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CIRCULATION.

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CONTENTS.

THE NICKEL INDUSTRY

A very timely report on the nickel industry, with special reference to the Sudbury region, prepared by Prof. A. P. Coleman, of the University of Toronto, has just been issued by the Mines Branch, Ottawa.

During the past few years the demand for nickel has greatly increased, and nowhere is this more evident than in the Sudbury district. The two large producers, the Canadian Copper Company and the Mond Nickel Company, report their business to be in a very satisfactory state. Large profits were made in 1912, and the present year finds the producers scarcely able to meet the requirements. The Mond Company has quite recently completed and put into operation at Coniston a splendid new smelting plant. The Canadian Copper Company last year completed the task of replacing its acid converters with large capacity basic converters, and put into operation a new reverberatory plant for the treatment of fines. This company has now well under way plans for largely increasing the capacity of the smelter.

A third company, the Dominion Nickel-Copper Company, has during the past two years been making very exhaustive exploration of some other properties and has discovered a large body of ore at the Murray mine. The company had made considerable progress with plans for a smelter. Changes of ownership have taken place lately, however, and the new owners have not yet made their intentions public. For the present the preparations for erection of a smelter have been postponed.

The successful operations of these three companies has made the Sudbury district take on new life, and the confidence evidenced by the directors in their last annual reports indicates that the industry will become much greater in the near future.

With the renewed interest in the nickel field, it is very fortunate that an up-to-date volume on the industry is now available. Some years ago Dr. Coleman prepared a report for the Ontario Bureau of Mines, in which he gave a remarkably clear idea of the structural features of the nickel deposits. During the past few years Dr. Coleman has been working in the district for the Canadian Copper Company, and later for the Department of Mines. The information gained has enabled him to produce an excellent revised monograph.

The monograph is accompanied by a general geological map of the district and special maps of the more important mines, the whole representing the advances made in knowledge of the region due to three summers' work in the field.

In addition to descriptions of all the known nickel ore deposits in Ontario, there are accounts of methods of mining and smelting the ores, and of the chief nickel regions of other countries.

In the preparation of the work Dr. Coleman was greatly aided by the mining companies. Information was freely granted by the several companies. The compiling of the accompanying maps and plans has been the work of Mr. R. B. Rose.

VARIATIONS IN VALUES WITH DEPTH

It has been found by actual experience in mining metals in all parts of the world that ore deposits do not continue with undiminished value to very great depth. In many cases the productive portion has been found to be only that within a few hundred feet of the surface, and mines over 3,000 feet in depth are comparatively rare, though several very important deposits continue profitable to considerably lower levels.

Statements of regularity of decrease in values with depths are, however, often based on insufficient data. It is a common practice to point to the history of mining operations in a locality and call attention to the decrease in values as evidenced by gradually waning production, followed by closing down of the mines. We are then told that the values gradually fell off as the deeper levels were opened, and that there is probably no more ore at greater depth.

As a rule the assay plans, showing exactly where the values occur, are not made public, and the information gained by the operators is ultimately lost. It is, however, often possible to obtain sufficient evidence to show that the change in values with depth is not properly described as regular, that many deposits are richer at depth than at the surface, that the variations with depth are often not unlike the variations with lateral extent, that there is often a noticeable relation between length and depth, that many rich deposits do not outcrop, that there are probably ore bodies at depths far beyond the lowest levels yet reached by mining operations which are not known, simply because they do not outcrop, and that in glaciated areas there is often no good reason to postulate any close relation between the character of ore and the present surface.

To properly interpret figures giving production for successive years, and these are the figures most commonly available to the public, it is evidently necessary to know what portion of the deposit the ore was coming from. Where no assay plans are available, we have often, unfortunately, to assume a gradual deepening on the ore deposit; but even in these cases some information can commonly be obtained to show what portions of the mine were being most energetically worked each year.

As a rule, the first openings in a deposit are made in what is believed to be the central and best portion of it. As depth is attained, lateral extensions are made into the lower grade ore on either side. Without any change with depth the yearly records then show a decrease in values.

In most deposits the ore shoots pitch to right or left with depth. Shafts seldom follow the ore shoots, and if started in them get into poor ore long before the main shoot fails. Again the records show a falling off in values, which is not a true indication of the variation in the character of the deposit with depth.

In some cases, where one ore deposit has proven sufficiently rich to encourage mining to considerable depth, lateral exploration at low levels has resulted in the discovery of other ore deposits, which near surface are valueless, and which would have been undiscovered but for their proximity to a deposit which was rich enough near surface to permit of profitable mining.

One very essential feature to be noted in discussion of variations with depth is the change in character of formations in which the ore deposits occur. It is well known that very remarkable changes occur on passing from one formation down into a lower one. To discuss clearly the influence of depth then, it is evident that all deposits not confined to one series of rocks should be excluded, or that variations found wholly within one series be considered. If this is done, it is found that the general statements regarding decrease with depth in many cases find little support.

In Ontario and the Lake Superior States most of the valuable ore deposits occur in very old rocks which have been deeply eroded and then glaciated and more or less covered with glacial or fluvio-glacial deposits. It is quite unlikely that these deposits have, except for some very minor surface alterations, any close relation with the present surface. There is very good reason to believe that the deposits were formed in Pre-Cambrian or Cambrian times, in rocks that were not at the then surface. They have been exposed later by erosion, which continued down through long geological ages. It is incredible that the depth of such erosion has been in any way influenced by, or bears any close relation to, such minor masses as those which constitute our ore deposits, and on the other hand there is little evidence that the deposits have been much changed since they were exposed. The exposed surface is rather comparable to one which might be sliced off at any arbitrary depth. From general considerations, therefore, there is no good ground to place any reasonable limit on the depths at which ore deposits occur.

There is no necessary connection between the occurrence of ores at great depth below the present surface and the continuance of an individual ore shoot to similar great depth. The former is a probability, the latter has been proven by countless mining operations to be not the case.

MICHIGAN COPPER MINERS STRIKE

On July 23rd, the Western Federation of Miners called a strike in the Lake Superior copper mining district, and since that date the copper country has been the scene of serious disorders necessitating the calling in of the State Militia. No immediate settlement seems likely, as neither union nor mine managers show any tendency to yield.

For several months the strike has been expected. The union has made no secret of its intention of taking advantage of the present shortage of labor in order to gain a foothold in the Michigan copper district. Previous efforts of the same kind have been flat failures.

It is stated that the demands presented ask for improvement in mining conditions, a minimum wage, recognition of the federation, and a change in operation of the one man drilling machines, the idea being to have an extra man for each two machines.

About 15,000 men are affected by the strike. About 16,500,000 pounds copper per month will be lacking in the production. The men will lose in wages about $1,000,000 per month, and very large amounts will be lost by those who are indirectly connected with the industry. The stockholders will lose an indeterminate large sum, which depends upon the price of copper.

On July 30th, Governor Ferris presented a plan to both sides to settle the strike; but this plan was not acceptable to the operators, who, however, said they were willing to meet committees provided the men came as employees and not as representatives of the Western Federation of Miners.

The less responsible element have been guilty of serious offences, sluggings have been of common occurrence, and an attempt has been made to prevent the operation of the pumps. This wanton damage to life and property naturally results in loss of sympathy for the strikers; but the organizers of the strike disclaim any responsibility for acts of violence. It is scarcely likely that they approve of such acts.

It appears that the strikers are for the most part Finns and Austrians, while Cornish, Irish and Italian miners are for the most part ready to go to work. Many of the Cornishmen returned to England some months ago, intending to stay away until the Federation and the Finnish socialists have settled their differences with the mine operators.

It is of course unlikely that the Federation should call a strike without a cause; but the accounts so far published make it appear that recognition of the union is the chief cause. The operators side of the case is presented in the following extracts from a message to Governor Ferris, bearing date of August 1st:—

"On the 23rd of July the strike called by the Western Federation of Miners took place. It was and is under the direction of skilled and experienced strike leaders of the federation, who are not residents of this district, or of this State. The strike took out only those affiliated with that organization on the morning when it went into effect. Many of our employees continued at work during the day.

"A campaign of violence and riot was at once instituted.

"The officers of the counties were without power to maintain order or to restrain lawlessness.

"By threats publicly made, including threats of destruction of their homes in their absence, violence to their families and death to themselves, the men of the night shift were deterred from going to work underground.

"Mechanics and labourers were driven from their employment by riotous mobs, armed with firearms, clubs, rocks, iron bars and other weapons. Mechanics, miners and labourers who desired to work or while at work, were cruelly beaten, and many were severely injured.

"The officers of the law were helpless, derided, cursed and their authority ignored.

"A deputy sheriff's star was a signal for an attack on the wearer.

"Officers were assaulted and beaten.

"The men were driven from the pumps and the mines were flooded with water, causing great destruction and damage.

"At some of the mines, even the operations of pumps for the fire protection of the community was forcibly prevented and the men driven out.

"At every branch of the mining industry at the several mining locations, the labor of the employes willing and anxious to work, was stopped forcibly, riotously, by threats and intimidation, by violence and assault, by woundings and beatings.

"There was no call by these strikers for conference, or for mediation or for adjustment while they thus completely dominated the situation.

"There is therefore no industrial dispute between the mine owners and employes. Under the circumstances, and because of our knowledge that the majority of our employes have at no time sympathized with the purpose of the federation, and have been and are now willing and anxious to continue in their employment, we cannot recognize the right of the Western Federation of Miners to intervene or to assume to represent our employes with respect to the present conditions, or in any other manner whatsoever."

It is regrettable that the outlook for a settlement seems far removed. The miners and their families are not in a position to stand a long period of enforced idleness, and to many of them even the loss of a few days' wages is a very serious matter. Those who wish to work should be allowed to work, and the State must be responsible for their protection. The stand taken by the operators seems likely to result in a deadlock until the miners are ready to discuss their grievances as employees rather than as members of the union.

INTERNATIONAL GEOLOGICAL CONGRESS

SUDBURY-COBALT-PORCUPINE EXCURSION.

On Wednesday evening, July 23rd, 45 members of the Congress left Toronto on a special C. P. R. train to visit the mining districts of Northern Ontario. The excursion was very well arranged, and, from start to finish, proved very interesting. Some of the places visited have become widely known, both on account of their commercial importance and on account of their scientific interest. The structure and origin of the ore deposits has proven an attractive subject to many geologists, and it was a pleasure much appreciated by the visitors to have the characteristic features of the several deposits pointed out to them by men who have made a special study of the several districts.

All over the world the Sudbury deposits are referred to as the most notable example of that particular type of ore deposits supposed to be the result of magmatic differentiation. It was therefore of special interest to have the features of these deposits pointed out by Dr. A. P. Coleman, who has made several years study of the deposits and has long contended that the ore bodies have been formed by segregation of the sulphides from a molten magma which was chiefly composed of the constituents of norite—the rock in which the ore occurs.

The members found little difficulty in finding hand specimens which show apparently secondary deposition of sulphides, especially of chalcopyrite; but as has already been mentioned by exponents of the magmatic theory, this secondary deposition is of minor importance, as the localization of the ore bodies seems to have depended on phenomena of much greater magnitude. The secondary deposits may easily have been formed by local changes within the original massive ore bodies and the neighbouring rock.

The Sudbury Norite.—Prof. Coleman first took the party to outcrops near Sudbury and pointed out several exposures of the Sudbury series—McKim greywacke and Ramsay lake quartzite—and the overlying conglomerate. Then, going to Windy lake on the C. P. R. Railway, the rocks which underlie the nickel bearing eruptive were seen. The railway was followed southeastward, giving a section across the eruptive. It was easily seen that the rock becomes, towards the upper and inner edge, lighter coloured and more siliceous. At the outer lower edge it is a dark gray, fine norite. This gradually changes to a coarser-grained rock containing less pyroxene and more reddish feldspar and micropegmatite. At the top it is quite red and siliceous and granite-like in appearance.

Below the nickel-bearing eruptive the rocks are much brecciated. In the vicinity of Sudbury several outcrops were visited and the "crush conglomerate" examined. Prof. Coleman, in calling attention to these outcrops, stated that this is characteristic of the foot-wall rocks all the way around the nickel range. Apparently the intrusion of the norite mass has been accompanied by very extensive crushing of the underlying rocks.

The Inner Basin.—Above the nickel-bearing eruptive there is a fine grained siliceous rock, which Dr. Coleman says is characteristic of the whole basin. Outcrops of this material were examined and it was found difficult to distinguish between the acid edge of the micropegmatite and what Dr. Coleman believes to be fused conglomerate.

Dr. Coleman stated that unaltered conglomerate and micropegmatite are not found in contact, but that in going from the overlying, Trout lake, conglomerate towards the eruptive there is always noted a gradual change from a distinctly fragmental rock to a fine-grained hard rock, which cannot be readily distinguished from felsitic igneous rocks. The change is so gradual that the conclusion reached is that the eruptive has intruded the conglomerate and was at a high enough temperature to alter it very extensively before solidifying.

Above the conglomerate is a dark coloured siliceous rock known as the Onaping tuff. Good exposures of this were examined at Onaping falls. At Onwatin lake outcrops of the overlying Onwatin slate were examined. It was found by several of the party that these rocks are specially productive of red raspberries. Asked as to the possibility of the Trout lake conglom-

AT WINDY LAKE, SUDBURY DISTRICT

A. W. G. Wilson, Ottawa; W. G. Miller, Toronto; A. C. Lane, Tufts College; Bedford McNeill, London; A. P. Coleman, Toronto; J. B. Tyrrell, Toronto; P. P. Piatnizky, Russia; Jules Szadeczcy, Hungary; A. G. Charleton, London; A. G. B. Wilbraham, London; G. W. Grabham, Khartoum, Africa; A. G. Burrows, Toronto.

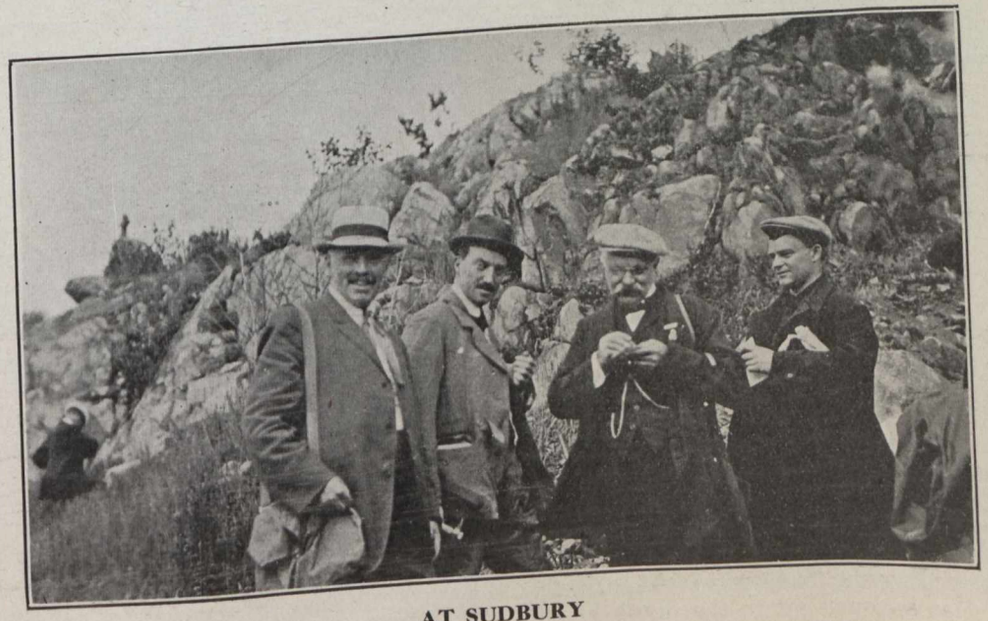
NEAR WINDY LAKE, SUDBURY DISTRICT

C. W. Knight, Toronto; P. Piatnizky, Russia; J. B. Tyrrell, Toronto; G. W. Grabham, Khartoum; G. A. J. Cole, Dublin, Ireland.

erate, which overlies the nickel-bearing eruptive, and the basal conglomerate near Ramsay lake, being of the same age, Dr. Coleman replied that he considers this improbable. He stated that all around the inner basin the Trout lake conglomerate occurs and is always of the same character—a dark gray, hard conglomerate characterized by numerous pebbles of gray chert. He pointed out that the Ramsay lake conglomerate is quite different in appearance and composition and was probably not formed at the same time.

Having made examination of the several types of rock and of exposures which show their structural relations, visits were then made to the nickel mines.

Murray Mine.—The first mine visited was the Murray. This property, which is on the main line of the C. P. R., and was discovered by the building of the railroad, was worked several years ago; but has not been producing for ten years or more. During the past two years, however, the property has been systematically prospected by diamond drilling and excellent recall results obtained. According to Mr. Hitchcock, who is in charge of the drilling operations, holes are being put down vertically at intervals of 200 feet and several million tons of ore has been discovered. The deposits worked in the early days are said to have dipped at about 45 degrees; but the drilling indicates that the



AT SUDBURY

J. A. Dresser, Sault Ste Marie, Ont.; G. Merciai, Pisa, Italy; E. Mattirolo, Torino, Italy; F. H. Forest. Rigaud, Quebec.

large body of ore penetrated by the drills dips at a considerably lower angle.

The Dominion Nickel Co. has done about 90,000 feet of drilling at the Murray and other properties in the Sudbury district in the past two years. About 20,000 feet of this was done at the Murray.

Having found a large body of ore the company employed a staff of engineers to work out methods of mining and treating the ore. Quite recently there has been a change in ownership and the property is now supposed to be under control of Dr. A. F. Pearson and associates. At present it is being operated under the names of the trustees of the property. Plans for the smelter are well advanced; but the owners have decided not to go ahead with the construction for some time.

According to Dr. Coleman, the nickel ore body at the Murray is now known to reach a depth of 1,100 feet and to include more than 10,000,000 tons. Several holes are being drilled to explore the deposit at greater depth.

AT SUDBURY

Dr. A. C. Lane and Prof. J. Barrell discussing the grain of rocks.

After pointing out the extensive gossan outcrops, Dr. Coleman led the party to exposures of the underlying rocks. The norite rests on a complex of ancient lavas showing in places, amygdaloidal and pillow structures.

Creighton Mine.—The following day was spent at the mines and smelting plant of the Canadian Copper Company. First the Creighton mine was visited. Dr. Coleman led the party past the open pit to an outcrop east of the mine, where is shown a characteristic contact of norite with the older gneiss. At the open pit the foot-wall rocks, the ore, the norite and a dike of diabase which cuts the ore were examined. The ore forms a somewhat pear-shaped body dipping to the north and pitching to the west. The mine is at present by far the largest producer of nickel in the world; but it will be far surpassed by the No. 3 mine. The Creighton is being mined as an open pit to the depth of 300 feet and underground mining is being done at lower levels. On returning to the train the party were presented with copies of a well-illustrated booklet describing the company's plants and methods, and with fobs of monel metal and specimens of pentlandite—the mineral which yields the nickel.

AT SUDBURY

A. G. Charleton. Past-President Institution of Mining and Metallurgy.

Roast Yards.—Leaving the Creighton mine, the party next went to Copper Cliff. The train was stopped in the roast yards and the burning piles of ore were examined, while members of the Company's staff explained the process of roasting.

Offset Deposits.—Dr. Coleman then led the party to exposures on the east shore of Macdonald lake, where a typical "offset deposit" was seen and trace southward to No. 2 mine. It was pointed out that the basic edge of norite narrows to a funnel leading to the long and important Copper Cliff offset, passing through granitoid gneiss, greenstone and graywacke. No. 2 mine, with its open pit 300 feet deep, is a typical columnar offset deposit.

