1	86	1,684
Whitewater	35	100
Yankee Girl	72	2,774
Centre Star	3,144	80,150
Le Roi	929	32,086
Le Roi No. 2	334	11,985
Sullivan	414	19,881
Other mines	...	10,688
Total	6,402	188,355

STOCK MARKETS.

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg., Toronto, Ont).

NEW YORK CURB.

	Bid.	Ask.
British Copper	2.00	2.25
Braden Copper	6.87½	7.00
Chino Copper	37.25	37.50
Giroux Copper	1.50	1.75
Goldfield Cons.	1.50	1.62½
Green Can.	6.75	6.87½
Inspiration Copper	14.87½	15.00
Ray Cons. Copper	18.00	18.37½
Standard Oil of N. J.	361.00	363.00
Standard Oil of N. Y.	144.00	145.00
Standard Oil, old stock	1135.00	.....
Standard Oil Subs	680.00	.....
Tonopah Mining	4.18¾	4.25
Tonopah Belmont	6.12½	6.18¾
Nevada Cons Copper	16.25	16.37½
Yukon Gold	2.25	2.50

PORCUPINE STOCKS.

	Bid.	Ask.
Apex	.01	.02
Crown Chartered	.00½	.00⅝
Dome Extension	.07	.07¼
Dome Lake	.41	.44
Dome Mines	14.50	16.00
Eldorado	...	...
Foley O'Brien	.23	.25
Hollinger	15.85	16.00
Jupiter	.34	.34¾
McIntyre	1.75	2.35
Moneta	.03½	.06
North Dome	.30	.50
Northern Exploration	.50	1.50
Pearl Lake	.34	.35
Plenaurum	.75	1.00
Porcupine Gold	.09½	.10¼
Imperial	.01½	.02
Porcupine Reserve	...	.14
Preston East Dome	.02	.02½
Rea	.15	.30
Standard	...	...
Swastika	.04½	.05
United	...	...
West Dome	.10	.20

Sundry.

	Bid.	Ask.
American Marconi	4.00	4.25
Canadian Marconi	2.00	3.00

COBALT STOCKS.

	Bid.	Ask.
Bailey	.07⅞	.08
Beaver	.30	.31
Canadian	.22	.25
Chambers-Ferland	.17¼	.18
City of Cobalt	.47	.50
Cobalt Lake	.60	.65
Coniagas	7.20	7.50
Crown Reserve	3.10	3.20
Foster	.06	.07
Gifford	.04½	.06
Gould	.03⅜	.03½
Great Northern	.15¾	.16
Hargraves	.04½	.05
Hudson Bay	68.00	70.00
Kerr Lake	3.45	3.55
La Rose	2.30	2.40
McKinley	1.77	1.80
Nipissing	8.45	8.55
Peterson Lake	.22¼	.22¾
Right of Way	.04½	.06
Rochester	.02½	.03
Leaf	.03¼	.03½
Cochrane	1.10	1.25
Silver Queen	.03	.04
Timiskaming	.35	.35½
Trethewey	.30	.32
Wettlaufer	.11	.11½
Seneca Superior	2.10	2.20
Buffalo Mines	2.10	2.40
Porcupine Crown	1.00	1.25

TORONTO MARKETS.

July 24th—(Quotations from Canada Metal Co., Toronto)—
- Spelter, 5½ cents per pound.
- Lead, 5.40 cents per pound.
- Tin, 45 cents per pound.
- Antimony, 10 cents per pound.
- Copper, casting, 15¼ cents per pound
- Electrolytic, 15½ cents per pound.
- Ingot brass, 11 to 15 cents per pound.

July 24th—Pig Iron—(Quotations from Drummond, McCall & Co., Toronto)—
- Summerlee No. 1, $26.00 (f.o.b. Toronto).
- Summerlee No. 2, $25.00 (f.o.b. Toronto).
- Midland No. 1, 19.20 (f.o.b. Toronto).
- Midland No. 2, $19.00 (f.o.b. Toronto).

July 24th—(Quotations from Elias Rogers Co., Ltd., Toronto)—
- Coal, anthracite, $7.50 per ton.
- Coal, bituminous, $5.00 per ton for 1¼-inch lump.

GENERAL MARKETS.

July 22—Connellsville coke (f.o.b. ovens).
- Furnace coke, prompt, $2.50 to $2.60 per ton.
- Foundry coke, prompt, $2.85 to $3.00 per ton.

July 22nd—Tin, straits, 41.30 cents.
- Copper, Prime Lake, 14.50 to 14.60 cents.
- Electrolytic Copper, 14.50 cents.
- Copper wire, 15.50 cents.
- Lead, 4.35 to 4.40 cents.
- Spelter, 5.40 cents
- Sheet zinc (f.o.b. smelter), 7.00 cents.
- Antimony, Cookson's, 8.40 to 8.50 cents.
- Aluminum, 23.00 to 23.50 cents.
- Nickel, 40.00 to 45.00 cents.
- Platinum, ordinary, $46.00 per ounce.
- Platinum, hard, $51.00 per ounce.
- Bismuth, $1.95 to $2.15 per pound.
- Quicksilver, $39.00 per 75-lb. flask.

SILVER PRICES.

	New York. Cents.	London. Pence.
July 8	58⅛	26 3/16
July 9	58⅜	26 15/16
July 10	58¼	26⅞
July 11	58⅜	26 15/16
July 12	58¾	27 1/16
July 14	58⅜	26 15/16
July 15	58⅜	26 15/16
July 16	58½	27
July 17	58⅝	27 1/16
July 18	59⅛	27¼