The Copper Cliff mine is not now working, but was one of the richest of the early mines. The ore body

Waiting for the special train at Levack. Mr. Bedford McNeill in contemplative mood.

DR. COLEMAN DESCRIBING STRUCTURAL FEATURES AT CREIGHTON MINE

Mr. aud Mrs. J. B. Tyrrell, Toronto ; A. G. Charleton, London ; Miss Eubank, Toronto ; G. A. J. Cole, Ireland ; Dr. Coleman, Toronto ; O. F. Pfordte, Cairo, N.Y.; G. Merciai, Italy : A. E. Kitson, Gold Coast, West Africa ; C. W. Knight, Toronto ; S. Cerulli-Irelli, Italy.

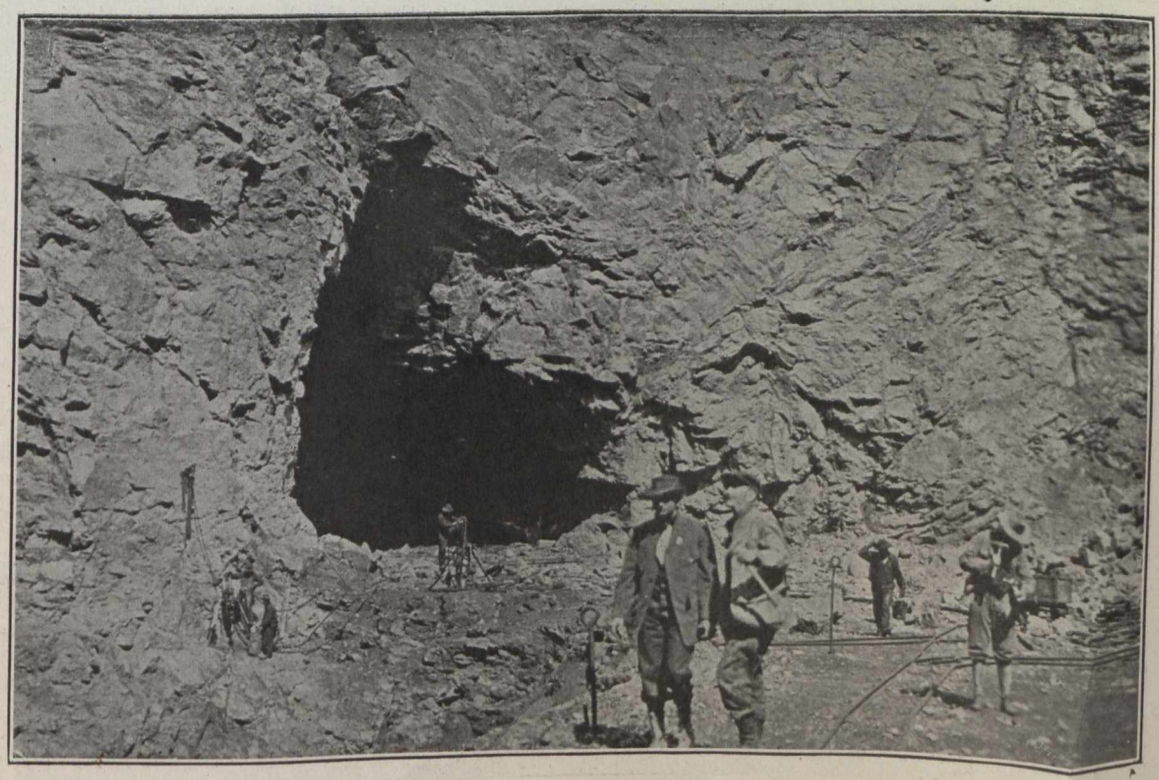
formed an irregular chimney, which has been followed for 1,300 feet on an incline of 70 degrees to the east.

Canadian Copper Company's Smelter.—In the afternoon the guides took the party over the smelting plant and explained the process of treating the ore. This was described in detail in the August 1st issue of the Journal.

No. 3, or Frood Mine.—Leaving the smelter the party proceeded by train to Frood and examined the enormous outcrops of gossan at what is believed to be by far the largest nickel deposit yet discovered. According to Dr. Coleman, it is estimated to contain at least 35,000,000 tons of ore, and perhaps as much as 100,000,000 tons. From No. 3 the gossan-covered ridge extends almost unbroken for a mile to the southwest and almost as far to the northeast, where the Stobie mine once produced more than 400,000 tons of ore.

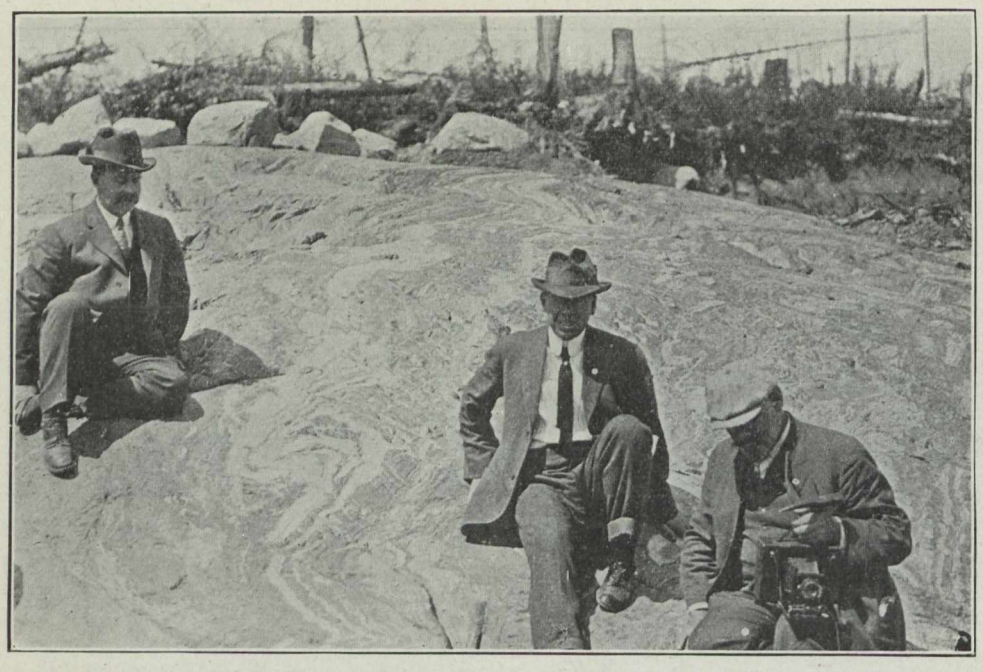
The deposit is being developed from two shafts on the property of the Canadian Copper Company. On adjoining property the Mond Nickel Company is sinking a vertical shaft, which is expected to reach the ore at a depth of about 800 feet.

At No. 3 mine the deposit has been developed for some distance at the 200 and 300-foot- levels. At the 200-foot level ore is being stoped by widening out crosscuts on reaching the ore and gradually extending the stope by making a fan-shaped opening, as has been done at some of the other properties.



OPEN PIT, CREIGHTON MINE, CANADIAN COPPER COMPANY

Supt. Kaeding ; Fred Searls, Goldfield, Nevada; F. L. Ransome, U.S.G.S., Washington, D.C.



ON OUTCROP OF CONTORTED IRON FORMATION, MOOSE MT., ONT.

C. V. Corless, Mond Nickel Co.; F. A. Jordan, Moose Mt. Ltd. and Dr. J. F. Kemp, Columbia University.

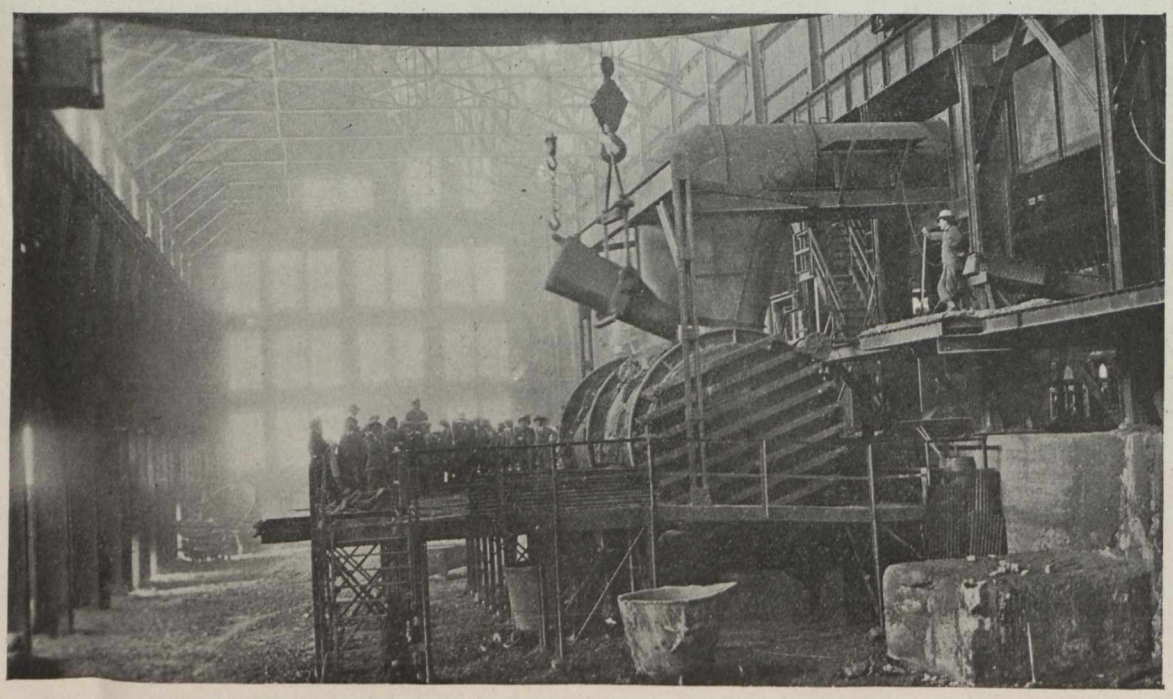
At the 300-foot level a very different mode of attack is planned. Crosscuts through the ore body are being run at intervals of 50 feet. From the crosscuts inclined raises will be put up at intervals of 30 feet on each side, staggered at 15 feet.

The ore at No. 3 mine differs considerably from that at the Creighton. It is not commonly massive sulphide; but has a distinctly spotted character. The sulphide minerals occur as grains distributed with a regularity equal to that of the silicate minerals.

The orebody is more regular in shape than that at Creighton. It is a thick tabular mass dipping rather steeply at surface and, so far as can be told from drilling, flattening somewhat with depth.

While No. 3 ore is considerably lower grade than Creighton ore, the deposit is expected to prove even more valuable on account of its greater size.

Entertainment by Sudbury Board of Trade.—After returning to Sudbury on Friday evening, the members assembled in the Town Hall to partake of a supper given under the auspices of the Sudbury Board of Trade. A lengthy toast list kept the party up late in spite of Dr. Coleman's earnest requests to the speakers to be brief. It was generally conceded that Prof. Coleman made the speech of the evening when in response to a toast to the ladies he said: "The ladies are asleep. God bless them." Speeches of welcome to the visitors and of thanks to the Board of Trade and citizens of



Charging a basic converter at new smelter of the Mond Nickel Company at Coniston, Ont.

Sudbury for a splendid reception were received with much applause.

Moose Mountain.—Saturday morning the party was taken over the Canadian Northern Railway to Moose Mountain. Here the iron ore deposits and associated rocks were examined. At No. 1 mine, which is worked largely as an open pit, the ore is magnetite more or less interbanded with hornblende and green epidote. At No. 2 mine the ore consists of interbanded magnetite and silica without hornblende or epidote.

The ore mined is crushed and then concentrated by magnetic separation. By this means a marketable product is obtained. Much of the ore runs only 35 to 40 per cent. iron; but by a simple treatment the grade is brought up to 60 per cent.

In the vicinity of the mines many interesting structural features are well exposed. In places the banded ore is cut by dikes of granite and by thin seams of epidote. Where the iron formation crosses the Vermilion river interesting crumplings and foldings of the banded ore were pointed out by Dr. Coleman. A variety of interesting small scale structural features, such as anticlines, synclines and faults were also seen in the old rocks.

Recently Mr. Lindeman of the Department of Mines has been studying the district and has prepared a magnetometric map of the iron formations. Copies of this map were received just in time for distribution to members of the excursion.

After visiting the outcrops and mines, the party was conducted through the concentration plant and the methods of magnetic separation and briquetting of the ore were explained.

The officers of the company then entertained at a luncheon in the schoolhouse. A good meal, nicely served by the ladies of the village, was followed by several happy speeches. After luncheon a start was made southward. At several points the train was stopped to allow examination of outcrops along the railway. At Garson lake several of the party showed more interest in the water than in the rocks, and by general consent a stop was made to permit of a more intimate acquaintance with the lake. Refreshed by a swim, the party was then taken to the Coniston roast yards and smelter.

At Coniston the Mond Nickel Company has recently constructed a very complete smelting plant for the treatment of nickel-copper ores, and much interest was shown in the methods of handling the ore and furnace products here. The officers of the company conducted parties through the plant and explained the processes. Several labour and heat-saving devices have been introduced in the new plant.

In the evening the party returned to Sudbury, and on Sunday afternoon the train pulled out for Cobalt and Porcupine.

(To be Continued.)

MARITIME PROVINCES EXCURSION.

Visit to the Sydney Coalfield.

Cape Breton Island, within the past few years, has been visited during the summer months by many associations and congresses, and bodies of persons joined together for some ostensibly educative purpose. These parties have curiously coincided with hot weather in other parts of the American continent, and it has been shrewdly surmised that a desire to feel the cool Atlantic breezes was not altogether unconnected with the presence of these gatherings in Cape Breton, and there has been a feeling that business was sometimes interfered with unnecessarily in receiving and entertaining the visitors, for it is in the summer time that the coal mines and steel works are most busy, and interruptions are sufficiently numerous without further additions.

A pleasing exception, however, is the recent visit of a portion of the International Geological Congress to the Sydney coalfield. The geologists who composed this party were very evidently not on a junketing excursion, and the inspection of any undeveloped country by a discerning and well-informed party of specialists such as made up the Maritime Provinces excursion of the Geological Congress, cannot but be followed by an increasing interest in its resources and a more exact knowledge of its geological characteristics.

The Sydney trip commenced on Wednesday, the 23rd of July, with a visit to the Point Edward limestones, where the party inspected Limestone Point. Here the bedded limestones are seen dipping under the northwest arm of Sydney Harbour, and can be observed to disappear under the Millstone Grit on the other side of the arm. Several of the party evinced considerable interest in a curious appearance shown by weathered fragments of the limestone, the surface of the rock being covered by closely packed circular knobs showing a distinct concretionary structure. One learned gentleman remarked that the rock had "a curious botyroidal structure resembling sheep's brains." More may be heard of this, when the specimens reach Europe! An old quarry, known as Louisburg Quarry was next visited, which is said to have furnished lime for the French fortifications at Louisburg. Here numerous shell fossils were to be seen and further nodular specimens. The Nova Scotia Steel Company's quarries at Point Edward Post Office were then visited, where the full bench of the bedded limestone was exposed in working face. The limestone bed was covered with from ten to twenty feet of reddish drift, and in some places the top of the limestone was curiously water-worn.

Taking the ferry steamer at Leitches Creek, the party sailed down the Northwest Arm and landed at the Quarantine station on Point Edward, about on the axis of the anticline, which divides the two arms of Sydney Harbour. Here an exposure of black shale was visited that yielded a large number of small fossil fauna, particularly the minute fossil shell Leaia. One of the German geologists picked up from the underlying sandstones a fine specimen of a fish-spine about eight inches in length, and a compatriot was the proud possessor of a slab of sandstone showing a well defined cast of mud-cracks arranged in rough pentagons over its lower surface. The black-shale bed occurred just about breast-high, and in a favourable position for attack. An interesting photograph might have been had of some forty persons ranged in a continuous row vigorously attacking the crumbling shale with their hands, and all, apparently, well pleased with their finds.

From Point Edward the geologists proceeded to North Sydney, landing there and taking the tram-car to the point where the Millstone Grit, said to be here over 3,000 feet in thickness, gives place to the true Coal Measures. The party descended the cliffs and walked at the base as far as the outcrop of the Sydney Main Seam. Several members of the party preferred the highway to the rocky base of the cliffs, remarking that they had seen Millstone Grit before; but by the time coal-bearing measures were reached the

whole party were interested examiners. The coast section between North Sydney and Sydney Mines is an imposing one, and probably ranks next in interest to the Joggins exposure, which the party expected to see in the following week. Some magnificent specimens of fossil trees were to be noticed. One Sigillaria in particular was in an ideal position for inspection at the base of the cliff. It was 2 feet 7 inches across the base, and about four feet of the trunk was exposed, the remainder being hidden in the overhang of the cliff. The carbon envelope, always present around fossil plants in the coal measures, enclosed the trunk completely, passing between the base and a small seam of impure coal, on top of which the trunk had apparently been deposited uprightly. The position of the fragment and its surroundings was evidence of the quiet conditions under which it must have been deposited. The trunk was finely marked with the characteristic flutings and pits of the Sigillaria. In several other places at the top of the cliff, where the marls had crumbled under the action of the waves and the atmosphere, there were visible a number of semi-circular shafts where the fossil trees had been, but had fallen out. Near the outcrop of the Sydney Main Seam was a wealth of fossil remains. At least a dozen large and well-preserved specimens of Sigillaria, Lepidodendra and Calamites were to be seen within a space of two yards.

The shale bands in close proximity to the coal seams were found rich in small shell specimens, among which were noticed ostracods, anthracosia (or carbonicola, as it is now the fashion to term this variety), anthracomya and naiadities. Fish scales were also to be found and the delicate iridescent shell estheria. Various ferns and such forms as asterophyllites and sphenophyllum were present in considerable numbers, but the geologists appeared to be more particularly taken with the shell horizons.

A fairly good idea of the nature of the strata overlying the coal seams in the submarine areas can be obtained from an inspection of the cliffs. The colouring is in places very pretty. A variety of shades characterize the marls, red, green, blue, purple, grey and black all being visible. A characteristic of the mud-shales is a star-like marking, such as might be occasioned by the splashing of a stone into mud or soft clay. Numerous lines can be seen radiating from a central point, that is usuallly a lighter colour than the surrounding shale, being evidently the decomposed remains of a root with its surrounding rootlets, seen end-on to the observer. In some places a longitudinal section of such a root could be seen. In a rock at the base of a cliff washed by the tide could be seen a stigmaria, extending for five to six feet in length, with rootlets in situ.

After walking along a portion only of the Sydney mines exposure, one appreciated the industry of the late R. H. Brown, who measured the vertical depth of these measures from end to end of the Sydney coal-field, and sketched with excellent precision the whole shore exposure from North Sydney to Cranberry Head. A comparison of Mr. Brown's sketches, made in 1870 or thereabouts, with the exposure as it is to be seen to-day would be interesting.

After reaching the crop of the Sydney mine seam the party left the cliffs and regained the highway, proceeding to Sydney, which completed the first day's work. The conversation in the crowded tram car was very cosmopolitan. A gentleman from Holland was to be heard explaining in halting French to a group of Frenchmen the customs of the natives of Java and Batavia. On the opposite side an Austrian was relating a college story to a German, and close by was an interesting Japanese gentleman from Dairen, Manchuria, who said little but missed nothing.

On the second day the party divided into four groups—one group going to the Princess pit of the Nova Scotia Steel and Coal Company, Sydney Mines, a second group to the works of the Dominion Iron and Steel Company at Sydney, a third group to No. 2 Colliery of the Dominion Coal Company, while a small party visited the old French fortifications at Louisburg. Your correspondent can only detail the journeyings of the party who visited No. 2 Colliery. The Rescue Station was visited, and a group of trained men wore the Draeger apparatus for the benefit of the visitors, who were also shown the Pulmotor, electric lamps and other accessories of this well-equipped station. The superintendent of the station has for some time been accumulating fossils from the Glace Bay mines, chiefly flora, and these were also shown to the geologists. Some large and excellent specimens of the predominating tree and fern fossils were in the collection, including a really fine sigillaria, five feet long by eighteen inches wide, and the only specimen of Bothodendron punctatum your correspondent has known to be discovered in the Sydney field.

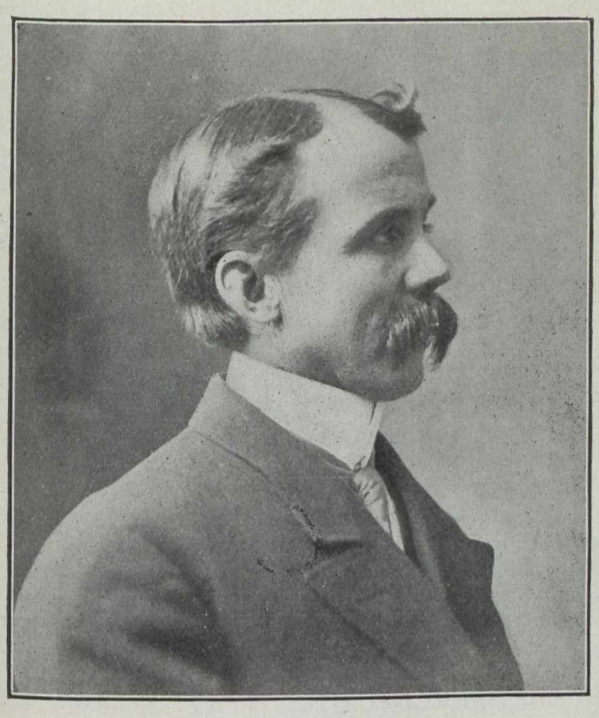
From the Rescue Station a portion of the party visited Table Head, and what is popularly known in Glace Bay as the Burnt Mines. In reference to this vicinity, Mr. Brown's book quotes from the memoirs of M. Pichon, the secretary of the French Governor of Louisburg, who relates in his history of Cape Breton, published in 1760, that "the English had a coal pit at Burnt Head, defended by a fort of considerable strength, where, with fifty men, they successfully repulsed the attacks of the savages and kept possesssion of the fort." M. Pichon further relates that the pit took fire in 1752, when the fort was also entirely consumed. Traces of this fire may still be seen along the outcrop of the Hub seam, and in places the heat of the burning coal has changed the shale cliffs into masses of slag.

The party of geologists were informed that they were standing approximately in the centre of the trough of the Glace Bay synclinal basin, and that beneath their feet were at least seven workable coal seams, aggregating thirty-nine feet of coal, in the comparatively shallow depth of 1,300 feet of strata. They were also told that seaward there was, for all practical purposes, an illimitable supply of submarine coal. One gentleman, whose name is not altogether unknown in Canadian geology, confessed that the day being fine and the air salubrious, he had lain down on the grass and betaken himself to sleep.

While one portion of the party was inspecting the Burnt Mines, the other portion had descended No. 2 shaft and seen the unique weighing and hoisting arrangements in the Phalen pit bottom. Many questions were asked of those who accompanied the party, but none more incisive than those of Mr. Kido, of Manchuria, who insisted upon sketching everything that caught his fancy, and jotted down in his note book the names and addresses of the makers of the machinery.

In the afternoon the scattered parties gathered together and were the guests at lunch of the Dominion Steel Corporation and the Nova Scotia Steel and Coal Company. On the following day the party proceeded to inspect the limestone quarries on the George's River limestone series, from there to Antigonish and thence to the shale cliffs at Arisaig. F. W. G.

CONGRESS PERSONALS



Dr. A. E. Barlow

Wladimir Loewinson-Lessing, of St. Petersburg, Russia, is one of Europe's leading geologists, and stands foremost among the Russians. He is an authority on rocks and the author of several papers.

John Walter Gregory is one of England's leading mining geologists. He was for some years professor of geology at the University of Melbourne and director of geological surveys of Victoria. He has studied the mining fields of several countries, and is the author of several papers on mining geology, including Mount Lyell mines, Victoria gold and tin fields, Ballarat gold field, South Rhodesian gold fields, etc.

Edward O. Ulrich, geologist, U. S. Geological Survey, is one of America's leading paleontologists. He has studied especially stratigraphy and invertebrate paleontology.

Walter Harvey Weed, consulting geologist and mining engineer, New York City, is one of the most prominent mining geologists in America. He has mapped several mining districts for the U. S. Geological Survey, and has contributed numerous articles on the origin of ore deposits. His writings include reports on geology of Mexico, coal of Montana, copper deposits of Butte, and copper mines of the world.

Waldemar Lindgren, professor of geology, Massachusetts Institute of Technology, is one of the foremost authorities on metalliferous deposits. He has made many valuable contributions to the literature on gold, silver and copper deposits, especially on the gold deposits of Colorado and California and the copper deposits of Clifton, Arizona.

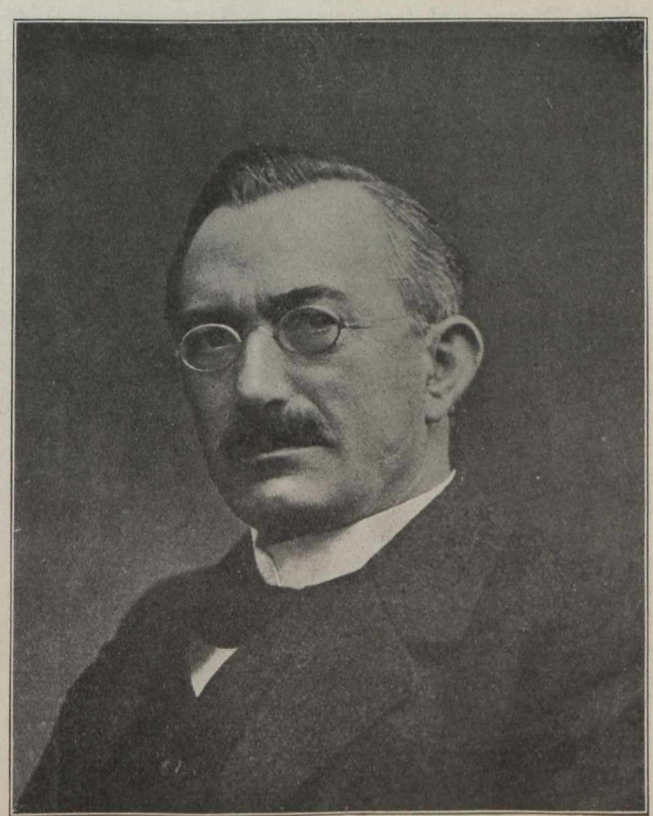
Dr. Charles Kenneth Leith, professor of geology, University of Wisconsin, is a prominent authority on the geology of the iron districts of the United States. With Dr. Van Hise he has made careful study of the Lake Superior district, and has done much towards determining the structure of the ore deposits and their origin.

Dr. Frederick Leslie Ransome is chief geologist of the U. S. Geological Survey. He is a native of Greenwich, Eng., and a graduate of California University. He has taught mineralogy at Harvard and geology at Chicago University. He joined the staff of the U.S.G.S. in 1897, and has written for the Survey several important works. His special studies have been the geology of gold, silver, lead, and copper deposits in Western United States.

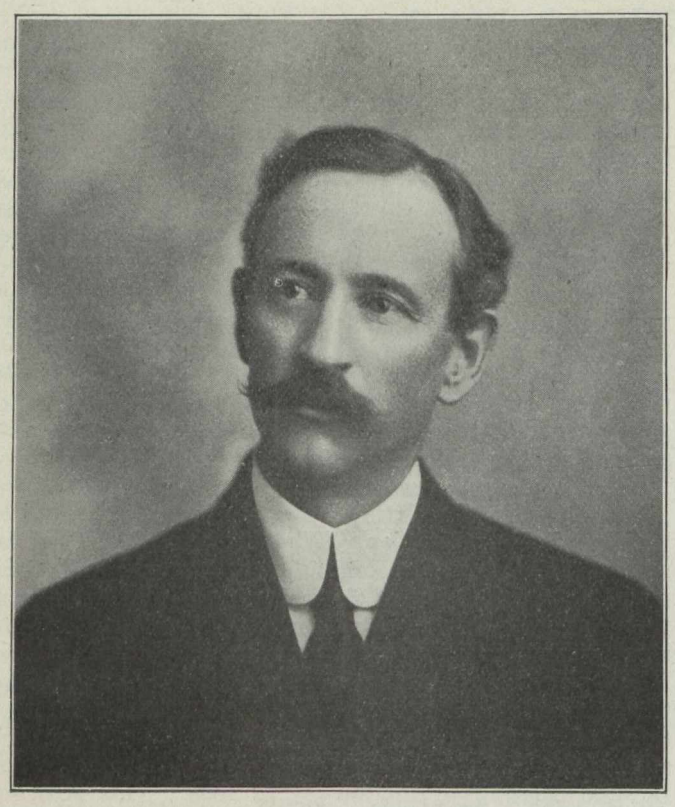
William Herbert Hobbs, professor of geology, University of Michigan, makes a specialty of structural and dynamical geology and seismology. He has a reputation as a fault-finder. Dr. Hobbs has published numerous articles on mineralogy, petrography and geology, and is the author of books on earthquakes and general geology. He is an authority on the fracture systems of the earth's crust.

Dr. Charles Doolittle Walcott, Secretary of the Smithsonian Institution, Washington, D.C., ranks among the leading geologists of the world. He has made a special study of the oldest fossiliferous formations, and he has written numerous volumes on the stratigraphy and paleontology of the Paleozoic rocks. Dr. Walcott has done some very valuable work in the Canadian Rockies and has given remarkable descriptions of them. After being for several years on the staff of the U. S. Geological Survey, Dr. Walcott was appointed director of the survey in 1894. This position he held until 1902, when he joined the reclamation service. In 1907 he was appointed secretary of the Smithsonian Institution.

Louis V. Pirsson, professor of geology, Yale University, is one of the most prominent American geologists. He has described the geology of several of the districts of central Montana and of parts of New Hampshire. Dr. Pirsson has made a special study of rocks and rock minerals, and has published a text book on petrology.



Dr. Richard Beck



Dr. Charles P. Berkey

Dr. Fred E. Wright has made an especial study of microscopic methods and the microscopic properties of minerals and artificial products, made in the Geophysical Laboratory, Washington. He was formerly instructor in petrography at the Michigan College of Mines and Assistant State Geologist of Michigan.

Dr. Alfred C. Lane, Professor of Geology Tufts College, Mass., and formerly State Geologist of Michigan, is an authority on Michigan copper mines. He has published numerous papers on economic geology. He has made a special study of mine waters and the grain of igneous rocks. Dr. Lane is a graduate of Harvard and Heidelberg. He was instructor in mathematics at Harvard and later taught geology in the Michigan College of Mines. He was State Geologist of Michigan, 1899-1909.

Bedford McNeill, consulting engineer, London, Eng., is well known as author of "Bedford McNeill's Code," published in 1893 and 1908. He has inspected and reported on numerous mines in Germany, Transylvania, Colorado, Georgia, and Mexico, and has been consulting engineer to Anchor T. Mine, Ltd., Bacis Gold and Silver Mining Co., Ltd., Waterson Gold Mining Co., Ltd., etc. Mr. McNeill has long been a prominent member of the Institute of Mining and Metallurgy, and is now president.

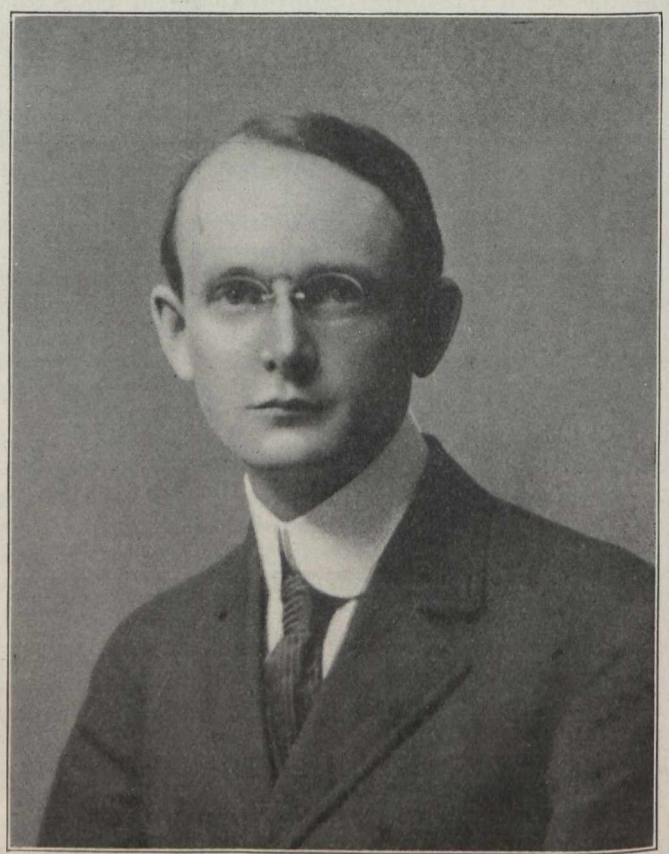
John W. Evans, delegate of the Geologists' Association, London, Eng., was in 1891-92 geologist and mineralogist to the Matto Grosso Gold and Exploration Concessions in Brazil. Later he became State geologist and chief inspector of mines and explosives, Mysore, India. In 1901-02, Mr. Evans traveled in the Eastern Andes and the lowlands of Bolivia and Matto Grosso and Amazonos, Brazil, for the Bolovian Syndicate. More recently he has been instructor in Economic Mineralogy to officers of the Colonial Service.

Albert E. Kitson, director of the Geological Survey of the Gold Coast, has made surveys and examinations in all the Australian States, Tasmania and New Zealand, and was for some time in charge of the Coal-Fields Survey, Victoria. Later he was Principal of the Mineral Survey, Southern Nigeria, British West Africa. Mr. Kitson conducted geological explorations and mining operations in Southern Nigeria and Dahomey. He has examined metal and coal mines in the British Isles, Germany, Austria and Italy, and reported on lignite and its manufacture into briquettes.

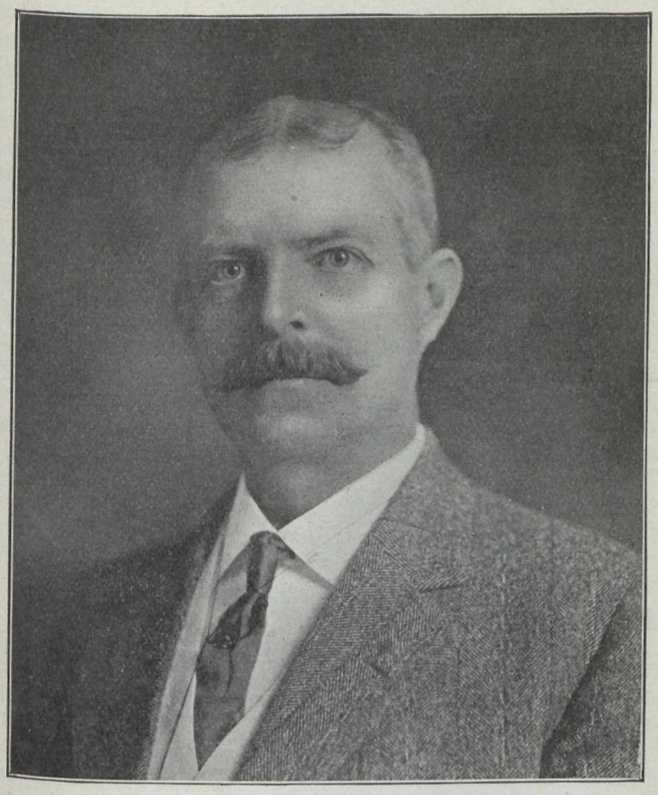
Harry F. Bain, Editor Mining and Scientific Press, San Francisco, was for some time geologist on the Iowa State Survey. During the period 1901-03 he was manager of mines at Idaho Springs and Cripple Creek, Colo. After being for a few years geologist on the staff of the U. S. Geological Survey, he was appointed Director of the Illinois Geological Survey. This position he left in 1909 to take up editorial work.

J. B. Tyrrell, consulting mining engineer, Toronto, has taken a very prominent part in the development of the mineral resources of Canada. As geologist on the staff of the Geological Survey, 20 years ago, he explored the Rocky Mountains north of the International boundary. Later, in Alberta, he determined the source of gold in the Saskatchewan River, and located most of the coal seams in the province. In 1893 Mr. Tyrrell began the exploration of a great unknown region between the Mackenzie River and Hudson Bay. In 1898 he began the investigation of the geology of the Klondike goldfields and of other parts of the Yukon Territory. Later he resigned from the Geological Survey and practiced as mining engineer in Dawson, reporting on many large properties and engaging in mining on his own account. Mr. Tyrrell moved to Toronto in 1906.

Arthur George Charleton, Past President of the Institution of Mining and Metallurgy, was at one time assistant manager of Canadian Consolidated Gold Mines, Deloro, Ontario, and later of mines in Nevada. In 1884 he reported on Wynaad and Mysore Gold Fields, India. Then he became general manager of Disraeli Gold Mining Co., Queensland, and in 1888 of the new Queen



H. F. Bain



Dr. Waldemar Lindgren

Gold Mining Co. In 1895 he founded the firm of Charleton and Co., in partnership with F. W. Grey, reporting on mines of gold, copper, silver-lead, manganese and cobalt, in different parts of the world. In 1894 Mr. Arthur Dickinson joined the present firm, Charleton, Dickinson and Co., who acted as consulting engineers to the Cornish Consolidated Tin Mines, Ltd.; the Anglo-Spanish Copper Co., etc. Mr. Charleton is the author of numerous papers on mining, milling and mine accounting.

William Harvey Emmons is a native of Mexico, Mo. He was for several years on the staff of the Geological Department, University of Chicago. As geologist on the U. S. G. S. he studied and described many of the ore deposits of Nevada, Montana and Colorado.

Reginald Aldworth Daly, Professor of Geology, Massachusetts Institute of Technology, Boston, is a Canadian who ranks among the leading geologists of the United States. He has contributed many very important papers on the geology of igneous rocks and is regarded as a leading authority on the subject.

Dr. Edmund Otis Hovey, Curator of the American Museum of Natural History, has made a special study of volcanoes, meteorites and earthquakes. He has described the volcanoes of the Lesser Antilles and eruptions of Mount Pele, Martinique and the Soufriere, St. Vincent.

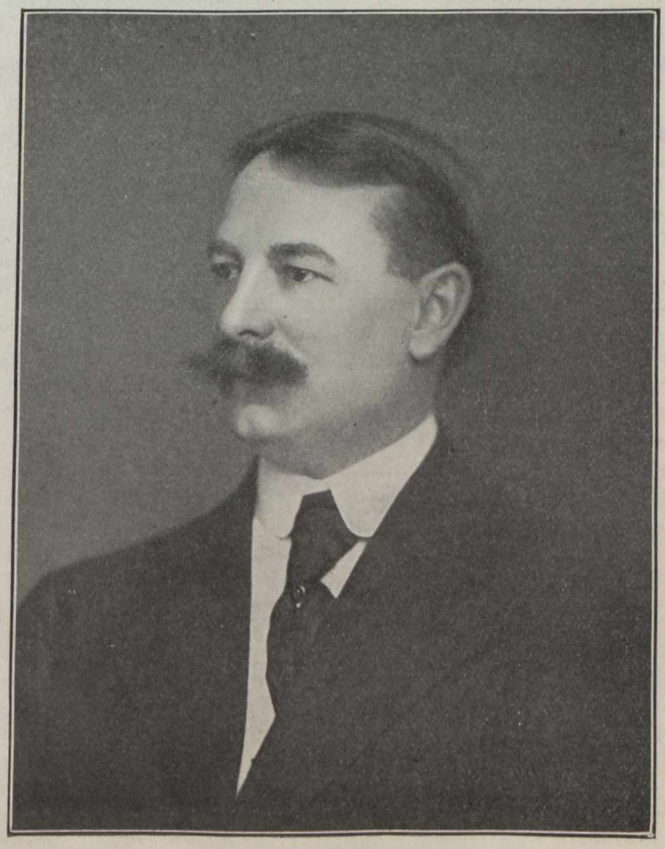
Alfred Harker, Fellow of St. John's College and Lecturer in Petrology, Cambridge, is well-known for his studies in petrology and for his text books on rocks. His work, "Petrology for Students" is in use in many colleges. Among his publications is an admirable work on the "Natural History of Igneous Rocks."

William Wallace Mein, Consulting Mining Engineer, New York, is well known in Ontario through his position as consulting engineer for the Dome Mines Co. and the Canada Exploration Co. Mr. Mein has held very important positions on the Rand, South Africa, being general manager of French Rand Gold Mining Co., Crown Reef, Robinson, Robinson Central Deep, Ferreira, Village Main Reef, Village Deep, Turf Mines, City Deep, New Modderfontein and Modderfontein Extension. In Alaska also Mr. Mein held important posts, being consulting engineer to Alaska Treadwell Group of Mines, Douglas Island, Alaska.

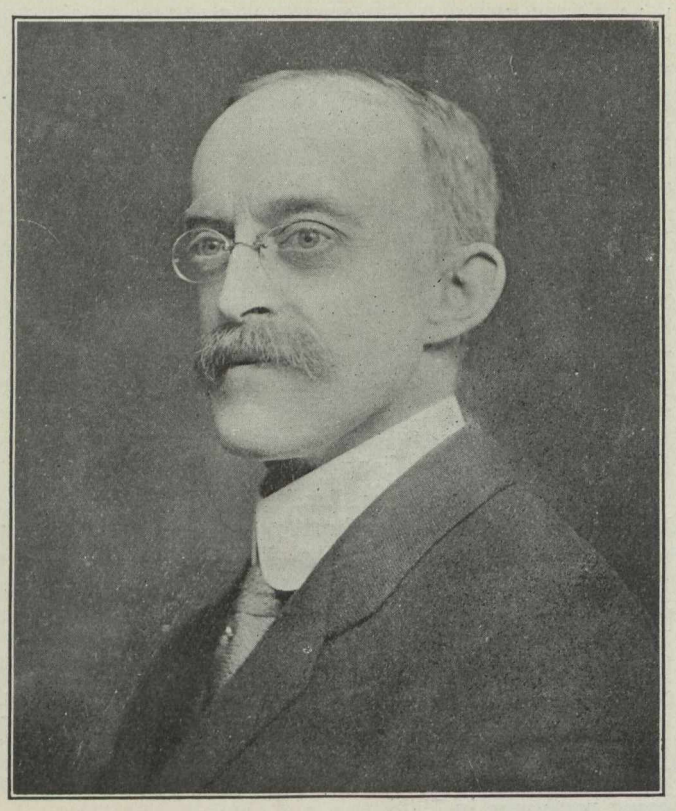
Dr. Florence Bascom, Professor of Geology at Bryn Mawr, Pa., enjoys the distinction of being the most prominent woman geologist in America. For several years she has been a member of the staff of the United States Geological Survey, and has written a number of valuable works on general geology and on the geology of Pennsylvania. Miss Bascom is a regular attendant at the meetings and excursions of the several societies to which she belongs. She took part in the last meeting of the Geological Congress in Sweden.

Professor Joseph Barrell of Yale University, New Haven, is a prominent authority on the origin of rocks. Of late he has written several illuminating papers on the importance of land-formed sediments among the old formations. Professor Barrell was, in 1893-97, instructor in mining and metallurgy at Lehigh University. After practising for two years as a mining engineer, and spending three years as United States geologist in Montana, he was, in 1900, appointed Assistant Professor of Geology at Lehigh. In 1903 he received an appointment at Yale and became professor in 1908.

Dr. Heinrich Ries, Professor of Geology, Cornell University, is the foremost authority on clays. He has made many valuable contributions to our knowledge of the clays of America. Dr. Ries has been engaged by the U. S. Geological Survey and by the State Surveys of Michigan, Maryland, New Jersey, Texas, Wisconsin and Virginia to report on clays. Recently he has done similar work for the Canadian Geological Survey.



Horace V. Winchell



W. F. Ferrier

Henry Shaler Williams, Professor of Geology, Cornell University, is a paleontologist who has made a special study of Devonian paleontology; geological history of organisms; evolution and geographical and geological modification of fossil faunas. He has published articles on changes in composition and modification of species in relation to change of location and succession in time as means of geological correlation and identification of their time relations.

Frank Leverett, Geologist, U. S. Geological Survey, is a leading authority on glacial geology, physiography and water resources. He has made numerous glacial investigations in the Upper Mississippi and Great Lakes regions. Mr. Leverett is lecturer on glacial geology, University of Michigan.

Horace Vaughn Winchell, Consulting Mining Engineer and Geologist, Minneapolis, is one of America's most prominent economic geologists. He makes a specialty of the determination of value and modes of extraction of ores and minerals. Mr. Winchell was, in 1889-91, Assistant State Geologist of Minnesota. He was then appointed Geologist in charge of explorations on Mesabi and Vermilion iron ranges for the Minnesota Iron Co. In 1893 he practised as consulting engineer and geologist and has been geologist (1898-1906) for the Anaconda Copper Co., and (1906-1908) for the Great Northern Railway Co.

The Reception in Ottawa.

A luncheon tendered them at the Experimental Farm by the Government, at which they received an official welcome from Premier Borden on behalf of Canada, and the unveiling in the afternoon by Hon. T. W. Crothers of the tablet erected by the Congress in honour of Sir William Logan, founder of the Canadian Geological Survey, formed the features of the visit to Ottawa, August 1, of some 200 delegates to the International Geological Congress at Toronto.

Arriving in the city the previous night the delegates were taken around to see its sights in the morning and then conveyed to the Experimental Farm. In Auditorium Hall there luncheon had been arranged at which about 350 sat down. At its conclusion speeches were made by Rt. Hon. Mr. Borden, who just returned in time for the event; Controller Parent, President Frank D. Adams and other delegates hailing from many countries.

After welcoming the Congress to Canada, Premier Borden expressed his appreciation of the coming of so many distinguished gentlemen representing nearly all the civilized nations of the world; a visit which meant much to a country like Canada, still busy with its first problems of development. This country, in fact, was so large that just a few months ago the Government had sent an expedition north to find just how far its boundary extended in that direction. It was expected to be heard from in about four years' time. He hoped the visit would give the delegates a new idea of Canada's resources and that she might learn from them some things that would help her to solve the problems of the future.

After a few words of welcome from Controller Parent on behalf of the city, Dr. Frank D. Adams, dean of the Faculty of Applied Science at McGill University and president of the International Geological Congress, replied on behalf of the latter body. He referred to the magnificent scale on which Nature's geological formations were visible in the Dominion. Its climate, too, was varied, and he had found great difficulty in convincing many of the delegates that "Our Lady of the Snows" could ever boast of even an inch of such frosty covering. In announcing the future programme of the party he made the interesting statement that on visiting Caughnawaga several of the delegates would be made chiefs of the Iroquois tribe.

Other brief addresses were delivered by Dr. A. Strahan, director of the British Geological Survey; Dr. P. M. Termier, of Paris, director of the French Geological Survey; Dr. Max Belowsky, of Berlin, president of the university there; Prof. J. F. Kemp, of Columbia University, New York; Dr. J. H. Sederholm, director of the Geological Survey of Finland. Hon. Mr. Perley, who acted as chairman, also spoke a few words.

Tablet Unveiled.

At the conclusion of the luncheon the visitors were shown over the Farm and were then taken to the Victoria Museum for the unveiling of the tablet to the founder of Canada's Geological Survey and first director. The tablet has been affixed to a huge specimen of the Laurentian formation, the one with which Sir William Logan's work was chiefly connected. It was procured in Rockcliffe and has been set on a concrete pedestal in front of the main entrance of the Museum. On the tablet of copper is the following inscription: "Sir William Logan, Kt., LL.D., F.R.S., 1798-1875, the father of Canadian geology, founder and first director Geological Survey of Canada, 1842-1869; erected by the International Geological Congress of Canada, 1913."

The tablet was unveiled by Hon. T. W. Crothers, Minister of Labor, in the absence of Hon. Louis Coderre, Minister of Mines. After a few remarks by Mr. James White, of the Conservation Commission, Hon. Mr. Crothers accepted the tablet on behalf of the Government of Canada. He referred to the importance of the pioneer work which had been done by the late Sir William Logan in the interests of the Dominion and congratulated the Congress on its commemoration of his memory.

Some of the members of the A 1, A 2, and A 3 excursions visiting the Dominion Parliament Buildings at Ottawa.

Dr. A. E. Barlow, chairman of the Logan Memorial Committee, also said a few words, stating that besides the present tablet one had already been erected in Perce, in Gaspe Peninsula, where much of Dr. Logan's early work was carried on. President Adams, of the Congress, then gave a sketch of Sir William Logan's career. A Montreal man, he had gained experience in Wales and then returned to Canada as first director of the Canadian Geological Survey. He had been given the munificent sum of fifteen hundred pounds and told to go out and survey Canada with it, a work to which he devoted not only all his energy, but considerable private resources.

At the conclusion of the ceremony the delegates were entertained to tea in the Museum, and then left for Montreal.

Reception in Montreal on August 2.

The scientific and intellectual world of Montreal on August 2 entertained nearly three hundred geologists, who have gathered from every civilized country in the globe to meet in Toronto next week, in international conference. To these men belong the functions of digging out and reading in rocks and stones the early history of the earth, and to make guesses at the riddle of existence. It was not a band of "fossils," but of keen analytical professors, that were entertained by a committee, presided over by Dr. Milton Hersey and representatives of the Universities of McGill and Laval. Many persons marked the absence of an official reception from the civic corporation, due to an oversight in not providing funds in time; but the distinguished entertainment committee made such excellent arrangements in providing for the reception and care of their guests as to more than make up for an absence of civic recognition. It was a highly intellectual party that stayed at the McGill Union over night, sent representatives to the McGill Convocation, had luncheon at the Windsor, and went on an excursion to Lachine, visited the Indian village of Caughnawaga, witnessed the historic and traditional tribal rites, and had an exciting trip down the Rapids, where the boat was somewhat damaged and had to be hurriedly docked.

The day's round of duties began with the Convocation of McGill University at Royal Victoria College. Here a very distinguished audience witnessed the oldest Canadian university confer her highest, her most prized degree of Doctor of Philosophy, honoris causa, on six distinguished visitors. The recipients all expressed their deep sensibility at receiving this mark of signal appreciation, and at being enrolled among the McGill alumnae. The proceedings were plain and direct.

Shortly after 10.30 o'clock, the time set for the convocation to meet, a procession, headed by Dean Moyse, the acting principal, and made up of members of the faculty and the six recipients of the Degree, made its way to the Hall of Convocation.

Those who were honored by Degrees were: Prof. Helge Backstrom, of Mineralogy and Petrography, in the University of Stockholm; Prof. Alfred Bergeat, of Geology of the University of Koenigsberg, Germany; Prof. James Furman Kemp, of Geology, of Columbia University, New York; Lecturer Alfred Harker, of Petrology, in Cambridge University, and Prof. Alfred Lacroix, of the Museum of Natural History, Paris.

Each candidate for the degree was introduced by a member of the McGill faculty; Dean Moyse said over a few words of Latin, and he became a Doctor of Philosophy.

After the procession reached the platform, Prof. John Macnaughton opened the proceedings wth prayer. Then came the work of conferring Degrees.

Prof. Howard Barnes, introducing Prof. Helge Backstrom, of Stockholm University, the first to be honored, said that Swedish savant was a representative of the distinguished school of geologists, whose studies of ancient geological formations of the far north of Scandinavia have shed so much light on the early history of the world. He is an author of scientific repute, and a member of the Upper Chamber of the Swedish Parliament.

Dr. Backstrom, in reply, expressed his deep gratitude at the honor conferred upon him by the Canadian geologists, whose studies were similar to their own. He took this as a testimonial that the work of the Swedish geologists was appreciated in this country. Sweden had water powers and a similar climate to this country, and he expected that from these aspects the civilization of the two countries would develop on similar lines. In conclusion, he expressed a hope that this would lead to greater intercourse in future.

Professor Dale, who was sponsor for Prof. Alfred Bergeat, of the University of Koenigsberg, the next recipient, sketched the career of the distinguished scientist. He had particularly studied geological formations in connection with ore, the developments of which had such a far reaching influence on the progress of the world. He had done distinguished work in Mexico, and his book had a far reaching effect.

In reply to the honour conferred, Prof. Bergeat spoke in German, thanking them for their interest in and honouring of his work. He spoke of the great physical aspects of Canada, and said it was important in the geological world. He modestly disclaimed any special distinction in his labours, and said the standing of McGill as a university was recognized in Europe.

Prof. Alfred Harker, lecturer on petrology in Cambridge University, was presented by Prof. Macnaughton. Prof. Harker, he said, represented the most distinguished learned societies in the English-speaking world. First came the Royal Society, founded to follow out the scientific studies opened out by Bacon. He referred to the great work of Prof. Harker in studying the rocks of Scotland. His work in the Highlands has added much to the problem of metamorphism, and he has written eminent works on his studies.

In replying to the honour, Prof. Harker said he took this distinction, not as paid personally to him, but as a tribute to his university. He would be a blind and indifferent man if he did not take a deep interest in the progress of this country, particularly education. He had deep interest in McGill University. Everywhere they went they found strong evidence of vitality and evidence of the prominent part this university is playing in the life and development of this country.

Prof. McLeod said in presenting Prof. James Furman Kemp, who occupies the chair of geology at Columbia University, as the most distinguished geologist in America. His studies of the rocks of the Adirondacks was well known. His work on the studies of ore deposits was the best compendium they possessed. For twenty years he had been a professor in Columbia University, New York, and his lectures attracted not

only large bodies of students from the United States, but also from foreign countries. Prof. McLeod said he also wished to express the thanks of McGill for the brilliant courses of lectures he has delivered to her students.

Prof. Kemp said in reply that he certainly felt very much at home in a McGill audience, and in a McGill alumni. He spoke of the great part geology has played in progress, and he referred to the great work that McGill has done in this sphere. He recalled the labours of Sir William Dawson and Sir William Logan in the rocks of Ontario and Nova Scotia, of Prof. Harrington, of Dr. George Dawson, the intrepid explorer of Northern America, of the regiment of McGill graduates who have explored the north. Geologists turn to McGill from all over the world when they want knowledge of the interior of the earth, and seek it from Prof. Frank O. Adams. One member of the geological conference will carry back to his home deeply felt recollections of the significance of this day.

Dean Adams introduced Prof. Alfred Lacroix, member of the French Institute for the degree. He did much work in Guiana, Madagascar, Martinique after the volcanic eruption, where he was sent in a French battleship. His writings were numerous, and he was the most distinguished mineralogist of the present day.

In replying, Prof. Lacroix said he was deeply touched by the honour. He paid tribute to Canada as a fine country. He had been a student for twenty-five years. He spoke of the influence of McGill as high in promoting scientific research, and of the importance of the study of minerals in solving scientific problems, and the furthering of human progress.

Dean Adams said they were glad to have in Canada such a distinguished body of scientists from all the Seven Seas. He hoped they might go away well pleased with the Dominion, and he hoped that they would come back again to Canada for another geological conference. He also hoped that they would meet again before that date.

Dean Moyse, in the name of Principal Peterson, gave them a hearty welcome to McGill University. It is a young university, said he. It was founded in 1821 and in 1829 it began its work. It nearly perished, but the medical faculty, the doctors, kept it alive. Then came Sir William Dawson, a Scotchman. McGill is a Scotch university, many of its professors are Scotch, but the English professors do much to hold their own. So far as geology is concerned, McGill is the Mecca of geologists, and he cannot see why they should meet in Toronto. Canada was a country of boundless resources, and her universities were busy in turning out men to grapple with them. But they must not forget they have an arts faculty and turned out a Rhodes scholar, who won the blue ribbon of Oxford scholarship. He regretted that they had not received a civic welcome, and he hoped that when they came again they would receive one that would make up for the absence of one this time.

From the Convocation Hall adjournment was made to the Windsor Hotel, where the visitors were the guests of the Montreal reception committee to a luncheon. An orchestra played the national airs of the countries represented by the geologists.

Dr. Milton Hersey, in behalf of McGill, and Laval Universities, the local committee, and the various learned societies, conveyed their greetings to the party. Various so-called international conferences had been held in Canada at various times, but this was the first one held here worthy of the title, international.

Geologists, said Dr. Hersey, are the only persons who can go back to the earliest stages of the earth's history. This was a new country, only three hundred years old, but within a stone's throw of this hotel were rocks of the oldest geological formation.

Dean Adams, of the McGill Faculty of Applied Science, and president of the conference, thanked Dr. Hersey for the splendid reception. He then read off a list of no less than twelve excursions from Montreal, got up for the visitors. The majority go to Toronto and Niagara Falls, and leave at various times.

IMPROVEMENTS AT THE CONSOLIDATED COMPANY'S SMELTING WORKS AT TRAIL, B.C.

By E. Jacobs.

The Consolidated Mining and Smelting Company of Canada, Limited, continues to make improvements and additions to the plant at its lead and copper smelting works at Trail, British Columbia. That it is smelting a larger quantity of ore this year than last is evident from the following comparison, which also shows a generally higher value of ore smelted. During five months ended May 31 of this year the quantity of ore and concentrates smelted was 134,660 tons, the gross value of the metal contents of which was $3,526,436. This compares with 296,458 tons of ore smelted during the company's last fiscal year and a gross value of metal contents of $5,083,078. The monthly average smelted this year was 26,932 tons, gross value $705,287, as against that for the last fiscal year of 24,705 tons a month of a gross value of $423,590.

The chief changes and betterments made during recent months are as below:

Lead-Smelting Department.

In the lead sampling mill provision has been made for finer crushing, so as to obtain a better product for good roasting. The crushing had been done by a Gates gyratory crusher, one set of Traylor Engineering Co.'s heavy duty rolls 42 in. diameter and 16 in. face, and two sets of lighter rolls by the same manufacturers. Now the light rolls have been replaced by two more sets of the heavy ones.

Conveyor belts are being placed under all lead beds. These will feed direct to the hoppers of the roasters, and so do away with the use of the annual labour that has been necessary for tramming from lead beds to roaster hoppers.

Part of the old Huntington-Heberlein plant building has been taken down, leaving but 175 feet of the old building standing. In place of that removed a wooden building has been erected, dimensions 61x234 ft. The

roof trusses are wood with iron tie-rods, making an excellent roof that stands wind and rain and carries the snow of winter. A similar roof at the company's lead refinery building has been serviceable and lasting. An electrically operated Niles 20-ton crane is used in this building; the rails that carry the crane are spaced 58 ft. centres.

Seven Huntington-Heberlein roasters are in use, and preparations are well forward for putting in two Wedge roasters, early receipt of which is expected. Space has been provided for the latter by hydraulicking away a gravel bank, and the firebrick to be used in construction is on the ground. It is intended to have the Wedge roasters in operation late in the ensuing autumn.

There has been a rearrangement of the converter pots, of which there are thirty-six in the building. These have been placed in four rows of nine each, and in convenient proximity there has been erected a large concrete bin in which the roasted ore is collected, being taken to it from the roasters on a steel conveyor. The converter pots are placed below the bin and filled from it and are then lifted to the converter stands by the Niles crane. After its contents have been sintered and cooled, the crane takes the converter pot and drops the sinter hard down on a floor, thus breaking up the large cakes. A Hayward clam-shell bucket, the largest size made, lifts the sinter and dumps it in a hopper that feeds a 24x36 inch Farrel crusher, from which it is taken to bins by a steel conveyor. At the upper end of the conveyor the sinter is passed over coarse and fine grizzlies which eliminate the fines and leave a better product for smelting in the lead blast furnaces. The fines are mixed with fresh roast from the roasters and reconverted.

A gas producer is being installed to provide gas fuel for all the roasters and such other purposes as it shall be found advantageous to use the producer gas for.

A new building has been erected alongside the H. & H. building, for housing the small Roots blower used for the converter pots, and for a centrifugal fan giving 16 oz. pressure. In the upper story of this building are an office for the shift boss, and change and lunch rooms for the men, so that they may be away from the lead dust when eating or resting.

Three new lead blast furnaces are being constructed. Dimensions at tuyeres are 45 by 216 in. They have wrought-iron jackets, with 14 tuyeres; also cast iron jackets with single tuyeres, as at present in use on the old furnaces. Height from centre of tuyere to feed floor level is 17 feet 6 in. These new furnaces will have their feed floor on the same level as that of the copper furnaces instead of the higher level found convenient for hand feeding. With mechanical feeding arrangements, one level for the feed floor of all furnaces, both copper and lead, admits of more economical handling of furnace charges, etc. To provide room for the new furnaces, the main furnace building has been extended eastward by the addition of another bay of about 40 feet, with a lean-to on the south. The lowering of the tapping floor of the lead furnaces by 10 feet below its former level involved the removal of gravel to that depth as a minimum, and this was done by hydraulicking it out to the dump. Meanwhile the feed tracks of the two old furnaces (which are to be taken out), columns of building, etc., had to be held up while the changes were being made and until concrete piers and I-beams had been put in to form a new foundation and substructure.

Copper Smelting Department.

In the copper smelting department, the improvements in hand include putting in a conveyor to convey the ore from the copper sampling mill to a stock pile when there is more ore coming from the mill than can at the time be held in the furnace charge bins. A new storage bin has been built, with a tunnel under it. This bin has floor and sloping sides, so that the ore may run into the discharge chutes.

All stock pile floors and bins now have tunnels under them, so that cars for removal of materials may be run in and so be loaded with less labour, the work of shovelling being thus entirely done away with.

In place of the 4-ton motors formerly used there are now two 7-ton electric locomotives for hauling to the charge bins, while larger cars are being made, the intention being that these improvements shall allow of each day's hauling to the charge bins being done in one shift. One of the 7-ton locomotives is also used for hauling cars of lead anodes from the furnace tapping floor to the refinery, instead of by railway locomotive as before.

The copper smelting plant has for some time included five blast furnaces. Of these, No. 2 has been taken out and in its place there has been constructed a 42-in. by 35 ft. furnace with 28 standard tuyeres on each side. This furnace has an arched top and flat flue, the latter arrangement admitting of goosenecks being done away with to allow of putting in a travelling crane overhead for handling purposes on both furnace floors. It is expected that the new furnace will be found to possess such advantages that two similar furnaces, also of 450 tons capacity, will be substituted for three smaller furnaces, thus providing for treatment of 1350 tons of copper ore a day (exclusive of fluxes) in three blast-furnaces.

On the new No. 2 furnace, the water-feed pipes have been so arranged that all valves can be reached from the tapping floor, and discharge pipes so placed that the furnace-man can at all times see what waste water is coming from the jackets. The overflow trough has been made larger and placed farther out, so that no water will spill on to the furnace man when engaged underneath punching the tuyeres. This furnace has centre feed, the charge train being pushed into it by the electric motor, the charge cars running on water-cooled rails on track level. After the tunnels under the charge bins shall have been enlarged, wheels will be placed on the upper part of the charge cars and these will then, while in the furnace, run on rails placed at the proper height.

Crushing and granulating copper matte is not now done here as formerly, so the old plant used for that purpose has been taken out, thus giving more room at the west end of the furnace floor and allowing of a rearrangement of the tracks about No. 1 furnace. All low-grade copper matte is put through this furnace with siliceous ore to raise the copper content and give a matte of 35 to 40 per cent. copper for shipment to works at Tacoma, Washington, for converting.

No copper ore roasting is now done at Trail in the Huntington-Heberlein pots. Copper concentrate only, chiefly from Rossland mines, is sintered on the Dwight-Lloyd machines, the grates of which have been changed from the herring-bone grate previously used to straight slot self-cleaning grates.

In the Blower Room.

Blast is delivered to the furnaces at 32 to 34 oz. pressure. Six blowers have been in use—four Roots and two Connersville. Another No. 11 Roots is being added, this to give 401. cubic feet per revolution, and be driven by two 300 h.p. induction motors.

General Notes.

The pyrite smelting of raw copper matte, commenced in the early part of 1912, has been discontinued at Trail. While this practice was followed the charge consisted of 4,200 lbs. of matte, 2,000 lbs. of siliceous ore, 13.5 per cent. of lime rock, and 4 per cent. of Crow's Nest coke.

The ore treated in the copper smelting department is obtained chiefly from the company's mines at Rossland. An approximate analysis of this ore is:

Fe.	SiO_2	CaO	Al_2O_3	S	MgO
17.0	44.0	5.5	15.5	8.0	3.5

This ore is smelted with 30 per cent. of lime rock and 16 per cent. of Crow's Nest coke.

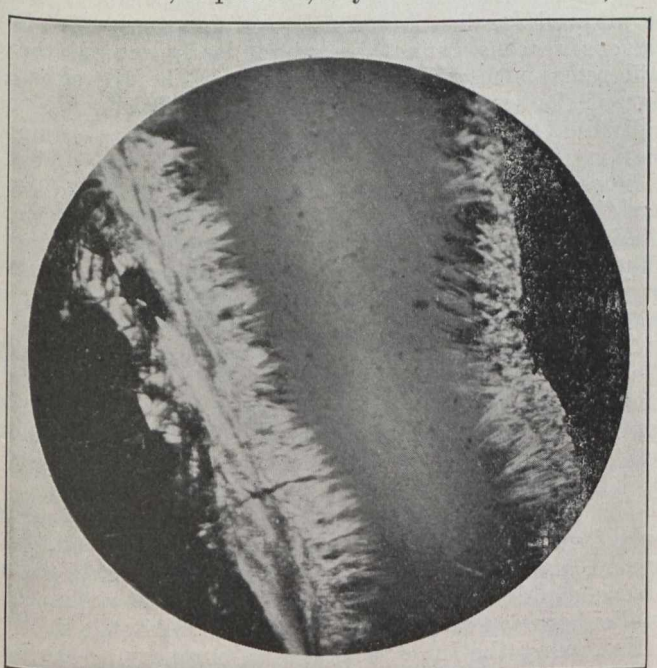
NOTES ON ASBESTOS VEINS AND THE MINERAL NEPHRITE

By W. J. Woolsey.*

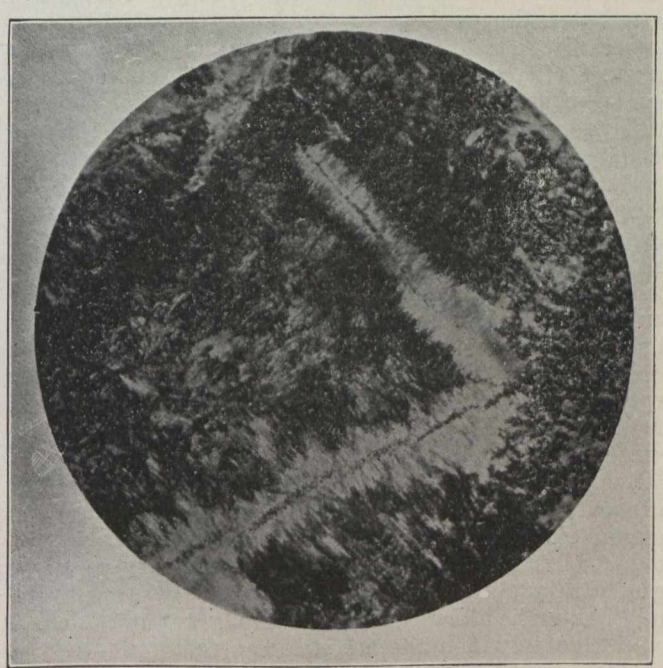
During a recent study of thin sections made from the serpentines of the Thetford-Danville areas, my attention was attracted by a mineral with characteristics foreign to the recognized components of our asbestos bearing serpentines. In the investigation I had the good fortune to discuss the matter with Dr. Ernst Kalkowsky, director of the Royal Geological Museum at Dresden, who at once recognized the mineral as nephrite; a mineral upon which the doctor is a leading authority, having made an exhaustive study of the deposits in Italy and New Zealand, results of which are included in a †monograph published in 1906.

My purpose in the investigation of these serpentines was to discover, if possible, any new characteristics, and if by chance I might find a thin section which would throw further light on the origin of asbestos veins as discussed in my paper to the ‡C. M. I. in 1910, in which appears a §microphotograph showing an asbestos vein growing from a centre outward in both directions. In Plate M. of this article I append a photo of a thin section from Danville serpentine showing outward growth, I found quite a number of similar examples, but nowhere have I observed any intimation of an asbestos vein crystallizing from the sides inward. This theory of outward growth is now firmly advanced by the German school, and they further hold the opinion that the growth of the fissure is synchronous with the growth of the asbestos vein and caused by its crystallizing force.

Having accepted the theory of outward growth of these veins there still remains the difficult task of harmonizinz it with what is observed in the field. The multitude of asbestos veins found in every deposit show apparently unmistakable evidence of an inward growth of the fibres. In Plate N will be observed an excellent example of one nephrite in the process of crystallizing and if we dare to assume that the presence of this nephrite in the asbestos veins would determine the crystal manner, we would then understand how inward growth is also possible. This would mean that our asbestos veins are to a considerable degree composed of nephrite which, of course, would not be evident by chemical analysis.



N—Microphotograph of Nephrite vein, magnified 30 times, showing inward growth



M—Microphotograph of Asbestos vein, magnified 60 times, showing outward growth

Since learning of nephrite I have observed it quite plentifully in the Danville deposit, and in the Broughton series, where what was formerly an asbestos vein has been changed to nephrite. In the sections I examined of Thetford serpentine there was no evidence of the mineral, nor have I observed it there in place. In the monograph above referred to, it is held that all or practically all nephrite is derived from serpentine. The Broughton series being older than the Thetford series, and also older than the Danville series, in action of the formation at least, it might be expected to find it more plentiful in this older series.

*Mining Engineer, Thetford Mines. †Geologie des Nephrites im Sudlichen Ligurien.
‡Journal of the Canadian Mining Institute, Vol. xiii.
§Microphotograph faces pp. 415.

THE COAL RESOURCES OF THE WORLD*

This monograph, which is intended to form a companion work to the Iron Ore Resources of the World, published under the auspices of the Eleventh Congress, consists of three quarto volumes of 1,360 pages in all, illustrated by upwards of 175 maps and figures in the text, and accompanied by a 68 page atlas of geologically coloured maps.

The preparation and publication of a Monograph was entrusted by the Executive Committee to a Coal Resource Committee, consisting of G. G. S. Lindsey, convenor; F. D. Adams, R. W. Brock, D. B. Dowling, Charles Fergie, James McEvoy, J. B. Porter, and William McInnes.

The work is edited by Messrs. William McInnes, D. B. Dowling and W. W. Leach, of the Geological Survey.

In the main body of the monograph there are reports on 64 countries, varying in length from over 100 pages for some of the countries with important reserves of coal, to a few pages in the cases of those with less important reserves. The greater number of the reports are in English; ten are in French and six in German. In the Summary of the Reports, which appears in the first volume, all the reports are summarized by editors, in English.

Mr. Brock, the general secretary of the Congress, contributes the preface to the book, in which is explained the conditions under which the publication was undertaken. Attention is called to the very cordial support given by Geological Surveys and other similar departments of Governments throughout the world. Through official sources such as these, the greater part of the information has been gained, although certain very valuable contributions are from the pens of specialists unconnected officially with the fields about which they write, but who were considered to have had unequalled opportunities for the study of these fields. An instance of a contributor of this character is Dr. Noah Drake, who writes on the Coal Resources of China, and whose long university experience in China has given him opportunities which few have had for the study of China's mineral resources.

Owing to the lack of uniformity in the usage of the different countries of the world in regard to the commercial classification of coals into anthracite, bituminous coal and lignite, it was found necessary to adopt an arbitrary classification, which might be used by all and thus make the results more easily comparable. A committee to whom the subject was referred drew up a scheme of classification, dividing the coals into A, B, C, and D groups, with various subdivisions, based mainly on composition and heating value. In this scheme A roughly corresponds to anthracite, B and C to bituminous coal, and D to sub-bituminous coal, brown-coal and lignite. With few exceptions the reports submitted conform to the classification asked for, as they do also to the other requirements regarding the depths to which computations were to be carried and the division of the reserves into actual, probable and possible reserve, though in some cases the information at hand has not been full enough to warrant strict compliance with the specified form on all these points.

In the Introduction Mr. Dowling summarizes the results, dealing first with the distribution of coal in the various geological systems. The range of important fields in the Palæozoic extends from Lower Carboniferous, in the case of the fields of Central Russia, Scotland and the Arctic Island, through Upper Carboniferous, to which the very large deposits of Western Europe and Eastern America appertain, to Permo-Carboniferous, in which are embraced most of the very extensive fields of China, India and Australia. The Mesozoic, though not so widely spread, contains very important coal basins in Europe, Western America and Asia. The Tertiary contains deposits of importance in most parts of the world, including fields in Central and Western Europe, in Japan, in New Zealand and throughout the great plains region of North America.

The total reserves of the world, compiled from all the reports received, amount to 7,397,533 million tons, of which nearly 4,000,000 millions are bituminous coals, nearly 3,000,000 millions are brown-coals of various grade, and nearly 500,000 millions are anthracite coals. Of the anthracite coals, Asia, with the great Chinese fields, has by far the largest supply of any of the great continental divisions, furnishing 407,637 million tons; in bituminous coals, America, with 271,080 million tons, leads by a great margin, as she does also in the various grades of brown-coals. The world's production of coal for the year 1910 was about 1,145 million tons, so that, though much must be allowed for loss in mining and for areas that for various reasons cannot be economically mined, there still remains many hundreds of years before exhaustion of the supply may be looked for. Taking up the individual countries, however, it is found that in more than one case the end is in sight.

In other tables the reserves of the different continental areas are classified as actual, probable and possible reserve, and in others the reserve of the individual countries are classified in a more particular way, thus Canada is shown to have actual reserves, in million tons:

Nova Scotia, Class B, 2,138; Class C, 50. Alberta, Class A, 668; Class B, 3,209; Class D, 384,908. British Columbia, Class A, 7; Class B, 23,764; Class D, 60; or totals of, A, 675; B and C, 29,161; D, 384,968 million tons; and to have probable reserves in addition of: A, 1,483; B and C, 254,500; D, 563,482 million tons.

The production of Canada at the present time is only in the neighborhood of twelve million tons annually, and though the output may be expected to increase rapidly the figures given above show that actual exhaustion of the supply lies very far in the future.

Following the Introduction is a Summary of the Reports by the Editors. In this a resumé, in English, of each of the extended reports in the volumes is given, together with brief compiled statements regarding a number of countries, including among others Greenland, from which comprehensive reports were not received. Lists are given also of the countries from which statements were received that they have no known coal resources.

The main part of the volumes, comprising 1,266 pages, is taken up by the extended reports received from the different countries of the world which have coal resources in one form or another. A glance over the index is sufficient to show how rare it is in any quarter of the globe, to find a country without fossil fuel of some kind. Volume I. contains reports from the Islands of Oceania, including besides the Australasian Island, the Philippines, Netherlands, India and the Antarctic continent, which is dealt with

*The Coal Resources of the World, an enquiry made upon the initiative of the Executive Committee of the Twelfth International Geological Congress, Canada, 1913. Three quarto volumes and an atlas in colours, 13½ x 19½ inches, bound in heavy paper covers. Morang & Co., Limited, Toronto, Canada.

by the well-known authority, Dr. David; and Asia. Under Asia is a very full report by Dr. Noah Drake on China, supplemented by one covering portions of China in detail and illustrated by 16 figures of different coal fields, by Kinosuke Inouye, of the Imperial Japanese Survey; the reports on China are very valuable contributions to our knowledge of the coal reserves of the world, since each of them contains much information not hitherto published, in the case of the Japanese report containing information acquired by various officers of the Japanese Geological Survey corps; articles by Inouye on Corea, Manchuria and Japan, all illustrated by figures and containing much new information; a very well written paper by H. H. Hayden, director of the Indian Geological Survey, on British India and neighbouring countries, and reports on the Malay States, Siam, Persia, and French Indo-China.

Volume II. contains reports concerning Africa, North, South and Central America, the West Indies, and part of Europe. Under Africa there is a report on the States of the South Africa Union, furnished by the Department of Mines, which contains good descriptions of their coal-bearing Karroo system, which lies upon a glacial conglomerate; and from eight other divisions, including Southern Nigeria, Rhodesia and Belgian Congo. North America begins with a report by J. P. Howley on the coal areas of Newfoundland, which, although they have not yet been exploited, Dr. Howley thinks are worthy of development and constitute extensions of the Nova Scotia fields. The article on Canada, which follows, is furnished by D. B. Dowling, who deals with the coal fields in order from east to west, describing each in turn, and tabulating its actual and probable reserves. Mr. Dowling estimates a total reserve in Canada of all classes of coal of 1,234,269,210,000 metric tons. The fields in the United States are taken up by M. R. Campbell, of the United States Geological Survey. Mr. Campbell estimates that the original content of the United States coal fields, not including Alaska, was 3,225,394,300,000 metric tons, of which up to 1910, 11,220,532,560 tons had been exhausted. Alaska is given separate treatment by A. H. Brooks and G. C. Martin, who consider that the known fields contain nearly 20,000 million tons over half of which is lignite. Robert T. Hill, late of the U. S. Geological Survey, contributes the paper on Mexico.

For Central America, the West Indies and South America, there are reports from Honduras, Panama, Trinidad, Colombia, Argentine and Chile. The chilean fields, which seem to be all of Tertiary age, are described by Miguel R. Machado, and the Argentine fields by E. Hermite, the director of the Argentine Geological Survey.

The rest of Volume II. is taken up with a part of the European reports. Great Britain is treated of by Dr. Strahan, of the British Survey, and Ireland by Grenville A. J. Cole and E. St. John Lyburn. The greater part of the coal is bituminous, and the total possible reserve for the Kingdom is estimated to be 189,534,749,920 metric tons. The report for Portugal is from the Department of Agriculture, and that for Spain by Luis de Adaro.

France is written off by M. Defline, one of the most eminent of the French corps of Mining Engineers, who estimates for France a reserve of coal of 17,584,625,000 tons, a large part of which is of bituminous grade. The French report is very fully illustrated by a series of geologically coloured maps in the atlas, showing all the principal coal fields of France in detail.

Other papers of exceptional interest in the second volume are those of Switzerland and Turkey; the former for the reason that it presents the case of a country whose resources in coal are almost depleted, the total actual reserve of Switzerland amounting to only 4,000 tons of anthracite and 500 tons of bituminous coal. Turkey, on the other hand, which is dealt with by Leon Dominian, M.E., has very considerable amounts of brown-coal in her Asiatic provinces and deposits of camel-like bituminous coal in the province of Adrianople. Reports from Italy, Greece and Bulgaria complete Volume II.

The 368 pages of Volume III. contain the reports from the remaining fourteen countries of Europe. All these reports are of a most interesting character, and all are the work of most eminent specialists in the various countries to which they refer; Denmark's contribution is by Dr. N. Hartz, that of the Netherlands by W. A. J. M. van Waterschoot van der Gracht, and that of Belgium by Armand Renier, M.E.

Germany contributes a most exhaustive description of the different coal fields of the Empire, written by twelve distinguished geologists, each describing a district with which he is particularly familiar. Very full tables of reserve accompany the German report; summarized, they give for Germany a total actual reserve of 94,865,000,000 tons of Stein coal and 9,314,300,000 tons of brown-coal, with in addition a large probable reserve.

The interesting report on Hungary is by Dr. Ludwig von Loczy and Dr. Charles de Papp, and that for Austria by Dr. Petrascheck, the eminent director of the Austrian Geological Survey; each of these reports is illustrated by maps, that of Austria being accompanied by a very valuable set of coloured maps in the atlas, which have been especially prepared for the work by Dr. Petrascheck. Bosnia and Herzegovina, Servia and Roumania are represented by papers contributed, in each case, by men who are in a position to speak with authority for each country.

Sweden, which has considerable resources in bituminous coal, is described by Dr. Edvard Erdmann. Norway's possible coal reserves, which are confined to some of the northern islands, are dealt with by Dr. Hans Reusch, and the interesting fields of Spitzbergen are the subject of an additional special paper by Bertil Hogbom, who estimates for that island a probable reserve of bituminous coal of 8,750,000,000 tons.

The volume closes with a paper, in English, on the coal fields of Russia, including Russia in Asia. Dr. Th. Eschernyschew, the director of the Russian Geological Survey, who in an introduction summarizes the Russian report, estimates for the Empire a probable reserve of coal of all grades of 239,997,000,000 tons, of which 18,001,000,000 tons are of anthracite coals.

For the purposes of the report, the Russian dominions are divided into thirteen districts, which are described separately, each by an author who has had especial opportunities of studying the particular field he describes. The collation of the information for this report, and the same is true of many reports contained in the volumes, entailed a large amount of field work, undertaken for the special purpose of the investigation, so that the 120 pages devoted to Russia are all of intense interest.

The reports contained in the volumes are illustrated by upwards of 175 maps and figures and by many tabulated statements.

The Atlas, which presents a very bright and attractive appearance, contains 68 pages of maps, most of

them in colours. It opens with a map of the world in hemispheres, geologically coloured to show the distribution of Tertiary, Mesozoic and Palæozoic coals throughout the world. Especially noteworthy among the plates are, perhaps, the coloured maps of China, Corea, Manchuria and Japan, those of Austria and of France; the eight maps of the coal fields of Canada and those of Servia, Roumania and Sweden. The Atlas closes with a geologically coloured map of the island of Spitzbergen.

ANNUAL REPORT OF THE MINISTER OF MINES FOR BRITISH COLUMBIA FOR 1912

The Annual Report of the Minister of Mines for British Columbia for the year 1912 was issued last month. It fills about 35 more pages than that for 1911, and, generally, is a comprehensive account of the progress of the mining industry of the province. It shows the mineral production for the year under review to have been of a total value of $32,440,800, as compared with $23,499,072 for 1911 and $26,377,066 for 1910. The comparison with the last mentioned year is the fairer one, for the 1911 production was adversely affected by labour difficulties at Crow's Nest Pass coal mines and consequent lessening of output of minerals, while during 1910 conditions were normal.

Quantities and Value of Production.

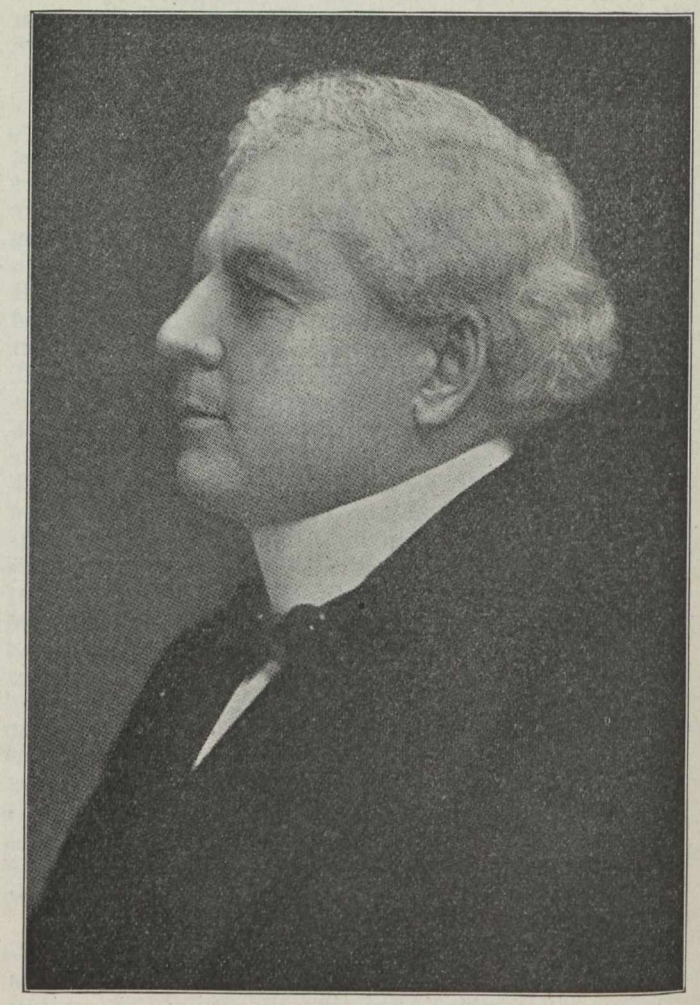
The quantities and value of the several products are shown in the following table:

Gold, placer	$ 555,500
Gold, lode, 257,496 oz.	5,322,442
Total gold	$ 5,877,942
Silver, 3,132,108 oz.	1,810,045
Lead, 44,871,454 lb.	1,805,627
Copper, 51,456,537 lb.	8,408,513
Zinc, 5,358,280 lb.	316,139
Total metallic	$18,218,266
Coal, 2,628,804 tons of 2,240 lb.	9,200,814
Coke, 264,333 tons of 2,240 lb.	1,585,998
Miscellaneous (building materials, etc.)	3,435,722
Total value of mineral production	$32,440,800

Summary—

	Value.	
Metalliferous minerals	$18,218,266	
Non-metalliferous minerals—		
Coal and coke	$10,786,812	
Building materials, etc.	3,435,722	14,222,534
Total		$32,440,800

In January the Department published a "Preliminary Review and Estimate of Mineral Production" for 1912, in which the estimate of the Provincial Mineralogist, Mr. Wm. Fleet Robertson, was that the total value of the mineral products was $32,606,000. The revised figures show that this estimate was $165,200 in excess of the actual value of the production—a quite small amount in comparison with the total, and an evidence of the care taken in endeavoring to ascertain the position before returns had been received from the producing mines. There was variation in totals of value of separate mineral products, the chief of which were an underestimate of that of gold by about $417,000, and an overestimate of that of building materials, etc., by about $814,000. However, the total value, as eventually ascertained, was so near to that given in the preliminary estimate, that the usefulness of having the latter prepared and made available for the information of the public, as had also been done in two immediately preceding years, was again demonstrated.



SIR RICHARD McBRIDE, K.C.M.G.

Premier and Minister of Mines of British Columbia

The Statistical Tables.

The various statistical tables included in the report under review give much information to those interested in the mineral production and progress of the mining industry of British Columbia. Table 1 shows the gross value of each of the more important of the minerals produced, and that the aggregate value for all years is $430,137,522, in the following proportions:

	Value.
Placer gold	$ 72,194,603
Lode gold	70,859,022
Total gold	$143,053,625
Silver	33,863,940
Lead	27,520,753
Copper	73,723,562
Other metals (zinc, etc.)	1,528,403
Total metallic	$279,690,283
Coal and coke	$132,871,155
Building stone, bricks, etc.	17,576,084
Total non-metallic	$150,447,239
Aggregate value of production	$430,137,522

Table II. shows the value of each year's total production over a period of 20 years—1893-1912. It is seen that the total for 1912 was the highest—by $6,063,734, or 23 per cent. higher than that of the previous highest—of all years in the history of mining in the province.

Table III. exhibits the quantities and value of production for three years—1910, 1911 and 1912—the figures from the last year, shown in the first above-printed table, are taken from this. There was a general increase in production, save only in building materials, as compared with 1911, while comparatively small decreases in lode gold and coal was abundantly compensated for in other minerals, to a net total, as already stated, of more than $6,000,000.

Production by Districts.

Table IV. exhibits the output of minerals by districts and divisions for three years. Omitting divisions and taking that of districts only for the years 1910 and 1912 for comparison (1911 production not having been normal), the figures are as under:

	Value of Production.	
Districts.	1910.	1912.
Cariboo	$ 239,000	$ 268,000
Cassiar	283,807	467,579
East Kootenay	6,121,832	5,723,004
West Kootenay	5,088,186	6,165,255
Boundary	6,998,519	8,716,406
Lillooet	9,832	5,000
Coast	7,635,890	11,095,556
Totals	$26,377,066	$32,440,800

It will be seen that the only decrease worth noting was that of East Kootenay, of nearly $400,000. The largest increase was in the Coast district, which, however, made a gain of only $516,500 as compared with 1911, in which year labour difficulties did not affect this district as they did the Kootenays and Boundary. The increase made by West Kootenay district came from Ainsworth and Slocan in largest amount ($1,160,000), and Trail Creek in smallest ($249,000), against which there was a loss of $294,000 in Nelson division and $38,000 in other parts, leaving a net gain for the district of $1,077,000. Of Boundary district's gain of nearly $1,718,000, about $1,459,000 was in the value of copper produced. More than half of the gain made in Coast district was in copper and the remainder in structural materials.

Various Mineral Products.

Table V. gives some details of the miscellaneous products included in the year's mineral production, mostly of the various building and other structural materials, such as cement, lime, building stone, rock, sand and gravel, clay products, etc. While these figures are not complete, they are believed to fairly represent the approximate value of those products so far as it has been practicable to ascertain it.

Tables VI., VII. and VIII. are the customary record of yearly totals of placer gold, lode metals, and coal and coke, respectively. An examination of these will show that the total for placer gold was in 1912 the highest for four years; that for lode gold second only to 1910 in all years; that for silver the highest since 1906; that for lead higher than for any preceding year since 1907; while the total value of copper constitutes the highest on record in the province. In coal and coke the figures were the highest yet recorded, except for 1910, when the total for these minerals was nearly $322,000 higher.

Table IX., which is the most elaborate table in the Report, shows details of metalliferous production for four years—1909-1912—and the districts and divisions in which such production was made. Tonnage of ore mined and its metallic contents and market value are also included in this table.

Table X. presents in graphic form the facts shown in figures in other tables, and demonstrates to the eye the growth of mineral production and the fluctuations to which it has been subjected.

Comparison With Other Provinces.

Table XI. compares graphically the output of certain mineral products of British Columbia with the combined output of similar products in all the other provinces of the Dominion. An analysis of the figures gives the result that British Columbia produces more lode gold, lead and copper than all the rest of the Dominion combined, and is to be credited with nearly 30 per cent. of the value of the coal and coke production of Canada.

Men Employed in Mining.

A summary of the figures showing the number of men employed in several classes of mines follows:

There were 86 mines that shipped ore in 1912 (51 of them more than 100 tons each), and there were employed in these a total of 3,402 men—1,229 above and 2,173 below ground. The non-shipping mines numbered 96, of which 51 were idle and 45 working; in the latter 435 men were employed—130 above and 300 below ground. The total number employed at metalliferous mines was, therefore, 3,837.

The coal mines gave employment to a total of 7,130, this number including 221 boys among the 6,391 whites, and the following other classes of labour: Japanese 117 and Chinese 622. The proportion employed underground was 5,275, of which 4,952 were whites and only 323 were of other races.

From the foregoing it will be seen that there were employed at metalliferous mines 3,837, and at coal mines 7,130; total, 10,967. It may be taken for granted that men engaged in prospecting were not included, and probably the figures omit as well men employed at smelting works, but of this there is not any mention.

(To be continued.)

CROWN RESERVE.

Owing to falling off in production from the Carson vein the Crown Reserve Mining Company's profits have been recently much diminished, and it is announced that the 3 per cent. monthly bonus will not be paid regularly in the future. The announcement followed a sensational drop in the market price of the stock.

CLASSIFICATION OF COALS

By J. M. Gordon, Montreal.

Many attempts have been made to classify coals, but no classification to-day is strictly accurate. A classification very much in use by the commercial man is the classification of coal by the length of flame, but as this can only be comparative we have in different districts the same phrase meaning an entirely different degree of the physical properties exhibited by the coal when under a state of combustion. For example the long flame coals of the North of England are very different from the long flame coals of Scotland. Again flaming coals mined at Aachen (Aix le Chapelle) would, on a Westphalian basis, be classified as dry, and under the same classification the coke coals found in the Saar District would be named flaming coals. The flame depends on the quantity of hydrogen and carbon volatalized. No classification can be formed from a volatile matter basis. This will be seen when the two following Welsh coals are compared. They each have approximately 35 per cent. volatile matter:

	Carbon	Hydrogen	Oxygen and Nitrogen
*Vivian & Sons, Morfa.	88.27	5.66	6.07
Machine rock vein	75.98	5.15	18.87

These coals have the same volatile matter, but are far apart in composition and in calorific value.

These terms apply whether the low agglomerative power of the oxygen or volatile matter content is high or low.

This classification makes no discrimination between a high carbon non-coking coal and a low carbon high oxygen non-coking coal; they are both thrown into the same heap and called sand coals. If there is to be any classification at all, surely it should discriminate between an anthracite coal and a very poor steam coal or lignite. The classification runs as follows:

Combined hydrogen under 2% carbon:

Disposable hydrogen under 4% carbon is a dry or sinter coal, or anthracite.

Disposable hydrogen over 4% carbon, coking coals.

Combined hydrogen over 2% carbon:

Disposable hydrogen over 4% of carbon, difficulty coking gas coal.

Disposable hydrogen under 4% of carbon, non-coking gas and sand coals.

On examination of the above it will be noticed that the properties of coking are attributed in both cases to the coals containing disposable hydrogen over 4% of carbon. This classification cannot be considered accurate since cannel coals will not conform with the rule; neither will some of the Scottish steam coals. Since this classification was drawn up it has been infallably proved that oxygen as a primary base to work on will lead to no true scientific classification. Hilt on grasping this drew up a classification based on volatile matter expressed in percentage of the amount of coke. It reads as follows:

Lean Anthracite coals ..... 5 —10 per 100 of coke
Sinter coals poor in gas....10 —15.5 per 100 of coke
Coking coals .....15.5—33.3 per 100 of coke
Coking gas coals .....33.3—40 per 100 of coke
Gaseous Sinter coals .....40 —44.4 per 100 of coke
Gaseous sand coals .....44.4—48.0 per 100 of coke

Along with this classification can be taken Gruners' which runs as follows:

SCHONDORFF'S CLASSIFICATION OF COALS

Surface.	Colour.	Coherence.	Schondorff Term.	Sylers Term.
Rough like fine sand.	Black.	Entirely pulverulent	Sand coal.	Discretive coal.
Rough like fine sand.	Black.	Just coherent flat.	Sintered sand coal.	Semi-accretive.
Rough like fine sand.	Black.	Just coherent all over flat, radial cracks in coke.	Sinter coal.	Accretive.
Rough like fine sand.	Dull grey	Solid with bud-like projections from surface.	Coking Sinter coal.	Semi-Concretive.
Smooth.	Metallic grey	Solid more or less swollen.	Coking coal.	Concretive.

In 1865, in Uber die Steinkolen Deutchlands Fleck published a classification, based on combined hydrogen, or in other words, he employed an oxygen basis. As Syler has pointed out this classification is most inaccurate, and to demonstrate this he shows that between the limits of 90 and 93 per cent. of carbon the hydrogen is given at 4 to 4.5, and volatile combustible 10 to 18 per cent., while the statement is made that this coal is lean or anthracite with a pulverulent coke. Actually between these limits are coals carrying from 3.4 to 5.2 per cent. of hydrogen, and from 6 to 24 per cent. of volatile matter. These coals vary from hard coals, which are non-coking to very pronounced coking coals.

Schondorff, who so strongly condemned Greners classification, brought out a classification based on coking properties:

*Syler.

Gruner's Classification of Coals (Exclusive of Lignites) as Regards Their Industrial Value.

Names of the Five Types, or Classes.	Real calorific power.		Evaporative power. K.		Percentage composition of the organic constituents. Carbon.		Hydrogen.		Oxygen.		Number of parts by weight of oxygen, taking the weight of H as 1.*		Weight of volatile matters yielded by 100 parts of coal.		Weight of coke yielded by 100 parts or pure coal.	
1st Class—Dry coals, burning with a long flame ...	8,000 to	8,500	6.70 to	7.50	75 to	80	4.5 to	5.5	15 to	19.5	3 to	4	55 to	60	45 to	40
2nd Class—Fat coals, burning with a long flame, or gas coals	8,500	8,800	7.60	8.30	80	85	5	5.8	10	14.2	2	3	60	68	40	32
3rd Class—Fat coals, properly so-called, or furnace coals.	8,800	9,300	8.40	9.20	84	89	5	5.5	5.5	11	1	2	68	74	32	26
4th Class—Fat coals, burning with a short flame, or coking coals	9,300	9,600	9.20	10	88	91	4.5	5.5	5.5	6.5	1		74	82	26	18
5th Class—Lean (maigre) coals, or anthracites	9,200	9,500	9	9.50	90	93	4	4.5	3	5.5	1		82	90	18	10

*This amount includes the nitrogen, which Gruner states rarely exceeds 1 per cent. of the organic constituents, but this is rather under the average amount.

The nature and appearance of the coke in the 1st class was pulverulent or at the most fritted; in the 2nd class caked but porous, and very brittle; in the 3rd class caked, moderately compact, and more or less swollen; in the 4th class caked, very compact, but little friable; and in the 5th class somewhat slightly fritted but more frequently pulverulent.

Muck has already disposed of these classifications by shewing that the coals of the Ruhr district do not agree with them, since they contain 10 to 15 per cent. of volatile matter and so would be classified as non-coking coals while they are decidedly coking coals; while again in the Ruhr district coals are mined containing 30 to 32 per cent. volatile matter, which are distinctly long flame bituminous coals, but which would be classified by Gruner as Smith coals. I cannot see where there could be any correlation between coking properties and volatile matter. Generally speaking, the coals found in the Westphalian district in Germany are much poorer in volatile matter per degree of hardness of coke than in most other districts in Europe, while the contrary is to be said about the coals of the Saar district. Below 75 per cent. of carbon Gruner considers the coals no longer bituminous, but lignite. This is quite erroneous, for many of the Scottish carboniferous coals go below this percentage in carbon. Cannel coal does not agree with this classification.

Andrae Classification of Coals.

	Carbon		Hydrogen		Oxygen and Nitrogen		Specific Gravity	
Anthracite.	90 to	95	4.5 to	3	5.5 to	2	1.4 to	1.6
Semi-bituminous	89	92	5	4	6	4	1.35	1.40
Bituminous, clear burning	88	91	5.5	4.5	6.5	4.5	1.31	1.35
Bituminous, flaming	84	89	5	5.5	11	5.5	1.29	1.31
Bituminous, fuliginous	80	85	5	8.5	14.2	10	1.25	1.29
Gaseous.	75	80	5.5	4.5	19.5	15.5	1.22	1.25

Like Gruner's classification this one also takes in limits of hydrogen concomitant with carbon. The hydrogen range, like Gruner's, is wrong, so also is the range of specific gravities. For example he allows 1.22 to 1.25 for gaseous coals; that is coals from 75 to 80 per cent. in carbon. He has not taken into consideration the weight of ash, nor will his specific gravities anywhere compare with the Scotch coals ranging about 76 per cent. in carbon lie around 1.29 to 1.31. Here also he makes his minimum of carbon 75, and thus cuts out a large percentage of the coals of Scotland.

The following classification was brought forward by C. Syler:

1. Anthracite Carbon Plane:—
   (a) Ortho-hydrous; H. under 4; Vol. under 9 (5-9) ortho anthracite.
   (b) Per-hydrous; H. over 4; Vol. over 9 (9-15) semi-anthracite.
2. Carbonaceous Plane: C. 93.3-91.2:—
   (a) Sub-hydrous; H. under 4.2 (1) Vol. 7. 7-12; sub-carbonaceous.
   (2) Vol. under 7.7 pseuda anthracite.
   (b) Ortho-hydrous; H. 4. 20-4.45 Vol. 10-14; carbonaceous.
   (c) Per-hydrous; H. over 4.5 Vol. 14.21 semi-bituminous.
3. Hydro-carbonaceous or Bituminous Plane C. 91.2-84.
   (1) Meta-bituminous: 91.2-89.
   (a) Sub-hydrous H 4.5-4.9 Vol. 16-23: Sub meta bituminous.
   H 3.7-4.5 Vol. 10-16 pseudo carbonaceous.
   H under 3.7 Vol. under 10 pseudo anthracite.

(b) Ortho hydrous H. 4.9-5.7 Vol. 23-30.
(c) Per hydrous H. over 5.7 Vol. 30.44.
(2) Ortho Bituminous C. 89-87.
(a) Sub-hydrous H. 4.5-5 Vol. 16-23: Sub-ortho bituminous.
H under 4.5 Vol. under 16 pseudo carbonaceous.
(b) Ortho-hydrous H. 5-5.7 Vol. 23-30.
(c) Perhydrous H. 5.7 and over Vol. over 30.
(3) Para Bituminous C. 87-84.
(a) Sub-hydrous H, 5 and under Vol. 16-29 sub para bituminous.
(b) Ortho hydrous H. 5-5.8 Vol. 30-40 usually.
(c) Perhydrous H. over 5.8 Vol. over 40 seldom under.

4. Carbo-hydratous or Lignitious plane C. 84-75.
Meta Lignitious C. 84-80 Ortho Lignitious C. 80-75.
(a) Ortho-hydrous H. 4.7-5.8 Vol. 31-57.
(b) Perhydrous H. over 5.8 Vol. 31-57.

Anthracite Carbon Plane—
Arthohydrous coals are quite descretive(non-coking) the residue being powdery. Volatile matter is not proportional to hydrogen.
Perhydrous coals: The higher percentage of hydrogen gives this coal no longer the properties of anthracite, but those of a dry non-coking carbonaceous coal.

Carbonaceous Plane—
Orthohydrous coals: Coke partly firm, coherent, or hard and partly in powder. This is what Schondorff calls a sintered sand coal (semi accretive Seyler.) Includes the famous Welsh Aberdare smokeless and some Westphalian Esskohlen.
Sub-hydrous: All these coals are sand or discretive coals, include certain dry steam coals and bastard anthracites.
Perhydrous: The coke is generally well formed near the lower limits of hydrogen the coke is sometimes black, rougher flat or the coal is of the accretive class, like the normal hydrous coals of the carbonaceous plane.

Bituminous or Hydrocarbonaceous Coals: Meta bituminous plane—
Ortho hydrous: This class belongs to Gruners short flame bituminous coal or coke coal proper.
Sub-hydrous: As the hydrogen goes down the coals become almost discretive.

Ortho Bituminous or Ortho Hydrocarbonaceous plane—
These correspond to the true bituminous coals of Gruner. Most of the coking coals of Westphalia belong to this class.

Para Bituminous—
Splint and free burning steam coals; Silkstone of Yorkshire.

Carbo-hydratous—
All coals down to the true lignites.

Exceptions to the correlation of hydrogen and volatile matter are those by Muck of the Pseudo cannies that associate coals in Westphalia.

C. Syler in his classification makes his lowest plane, which he calls carbohydratous, contain from 84 to 75 per cent. of carbon. Everything below this he calls a lignite. It may be pointed out that there are few places in the Scottish carboniferous coalfields in unfaulted zones, or in zones that have not suffered from regional metamorphism, where the coals do exceed 75 per cent. of carbon. Syler has deduced nearly all his facts from South Wales—a coalfield which has suffered a good deal both from dynamic and regional metamorphism. Nor will Syler's classification apply to the Westphalian pseudo-cannels and their associates, some of the Vancouver Island coals, or the Scottish or English cannel coals.

Recently in Canada a classification, called the "Split-Volatile ratio" has been in use. The classes adopted for this method are:

Anthracite	15
Semi-anthracite	13 —15
Anthracite coal	10 —13
High carbon bituminous	6 —10
Bituminous	3.50— 6
Low carbon bituminous	3 — 3.50
Lignitic coal	2.50— 3
Lignite	1.20— 2.50

These figures are derived from a formula concocted as far as I can see on no legitimate hypothesis. As a matter of fact it has a few different forms. As submitted by D. B. Dowling it reads:

$$\frac{\text{Fixed Carbon} \times \frac{1}{2}\ \text{Volatile Combustible.}}{\text{Moisture} \times \frac{1}{2}\ \text{Volatile Combustible.}}$$

and reads as follows when quoted by Professor J. B. Porter, of McGill in the Investigation of the Coals of Canada:

$$\frac{\text{Fixed Carbon} \times \frac{1}{2}\ \text{Volatile Matter.}}{\text{Moisture} \times \frac{1}{2}\ \text{Volatile Matter.}}$$

Surely there is a great difference between volatile combustible and volatile matter, also in the present monograph the word volatile alone is used, which has no meaning whatever. As the first is the original, and I presume the correct one, we shall proceed to discuss it. As already mentioned there is no relation between fixed carbon and volatile matter. It is on this point, mainly, that this formula falls down. Secondly, it works on an inadequate, and to my mind practically useless analysis, known as proximate analysis. I have seen it time and time again used without first eliminating the ash and proportioning the other factors, and as the formulae has two factors which have to be added before the ratio is derived, it is a mathematical inexactitude to use the units of the analysis without first eliminating the ash and foreign matter. Few remarks are to be passed on this classification, for it will not apply with the coals in Europe, nor to many of the coals on this continent. For example, take the steam coals in Eastern Fifeshire, in Scotland. Here we are told that there is nothing but lignites if we use the split volatile ratio. A few of the seams are as follows:

Seams.	Split Volatile ratio.
Barn craig tops	2.30
Barn craig bottoms	2.02
Coxtool	2.31
Chemiss splint	2.07
Chemiss sewel	2.03
Pilkembare	1.66
Brankstone	2.08
Bowhouse	1.95

Charles Clapp, of the Geological Survey, in the Transactions of the Canadian Mining Institute, gave the analysis of a few of the Nanaimo coals. One of the analysis shows the split volatile ratio as 2.92, but he does not adhere to the classification resulting from the formulae, for he calls this coal a "bituminous coal of fair grade," and states that it yields a coke, the character of which is firm and coherent. This coal according to the split volatile ratio is a lignitic coal. Again, in the above

quoted publication, a coal mined 200 miles from San Francisco is referred to in a paper by Foster Bain, on the "Fuel Problems of the Pacific." In the discussion of this paper R. V. Norris, of Wilkesbarre, and also by E. W. Parker, of the U. S. Geological Survey, state that this coal contains volatile combustible matter of 50 per cent. and fixed carbon of from 42 to 43 per cent., with low sulphur and ash, and they classify it as "a true bituminous non-coking coal." However, by the split volatile ratio method this coal would be classified as a lignite. Again Dowling's classification does not hold for cannel coal. From experience in different coalfields in various countries in the world, I have come to the conclusion that these abortive attempts to classify and subdivide coal by its chemical analysis is absurd and a useless waste of time. The old method of broadly classifying by physical properties is still the best. An examination of the following list it will be seen that no classification can be formed by chemical analysis:

Cannel coal conforms with none of the chemical classifications, nevertheless it is a true coal. I have seen many cases of splint coal having the same analysis as a steam coal, but yet these coals can never be classified by an engineer under the same heading. The splint coals are coal. It has been proved that the flora which went to constitute the Scottish fields was generally of a different nature to that of the English fields.

The Scottish coals I mention which are classified by the split volatile ratio as lignite, are judging from their chemical analysis, much poorer than the Belly River lignites of Canada; yet this type of coal is greatly exported to Northern Europe for the purpose of steam raising. In burning the Scottish steam coals you can always see slight belling of dark heavy oils when the coals are on the combustion. This is never seen when burning lignite.

But after all, why all this unnecessary classification? Coal is sold to steam raisers. All they require to know is how many pounds of water can be raised to steam from 212° F., by one pound of coal, and if the coal clinkers. The householder wants a coal that is clean to handle and at the same time has an ash heavy enough to remain in the grate or the ash pan, and not blow about the house. Until a proper petrographical classification is established, I prefer, therefore, to adhere to the old and simple method, whereby costs are known as anthracite, steam, household, cannel, lignite (brown-pitch).

TABLE SHOWING CHEMICAL ANALYSIS OF COALS

		C.	H.	O.	N.	S.
1.	Steam navigation	92.83	3.51	2.61	.21	.87
2.	Gas (Cannel)	89.76	6.66	3.58	*	
3.	Gas (Cannel)	88.50	6.11	5.39	*	
4.	Steam	88.38	5.64	2.65	1.83	1.50
5.	Gas, coke, steam and household	86.95	4.97	5.23	1.06	.89
6.	Gas, navigation and coke	86.80	4.63	6.81	1.02	.89
7.	Gas (Cannel)	85.81	5.85	8.34	*	
8.	Gas (Cannel)	85.48	5.90	8.62	*	
9.	Steam	85.23	5.68	5.82	1.57	1.70
10.	Gas (Cannel)	85.20	6.17	8.63	*	
11.	Steam	84.73	5.58	6.63	1.67	1.40
12.	Household	84.13	5.60	5.70	1.30	3.27
13.	Gas (Cannel) Scotch	84.03	9.15	6.82	*	
14.	Steam navigation	84.01	4.96	8.78	1.30	.95
15.	Steam	83.95	5.24	8.17	1.51	1.13
16.	Household and gas	83.89	5.95	7.56	1.79	.81
17.	Household	83.58	6.79	8.17	1.42	.06
18.	Steam navigation coking	83.16	5.12	9.33	1.28	1.11
19.	Household	82.87	5.73	8.67	1.18	1.55
20.	Household	81.71	6.30	7.20	2.27	2.52
21.	Navigation	80.42	5.95	11.32	.52	1.79
22.	Steam	80.22	5.55	10.07	2.51	1.65
23.	Gas Cannel (Scotch)	79.61	11.24	9.15	*	
24.	Gas Cannel (Scotch)	78.44	8.90	12.66	*	

*Including nitrogen and sulphur.

mostly microsporaceous while the steam coals, speaking in a wide sense, are megasporaceous; while again the spores of cannel coal are found to have been once highly resinous. This is the keynote for proper classification. The classification of coal cannot be performed in a chemical laboratory, it should be undertaken by the petrographer. Why are certain coals much more open in texture than others which lie within a depth of sixty feet of them, but yet contain practically the same chemical properties, the one being a good steam coal, the other being of practically no use but for household purposes? The petrographer can tell you what a chemist cannot. In Scotland we have the high oxygen long flame coal, while in Yorkshire, Durham and Northumberland we have coals contemporaneously deposited, with a base containing much lower oxygen and is different type of

ASBESTOS ROOF STOPS CONFLAGRATION.

The ability of asbestos roofing to resist fire and check the progress of a blaze was again demonstrated by a fire which broke out in one of the sheds of the Export Lumber Company, Charlestown, Mass.

Due to the high wind blowing at the time, sparks and burning embers fell on the highly inflammable roofs of buildings for a radius of a quarter of a mile around. The result was a score of small fires that gradually grew until several acres were ablaze at one time.

The fire burned its way from the sheds of the Export Lumber Company to a large storehouse which is covered with asbestos roofing manufactured by the H. W. Johns-Manville Co. Falling embers and sparks had no effect on this roofing.

PERSONAL AND GENERAL

Mr. Henry E. Allen, for four years silver mining in Mexico, left that country recently and is now at Victoria, B.C.

Mr. J. P. Keene, for several years manager of the Cariboo gold mine and stamp mill, in Camp McKinney, B.C., is now directing development work at the Wonderful silver-lead mine, near Sandon, Slocan district.

Mr. J. P. McFadden, formerly of Michigan, is now superintendent of the Surprise silver-lead mine, near Cody, Slocan, British Columbia.

Mr. J. W. D. Moodie, vice-president and general manager for the Britannia Mining and Smelting Co., Ltd., has returned to Britannia Beach, Howe Sound, B.C., from a trip to Montana and Utah.

Mr. John E. Rinta, after ten years' active connection, as foreman and superintendent successively, with the Rambler-Cariboo silver-lead mine, Slocan, B.C., has been appointed manager in successor to Mr. W. E. Zwicky, resigned.

Mr. Charles Graham, of Middlesboro, Nicola Valley, B.C., superintendent for the Nicola Valley Coal and Coke Co., has been appointed superintendent for the Corbin Coal and Coke Co., which is operating a coal mine at Corbin, Crow's Nest district, South-east Kootenay, also in British Columbia. He expected to take up his new duties about the middle of August. Mr. Robert Fairfoull, who has been overman at the No. 2 mine, Middlesboro colliery, is his successor as superintendent for the Nicola Valley Company.

Mr. W. M. Brewer, of Victoria, B.C., has gone to the Bridge River section of Lillooet district to investigate mining conditions there for the British Columbia Department of Mines. Mr. Donald G. Forbes is similarly engaged in the Coast district of that province.

Mr. H. H. Johnson, of London, is on Vancouver Island, B.C., where he is preparing to operate a copper property, to be known as the Ptarmigan mine.

Mr. Ralph S. G. Stokes was in Vancouver, B.C., recently.

Mr. W. P. Alderson, formerly in the metallurgical department at the Hollinger mine, Porcupine, is now general manager of the Motherlode Sheep Creek Mining Co., at Sheep Creek, Nelson mining division, B.C.

Mr. Ben Hughes, of Cobalt, was in Toronto last week.

Mr. Roy E. Margenau, instructor in metallurgy at the Michigan College of Mines, has accepted a position with the Buffalo Mines Co. at Cobalt.

Mr. A. A. Cole, of Cobalt, is in Toronto attending meeting of the International Geological Congress.

Mr. Ralph Scott, of the Dome Mines Company's staff, has been appointed mine engineer.

Mr. J. Swent has joined the engineering staff at the Murray mine in the Sudbury district.

Mr. H. Portis, who was for some time on the staff of the Jacobs Asbestos Mining Company at Thetford, is now in Chicago.

F. J. Jordan, manager of Moose Mountain Iron mine, visited Cobalt and Porcupine with the A3 excursion of the Geological Congress.

Dr. J. M. Bell is in Toronto.

Norman L. Bowen, formerly connected with the Bureau of Mines, Ontario, and now on the staff of the Geophysical Laboratory at Washington, D.C., is in Toronto for the Congress meeting.

Dr. H. S. Sjogren, the prominent Swedish authority on iron ores, visited the Moose Mountain iron mines with the A3 excursion.

Among those who visited the Quebec Asbestos mines on the A5 excursion this month were: Hans Arlt, Germany; Karl Boden, Germany; O. B. Boggild, Denmark; Leon H. Borgstrom, Finland; T. C. Denis, Canada; J. A. Dresser, Canada; L. L. Fermor, India; Mrs. L. L. Fermor, India; H. Frechette, Canada; S. McL. Gardner, Scotland; George Guric, Germany; R. Harvie, England; R. E. Hore, Canadian Mining Journal; Jas. Howley, Newfoundland; Mark Hurll, Scotland; J. McG. Hurll, Scotland; J. P. Krusch, Germany; Andrew Lawson, U.S.A.; A. Mailhot, Canada; Dr. C. Palache, U.S.A.; Dr. Fred Von Grote, Germany; O. A. Welter, Germany; E. Wigglesworth, U.S.A.; J. E. Wolff, U.S.A.; Berkey, U.S.A.; Bain, U.S.A.; P. Fabrega, Spain; C. Kido, Japan; R. B. Murray, England; Dr. Edgar Wherry, U.S.A.; H. B. Wallis, England; P. Zoude, Belgium; A. G. B. Wilbraham, England; B. Weigand, Germany. Mr. T. C. Denis, Superintendent of Mines for Quebec, and Mr. J. A. Dresser, geologist for the Lake Superior Corporation, were the leaders, and they made the excursion a very interesting one.

H. B. Wallis and A. G. B. Wilbraham, mining engineers of London, England, were members of the Sudbury-Cobalt-Porcupine excursion, and will go west to the Pacific Coast and up to the Yukon after the Toronto meeting.

Among the members of the A3 excursion who visited the Kirkland Lake gold fields last month were Bedford McNeill, president, and A. G. Charleton, past president, of the Institution of Mining and Metallurgy.

OBITUARY

Mr. Thomas G. Procter, managing director of the Lucky Jim Zinc Mines, Ltd., operating the Lucky Jim mine, near Bear Lake, Slocan district of British Columbia, was killed near his home at Oak Bay, in the vicinity of the City of Victoria, late on the night of July 9. He had taken the last car from the city and immediately after stepping off the car was struck by a passing automobile. When lifted to the sidewalk he was still alive, but expired before the arrival of the doctor a short time afterward. Mr. Procter was born in Lancashire, England, in 1862, and at the age of 14 years joined the British navy. Several years later he left the navy service and came to America where, in the middle Western States, he for some time was engaged in cattle ranching. In 1891 he went to the Kootenay district of British Columbia, with which he has since been actively connected steadily increasing his interests in the country and taking a prominent part in the development of its varied interests. During a long period of residence in Nelson he did much to promote the advancement of that town, while his efforts were also directed toward the profitable utilization of the chief resources of Kootenay district—mining, lumbering, and the clearing and cultivation of land. He was one of a number who did much work and spent much money in developing mineral claims in Ainsworth and Slocan mining divisions of West Kootenay, and up to the time of his death he continued his activities in that direction. About two years ago he removed his office to Victoria and made his home in the neighbouring suburb of Oak Bay, paying frequent visits to Kootenay from the coast. Among numerous other affiliations, he was a member of the Canadian Mining Institute, and was one of the western members who attended its semi-annual meeting held in Victoria last September.

SPECIAL CORRESPONDENCE

PORCUPINE, SWASTIKA AND KIRKLAND LAKE

Plant for Porcupine Crown Mine.—All the machinery for the cyanide plant at the Porcupine Crown is on the ground, and the management confidently expects to have the enlarged plant running in six weeks' or two months' time. This will give it a capacity of about 100 tons per day.

Ten more stamps have been added. The concrete work for twenty stamps was finished at the time the first section was built, so that the other ten stamps had only to be erected, the building enlarged, and the cyanide plant added.

The present ten stamp mill is treating about 65 tons per day. During July it was making an extraction of 82 to 87 per cent., and with cyanidation it is confidently expected to bring that up to 95 per cent. at least. The ore is more free milling than at the Hollinger. Ore taken from development right across the drifts has run about $22 per ton. The July clean-up amounted to $25,000.

Plans for a refinery have been drawn, and the plant at the Porcupine Crown will be very complete by the time the snow falls.

The Lucky Cross Mine at Swastika has shut down in order to make alterations and repairs to the mill. It is also probable that there will be a change in the management. Just before closing down the richest shoot of ore ever encountered in the mine was opened up on No. 9 vein at the 100 foot level. The vein in the face of the drift is three feet wide and is full of free gold. Tests show the presence of telluride. This is the first indication of this mineral nearer than Kirkland Lake. The vein has been drifted on for about fifty feet and has shown consistent values, but it was not until the last shoots were put in a little while before closing that the high grade was encountered.

Schumacher Opens a Good Ore Shoot.—What promises to be one of the most important strikes of the year in the Porcupine camp has been made on the property of the Schumacher mine. At the 100 foot level the vein is five feet wide. Of this three feet is very high grade ore and two feet of $10 ore. It had at the beginning of the month been drifted on for twenty feet, and the face was as good as where the vein was first struck. Work at the Schumacher mine was last year hindered by an unfortunate accident, which made it impossible to drift further towards the lake on the 100 foot level. There was a change of mine management and Mr. Joe Houston counselled diamond drilling. This was one of the veins from which good cores appeared in the drill.

Jupiter Mill.—Owing to various reasons it has been decided to delay the building of the Jupiter mill. It will not be built this year. The working staff, which was at one time this summer the fourth largest in camp, will be reduced and underground development will proceed at a normal rate of progress.

The McIntyre has struck its vein at No. 5 shaft, 45 feet below the 200 foot level. The ore is said to be of an excellent grade. This will now provide another point from which the new mill can be supplied with ore. It is proposed to build an aerial tramway across Pearl Lake from No. 4 shaft.

The Hughes Porcupine is now sinking to the 400 foot level. About fifty feet of drilling has been done both ways from the winze. At the 300 foot level the vein is still good.

Burnside Property.—A rich but small vein has been found on the south lot of the Burnside property at Kirkland Lake. This claim adjoins the Wright-Hargraves property. The vein is not more than an inch wide on the surface, but the fissure has been traced for fifty feet and some very rich specimens have been taken out.

Exploring Party Returns from Hudson Bay.—Another party has returned from the east shore of Hudson Bay without finding either placer gold or precious stones. The party left Cochrane early in May and went to Rupert's House and their proposed destination via the Harricanaw. They arrived back in Cochrane at the end of July. While disappointed at the failure of the expedition, the members are optimistic as to the possibilites of the country as a field for exploraton.

Vipond Mine.—There is a possibility that the Vipond mine may be started up again shortly. It is understood that all outstanding debts have been met and that the shaft will be dewatered soon and work commenced. The mine has been shut down since the fall, when the strike disorganized labour.

The Teck-Hughes vein at the 100 foot level of that Kirkland Lake property has been cut and shows good high grade ore. It was found sixteen feet from the conglomerate porphyry contact. It is fourteen inches of typical Kirkland high grade ore. The shaft was put down on the vein, but it dipped out at about forty feet. A winze will now be sunk on the ore and the vein followed down to the 200-ft. level. As the vein on the surface has been traced and stripped for a thousand feet on the Teck-Hughes and the Wettlaufer, with good values on the surface, the strike at the 100 foot level seems significant.

Tough-Oakes Finds More Ore.—In cutting the station at the 100 foot level of the Tough-Oakes mine an additional four inches of high grade ore was encountered about nine feet from the main vein. A station and ore pocket is now being cut at the 200 foot level, and the shaft will be carried down with all despatch to the 300 foot level. Five claims in Teck and Lebel township, in which Mr. C. A. Foster has a controlling interest, have been incorporated into the Tough-Oakes Gold Mines, with a capitalization of $3,000,000, in 600,000 shares, with a par value of $5. Four hundred and fifty thousand shares have been paid to the original holders for the claims and 50,000 shares will be offered to the public at $4 a share in order to finance the building of a mill.

COBALT, SOUTH LORRAIN, GOWGANDA AND ELK LAKE

Concentration Methods at Cobalt.

At the reception given to the A3 excursion of the International Geological Congress by the Cobalt branch of the Canadian Mining Institute, Mr. Fraser Reid, of the Coniagas, gave a most interesting resume of the development of the concentration of Cobalt ores. Mr. Reid, as a patentee of a table that is making a marked gain in saving, was very competent to give this paper. He has been in charge of the Con-

iagas mill since its building, and has watched the various processes for the reduction of the ore as they were evolved. Mr. Reid is a graduate of Queen's, and had the distinction also of being one of the pioneers of the Cobalt camp. He has done much to bring the process of straight concentration to its present efficiency in the camp.

He stated to the visitors that to-day the camp has 500 stamps in operation, with a dropping weight of 625,000 pounds and roll mills to the equivalent of 150 stamps, giving a total dropping weight if all were stamps of 800,000 pounds of metal.

About 75 per cent. of the total ore milled is crushed by stamps, the stamps being in favour owing to the hardness and toughness of the ore, and simplicity and reliability of it as a crushing device.

After describing the process of straight concentration in detail, Mr. Reid said that up to the latter part of 1912 the cyanide process played a minor part in the recovery of silver. But with new additions to the Dominion Reduction mill and the advent of the Nipissing low grade mill the process had now become a more important factor in the production of the camp.

Amalgamation is employed in three mills, the Nipissing and Buffalo high grade mill treating high grade ore and concentrates, and the Dominion Reduction treating concentrates only. These mills recover the values in the form of marketable bullion. Amalgamation does not play any part in the recovery of values from the low grade ores.

There were thirteen mills in the camp using straight concentration, three using cyanide as an adjunct to concentration, the Buffalo mill cyaniding the slimes only, the Dominion Reduction and the O'Brien, which reground the sand tailings from the concentration process and cyanided the whole. One mill only, the Nipissing low grade, used an all sliming cyanidation process.

An analysis of the total silver production of the camp would show approximately the following figures: recovered by sorting underground, about 50 per cent.; recovered by preliminary treatment in mills, 20 per cent.; recovered by mechanical concentration after stamping, 17 per cent.; recovered by cyaniding, 13 per cent.

The ratio of concentration by mechanical concentration averaged 37 tons of ore to one of concentrates.

Mr. Reid also described lucidly the process in vogue at the Nipissing low grade and at the O'Brien mill, giving them as instances of divergence from the general practice in the camp.

Mr. A. A. Cole, now recognized as the authority on the statistics of the Cobalt camp, also gave an example of his versatility in exhibiting slides of veins underground. In their photographic perfection and completeness these are probably unique, and the visitors were delighted with the graphic nature both of the slides and the description Mr. Cole gave of them.

Reception Appreciated by Geologists.

As indicative of the appreciation the geologists felt for the treatment they received at the hands of the local committee and the Cobalt mine owners, the following letter received by the committee speaks for itself:

"We, the undersigned members of the Twelfth International Geological Congress, wish hereby to tender and express to the local committee members, Messrs. E. V. Neelands, A. A. Cole, B. Neilly, Fraser Reid and Chas. Watson, our hearty appreciation and thanks for the thoughtfulness, hospitality and executive ability which have made so remarkably effective and delightful our visit to Cobalt, under the leadership of Dr. Miller, the godfather of the district. We beg to express also to the managements of the Coniagas, Crown Reserve, Beaver and Timiskaming mines and of the Nipissing high grade mill, and to the ladies, our appreciation of the cordial reception, worthy of so uniquely prosperous a mining district."

Lumsden Mine.—A twenty ton car of high grade ore from the Lumsden mine, now being treated at Campbell and Deyell's, is interesting, inasmuch as it is the first ore shipped from this property. Most of it has been stored for some time. The Lumsden property is controlled and very largely owned by Mr. John Lumsden, of Ottawa. It is situated on Brady Lake, adjoining the Rochester and the Badger, and is separated by one claim from the Timiskaming and the Beaver, the only two other producing mines in this portion of Coleman township. Short shoots of very rich ore have been found on the Lumsden property from time to time, and this has been taken out as it has been found. This is the ore that is now being shipped. It came from the 250 and 300 foot levels. Three drills are working on calcite veins, on the 225, 250, and 300 foot levels. While these veins have yielded some high grade ore, they now show only low values in silver.

Orion Realty Company's Ore Seized.—An unusual occurrence was witnessed in the camp this week, when a car of concentrates belonging to the Orion Realty Company was seized to pay debts. The car was valued at $11,000. The Orion Realty Company was working the old Silver Cliff property on a lease, but ran out of funds. The car has since been released and has gone to the smelters.

Hudson Bay Output for June.—Owing to the fact that operations at the Hudson Bay mine have necessitated the handling of much waste rock, the heads at the mill ran as low on an average as 20.20 ounces to the ton. This, of course, did not include high grade. The reduction for the month of June was 42,814 ounces, the ore concentrated amounted to 2,096 tons, mill heads, 20.20 ounces to the ton, tails, 3.60 ounces to the ton, extraction, 82.70 per cent.; ore crushed in 24 hours 77.6 tons. A fire during the last week in July destroyed the engine house at the Hudson Bay, and the output for that month will therefore be lower than usual, as operations had to be suspended. The Hudson Bay is one of the many Cobalt companies seeking new mining ventures. They are now stripping a vein on a property in Beattie township near Painkiller Lake, with a view to taking a working option on it if the vein fulfils expectations. They have, however, finally abandoned their claims at Hangingstone Lake, near Gowganda. They are starting work on some claims of their own staking at Kirkland Lake.

The June Mill Report of the Buffalo Mines Reads: Mill ran, 610 hours; ore milled, 5,955 tons; average assay per ton before milling, 31.15 ounces; ounces silver recovered, 161,331; ounces of silver paid for during the month, 33,621 ounces.

The Mapes Johnston Mining Company, working near Elk Lake, has bought the plant of the Montreal James, also an Elk Lake property, but long shut down. This fall the Mapes Johnston intend to open up their property on a larger scale, all working being carried on by hand so far.

STATISTICS AND RETURNS

Cobalt Ore Shipments.

The ore shipments for the week ending August 8th, with the classifications, are:

Mine.	High.	Low.	Pounds.
Coniagas	4	0	337,120
Cobalt Townsite	1	0	61,500
Trethewey	1	1	92,083
McKinley	2	0	129,500
Cobalt Lake	1	0	64,200
Seneca Superior	1	0	62,500
Casey Cobalt	1	0	45,000
Timiskaming	1	0	61,330
Miscellaneous	1	0	79,000
Total	13	1	932,233

The shipments from the Cobalt camp, for the year to date, are:

Mine.	High.	Low.	Tons.
Bailey	5	1	158.15
Beaver	8		237.43
Chambers-Ferland	3	4	223.77
City of Cobalt	4		105.14
Cobalt Townsite	39		1,411.65
Cobalt Lake	20		644.08
Buffalo	2		66.13
Coniagas	32		1,073.83
Crown Reserve	14		336.00
Cobalt Comet	24		377.83
Green-Meehan		1	12.96
Hudson Bay	10		369.81
Kerr Lake	16	1	440.61
LaRose	37	3	1674.64
McKinley-Darragh	45		1674.64
Nipissing	2	37	1132.85
O'Brien	9		327.06
Seneca-Superior	6	3	280.69
Silver Cliff	2		48.05
Trethewey	8	8	408.67
Temiskaming	11	3	362.64
Casey-Cobalt	5		287.52
Colonial	1		21.56
General Mines		1	8.80
Silver Queen			169.89
Wettlaufer			122.26
Miscellaneous	3		127.55
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
Total	305	64	12,289.12

The bullion shipments for the week ending August 8th, are:—

Mines.	Bars.	Ounces.	Value.
Nipissing	106	129,164.73	$76,530.10
O'Brien	27	25,125.00	14,394.78
Kerr Lake		4,051.90	2,413.18
Penn-Can	5	3,550.00	2,094.00
Trethewey	3	2,351.00	1,396.00
Cobalt Comet	3	1,434.15	847.00
		165,676.78	$97,675.06

The bullion shipments for the year to date are:—

Nipissing	3,488,703.72	$2,001,953.72
Penn-Can	10,760.30	6,445.08
Buffalo	918,165.90	578,964.39
Crown Reserve	260,266.00	161,738.25
Dom. Red.	314,860.40	181,256.58
Townsite	10,909.00	6,647.00
Miscellaneous	3,920.00	1,623.00
Timiskaming	17,760.20	10,335.41
O'Brien	118,309.77	61,998.66
Wettlaufer	4,715.00	2,925.00
Miller Lake	3,710.20	2,053.01
Colonial	635.00	374.00
Trethewey	13,529.83	8,282.04
Casey Cobalt	2,394.00	1,520.00
Kerr Lake	18,330.88	11,461.16
Bailey	1,839.00	1,103.40
Cobalt Lake	1,717.80	996.36
Wettlaufer	4,391.00	2,634.60
City of Cobalt	1,755.45	1,053.00
Preston East Dome	3,452.60	2,002.50
Cobalt Comet	2,432.65	1,426.13
	5,202,558.70	$3,056,793.29

STATISTICS OF PENNSYLVANIA ANTHRACITE PRODUCTION, 1907-1912

Year.	Quantity (long tons).	Value.	Average price per ton	Average number men employed	Average number days worked
1907	76,432,421	$163,584,056	$2.14	167,234	220
1908	74,347,102	158,178,849	2.13	174,174	200
				†171,195	
1909	72,384,249	149,181,587	2.06		205
				‡166,801	
1910	75,433,246	160,275,302	2.12	169,497	229
1911	80,771,488	174,952,415	2.17	172,585	246
1912	75,322,855	177,622,626	2.36	174,000	231

†State mining department figures. ‡U. S. census figures.

STOCK MARKETS.

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

Toronto, Ont., Aug. 7, 1913.

New York Curb.

	Bid.	Ask.
British Copper	2.75	3.00
Braden Copper.	6.87½	7.00
Giroux Copper.	1.37½	1.50
Goldfield Cons.	1.62½	1.75
Greene Can.	6.25	6.50
Chino Copper	39.87½	22.50
Inspiration Copper	15.12½	15.25
Ray Cons.	19.00	19.25
Nevada Cons.	16.25	16.50
Miami Copper	22.37½	22.50
Tonopah Mining	4.25	4.37½
Tonopah Belmont	6.43¾	6.56¼
Tonopah Merger	.70	.71
Standard Oil of N.Y.	368.00	370.00
Standard Oil of N.J.	369.00	370.00
Standard Oil Old Stock	1075.00	.....
Standard Oil Subs	750.00	.....
Yukon Gold	2.06½	2.12½

Porcupine Stocks.

Apex	.00½	.01½
Crown Chartered	.00½	.01
Dome Extension	7.00	7.00½
Dome Lake	.35	.37
Dome Mines	13.50	14.50
Eldorado	.....	.....
Foley O'Brien	.20	.23
Hollinger.	15.00	15.50
Jupiter.	.26	.28
McIntyre.	1.75	2.00
Moneta.	.03	.06
North Dome	.25	.40
Northern Exploration	.50	1.50
Pearl Lake	.33¼	.34
Plenaurium.	.75	1.00
Porcupine Gold	.08	.08½
Imperial.	.01½	.02
Porcupine Reserve	...	.14
Preston East Dome	.02	.02½
Rea.	.15	.30
Standard.	.....	.....
Swastika	.03¼	.04¼
United.	.00½	.01
West Dome	.10	.20

Sundry.

	Bid.	Ask.
American Marconi	4.12½	4.50
Canadian Marconi	2.00	2.50

Cobalt Stocks.

	Bid.	Ask.
Bailey.	.07⅜	.07½
Beaver.	.32½	.33
Canadian.	.21½	.23
Chambers Ferland	.17½	.19
City of Cobalt	.49	.50
Cobalt Lake	.57	.62
Coniagas.	7.10	7.60
Crown Reserve, ex-div.	2.40	2.50
Foster.	.05	.08
Gifford.	.04½	.05
Gould.	.03	.03¼
Great Northern	.12	.12½
Hargraves.	.03	.06
Hudson Bay	69.00	74.00
Kerr Lake	3.50	3.65
La Rose	2.25	2.35
McKinley.	1.80	1.82
Nipissing.	9.60	9.75
Peterson Lake	.20½	.21½
Right of Way	.04	.06
Rochester.	.03	.03½
Leaf.	.03	.03¼
Cochrane.	.75	1.00
Silver Queen	.03	.05
Timiskaming.	.29	.31
Trethewey.	.27	.33
Wettlaufer.	.11	.12
Seneca Superior, ex-div.	2.10	2.40
Porcupine Crown	1.10	1.30
Buffalo.	2.25	2.50

TORONTO MARKETS.

Aug. 11—(Quotations from Canada Metal Co., Toronto).
Spelter, 5½ cents per pound.
Lead, 5.75 cents per pound.
Tin, 44 cents per pound.
Antimony, 9½ cents per pound.
Copper, casting, 15¾ cents per pound.
Electrolytic, 15¾ cents per pound.
Ingot brass, 11 to 15 cents per pound.

Aug. 11—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).

Aug. 11—(Quotations from Elias Rogers Co., Ltd., Toronto).
Coal, anthracite, $7.50 per ton.
Coal, bituminous, lump, $5.00 per ton.

GENERAL MARKETS.

Aug. 8—Connellsville Coke (f.o.b. ovens).
Furnace coke, prompt, $2.50 per ton.
Foundry coke, prompt, $3.00 per ton.

Aug. 8—Tin, straits, 41.70 cents.
Copper, Prime Lake, 15.75 cents.
Electrolytic copper, 15.75 cents.
Copper wire, 16.75 to 17.00 cents.
Lead, 4.50 cents.
Spelter, 5.65 to 5.75 cents.
Sheet zinc (f.o.b. smelter), 7.50 cents.
Antimony, Cookson's, 8.37½ cents.
Aluminum, 22.75 to 23.25 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	25	59	27 3/16
"	26	59⅛	27¼
"	28	59⅜	27⅜
"	29	59⅝	27½
"	30	59⅜	27⅜
"	31	59⅜	27⅜
Aug.	1	59¼	27 5/16
"	2	59⅜	27⅜
"	4	59⅜	....
"	5	59¼	27 5/16
"	6	59⅛	27¼
"	8	59	27 3/16
"	9	59	27 1/16
"	11	59¼	27 5/16
"	12	59¼	27 5/16